Istanbul Platform Capabilities

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Now Platform Capabilities

The ServiceNow Platform is a powerful cloud application platform that enables you to link real-time data with activities, tasks, and processes to achieve better work outcomes.

This video explains some of the essential concepts of ServiceNow and demonstrates how to navigate the UI.

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. The features should not be used 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
- Safari version 6.1 and later
- Internet Explorer version 10 and later
  - 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 Connect

Several types of components are installed with Connect.

Tables installed with Connect

Connect adds the following tables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborator</td>
<td>Stores a record for each conversation, for each conversation member.</td>
</tr>
<tr>
<td>[collaborator]</td>
<td></td>
</tr>
<tr>
<td>Connect Action</td>
<td>Stores a record for each Connect action. This table is also used in Connect Support.</td>
</tr>
<tr>
<td>[connect_action]</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The Collaborator table is left over from the Collaborator plugin in Fuji. It is not used in Connect or Live Feed.

Properties installed with Connect

Connect adds the following system properties.

**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: Configure the email notification interval</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: Disable the Connect overlay on page 35</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: Customize the Connect audio notification sound on page 35</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.  
  - 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 |
### Name: glide.live_feed.task_header_button

Determined whether the show live feed icon (pearance) 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

### Business rules installed with Connect

Connect adds the following business rules.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add message to conversations</td>
<td>Visual Task Board Card [vtb_card]</td>
<td>Generates system messages for conversations created from Visual Task Boards. The messages provide updates when cards are added to the board or moved between lanes.</td>
</tr>
<tr>
<td>Broadcast Chat APNS</td>
<td>Live Feed Message [live_message]</td>
<td>Generates push notifications when new messages are received in a conversation.</td>
</tr>
<tr>
<td>Broadcast Chat APNS</td>
<td>Live Mention [live_mention]</td>
<td>Generates push notifications when a user is mentioned in a conversation.</td>
</tr>
<tr>
<td>Connect: Notify Record Conversations</td>
<td>Attachment [sys_attachment]</td>
<td>Enables record conversations to display attachments added to the underlying record, in real time.</td>
</tr>
<tr>
<td>Send Notification</td>
<td>Notification [live_notification]</td>
<td>Generates the appropriate notifications when a user is mentioned in an activity stream.</td>
</tr>
<tr>
<td>Sync Board Members With Group Members</td>
<td>Live Group Member [live_group_member]</td>
<td>Adds Visual Task Board members as conversation members when you create a conversation from the board.</td>
</tr>
</tbody>
</table>
Notifications installed with Connect

Connect adds the following notifications.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration Offline Group Message(s)</td>
<td>Sends an email notification to offline users when there are new messages in group chats they are members of. Contains a link to open the conversation and a summary of the messages.</td>
</tr>
<tr>
<td>Collaboration Offline Message Bundle</td>
<td>Sends an email notification to offline users when there are new messages in direct chats. Contains a link to open the conversation and a summary of the messages.</td>
</tr>
<tr>
<td>ConnectMessagePushNotification</td>
<td>Sends push notifications to users according to their notification preferences. This notification also impacts Connect Support.</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 Legacy chat to Connect Support migration on page 54.

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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 Connect Support

Several types of components are installed with Connect Support.
Note: Connect Support also utilizes many of the components installed with Connect Chat.

### Tables installed with Connect Support

Connect Support adds the following tables for system use.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chat Queue Entry Transfer [chat_queue_entry_transfer]</td>
<td>Stores a record each time an agent transfers a support conversation to another agent.</td>
</tr>
</tbody>
</table>

### Properties installed with Connect Support

Connect Support adds the following system properties.

<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>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td>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>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 0</td>
</tr>
<tr>
<td></td>
<td>• Location: Collaborate Support Administration Properties</td>
</tr>
<tr>
<td>glide.connect.support.enabled</td>
<td>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.</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>
<tr>
<td>glide.connect.support.reflect_system_messages</td>
<td>Controls whether Connect Support reflects system messages in records created from a support chat, for example, transfer notices, automated queue messages, etc.</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>
</tbody>
</table>

Business rules installed with Connect Support

Connect Support adds the following business rules.
<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNC - Chat Queue Average Wait Time</td>
<td>Chat Queue Entry [chat_queue_entry]</td>
<td>Populates the Average wait time field on the Chat Queue table with a calculated value when a support conversation is accepted. The calculation is based on the last 20 support conversations for the queue.</td>
</tr>
<tr>
<td>SNC - Chat Queue Entry Duration</td>
<td>Chat Queue Entry [chat_queue_entry]</td>
<td>Populates the Duration field on the Chat Queue Entry table with a calculated value, based on the amount of time the support conversation was open.</td>
</tr>
<tr>
<td>SNC - Reflect Support Record in Q.Entry</td>
<td>Live Group Profile [live_group_profile]</td>
<td>Populates the Document table and Document ID fields on the Chat Queue Entry table when an agent creates an incident from a support conversation.</td>
</tr>
</tbody>
</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 1: Additional plugins for Connect Support**

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
</table>
| Connect Support Manager's Dashboard [com.glide.connect.managers_dashboard] | 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.  

**Note:** The Connect Support Manager's Dashboard plugin does not activate Connect Support automatically. You must activate Connect Support to collect data for the homepage. |
<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
</table>
| Human Resources Application: HR Connect  
[com.snc.hr.hr_connect]                                      | 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.                                                                                           |
| Performance Analytics - Content Pack - Service Desk Chat  
[com.snc.pa.chat]                                             | 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.                                                                                                                                 |
| Performance Analytics - Context Sensitive Analytics for Chat  
[com.snc.pa.chat.context_sensitive-analytics]                | 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. |
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 new conversations.

The sidebar is collapsed by default. Click the toggle Connect sidebar icon

![Toggle Connect Sidebar](image)

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 new 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 3: 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 2: Chat mini window icons

<table>
<thead>
<tr>
<th>Icon</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄</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>📄</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>📲</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>⌋</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>✗</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>🔘</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 new Connect actions.</td>
</tr>
<tr>
<td>🗣</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 provides additional tools to help keep track of important information in conversations.

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 3: 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 Connect sidebar.</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 4: 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 4: Conversation tool tabs

<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Info](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. |
<p>| <img src="image" alt="Record" /> | 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. |</p>
<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>📚</td>
<td>Knowledge Base</td>
<td>Displays a compact view of the knowledge homepage. For more information, see <em>Share knowledge in a Connect Support conversation</em> on page 47.</td>
</tr>
<tr>
<td>👤</td>
<td>Members</td>
<td>Lists all members of the current conversation. You can add or remove conversation members for group and record conversations.</td>
</tr>
<tr>
<td>📄</td>
<td>Attachments</td>
<td>Lists all attachments in the conversation. Click an attachment to open it. Click Add Attachment to upload an attachment.</td>
</tr>
<tr>
<td>📣</td>
<td>Notification preferences</td>
<td>Contains settings to control which notifications you receive for the current conversation. For more information, see <em>Edit which notifications you receive for a conversation</em> on page 28.</td>
</tr>
</tbody>
</table>

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. Enable or disable Connect mobile, desktop, email, or audio notifications.

Edit which notifications you receive for a specific conversation.

Connect notification browser support

The following browsers support Connect chat notifications.
Table 5: 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. |
| Microsoft Edge                               | Notifications are enabled by default on Windows 10 PCs and tablets starting with EdgeHTML 14. For more information, see  

**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 Connect notification browser support on page 27.

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.

<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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Desktop Notification Settings</th>
<th>Choose to receive desktop 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Email Settings</th>
<th>Choose to receive email 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audio Notification Settings</th>
<th>Choose to receive audio 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>
</tbody>
</table>

| System Message Notifications | Enable or disable system message notifications, which are automatically generated by events like conversation membership changes and Visual Task Board updates. This option is not available for direct conversations. |
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 (i), 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 42 and Connect Support administration on page 54.

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>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Disable Presence glide.ui.presence.disabled | Turns off user presence globally when enabled. Enabling this property turns off user presence throughout the platform, not just in Connect.  
- Type: true | false  
- Default value: false  
- Location: Collaborate Administration Properties  
- Learn more: User presence |
| Enable Connect in the frameset collaboration.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 35 |
| Enable Connect to retrieve external link metadata in order to render richer content in messages with links to YouTube, news articles, images, etc. 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 |
| Number of minutes to wait before collecting unread messages and sending an email to offline users. collaboration.email_interval | 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 |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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. 
connect.notification.audio_alert | 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 35 |
| 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* |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable the legacy chat &quot;Create or Join Chat Room&quot; link on the Incident form (Must have Chat plugin enabled to see link)</td>
<td>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.</td>
</tr>
<tr>
<td>glide.connect.enabled</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>
</tbody>
</table>

### 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 `collaborationrameset` property to `false`.

1. Navigate to Collaborate Administration Properties.
2. Locate the property called Enable Connect in the frameset (`collaborationrameset`) and clear the check box.
3. Click Save.

When the frameset is disabled, any Connect chats open in the Connect workspace.

### 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 Collaborate 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 Collaborate Administration Actions.
2. Click New or open an existing Connect action.
3. Complete the Connect Action form, as appropriate.

<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 conversation.type === &quot;support&quot; or conversation.table === 'chat_queue_entry'. 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Script    | Script to execute when the action is run. For example, to create a new incident based on the conversation, enter the following code: ```
response.newRecord("incident",{
    short_description:
    conversation.document.short_description
    ||"",
    caller_id:
    conversation.document.opened_by
});
``` For information about the response object, see the API reference documentation. **Note:** You can only create a Connect action based on a task table. |
| Shortcut  | Text that triggers the action when entered after the "/" character in a conversation. |
| Title     | Text that appears in the Connect action menu. The title for each Connect action should be unique. |
Figure 6: 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.

### 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.</td>
</tr>
<tr>
<td></td>
<td>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><strong>Follow the record and open a chat mini window</strong></td>
<td>1. In the form header, click the down arrow in the Follow button.</td>
</tr>
<tr>
<td></td>
<td>2. Select Open Connect Mini.</td>
</tr>
<tr>
<td></td>
<td>The system adds you as a member of the record conversation and opens it in a Connect mini window.</td>
</tr>
<tr>
<td><strong>Follow the record and open the Connect workspace</strong></td>
<td>1. In the form header, click the down arrow in the Follow button.</td>
</tr>
<tr>
<td></td>
<td>2. Select Open Connect Full.</td>
</tr>
<tr>
<td></td>
<td>The system adds you as a member of the record conversation and opens it in the Connect workspace, the full-screen view.</td>
</tr>
</tbody>
</table>

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 ( ).
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.

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>
<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>
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 32.

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 Collaborate 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 8. When Connect Support is enabled, users designated as support agents have access to the support tab of the Connect sidebar.

Features include:

- Administrators can create chat queues and enable users to access live support.
- Support agents can monitor the queues to provide instant support.
• Drag-and-drop sharing of links, files, and records.

UI16 or UI15 is required to use Connect Support.

**Note:**
- Connect Support does not replace legacy chat but offers some of the same functionality. The features should not be used 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 (สะอาด).
   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 8: 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.

![Book icon](image)

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 977.

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>
<tbody>
<tr>
<td><strong>Transfer the conversation to an agent</strong></td>
<td>1. To start the transfer request, click Transfer by an agent's name. Be sure to choose an agent who is online, which is indicated by a green dot on their avatar. You can cancel the transfer any time before it is accepted.</td>
</tr>
</tbody>
</table>

2. When the transfer is accepted, select one of the following options in the dialog box that appears.
   - Stay: Remain in the conversation. This 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. This 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>
</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 ( - ). |

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 to field on the Chat Queue [chat_queue] table. For more information, see *Administer Connect Support queues* on page 56.

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 9: Connect Support states diagram
### Table 8: Connect Support chat states

<table>
<thead>
<tr>
<th>State</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Waiting                | • Requestor/end user entered a queue by sending a message; agent did not accept it yet  
                         | • End user re-joins a session before agent closes it                                                                                     |
| Work in Progress       | • Agent accepts a chat from a queue. Both requester and agent  
                         | • Requestor/client leaves an ongoing conversation (session times out, loss of connectivity); agent does not end a session; requester rejoins |
| Closed Abandoned       | Requestor/client leaves a conversation before agents accepts it                                                                           |
| Closed Escalated       | Agents escalated an ongoing conversation by performing Escalate action from a hamburger menu.                                             |
| Closed Complete        | • Agent leaves/closes an ongoing conversation with a requestor/client  
                         | • End user times out  
                         | • End user ends their session                                                                                                           |

### 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 32.

### Legacy chat to Connect Support migration

Use these basic steps to migrate from legacy chat to Connect Support.

### Context

Connect Support is an extension of Connect. Users designated as support agents have access to the support tab of the connect sidebar. Connect Support should not be used 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 won't work accurately.
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 13.

Hide the Social IT application

Activating Connect Support doesn't completely eliminate the legacy chat module. To prevent users from using it, hide the Social IT application menu. For more information, see Enable or disable an application menu or module.

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 9: 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>
<tbody>
<tr>
<td>Should Connect be used for handling chat queue entries glide.connect.support.enabled</td>
<td>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.</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>
<tr>
<td>Number of support conversations an individual agent can have at one time (-1 is unlimited) 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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Show agent avatar in Connect Support conversations.</strong> connect.support.show_agent_avatar&lt;br&gt; <strong>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.</strong>&lt;br&gt;• Type: true</td>
<td>false&lt;br&gt;• Default value: true&lt;br&gt;• Location: Collaborate Support Administration Properties</td>
</tr>
<tr>
<td><strong>Number of seconds to wait (without user interaction), before presenting end-users with an idle countdown timer</strong> connect.support.idle.delay&lt;br&gt; <strong>Determines how many seconds a user must be inactive in a support conversation before an idle countdown timer appears.</strong>&lt;br&gt;• Type: integer&lt;br&gt;• Default value: 120&lt;br&gt;• Location: Collaborate Support Administration Properties</td>
<td></td>
</tr>
<tr>
<td><strong>Number of seconds to count down from before marking end-user as having left their support session</strong> connect.support.idle.count_down&lt;br&gt; <strong>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.</strong>&lt;br&gt;• Type: integer&lt;br&gt;• Default value: 60&lt;br&gt;• Location: Collaborate Support Administration Properties</td>
<td></td>
</tr>
<tr>
<td><strong>Limits the number of closed conversations that the support user can see. (0 = unlimited)</strong> connect.support.user.closed.conversation_limit&lt;br&gt; <strong>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.</strong>&lt;br&gt;• Type: integer&lt;br&gt;• Default value: 0&lt;br&gt;• Location: Collaborate Support Administration Properties</td>
<td></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. Connect and legacy chat should not be used concurrently.

1. Navigate to Collaborate Queues .
2. Click New or open an existing queue from the list.
3. Complete the Chat Queue form, as appropriate.

Table 10: 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>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 Collaborate 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.

Configure the add support users property

Administrators need to configure the property for support agents to add users to a Connect Support conversation.

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 the property does not already 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>

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.

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 support organization's recent performance. 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 11: 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 [com.glide.connect.managers_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>Performance Analytics - Context Sensitive Analytics for Chat [com.snc.pa.chat.context_sensitive_analytics]</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>
</tbody>
</table>

**Note:** For more information about these plugins, including which other plugins they activate, see Additional plugins for Connect Support on page 16.

**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 Collaborate 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)
Istanbul ServiceNow Now Platform Capabilities

- 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 Premium 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.

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 2250.
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 2250 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>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/&gt;$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>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>

### Content packs and in-form analytics for Service Desk Chat

Content packs 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 content packs and in-form analytics on instances that have not licensed Performance Analytics Premium to evaluate the functionality. However, to start collecting data you must license Performance Analytics Premium.

### Content packs

The Performance Analytics widgets on the dashboard visualize data over time. These visualizations allow you to analyze your business processes and identify areas of improvement. With content packs, you can get value from Performance Analytics for your application right away, with minimal setup.

**Note:** Content packs 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 content pack 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.

### Legacy: Chat

Legacy chat provides real-time communication via instant messaging between users in a ServiceNow instance.

**Note:** The Connect on page 8 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.

Figure 11: Chat Desktop

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 the following 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 the following 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                                                                                              • Default value: assignment_group,watch_list                                                                                       • 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>glide.chat.sound.message_received.mp3</td>
<td>Sound played when a message is received in chat (mp3).</td>
</tr>
<tr>
<td></td>
<td>• Type: string                                                                                              • Default value: media/rcvmsg.mp3                                                                                             • Location: Social IT Chat Administration Properties</td>
</tr>
<tr>
<td>glide.chat.sound.message_received.ogg</td>
<td>Sound played when a message is received in chat (ogg).</td>
</tr>
<tr>
<td></td>
<td>• Type: string                                                                                              • Default value: media/rcvmsg.ogg                                                                                               • Location: Social IT Chat Administration Properties</td>
</tr>
<tr>
<td>glide.chat.sound.queue_beep.mp3</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• Type: string                                                                                              • Default value: media/button_toggle_on.mp3                                                                                      • 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.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  
- Location: Social IT Chat Administration Properties |
| glide.short_poll_delay | 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.  
- Type: integer  
- Default value: 1000 (one second)  
- Location: Social IT Chat Administration Properties |

### Legacy: Script includes installed with legacy chat

Legacy chat adds the following 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 the following 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>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</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</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>Chat Queue Entry [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 [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 [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 [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 [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 [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 [sys_live_message]</td>
<td>System table that stores and manages chat messages. Extending or modifying data in this table is not recommended.</td>
</tr>
</tbody>
</table>
### Legacy: Business rules installed with legacy chat

Legacy chat adds the following 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>SNC - Chat Queue Average Wait Time</td>
<td>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.
Figure 12: Chat desktop

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>
<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.

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture</td>
<td>Select any picture. Your picture appears beside your name in other users' favorites list and at the top of your favorites list.</td>
</tr>
</tbody>
</table>

Figure 13: 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 14: 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 15: 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 16: 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><img src="image" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td>• Out to lunch</td>
<td><img src="image" alt="Beth Anglin" /></td>
</tr>
<tr>
<td></td>
<td>You cannot create a custom message from the chat desktop.</td>
<td>Figure 17: Chat away msg</td>
</tr>
</tbody>
</table>

![Diagram of System Administrator showing user statuses](image)
## Status and Description

<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="image" alt="Beth Anglin" /></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="image" alt="Beth Anglin" /></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 15: 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 (IFS): access a menu with options to *add a favorite user*, *view online users*, *create a chat room*, and *view chat rooms*.
  - Add User (IFS):
    - :*add a favorite user*.
  - Create Room (IFS):
    - :*create a chat room*.
  - Invitations (IFS):
    - :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 (верху) 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.

Figure 25: 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.

Figure 26: 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.

Figure 27: 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.

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 31: 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.
Create Room

<table>
<thead>
<tr>
<th>Room name:</th>
<th>Chat Room for INC0000003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Wireless access not available on floor 3</td>
</tr>
<tr>
<td>Password:</td>
<td>*****</td>
</tr>
<tr>
<td>Room access:</td>
<td>![Warning Icon]</td>
</tr>
<tr>
<td>Features:</td>
<td><strong>Public</strong>&lt;br&gt;A room that can be found by any user through normal means such as searching and service discovery.</td>
</tr>
<tr>
<td></td>
<td><strong>Members Only</strong>&lt;br&gt;A room that a user cannot enter without being on the member list or invited.</td>
</tr>
<tr>
<td></td>
<td><strong>Temporary</strong>&lt;br&gt;A room that is destroyed if the last occupant exits.</td>
</tr>
<tr>
<td>Invite:</td>
<td>Fred Ludy&lt;br&gt;Beth Anglin&lt;br&gt;ITIL User</td>
</tr>
</tbody>
</table>

**Figure 32: Chat task create**
### Table 16: 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 33: 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>

**Legacy: Create a chat room for a task**

How to start a legacy chat with multiple users from a task record.
Note: This procedure is not possible if the Connect on page 8 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](Figure 36: 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](Figure 37: 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 8 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.
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 (,:) (example, 😊). 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</td>
<td>😊 Figure 39: Smiley</td>
</tr>
<tr>
<td>B) B-) BD B-D</td>
<td>😎 Figure 40: Shades</td>
</tr>
<tr>
<td>:D :-D</td>
<td>😃 Figure 41: Big smile</td>
</tr>
<tr>
<td>:* :-*</td>
<td>😞 Figure 42: Kiss</td>
</tr>
<tr>
<td>:( :-(</td>
<td>😞 Figure 43: Frown</td>
</tr>
<tr>
<td>Text</td>
<td>Image</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>&lt;3</td>
<td><img src="image" alt="Heart" /></td>
</tr>
<tr>
<td>;) ;-)</td>
<td><img src="image" alt="Wink" /></td>
</tr>
<tr>
<td>:P :-P</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>:O :-O</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>X( X-(</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>:&quot;) :&quot;-&gt;</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>:(( :((</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>(A)</td>
<td><img src="image" alt="Smiley" /></td>
</tr>
<tr>
<td>;? ;:?</td>
<td><img src="image" alt="Smiley" /></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 53: 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 54: 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 55: 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 56: Chat window menu
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 in Changing 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](image)

Figure 57: 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.

Figure 58: 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:
  
  \[\text{answer} = \text{g\_chat.getChatType()} == \text{'queue\_agent'};\]
- OnClick Action Script:
  
  \[\text{alert('The current user is: ' + g\_chat.getChatType());}\]
Chat action details

You can define a chat action name and the script that runs when the action is selected.

<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 pre-defined 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.

<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:</td>
</tr>
<tr>
<td></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>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>
<tr>
<td>Return Object</td>
<td>Details</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| **return**    | String - Returns one of the following values that specifies the type of user:  
|               | • queue_agent: Help Desk Chat support agent  
|               | • queue_user: Help Desk Chat end user  
|               | • group_chat: The individual is a member of a chat room (multiple users)  
|               | • conversation: The individual is a member in a private chat with another user |

<table>
<thead>
<tr>
<th>String</th>
<th>getChatQueueAgent()</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returns the sys_id for agent that is administering this thread.</td>
</tr>
</tbody>
</table>
|               | Returns:  
|               | String - Returns the sys_id of the chat queue agent. |

<table>
<thead>
<tr>
<th>String</th>
<th>getChatQueueUser()</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returns the sys_id for end user of the chat queue.</td>
</tr>
</tbody>
</table>
|               | Returns:  
|               | String - Returns the sys_id of the chat queue user. |

<table>
<thead>
<tr>
<th>String</th>
<th>getThreadID()</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Returns the thread ID. This returns the same value as g_chat.getChannelJID().getID().</td>
</tr>
</tbody>
</table>
|               | Returns:  
|               | String - Returns the thread ID. |

### Legacy: Help desk chat

Communicate with service desk staff using instant messaging.

**Note:** The [Connect Support](#) on page 44 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.

Figure 60: 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 44. 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 19: Chat queue details

<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)

Figure 62: 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.

![Chat queue link](image)

Figure 63: Chat queue link

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.

![HTML editor button](image)

Figure 64: HTML editor button

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,
    'c54f0abf0a0a0b452db84664f409c79c',
    '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. 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.

---

**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.
Live feed includes different types of feeds.
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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 139 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 102.
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 66: 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 20: 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. You may</td>
</tr>
<tr>
<td></td>
<td>choose to leave this field blank and include conditions in the script.</td>
</tr>
<tr>
<td>Description</td>
<td>Enter a description of the table notification.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>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 <code>${URI}</code> in the message text as shown in the following example. High priority incident opened: <code>${URI}</code> Short description: <code>${short_description}</code></td>
</tr>
</tbody>
</table>

**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:

\[
\text{Problem } \{\text{number}\} - \{\text{short\_description}\} \text{ has been resolved. } \{\text{fixed\_By\_Msg}\}
\]

- 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 fixed\_By\_Msg that we can access from the message
fixed\_By\_Msg = "" ; if ( !current. assigned\_to. nil ( ) )
```
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 68: 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 69: 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.
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

Using domain separation with the live feed application allows administrators to keep user content within a specific domain.

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 or UI11: 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 21: iFrame block fields

<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</td>
</tr>
<tr>
<td></td>
<td>(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</td>
<td>Stores links and attachments that are added to messages.</td>
</tr>
<tr>
<td>Live Favorite</td>
<td>Stores the favorite conversations, user groups, and messages.</td>
</tr>
<tr>
<td>Live Feed Searches</td>
<td>Stores live feed text searches. Access at Collaborate Feed Administration Search Log.</td>
</tr>
<tr>
<td>Live Follows</td>
<td>Maintains users’ follow preferences for user feeds.</td>
</tr>
<tr>
<td>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</td>
<td>Maintains the member lists for conversation and user group.</td>
</tr>
<tr>
<td>Live Mention</td>
<td>Stores the profiles mentioned in a message. References sys_user table.</td>
</tr>
<tr>
<td>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 Messages</td>
<td>Stores messages. References sys_user table. Access at Collaborate Feed Administration Messages .</td>
</tr>
<tr>
<td>Live Poll</td>
<td>Stores a poll question.</td>
</tr>
<tr>
<td>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</td>
<td>Stores poll options.</td>
</tr>
<tr>
<td>Live Table Notification</td>
<td>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 .</td>
</tr>
<tr>
<td>Live Tag</td>
<td>Maintains user-created tags. Access at Collaborate Feed Administration Tags .</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

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>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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Live feed integration</td>
<td>Journal Entry</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</td>
<td>Generates a notification event when new members are added.</td>
</tr>
<tr>
<td>live feed profile events</td>
<td>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</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</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</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</td>
<td>Ensures that a public group is visible.</td>
</tr>
<tr>
<td>LiveFeed Group Profile Visibility 2.0</td>
<td>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 belong to.</td>
</tr>
<tr>
<td>LiveFeed Membership Changes</td>
<td>Live Group Member</td>
<td>Enforces that only the group administrator and users with live_feed_admin role can manage membership for a group.</td>
</tr>
<tr>
<td>LiveFeed Single Group Membership</td>
<td>Live Group Member</td>
<td>Ensures that a user is not added multiple times to the same group.</td>
</tr>
<tr>
<td>Live Message Likes</td>
<td>Live Message Like</td>
<td>Updates the number of likes for a message.</td>
</tr>
<tr>
<td>LiveFeed Join Group Check</td>
<td>Live Group Member</td>
<td>Ensures that users can not automatically join private visible groups.</td>
</tr>
<tr>
<td>Update Follow/Follower Counts</td>
<td>Live Follow</td>
<td>Updates the following/followers counts.</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 Group</td>
<td>Assessable Record</td>
<td>Creates/Deletes a live feed group for an assessable record</td>
</tr>
<tr>
<td></td>
<td>[asmt_assessable_record]</td>
<td></td>
</tr>
<tr>
<td>Live Feed Message Visibility</td>
<td>Live Feed Message</td>
<td>Ensures user's access to live feed messages</td>
</tr>
<tr>
<td></td>
<td>[live_message]</td>
<td></td>
</tr>
</tbody>
</table>

**Email notifications installed with Live Feed**

Live Feed plugin installs the following email notifications..

<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Feed Feed Member Accepted</td>
<td>Sends an email to the administrator when a user has accepted to join the feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Declined</td>
<td>Sends an email to the administrator when a user has declined to join the feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Invited</td>
<td>Sends an email to a user when they have been invited to join a feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Left</td>
<td>Sends an email to the administrators when a user has left the feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Removed</td>
<td>Sends an email to user when they have been removed from the feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Request</td>
<td>Sends an email to administrators when an user requests to join a feed.</td>
</tr>
<tr>
<td>Live Feed Feed Member Request Accepted</td>
<td>Sends an email to the user when their request to join a feed is accepted.</td>
</tr>
<tr>
<td>Live Feed Feed Request Rejected</td>
<td>Sends an email to the user when their request to join a feed has been rejected by an administrator.</td>
</tr>
<tr>
<td>Live Feed MsgReply Subscription</td>
<td>Sends an email when a reply or reply_to_reply message is inserted into the thread of a message in a feed.</td>
</tr>
<tr>
<td>Live Feed Team Member Accepted</td>
<td>Sends an email to administrators when a user accepts an invitation to join a team.</td>
</tr>
<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>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
Figure 70: Example image

**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.
Figure 71: Tag

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 (>Edit) appears.
5. Click the edit tag icon.

Figure 74: 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.

Figure 75: 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.

![Figure 76: Message with tag icon](image)

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 77: 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 and UI11, 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.
Figure 78: Bookmark hashtag

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.

Figure 79: Hashtag in post

The hashtags associated with the message are displayed, along with 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.

![Figure 81: Pending members](image)

3. Click Pending members. This shows the users who have received invitations, but who have not yet accepted.
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.
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.
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
text field for comments on the activity formatter, each live post overwrites the field value. Comments added through live feed start with #LiveFeed on the activity formatter.

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.

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.

![Create group feed](image_url)
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 89: 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 90: 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.
Note: 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.

Figure 92: Profile

The profile record opens.

Figure 93: 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 94: 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>
<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 95: 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 23: Feeds types

<table>
<thead>
<tr>
<th>Feed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Live Feeds</td>
<td>Displays the following posts:</td>
</tr>
<tr>
<td></td>
<td>• messages from users you follow</td>
</tr>
<tr>
<td></td>
<td>• messages with hashtags you follow</td>
</tr>
<tr>
<td>Company Feed</td>
<td>Displays all posts, except those posted to private or unlisted groups.</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.

---

### Feed Description

<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>

---

**Figure 100: 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.

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**Bookmark feeds and hashtags**

The live feed interface uses the standard bookmarking functionality for feeds and hashtags.

In UI15 and UI11, 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.
Add content

ITFM Business Unit Overview
ITFM Overview
ITFM Segment Overview
ITFM Trending Dashboard
Live Feed
Performance Analytics
Project Daily Report
Project Portfolios
Text Search
Timeline

Live Feed

Compan…

Messages

Search messages

Add here

Add here

Add here

Add here
Use Live Feed with UI11

Using Live Feed with UI11 requires the UI11-Navpage layout with multiple panes plugin.

1. If you do not see a gray toolbar on the left side of the screen (called your edge), click the Switch to the new UI link in the banner.
2. Navigate to Collaborate Live Feed.
3. Drag the Live Feed module to the edge.
4. Point to the bookmark on your edge. When the tip window appears, click Edit Bookmark.
5. Select the Flyout check box.
6. Click Update.

   • You can now access live feed in a flyout window without navigating away from your working panes.
   • Notifications appear on the edge when new messages are posted in your My Feed.

   ![Image of UI11 notification]

   **Figure 103: UI11 notification**

   • When you open the bookmark, a blue circle appears beside new messages.
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 , , or 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 ( ![ paperclip icon ](image) ) 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 ( ![ paperclip icon ](image) ) 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.

Figure 107: 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 108: 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 (📝).
Note: The copy/paste functionality is supported in Chrome, Firefox, and Internet Explorer 11.

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.

![Figure 109: Add a URL](image)

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.

![Figure 110: URL Saved](image)
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.

![Figure 111: KB link](image)

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.
4. In the Question field, enter the question on which you are soliciting opinions.
5. In the Option fields, enter possible responses to the query.
6. To add more response options, click Add more options.
7. 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

Set up

- Basic email setup on page 183
- Advanced email setup on page 185
- Create an email notification on page 233
- The email client on page 349
- System mailboxes on page 349
- Inbound email actions on page 311

Push Notifications

- Set up push notifications for the ServiceNow mobile app on page 369
- Set up push notifications for a custom push app on page 372
- Push notifications on page 361

Subscription-based notifications

- Set up a notification device on page 386
- Add personal subscriptions on page 388
- Modify notifications for a specific user device on page 391

Troubleshoot and get help

- Ask or answer questions in the Notifications 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

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 311. 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 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 181.

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

ServiceNow Instance

Outbox with Email To:
user@yourdomain.com

Inbox For:
instance@service-now.com

Send

ServiceNow Outbound Mail Server
relay
Sends Email To:
user@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:
yourdomain.com
mx.yourdomain.com

Your Incoming Mail Server
pop.yourdomain.com
Route To Mailbox For:
user@yourdomain.com

Your Outbound Mail Server
smtp.yourdomain.com
Send Email To:
instance@service-now.com

Receive

User Email Account

Inbox For:
user@yourdomain.com

Outbox with Email To:
instance@service-now.com
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</td>
<td>Email sending</td>
<td>glide.email.smtp.active</td>
<td>Yes</td>
</tr>
<tr>
<td>Configuration</td>
<td>enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inbound Email</td>
<td>Email receiving</td>
<td>glide.email.read.active</td>
<td>Yes</td>
</tr>
<tr>
<td>Configuration</td>
<td>enabled</td>
<td></td>
<td></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

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.

4. Click New. The system displays a blank Email Account form.

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.
Figure 114: Sending email using your own SMTP server

- **ServiceNow Instance**
  - Outbox with Email To: user@yourdomain.com
  - Inbox For: instance@service-now.com

- **Domain Name System (DNS)**
  - Lookup Mail Server For: yourdomain.com
  - mx.yourdomain.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

- **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
  - Forward Rule Sends Email To: instance@service-now.com

- **Email**
  - Passed Your Spam Filter?
  - Yes

- **User Email Account**
  - Outbox with Email To: helpdesk@yourdomain.com

- **Inbox For**
  - user@yourdomain.com

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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 115: Receiving email using your own POP3 server

- **Outbox with Email To:** user@yourdomain.com
- **Inbox For:** helpdesk@yourdomain.com

**ServiceNow Instance**

**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: user@yourdomain.com

**Your Outbound Mail Server**

- smtp.yourdomain.com
- Send Email To: helpdesk@yourdomain.com

**Email Passes Your Spam Filter?**

- Yes (Send)
- No (Stop)

**Inbox For:** user@yourdomain.com

**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.

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>
Using your own SMTP and POP3 servers

ServiceNow Instance

Outbox with Email To:
user@yourdomain.com

Inbox For:
helpdesk@yourdomain.com

Send

Domain Name System (DNS)

Lookup Mail Server For:
yourdomain.com
mx.yourdomain.com

Receive

Your Outbound Mail Server
smtp.yourdomain.com
Send Email To:
user@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

Receive

User Email Account
Inbox For:
user@yourdomain.com

Outbox with Email To:
helpdesk@yourdomain.com

Email Passes Your Spam Filter?

Stop

No

Yes

Send
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](#) for more information.

Acting 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](#) 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](#) 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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.

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.
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
- IMAP

1. Navigate to System Mailboxes Administration Email Accounts.
2. Click New.
3. Fill in the fields on the form (see table).

### Table 25: Email Account fields

<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).</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The address in the From field on the Notification form takes precedence over this field.</td>
</tr>
<tr>
<td>Password</td>
<td>Password when Authentication type is Password.</td>
</tr>
<tr>
<td></td>
<td><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 test email address (non-production testing)**
  -
- **Append time zone 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, 650, 653, 654
- **Resend email when server returns unknown SMTP error codes.**
  - Yes | No
- **Notes 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:_r, _r, Accepted, Tentative, Declined:
- **Identify email as a forward by these subject prefixes**
  - Te, Fwd:
- **Discard everything below this text if found in a reply body (comma separated, case sensitive)**
  - from, Original Message, — inFrom,
- **Ignore email with these headers (comma separated, case sensitive)**
  - X-ServiceNow-Flag=YES, X-ServiceNow-Virus-INFECTED, Au
- **Ignore email when subject starts with text (comma separated, case insensitive)**
  - out of office autoresponder, undeliverable, delivery failure, returned mail:
- **Ignore email from these senders. Use the name before the @ sign, (comma-separated)**
  - mail-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
- **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 200 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>Email sending enabled</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Send all email to this test email address (non-production testing)

Append timezone to dates and times in sent email

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Create visible watermark in sent email. If false, create invisible watermark via hidden div tag.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Resend email if server returns these SMTP error codes

421,450,451,452

Do not resend email if server returns these SMTP error codes

500,501,502,503,504,550,551,552,553,554

Resend email when server returns unknown SMTP error codes.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Roles that can view email in the Activity formatter when including "Sent/Received Emails"

| itil |

Number of journal entries (Additional comments, Work notes, etc.) Included in email notifications (-1 means all).

3
<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</td>
<td>Specifies the comma-separated list of email addresses to which</td>
</tr>
<tr>
<td></td>
<td>(non-production testing)</td>
<td>the instance sends all email messages. Typically used in non-production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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</td>
<td>Specifies whether to append the system time zone to date and date/time</td>
</tr>
<tr>
<td></td>
<td>sent mail</td>
<td>values in outbound emails. For example,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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</td>
<td>Indicates whether the watermark in email notifications is visible</td>
</tr>
<tr>
<td></td>
<td>mail. If false, create invisible</td>
<td>(true) or wrapped in a hidden div tag (false).</td>
</tr>
<tr>
<td></td>
<td>watermark via hidden div tag.</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</td>
<td>Specifies the comma-separated list of SMTP error codes that force the</td>
</tr>
<tr>
<td></td>
<td>SMTP error codes</td>
<td>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</td>
<td>Specifies the comma-separated list of SMTP error codes that prevent the</td>
</tr>
<tr>
<td></td>
<td>these SMTP error codes</td>
<td>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>
<tr>
<td>Property</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<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\n_____ \n\nFrom:

Ignore email with these headers (comma separated name:value pairs)

X-ServiceNow-Spam-Flag: YES, X-ServiceNow-Virus: INFECTED, Auto-Subm

Ignore email when subject starts with text (comma separated, case insensitive)

out of office autoreply, undeliverable:, delivery failure:, returned mail:, au

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>
<tbody>
<tr>
<td>glide.email.read.active</td>
<td>Email receiving enabled</td>
<td>Specifies whether to enable or disable the inbound 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.reply_subject_prefix</td>
<td>Identify email as a reply by these subject prefixes</td>
<td>Specifies the comma-separated list of prefixes in the subject line that identify an email reply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>re:,aw:,r:,Accepted:,Tentative,Declined:</td>
</tr>
</tbody>
</table>

**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>
</tbody>
</table>
|                          |                                                                      | • Default value: 

-----

Original Message-----,


_____ 

From:
<table>
<thead>
<tr>
<th>Property</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.pop3.ignore_headers | Ignore email with these headers (comma separated name:value pairs) | 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 (*) for the subtype. For example, Content-Type:multipart/*; report-type=delivery-status; ignores emails containing a type of multipart and a value of report-type=delivery-status. For syntax specifications, see http://www.w3.org/Protocols/rfc1341/4_Content-Type.html.  
• Type: string  

**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 (Ignore mail from untrusted domains unless from an existing user; use * for all domains)</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>

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>
<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>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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>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</td>
</tr>
<tr>
<td></td>
<td><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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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_bytes</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>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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
</tbody>
</table>
|                                         | • Type: true | false  
|                                         | • Default value: false  
|                                         | • Location: System Property [sys_properties] table  
| glide.email.smtp.max_recipients         | 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.  |
|                                         | • Type: integer  
|                                         | • Default value: 100  
| glide.email.smtp.max_send               | 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.                                                                                                           |
|                                         | • Type: integer  
|                                         | • Default value: 100  
| glide.email.text_plain.strip_xhtml      | Indicates whether both outbound and inbound emails that are shown in comments convert the XML to plain text (true) or preserve the XML (false).                                                                                                                                         |
|                                         | • Type: true | false  
|                                         | • Default value: true  
| glide.imap.secure                       | Specifies whether to enable SSL encryption for connections to the IMAP server.                                                                                                                                                                                                 |
|                                         | • Type: true | false  
|                                         | • Default value: false  
| glide.imap.secure.port                  | Specifies the communications port for IMAP secure connections.                                                                                                                                                                                                                   |
|                                         | • Type: string  
|                                         | • Default value: 995  

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.imap.tls | Specifies whether to start the IMAP server in Transport Layer Security (TLS) mode.  
  - Type: true | false  
  - Default value: false |
| glide.notification.recipient.exclude_logging | 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.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.exclude_logging.device_inactive | Logs recipients who are excluded because their chosen notification device record is marked as inactive.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.exclude_logging.device_schedule | Logs recipients who are excluded based on the Schedule field on the New Device for System Administrator form for their chosen notification device.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.exclude_logging.event_creator | 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.  
  - Type: true | false  
  - Default value: true |
| glide.notification.recipient.exclude_logging.invalid_email | Logs recipients who are excluded because the email address for that user is invalid, for example the @ is missing, or empty.  
  - Type: true | false  
  - Default value: true |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| glide.notification.recipient.exclude_logging.user_calendar_integration_disabled | Logs recipients of calendar invitations who are excluded because the Calendar Integration field is set to None on the user record.  
- Type: true | false  
- Default value: true |
| glide.notification.recipient.exclude_logging.user_inactive    | Logs recipients who are excluded because the Active check box is cleared on the user record.  
- Type: true | false  
- Default value: true |
| glide.notification.recipient.exclude_logging.user_notification_disabled | Logs recipients who are excluded because the Notification field is set to Disabled on the user record.  
- Type: true | false  
- Default value: true |
| glide.notification.recipient.include_logging                  | 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 | false  
- Default value: true |
| glide.notification.recipient.include_logging.delegate         | Logs recipients who are included because they are delegates of another user.  
- Type: true | false  
- Default value: true |
| glide.notification.recipient.include_logging.event_parm       | Logs recipients who are included because they are in the parm1 or parm2 fields of the event record.  
- Type: true | false  
- Default value: true |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</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>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 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 all instances within the system.

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 29: 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>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</td>
</tr>
<tr>
<td></td>
<td>inbound email action purposes. Typically, these emails are either spam or auto-replies. See</td>
</tr>
<tr>
<td></td>
<td>the Error String field for details.</td>
</tr>
<tr>
<td></td>
<td>• send - failed: The server has attempted to send the email and failed.</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>was generated but lacked a recipient email address or is a duplicate email. See the Error</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>Note:</td>
<td>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>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.

*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.
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 30: Message body size limit properties

<table>
<thead>
<tr>
<th>Name</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. 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>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 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>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 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>
</table>
| `glide.email.inbound.max_attachment_count` | Sets the maximum number of attachments allowed per inbound email.  
• Type: integer  
• Default value: 30  
• Learn more: Inbound Email Attachment Processing |
| `glide.email.inbound.max_total_attachment_size_bytes` | Sets the maximum total attachment size in bytes allowed per inbound email.  
• Type: integer  
• Default value: 18874368  
• Learn more: Inbound Email Attachment Processing |
### Name | Description
---|---
glide.email.outbound.max_attachment_count | Sets the maximum number of attachments allowed per outbound email.  
  • Type: integer  
  • Default value: 30  
  • Learn more: Outbound Email Attachment Processing

glide.email.outbound.max_total_attachment_size_bytes | 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.  
  • Type: integer  
  • Default value: 18874368  
  • Learn more: Outbound Email Attachment Processing

**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:

```markdown
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.

Email diagnostics and troubleshooting inbound and outbound email

The Diagnostics and Connection page displays information about 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 121: Email diagnostics

Table 32: Email Diagnostics and Connection page

<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.</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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.</td>
</tr>
<tr>
<td>SMTP Sender 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 Sender 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.</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>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></td>
</tr>
<tr>
<td>Email Receiving</td>
<td>Status of inbound email as either Enabled or Disabled.</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 status of the email reader job, which downloads any email waiting on the mail server and creates email.read events.</td>
</tr>
<tr>
<td>Email Reader Processing Time</td>
<td>Duration of the last reader job run. This value should be shorter than the 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></td>
</tr>
<tr>
<td>{Accounts}</td>
<td>The result of the test connection to the accounts. The connection is tested 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 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 links to a video series on troubleshooting outbound emails.</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>

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 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 an email notification

Creating an email notification involves specifying when to send it, who receives it, and what it contains.

Role required: admin

**Note:** If you do not see all the fields on the form, switch to the Advanced view.

1. Configure email properties to enable your instance to send and receive email.
2. Navigate to System Notification Email Notifications.
3. Click New.
4. Fill in the fields at the top of the Email Notifications form, as appropriate (see table).
Use Email Notifications to send email about specific activities in ServiceNow, such as updates to incidents or change requests, to selected users. Email notifications allow administrators to specify:
- When to send the notification
- Who receives the notification
- What content is in the notification

Users can choose whether to receive email notifications by setting a preference on their User record. More info

<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></td>
<td><strong>Attention:</strong> 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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Only tables and database views that are in the same application scope appear in the list.</td>
</tr>
<tr>
<td>Type</td>
<td>Select the type of notification you are creating: EMAIL or Meeting Invitation.</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to enable the email notification.</td>
</tr>
<tr>
<td>Description</td>
<td>Type a description for this notification.</td>
</tr>
</tbody>
</table>

5. Fill in the fields on the When to send tab (see table).
**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: when a record is inserted or updated or when a particular event is triggered.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Weight     | [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.

**Note:** The SMTP Sender scheduled job determines how often to send email. By default, this job runs every minute.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Conditions | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Inserted   | Select the check box to enable email notification when a record is inserted. This field is visible only when the Send when field has been set to Record inserted or updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Updated    | Select the check box to enable email notification when a record is updated. This field is visible only when the Send when field has been set to Record inserted or updated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Event name | Select the event that triggers this notification. This field is visible only when the Send when field has been set to Event is fired.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
Field | Description
--- | ---
Advanced condition | Create a script to perform certain actions, like sending a notification based on the current email 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. Fill in the fields on the Who will receive tab (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`.

![Notification settings example](image-url)
<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>
<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, then 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.</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 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.</td>
</tr>
<tr>
<td>Exclude delegates</td>
<td>Select this option to prevent the instance from sending email notifications to delegates of the users you selected.</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.</td>
</tr>
<tr>
<td></td>
<td>For new notifications, this option is selected by default.</td>
</tr>
<tr>
<td></td>
<td>If you want know why you may not be receiving certain email notifications, see the blog post <a href="https://community.servicenow.com/articles/Troubleshooting-email-notifications-Send-to-the-Event-Creator?view=print">Troubleshooting email notifications - Send to the Event Creator</a> by a ServiceNow Technical Support Engineer in the ServiceNow Community.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event parm 1 contains recipient</td>
<td>Select this check box if the event parameter 1 contains one or more email recipients (in a comma separated-list). This field is visible only when the Send when field is set to Event is fired.</td>
</tr>
<tr>
<td>Event parm 2 contains recipient</td>
<td>Select this check box if the event parameter 2 contains one or more email recipients (in a comma-separated list). This field is visible only when the Send when field is set to Event is fired.</td>
</tr>
<tr>
<td>Subscribable</td>
<td>Select this check box to allow all users to subscribe to this notification. See Subscription-based notifications on page 386 for more information.</td>
</tr>
</tbody>
</table>

**Note:** Do not enable this option for notifications that contain sensitive or protected data or where you want to restrict who can see it.

**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. If the record contains sensitive or protected data, consider restricting the recipient list to just those users and groups who normally have access to it, and do not enable the Subscribable option.

7. Fill in the fields on the What it will contain tab (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 <em>Extra line spacing with paragraph tags in email client</em> 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. Do not remove the watermark as a reply to an email without a watermark creates an incident rather than updating the incident the original email referred to. For more information, and an alternative way to hide watermarks, see Watermarks on notification emails on page 347.</td>
</tr>
<tr>
<td>Message Text</td>
<td>Enter the notification message to send in plain text. This field is visible only if 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.</td>
</tr>
<tr>
<td>From</td>
<td>Enter the email address that you want the email notification to use in the From field. 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>Reply to</td>
<td>Enter the email address you want people to use when replying to the email notification. 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>Push message only</td>
<td>Select this option to send this notification only as a push notification to a mobile device. The Push Notification feature must be active.</td>
</tr>
<tr>
<td>Push messages</td>
<td>Associate one or more push messages with this notification. The Push Notification feature must be active.</td>
</tr>
</tbody>
</table>

**Note:** The push message and notification must be for the same table.
8. Click Submit.

Images can be inserted into email notifications that were created in the Eureka release or that were converted to rich format using the HTML editor. The images can be stored in the image library in your instance, or they can be inserted as attachments.

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.
<table>
<thead>
<tr>
<th>Content type</th>
<th>HTML and plain text</th>
<th>Importance</th>
<th>-- None --</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include attachments</td>
<td></td>
<td>From</td>
<td></td>
</tr>
<tr>
<td>Omit watermark</td>
<td></td>
<td>Reply to</td>
<td></td>
</tr>
</tbody>
</table>
| Push Message Only | Push Messages | Notify test case user | }

**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 uri = new Assessment.Title().getAssessmentInstanceURL(current.sys_id);
var url = "http://" + uri + "Link + "="<a href=" + uri + "Link"></a>"

template.print(url);
</mail_script>

To view your test queue at any time, sign in and navigate to Self-Service > My Tests.
```
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.
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.

**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, which increases total attachment size by approximately 37%.

**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:

```
${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 122: 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 | CHG00000001

Users
ITIL User

Subject
Change Request CHG00000001 notification -- Rollback Oracle Version

Body
Short description: Rollback Oracle Version
Click here to view Change Request: CHG00000001

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 33: 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>
</tbody>
</table>
| Event type             | The type of event that triggers the notification. This choice list appears if you preview an event-triggered notification. Select one of the following:  
  - Generated Event: Preview the notification with a generic event that the previewer creates. This does not actually generate an event record.  
  - Existing Event: Preview with an existing event record in the instance. If you select this option, select the event in the Event Record field. |
<p>| Event Record           | 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). |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users</td>
<td>The users who will receive the notification, as specified in the Who will receive section of the Email Notification form:</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td>Subject and Body</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

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 34: 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 $(number) - comments added</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Output: Incident INC1000001 - comments added</td>
</tr>
<tr>
<td><code>${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='${picture}?t=medium'/&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Output: Copyright © 2018 ServiceNow. All rights reserved.</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) Output:</td>
</tr>
<tr>
<td></td>
<td>• ${URI_REF}</td>
<td>• sysparm_scriptlet</td>
<td>$(URI) Output:</td>
</tr>
<tr>
<td></td>
<td>• URI: The link text is the word LINK.</td>
<td>• sysparm_view</td>
<td>Click here to view incident: LINK</td>
</tr>
<tr>
<td></td>
<td>• URI_REF: The link text is the display value of the record.</td>
<td></td>
<td>$(URI_REF) Source: Click here to view incident: $(URI_REF) Output:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Click here to view incident: INC0000055</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 LINK</td>
<td>• sysparm_scriptlet</td>
<td>Click here to view Incident: INC0010002 Click here to view Related Problem: R10040001</td>
</tr>
<tr>
<td></td>
<td>• URI_REF: The link text is the display value of the record.</td>
<td>• sysparm_view</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>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Available parameters</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>${notification:body}</code></td>
<td>Display the body contents of an email template or email notification. Use this notification variable to specify where to display body content in an email layout.</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><code>${mail_script:script-name}</code></td>
<td>Run the specified mail script.</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td><code>${NOTIF_UNSUB}</code></td>
<td>Display a link unsubscribe from this notification.</td>
<td>link_text: specify the text to display as a link within quotation marks.</td>
<td></td>
</tr>
<tr>
<td><code>${NOTIF_PREFS}</code></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](image1)

Click here to view incident: LINK

![Comments:](image2)

**Figure 123: 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):

```plaintext
${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](image3)

Click here to view incident: LINK

![Comments:](image4)

**Figure 124: 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):

```plaintext
${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 125: 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](image)
Click here to view Related Problem: PRB0040001

Figure 126: 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.

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>Table 36: Available unsubscribe macros</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unsubscribe type</strong></td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>Unsubscribe by email</td>
</tr>
<tr>
<td>(Unauthenticated)</td>
</tr>
<tr>
<td>Unsubscribe by notification preferences</td>
</tr>
<tr>
<td>(Authenticated)</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 127: 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.
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 37: 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 (sysemail_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".

```java
    template.print("Incident number - " + current.number);
```

More advanced scripts, like this one, can be found by browsing through the base system email templates.

```java
    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:

```java
    ... 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.
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```javascript
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.

```javascript
//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.

```javascript
if(!current.watch_list.nil()){
    //get watch list addresses and add to cc
    var watcherIds = current.watch_list.split(",");

    //get user records
    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 38: 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>
</tbody>
</table>

**Note:** GlideSysAttachment.copy copies all attachments; it cannot select specific attachments.
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Table</th>
<th>Description</th>
<th>Parameters</th>
<th>Script</th>
</tr>
</thead>
</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 (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>
<tbody>
<tr>
<td>Display Whether Tasks Have Attachments in List View</td>
<td>Business Rule</td>
<td>Attachments</td>
<td>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).</td>
<td>when: after insert/delete</td>
<td>function checkAttachment();</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[sys_attachment]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```javascript
function checkAttachment()
{
  if (current.operation() == 'insert')
  {
    hasAttachment('true');
  } // if inserting the task has an attachment
  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 the 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: glutiderecord query start date time is: ' + timeNow4.getNumericValue(), 'jwtest');
    hasAttachment = 'true';
  }
}
```
### 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>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule Controlling Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointment Invite</td>
<td>Type: Meeting Invitation</td>
<td>itil_appointment.inserted</td>
<td>Global business rule</td>
</tr>
<tr>
<td></td>
<td>Adds a meeting invitation to the recipient’s calendar by sending an iCalendar formatted email</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment Update</td>
<td>Type: Meeting Invitation</td>
<td>itil_appointment.updated</td>
<td>Global business rule</td>
</tr>
<tr>
<td></td>
<td>Updates an existing meeting in the recipient’s calendar by sending an iCalendar formatted email</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approval Rejected</td>
<td>Type: EMAIL</td>
<td>approval.rejected</td>
<td>approver events</td>
</tr>
<tr>
<td></td>
<td>An approval has been rejected – includes the approver’s name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approval Rejected by Other</td>
<td>Type: EMAIL</td>
<td>approval.rejected.by.other</td>
<td>approver events</td>
</tr>
<tr>
<td></td>
<td>An approval has been rejected – includes the approver’s name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approval Request</td>
<td>Type: EMAIL</td>
<td>approval.inserted</td>
<td>approver changes</td>
</tr>
<tr>
<td></td>
<td>Sends an email for the recipient to reply with an approval decision.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the approval email, the recipient selects a link that builds the appropriate reply email.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalog Approval Rejected</td>
<td>Type: EMAIL</td>
<td>request.approval.rejected</td>
<td>approver events</td>
</tr>
<tr>
<td></td>
<td>A catalog request has been rejected – includes the approver’s name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalog Approval Request</td>
<td>Type: EMAIL</td>
<td>request.approval.cancelled</td>
<td>approver changes</td>
</tr>
<tr>
<td></td>
<td>A catalog request for which you were an approver has been cancelled.</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>
| Catalog Approval Request           | Type: EMAIL  
A catalog request for which you are an approver has been made.      | request.approval.inserted         | approval events                 |
| Certificate Expired                | Type: EMAIL  
Notification that the X.509 certificate has expired.                  | certificate.expired               | certificate events              |
| Certificate Expiring               | Type: EMAIL  
Notification that the X.509 certificate is expiring in N days.          | certificate.expiring              | certificate events              |
| Change approved                    | Type: EMAIL  
A change request has been approved.                                      | change.approved                   | Change events and task events   |
| Change assigned to me              | Type: EMAIL  
A change request has been assigned to you.                                | change.assigned                   | Change events                   |
| Change assigned to my group        | Type: EMAIL  
A change request has been assigned to your group.                         | change.assigned.to.group          | Change events                   |
| Change commented (to assignee)     | Type: EMAIL  
A comment has been added to a change request. The person assigned to the change request receives an email notification. | change.commented                  | Change events                   |
| Change commented (unassigned)      | Type: EMAIL  
A comment has been added to a change request. The assignment group assigned to the change request receives an email notification. | change.commented                  | Change events                   |
<table>
<thead>
<tr>
<th>Email notification</th>
<th>Description</th>
<th>Triggering event</th>
<th>Business Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Notification</td>
<td>Type: EMAIL&lt;br&gt;Notification of a change in the fields label in a form.</td>
<td>label.notify</td>
<td></td>
</tr>
<tr>
<td>Change rejected</td>
<td>Type: EMAIL&lt;br&gt;A change request has been rejected.</td>
<td>change.rejected</td>
<td>Change events and task events</td>
</tr>
<tr>
<td>Change Task worknoted (unassigned)</td>
<td>Type: EMAIL&lt;br&gt;A work note has been added to a change task. The assignment group assigned to the change task receives an email notification.</td>
<td>change_task.worknoted</td>
<td>Change task events</td>
</tr>
<tr>
<td>Change Task worknoted (to assignee)</td>
<td>Type: EMAIL&lt;br&gt;A work note has been added to a change task. The person assigned to the change task receives an email notification.</td>
<td>change_task.worknoted</td>
<td>Change task events</td>
</tr>
<tr>
<td>Change Task assigned to my group</td>
<td>Type: EMAIL&lt;br&gt;A change task has been assigned to your group.</td>
<td>change_task.assigned.to_me</td>
<td>Change task events</td>
</tr>
<tr>
<td>Change Task assigned to me</td>
<td>Type: EMAIL&lt;br&gt;A change task has been assigned to you.</td>
<td>change_task.assigned</td>
<td>Change task events</td>
</tr>
<tr>
<td>Change worknoted (to assignee)</td>
<td>Type: EMAIL&lt;br&gt;A work note has been added to a change request. The person assigned to the change request receives an email notification.</td>
<td>change.worknoted</td>
<td>Change events</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&lt;br&gt;A work note has been added to a change request. The assignment group assigned to the change request receives an email notification.</td>
<td>change.worknoted</td>
<td>Change events</td>
</tr>
<tr>
<td>Email assigned to</td>
<td>Type: EMAIL&lt;br&gt;An incident has been assigned to you (the recipient of the email).</td>
<td>incident.assigned</td>
<td>incident.events</td>
</tr>
<tr>
<td>Email assigned to (sc_task)</td>
<td>Type: EMAIL&lt;br&gt;A task has been assigned to you (the recipient of the email).</td>
<td>sc_task.assigned.to.user</td>
<td>sc_task_events</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email assigned To Group</td>
<td>Type: EMAIL&lt;br&gt;An incident has been assigned to an assignment group of which you are a member (the recipient of the email).</td>
<td>incident.assigned.to.group</td>
<td>incident.events</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>Email assigned to group (sc_task)</td>
<td>Type: EMAIL</td>
<td>sc_task.assigned.to.group sc_task_events</td>
<td></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>
<tr>
<td>Incident Opened &amp; Unassigned</td>
<td>Type: EMAIL</td>
<td>incident.inserted</td>
<td>incident events</td>
</tr>
<tr>
<td></td>
<td>An incident has been opened and is unassigned. This notification uses a template for an ITIL user.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident Resolved</td>
<td>Type: EMAIL</td>
<td>incident.updated</td>
<td>incident events</td>
</tr>
<tr>
<td></td>
<td>An incident opened by you has been resolved, and feedback is required to determine if the incident should be closed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Closed Created</td>
<td>Type: EMAIL</td>
<td>kb.submission.closed_created_event</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A contributor’s submission to the Knowledge Base was accepted and an article was created.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Closed Duplicate</td>
<td>Type: EMAIL</td>
<td>kb.submission.closed_duplicate_event</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A contributor’s submission to the Knowledge Base was determined to be a duplicate, and no article was created.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Closed Invalid</td>
<td>Type: EMAIL</td>
<td>kb.submission.closed_invalid_event</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A contributor’s submission to the Knowledge Base was determined to be invalid ( unusable).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notify Change Calendar</td>
<td>Type: Meeting Invitation</td>
<td>change.calendar.notify</td>
<td>change events</td>
</tr>
<tr>
<td></td>
<td>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.</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>
| Notify Change Calendar Remove           | Type: Meeting Invitation  
Notifies 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.calendar.notify.Remove 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>
<tbody>
<tr>
<td>Problem worknoted (unassigned)</td>
<td>Type: EMAIL</td>
<td>problem.worknoted</td>
<td>Problem events</td>
</tr>
<tr>
<td></td>
<td>A work note has been added to a problem. The assignment group assigned to the problem receives an email notification.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reminder Insert</td>
<td>Type: Meeting Invitation</td>
<td>reminder.notify</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Creates a calendar reminder regarding an open task. The email is in the format of iCalendar formatted email.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reminder Insert</td>
<td>Type: Meeting Invitation</td>
<td>reminder.notify.delete</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reminder Insert Email</td>
<td>Type: EMAIL</td>
<td>reminder.notify.email</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sends the recipient a reminder email about a specific task.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Approved</td>
<td>Type: EMAIL</td>
<td>sc_request.approved</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>A Service Catalog request, opened by the recipient, has been approved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Assigned</td>
<td>Type: EMAIL</td>
<td>sc_requestassigned</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>A Service Catalog request has been assigned to the recipient.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request Completed</td>
<td>Type: EMAIL</td>
<td>sc_request.updated</td>
<td>sc_request events</td>
</tr>
<tr>
<td></td>
<td>A Service Catalog request, opened by the recipient, has been completed.</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>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`.

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.
gs.eventQueueScheduled( "incident.reminder", current, gs.getUserId(), gs.getUserName(), current.u_reminder);

3. Create an email notification record that reacts to the new incident.reminder event. This brief notification message is suitable for SMS as well.
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.

<table>
<thead>
<tr>
<th>Event name:</th>
<th>to_do.assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table:</td>
<td>To Do [u_to_do]</td>
</tr>
<tr>
<td>Description:</td>
<td>a To Do has been assigned</td>
</tr>
<tr>
<td>Fired by:</td>
<td>business rule</td>
</tr>
</tbody>
</table>

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 40: Priority 1 incident update notification Table

<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>
<tr>
<td>Field</td>
<td>Input Value</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Subject</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Message</strong></td>
<td>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, <code>&lt;hr/&gt;</code>, 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} &lt;hr/&gt; Comments: ${comments}</td>
</tr>
<tr>
<td><strong>List</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>List field</strong></td>
<td>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.</td>
</tr>
<tr>
<td>Field</td>
<td>Input Value</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<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:

**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).
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Figure 130: Email Template form with the HTML editor

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<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 ${risk} risk has been assigned to you.</code></td>
</tr>
</tbody>
</table>
| Message HTML  | Enter the content of the email template message. You can use the HTML editor toolbar to format the HTML, and you can include variables from the Select variables column. Variables map to column names available from the notification table, its parent tables, and reference tables. Use variables to include values from a record in the table such as an incident short description or comments and work notes. Notes:  
  - When a template is applied to a notification, the contents of this field are used when you select HTML and plain text or HTML in the Content Type field in the Email Notification form.  
  - You cannot use HTML code to control the appearance of the contents in the `${comments}` variable.  
  - If you want to include a link to the record that triggered the notification, see *Enable links to records* on page 259. |
Field | Description
--- | ---
Message Text | Enter the notification message to send in plain text.  
Note: 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.

SMS alternate | 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.  
Note: The message in this field is used when the message is sent to a device configured as SMS.

---

**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.
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.
Name | Knowledge Closed Create
--- | ---
Subject | Your KB Submission '{$number}' was closed after one or more articles were created

Message HTML

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}'
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:
<table>
<thead>
<tr>
<th>Name</th>
<th>Approval Request</th>
<th>Type</th>
<th>EMAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Approval(sysapproval_approve)</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**When to send**

- **Who will receive**
- **What it will contain**

**Content type**
- HTML, and plain text

**Include attachments**
- 

**Omit watermark**
- 

**Push Message Only**
- 

**Email template**
- `change-All-approve-rule`

**Subject**

**Message HTML**

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The selection list on the right shows the available fields from the sysapproval_approver table. All email templates 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.itil.approve.role

Name: change.itil.approve.role
Application: Global

Email layout: Unsubscribe and Preferences
Search: [ ]
Table: Approval [sysapproval.approver]

Subject: ${sysapproval.sys_class_name} ${sysapproval} Approval Request

Message HTML

B / I / U / Properties / Font Family / Font Sizes

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.itil.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:

![Mailto Approval Template](image)

**Figure 133: 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 would generate an email similar to the following example:
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 135: 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 136: 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>
12. 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>
<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></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>
</tbody>
</table>
### iCalendar template line

<table>
<thead>
<tr>
<th>iCalendar template line</th>
<th>Required?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<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>
</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.
Figure 137: Email layout overview

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.
Note: While email layouts can display dynamic content such as running a mail script, ServiceNow recommends limiting email layouts to static content and using email templates to display dynamic content. Limiting email layouts to static content allows you to re-use them in more use cases.

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 43: 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>
<tr>
<td>Layout</td>
<td>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 255. Note: The editor automatically formats any HTML code you enter from the Source code view.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Layout</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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 inbound email action takes the 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 44: Inbound action classifications

<table>
<thead>
<tr>
<th>Order</th>
<th>Type</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| 1     | Forward | The system classifies an email as a forward only when it meets all these criteria:  
  • The *subject line* contains a recognized forward prefix such as FW:  
  • The *email body* contains a recognized forward string such as From:.  
  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. |
| 2     | Reply  | 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:  
  • The subject line or email body contains a recognized *watermark* such as Ref:MSG0000008.  
  • There is no watermark and the *Reply-To header* contains a recognized record number such as INC0005574.  
  • There is no watermark and the subject line contains a recognized reply prefix such as RE: and a recognized record number such as INC0005574 |
| 3     | New    | The system classifies an email as new when it fails to match it to the forward and reply inbound action types. |
Figure 138: 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.
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, then 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.
### Property

**Property**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.email.forward_subject_prefix</td>
<td>Specifies the list of prefixes (comma-separated) in the subject line that identify a forwarded email.</td>
</tr>
<tr>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td>• Default value: fw:,fwd:</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 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.

<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_watermarks] 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 318.</td>
</tr>
<tr>
<td>Ref:MSGWTR0000008_wfLLz42lxCgUvG2JlYnh</td>
<td>The instance recognizes this string as a watermark and searches the Email Watermarks [sys_watermarks] table for a record with the number MSGWTR0000008_wfLLz42lxCgUvG2JlYnh. 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 318.</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.
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 141: Custom matching criteria
### Table 46: 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 |
<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>
<tbody>
<tr>
<td>New</td>
<td>The email does not meet the conditions for either a reply or forward type inbound email action</td>
<td>Create Incident</td>
<td>Create new record</td>
</tr>
</tbody>
</table>

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 - Create Incident

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>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>
<tr>
<td>Active</td>
<td>checked</td>
</tr>
<tr>
<td>Stop processing</td>
<td>unchecked</td>
</tr>
</tbody>
</table>

#### When to run

<table>
<thead>
<tr>
<th>Only emails of the selected Type will trigger this inbound action.</th>
<th>Only emails from senders with the Required roles will trigger this inbound action.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>New</td>
</tr>
<tr>
<td>Order determines when to run relative to other inbound actions.</td>
<td>Only emails from this sender will trigger this inbound action.</td>
</tr>
<tr>
<td>Order</td>
<td>100</td>
</tr>
</tbody>
</table>

#### All of the following conditions must be true, to trigger this inbound action.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Add Filter Condition</th>
<th>Add &quot;OR&quot; Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>-- choose field --</td>
<td>-- oper --</td>
<td>-- value --</td>
</tr>
</tbody>
</table>

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Note: You might need to configure the form to see all fields.

Table 47: Inbound Email Actions form 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 will add or update 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 one 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 actions 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>
</tbody>
</table>

Note: By default, inbound emails of the Forward type always generate new incidents regardless of the presence of a watermark. If this behavior does not match your business logic, you can change the recognized reply and forward prefixes to treat forwards like replies.

<p>| Required roles | Specify required roles the sender must have to trigger the inbound action. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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:  
email.subject. startsWith ( "chg:" ) |
<p>| Actions       |                                                                                                                                               |
| Field actions | 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. This field appears if the action type is Record Action. |
| 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.</td>
</tr>
<tr>
<td></td>
<td>A template is provided:</td>
</tr>
<tr>
<td></td>
<td>(function runAction(/GlideRecord*/ current, /GlideRecord*/ event, /EmailWrapper*/ email, /ScopedEmailLogger*/ logger) {</td>
</tr>
<tr>
<td></td>
<td>// Implement email action here</td>
</tr>
<tr>
<td></td>
<td>});(current, event, email, logger);</td>
</tr>
<tr>
<td></td>
<td>These are the objects 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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>the content in the subject line of the email. See Accessing email object variables on</td>
</tr>
<tr>
<td></td>
<td>page 326 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</td>
</tr>
<tr>
<td></td>
<td>incoming email&gt;. For example: logger.log (“Some information”)</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></td>
</tr>
<tr>
<td>Order</td>
<td>Enter a number to define the order in which this email action should be processed. Actions with lower numbers are processed first. For</td>
</tr>
<tr>
<td></td>
<td>more information. This field is not installed by the Ordered Email Processing plugin.</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 48: 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.</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 (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 49: 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>
<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:nuser@company.com">nuser@company.com</a></td>
<td><a href="mailto:nuser@company.com">nuser@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).

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 51: 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.

User creation from incoming email

An instance can automatically create users from incoming email.

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.
Table 52: 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;</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><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;User, New&quot;</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><a href="mailto:new.user@company.com">new.user@company.com</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;User&quot;</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>
<tr>
<td><a href="mailto:nuser@company.com">nuser@company.com</a></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

User creation method
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 will randomly select one of the users with the matching email address.

Redirecting email to the instance POP3 account
You can have other mailboxes 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.

```javascript
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**

Several examples of inbound email actions are available to help you build your own inbound email actions.

**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>Table 53: Inbound action field values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Target table</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;
```

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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>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>
</tbody>
</table>
### Field | Entry
---|---
Active | True
Target Table | Change Request [change_request]
Condition | `email.subject.indexOf("Change Request: ") == 0`
Script | `current.comments = email.body_text;`  
|   | `current.short_description = email.subject;`  
|   | `current.notify = 2;`  
|   | `if (email.body_text.assign !== undefined)`  
|   | `current.assigned_to = email.body_text.assign;`  
|   | `if (email.body_text.priority !== undefined)`  
|   | `current.priority = email.body_text.priority;`  
|   | `if (email.body_text.category !== undefined)`  
|   | `current.category = email.body_text.category;`  
|   | `current.insert();`

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).
if (current.getTableNames() == "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();
}

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 54: 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

The Ordered Email Processing plugin enables you to configure a processing order for inbound email actions.

In addition to forcing email actions to run in a prescribed order, the administrator can add a command to the script for an action that halts processing after the script runs. The plugin simply adds the Order column to the Rules [sysrule] table, which the instance uses to determine when to process emails.

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:

        event.state="stop_processing";
Figure 142: Inbound email actions: Order and Stop processing fields

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
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.

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.

Activate ordered email processing

The Ordered Email Processing plugin is enabled by default for all new instances and can be installed by a user with the admin role for upgraded instances.

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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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.

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 55: Default email filters

<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 <em>inbound email actions</em> 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 <em>glide.pop3.ignore_headers</em> property.</td>
</tr>
<tr>
<td>Ignore sender</td>
<td>Ignores email from specific senders. This filter overrides the <em>glide.pop3.ignore_senders</em> property.</td>
</tr>
<tr>
<td>Ignore subject</td>
<td>Ignores email with specific terms or phrases in the subject line. This filter overrides the <em>glide.pop3.ignore_subjects</em> property. This filter might not apply to emails arriving from unknown users. Unknown users can be locked out.</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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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: ✔

Short description: Ignore emails with calendar attachments, to prevent new incidents from being opened

Condition script:

```javascript
var emailInspector = new EmailInspector();
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

- Mark as ignored
- Actions on selected rows...
Table 56: New filter table

<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 through 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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.

The watermark always includes "Ref:" and a customizable prefix, followed by the auto-numbered identifier of the source record, such as incident, problem, or change request. The default prefix is MSG. For example, Ref:MSG3846157.

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

Inbound email actions might not work properly if watermarks are omitted from email notifications. Without a watermark, inbound email messages cannot be associated with the accumulated comments related to the original incident, and each subsequent notification that is sent is treated as a new incident.

**Note:** Do not use colons (:) in custom watermark prefixes. Colons are a reserved character and may cause the watermark to be ignored.

**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 indistinguishable because they use the same watermark. To avoid unintentionally triggering events in the wrong instance, create a unique watermark prefix for each instance.

1. Navigate to System Definition Number Maintenance.
2. Open the sys_watermark record.
3. Make the Prefix unique for this instance.
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.
Figure 143: 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 57: 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.</td>
<td>Change the ACL rule to control access to the email client.</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>Remove the email icon, see Email icon display on page 359.</td>
</tr>
</tbody>
</table>
| Autocomplete  | Defaults to only displaying a user's first and last name.                     | • To change search behavior, see Configure email client auto-complete search results on page 351.  
|               | A system property controls what columns the email client auto-complete displays. | • To display additional information, see Additional information in the email client auto-complete on page 352 |
| 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.

10

Include groups in Email Client autocomplete results
☑ Yes | No

Figure 144: Email client autocomplete properties
### Table 58: 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 59: 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>
Istanbul    ServiceNow    Now Platform Capabilities

Figure 145: Auto-complete in the email client

**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.

1. Navigate to System Policy Email Client Templates.
2. Click New.
3. Fill in the fields on the 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>Table</td>
<td>Select the table that the template applies to. You must 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</td>
<td>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.

```java
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 62: Email client 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 63: 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 users, 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 64: Access control values

<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.

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. Starting with the Geneva release, your instance supports push notifications.
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 taking action on related records. For example, you can have the instance send an approval request for a Change to a user, and let the user approve or deny the Change by clicking a response button on 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 365

  **Note:** Push notifications for on-premise instances are not supported.

- *Push notification setup with a custom push application* on page 365. If you create your own application, you must understand how push notifications and the Apple Push Notification Service system works. 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.

The push notification system

Several elements are involved in the push notification system.

- Customer instance: your instance.
- Push proxy: An instance that collects all push notifications that go to the ServiceNow mobile application and forwards them to the ServiceNow iOS application. If you create a custom push application, you do not use the push proxy.
- Push provider: The provider of push messages, which by default is the Apple Push Notification Service (APNs) for the ServiceNow mobile application.
- Feedback provider: The provider of feedback messages, which tell the instance what devices are no longer valid. By default, the Apple feedback server handles feedback messages for the ServiceNow mobile application.
- 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’s preferences to find their push device settings.
3. The instance sends the push notification to the push notification service, such as the Apple Push Notification Service (APNs). Optionally the instance can send the notification through a push proxy instance, which then forwards the notification to the APNs.
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 so that a response to the notification can be sent back to the correct instance.
5. 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.
6. The instance identifies a script to run to handle the response.
7. The script takes 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.

This diagram shows the elements of the push notification system. Within the ServiceNow infrastructure are your instance, the optional push proxy instance, and the ServiceNow feedback proxy. External to ServiceNow are the APNs, and the user's mobile device, which includes the application that is registered to receive push notifications. See Push feedback on page 365 for an explanation of the feedback servers.

Figure 148: The push notification system

Push notification responses

One of the benefits of push notifications is that users can take action 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:

http://{instance_name}/api/now/v1/push/{application Name}/action/{action}
The application name is the push application the user is using. This 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 Notification Action Script [sys_push_notif_act_script] table.

Push feedback

Feedback refers to the information about failed message delivery and the 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 in the Push Installation [sys_push_installation] table is set to inactive, thereby making it unable to receive push notification messages. If the same device is again able to receive push notifications, the device receives the same token and a new record is inserted into the Push Notification Installation [sys_push_notif_app_install] table.

Push notification setup with the ServiceNow mobile application

If you are using the default ServiceNow mobile application, push notifications are set up similar to subscribable notifications.

Note:

Push notifications with the ServiceNow mobile application are not supported in on-premise instances.

The process is as follows:

1. A user installs the ServiceNow mobile application and agrees to accept push notifications. The device then:
   • Obtains a token that identifies the device
   • Triggers the creation of a device in the user's notifications preferences
   • Automatically subscribes the user to the push-specific notifications that are set up for the ServiceNow mobile app.

   When the instance receives the push notification acceptance message, it creates a record in the Push Notification Installation [sys_push_notif_app_install] table. This record is what the instance uses to identify the device + mobile application combination necessary to identify a push notification recipient.

2. The system administrator sets up push notifications, just like they set up an email notification. Push notifications contain two parts:
   • The push message
   • The notification, which includes the push message

   Note: The push message and notification must be for the same table.

3. Verify the user's notification preferences to ensure that the user has a push device configured and that the user is subscribed to the relevant push notifications.

Push notification setup with a custom push application

If you are using your own mobile or push application, push notifications there are a number of steps to take in addition to setting up push notifications with the ServiceNow mobile application.

The process is as follows:
1. The push app developer creates a record in the Push Application [sys_push_application] table for the custom application. This record is what the instance uses to identify the device + push application combination necessary to identify a push notification recipient.

2. The push app developer creates push notification action scripts to tell the instance how to handle responses to push notifications.

3. The push app developer can also create a content payload in JSON for different types of push notifications. The content determines how a push notification appears on the push application, and whether or not the user can send a message in response to the push notification.

4. The system administrator sets up push notifications, and specifies the custom push app and, if desired, the content.

5. Users set up their push device on their user profile's notification preferences, just as they can set up email addresses or devices for SMS messages. Administrators can also set up these preferences on behalf of users.

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 timezone, 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.
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 Application [sys_push_application]</td>
<td>Push applications registered to the instance to receive push messages.</td>
</tr>
<tr>
<td>Push Default Registration [sys_push_notif_default_reg]</td>
<td>Contains all of 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 <em>Push Application</em> form.</td>
</tr>
<tr>
<td>Push Feedback [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 a central instance that uses a REST call to tell your instance which push applications to deactivate.</td>
</tr>
<tr>
<td>Push Message Attribute Definition [sys_push_notif_msg_attr_def]</td>
<td>The attribute definitions used for push message content specification.</td>
</tr>
<tr>
<td>Push Message Attribute Value [sys_push_notif_msg_attr_val]</td>
<td>The values associated with push messages.</td>
</tr>
<tr>
<td>Push Notification [sys_push_notification]</td>
<td>The push notifications that the instance attempted to send to users.</td>
</tr>
<tr>
<td>Push Notification Action Script [sys_push_notif_act_script]</td>
<td>The scripts that the instance uses in response to an actionable push message.</td>
</tr>
<tr>
<td>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Push Notification Installation [sys_push_notif_app_install]</td>
<td>The devices with push apps where users agreed to receive push notifications. The records in this table are listed 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 into the instance with the ServiceNow mobile application.</td>
</tr>
<tr>
<td>Push Notification Message [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 Content [sys_push_notif_msg_content]</td>
<td>The entire content, including JSON, for push messages.</td>
</tr>
<tr>
<td>Push Platform [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 66: 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 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 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 67: 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 68: Push notifications installed with push notifications**

<table>
<thead>
<tr>
<th>Push notifications</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConnectMessagePushNotification</td>
<td>Live Feed Message [live_message]</td>
<td>Sends a push notification when a new live feed message</td>
</tr>
</tbody>
</table>

**Set up push notifications for the ServiceNow mobile app**

Administrators can set up push notifications by creating push-specific notifications and associating them with standard platform notifications.

The **Push notification plugin** must be active.
Role required: admin

Follow these steps to set up push notifications that send content to users.

Create a push message

Before you create a push notification, create a push message with the actual message content.

Role required: admin

2. Fill out the fields on the form (see table).
3. Click Submit.
Table 69: 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 a push app that this message can be sent to.</td>
</tr>
<tr>
<td>Push Message Content</td>
<td>Select content layout for the message.</td>
</tr>
<tr>
<td>Message</td>
<td>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.</td>
</tr>
<tr>
<td>Related list</td>
<td></td>
</tr>
<tr>
<td>Push Message Attribute Values</td>
<td>Select the attributes that apply to this notification. The attributes on this form override those associated with the content layout.</td>
</tr>
</tbody>
</table>

Make sure that the relevant users have their push devices configured and that the users subscribe to the notification in the user’s notification preferences. See Set up a mobile notification device for a user on page 384, Select notifications on page 390, and Add personal subscriptions on page 388.

Create a notification using a push message

Email administrators can create a notification that specifically sends a push notification.

Configure the push message and create a push message content 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 233 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.

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.

To register a mobile device for push notifications, users must install the ServiceNow or custom mobile application and register the instance. Users can then subscribe to notifications in notification preferences. See Set up a mobile notification device for a user on page 384, Select notifications on page 390, and Add personal subscriptions on page 388.
Set up push notifications for a custom push app

Mobile application developers can set up a customized push app and configure components such as action scripts and notification layouts.

The Push notification plugin must be active.

Role required: admin or push_admin

Follow these steps to set up a push notification infrastructure using your own push application.

Caution: General system administrators do not need to configure these settings to use the ServiceNow mobile application with push messages. These instructions are intended for users who develop their own customized push application.

Create a push application

You must register your customized mobile application with your instance so it can receive push notifications.

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. By default, the ServiceNow mobile application is automatically set up and ready to use starting with the Geneva release. If you develop your own mobile application, you must create a record for it in the Push Application table.

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.

### Push Application Details

<table>
<thead>
<tr>
<th>Name</th>
<th>ServiceNowPushApp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push</td>
<td>REST API</td>
</tr>
</tbody>
</table>

### Push Notification Message Contents

```
var json = {
  "id": "",
  "app": "",
  "sound": "default",
  "payload": {
    "primary_subject": "",
    "primary_message": "",
    "secondary_subject": "",
    "secondary_message": "",
    "tagging": {
      "image": "",
      "message": "",
      "channel": "",
      "url": ""
    }
  }
}
```

### Push Default Registrations

- **Push Message Generation**
  
  ```json
  function buildJSON("/GlideRecord")
  ```
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter a descriptive name for the layout.</td>
</tr>
<tr>
<td>Push</td>
<td>Select from the following:</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 need to specify a X.509 Certificate.</td>
</tr>
<tr>
<td></td>
<td>• REST API: Send push notifications through an intermediary instance, that in turn sends the notification to the APNs. The commutation between the two instances is via a REST message.</td>
</tr>
<tr>
<td></td>
<td>• None: do not enable push notifications for this application.</td>
</tr>
<tr>
<td>Feedback</td>
<td>Select from the following:</td>
</tr>
<tr>
<td>Apple</td>
<td>The X.509 Certificate and Sandbox Certificate you created on the Apple notifications portal. The certificate allows 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 API key you obtain 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 content layout 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 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

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>

See Push notification example on page 380 for an example of a push action.

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

The content layout defines the style of push notification that can be sent out. Push contents give you the opportunity to add content, such as a picture, as well as provide action buttons or icons. Use these in the script:

- current: the properties of the current record.
- message: the push message sent as the body of the entire push content.
- attributes: the object of the push message attributes that you define.

2. Fill out the fields on the form (see table).
3. 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(),
        "syst_id": current.sys_id
    }
};
```
Table 72: 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 layout.</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 layout. See the example scripts below.</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 an attribute definition on page 377 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;
```

Create an 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.
These attributes can be overridden by any *push message attribute values* that you create.

2. Select a content layout record or script record.
3. In the Push Message Attribute Definition related list, click New.
4. Fill out the fields on the form (see table).
5. Click Submit.

Table 73: Push Message Attribute Definition form fields

<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>
<tr>
<td>Attribute Type</td>
<td>Select the type of attribute:</td>
</tr>
<tr>
<td></td>
<td>• Action: An action to take on the instance, as defined by a script.</td>
</tr>
<tr>
<td></td>
<td>• String: An arbitrary string to send as part of the message content. The string can specify items like a button label in the message.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Script</td>
<td>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.</td>
</tr>
<tr>
<td>Default Value</td>
<td>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.</td>
</tr>
</tbody>
</table>
Table 74: 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>

See *Push notification example* on page 380 for an example of a push message attributes.

**Push notification example**

This example illustrates a customized push notification, including customized push actions and content.

In this example, you will learn how to create a push notification for incidents that are not assigned to anyone. This example assumes you created your own custom push application that is referred to in this example as MyPushApp. The notification will be sent to a user who can respond by accepting assignment to the incident or ignoring it.

**The push actions**

First you will 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:
(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:

(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 375 for specific steps on how to create these actions.

The push content

Next, you will create the JSON content that specifies two buttons that the user will use to respond to the incident. The content is as follows:

(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;
})(current, message, attributes);

The content script specifies two labels and two actions, one for each button. You must create definitions for these. But later you will override these definitions with the actual button labels and actions on the push message. Here are the definitions:
The push message

Next you will 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 just created.
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 75: 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 is associated with button 2.</td>
</tr>
<tr>
<td></td>
<td>The value is ignored because this attribute specifies an action.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>action_on_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 is associated with button 1.</td>
</tr>
<tr>
<td></td>
<td>The value is ignored because this attribute specifies an action.</td>
<td></td>
<td></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>none</td>
<td>Assign to me is the label the user sees for button 1.</td>
</tr>
</tbody>
</table>

**The push notification**

Finally, you will create a notification that is triggered when a new incident is unassigned. It is sent to a group named Incident Manager. You will then associate the push message that you just created with it. The notification is as follows:
When a user registers their mobile application to an instance, a notification device is automatically created for them in their notification preferences. You can still set up or modify mobile notification devices for your users.

If your users have the ServiceNow mobile application installed on their devices, you do not need to follow these instructions.

1. Navigate to User Administration Users.
2. Select a user.
3. Click Notification Preferences.
4. Click New Device.
5. In the Type field, select Push.
6. In the Push app field, select the application that is already configured to handle push notification for the instance.

See Set up a notification device on page 386 for more information on the other fields in this form.

You can also disable the push device for the user if the user should no longer receive push notifications.

**Note:** You do not need to disable the push device for the users who remove the push app or who no longer use their push device. The instance automatically deactivates their device in the Push Notification Installation table.
7. Subscribe to the push notifications or instruct the user to subscribe in their notification settings.

Failed push notification messages

Push notification delivery might fail for a number of reasons. You can view which messages failed and re-queue 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. See the iOS developer library for more information about how Apple handles push notifications.

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. See the iOS Developer Library payload documentation for more information on Apple payload limitations.

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 and will be processed.
   - 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 a number of push notifications continue to fail, consider increasing the value in the glide.push.notification.ttl_seconds property. See Push notification properties on page 385 for more information.

Push notification properties

Push notifications provides several properties to customize the setup.

Add these properties to the System Properties [sys_properties] table.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.push.debug</td>
<td>Creates entries in the system log for push notification errors.</td>
<td>false</td>
</tr>
<tr>
<td>glide.push.feedback.debug</td>
<td>Creates entries in the system log for feedback sent by the APNs.</td>
<td>false</td>
</tr>
</tbody>
</table>
### Property Descriptions

**glide.push.notification.ttl_seconds**

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.

Default value: 21600 seconds (6 hours)

**glide.push.enabled**

Enables or disables push notifications.

Default value: true

### 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 devices, such as mobile phones, 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.

In previous releases, users had to wait until they received a notification before the subscription-based notification appeared in their notification settings. Starting with the Helsinki release, notifications that administrators marks as subscribable are automatically available in user notification settings.

Administrators should create subscription-based notification 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 the new functionality available with the Helsinki release. This plugin is active by default on all new and upgraded Helsinki instances.

The plugin installs the Notification Subscription [sys_notifSubscription] table, which holds user subscriptions to all notifications.

**Note:** The mobile interface does not support the new user notifications page.

### Set up a notification device

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>
<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 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>

**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

Any user 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* on page 386 for a description of all fields.

### Add personal subscriptions

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 administrator’s notification filter 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](image)

**Figure 152: Add personal subscriptions**

### Table 78:

<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 [Create an email notification](page 233) on page 233.</td>
</tr>
<tr>
<td>Active</td>
<td>If 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>An additional 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 in the administrator’s notification filter.</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 Subscription management screen.

![Subscription](image)

Figure 153: 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 click 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

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 specific user device

After you set up the devices through which users can receive notifications, you can assign the notifications to each device and add advanced conditions to limit what notifications you can receive.

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.

![Notification Preferences](image)

Table 79: 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>
### Filter
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 administrator's notification filter. This field is not available when an advanced filter is configured.

### Advanced filter
Select this option if you want to use the condition builder to create additional criteria. When you select the check box, the Filter field is replaced by the Table and Conditions fields.

### Table
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.

### Conditions
Define as many conditions as needed to limit the notifications you receive.

---

### 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 80: 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:abc222334444def@text.att.net">abc222334444def@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>
<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.subject  
| | • 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.
4. Select the Mandatory check box.

That notification is now locked in user 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.

### 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. Notification filters are available for selection in the Filter field of a user’s Notification Preferences form.

**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.

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 82: 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 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.

\[
{\text{NOTIF\_UNSUB}} \text{ from this notification by email or } {\text{NOTIF\_UNSUB+link_text="click here"}}.
\]

Manage your \{$\text{NOTIF\_PREFS}$\} or \{$\text{NOTIF\_PREFS+link_text="click here"}$\}.

When rendered in an email notification, the unsubscribe links only display the link text.
Figure 156: Sample email with unsubscribe links

If a user clicks the Unsubscribe link, the email client creates a message such as this:
Notify

Notify allows you to integrate with telephony providers such as the Twilio service to manage phone calls and SMS messages from within your instance.

Notify with the Twilio service

Notify allows you to send and receive phone calls and SMS messages from your instance using the Twilio telephony service.

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.
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 subaccount (https://www.twilio.com/).

**Important:** Ensure that each instance you configure Notify on uses a different Twilio subaccount. Each subaccount specifies a unique SID, authentication token, telephone numbers, and endpoint. Using the same subaccount across multiple instances may cause your Twilio service configuration to be overwritten.

Role required: notify_admin

1. Navigate to Notify Twilio Configuration.
2. 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 Save.

   A read-only list of E.164 and short code phone numbers associated with this Twilio subaccount 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 the number belongs to.

   **Note:** If you buy or release numbers on the Twilio subaccount, 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.

E.164 and short code phone numbers you import to Notify 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.

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>
</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 406

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>
</tbody>
</table>
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 communications 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.

• 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

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.

<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>

How incoming Notify calls are processed

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.

Notify conference calls

Notify allows you to connect multiple callers to a single conference call.

Conference call records are stored on the Notify Conference Call [notify_conference_call] table. Conference call participant records are stored on the Notify Participant [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.

Notify administrators 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

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.

Using SMS with Notify

You can send and receive SMS messages using Notify.

Use the Notify API sendSMS method, or using the send SMS workflow activity. Inbound and outbound SMS messages are stored on 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.

Properties for Notify

These are the properties related to 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>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>

Notify tables

Notify tables store information related to Notify.

<table>
<thead>
<tr>
<th>Notify</th>
<th>Legacy Notify</th>
</tr>
</thead>
<tbody>
<tr>
<td>notify_conference_call</td>
<td>notifynow_conference_call</td>
</tr>
<tr>
<td>Notify</td>
<td>Legacy Notify</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>notify_call</td>
<td></td>
</tr>
<tr>
<td>notify_call_status</td>
<td></td>
</tr>
<tr>
<td>notify_participant</td>
<td>notifynow_participant</td>
</tr>
<tr>
<td>notify_participant_session</td>
<td>notifynow_participant_session</td>
</tr>
<tr>
<td>notify_message</td>
<td>notifynow_message</td>
</tr>
</tbody>
</table>

Figure 158: Notify call sequence
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>

Notify workflow activities

Notify 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 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>
<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>
<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.</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>
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 87: 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>

Conditions

The conditions determine which transition comes after this activity. The 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 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 88: 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>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</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.

**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 89: 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 90: 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>
</tbody>
</table>
### Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
</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>`.

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 91: 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 92: 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 {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 97: 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 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 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.

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 a telephony provider such as 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>
<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 Language [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.

Notify on task

Notify allows you to send SMS alerts and initiate conference calls from any task record.

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 message 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 send the SMS to.
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 send the SMS to.
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.

Notify with incident alert

You can use Notify with Incident Alert to send SMS messages or start conference calls based on incident alerts.

Notify with incident alert requirements

Certain configuration steps are required to use Notify with Incident Alert.

To use Notify with incident alert:

• Both Notify and Incident Alert 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 alert

As part of processing an incident alert, 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 alert.
3. Click the Initiate Conference Call related link.
4. Within the dialog box that appears, select the participants for the conference.
The dialog box displays the recommended and selected participants for the conference. All users from the User Contacts list in the incident alert are selected by default. 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 Alert 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 Alert form and also are listed in the Conference Calls related list.
Figure 160: Conference bridge history
Send an SMS notification for an incident alert

Notify sends an SMS to the users defined as default contacts for the alert.

When you create a new incident alert, 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 alert for <CI Name> has been opened.

Administrators can modify the content of this message by editing the SMS on new Incident Alert business rule.

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.

Notify with on-call scheduling requirements

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 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>Table 99: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 100: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Array</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>
<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 102: 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)

Makes a call to an E.164-compliant phone number.

<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>
Table 104: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```javascript
var from = '+14048007337';
var to = '+31646810495';

// set up call
new SNC.Notify().call(from, to);
```

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 105: 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 106: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>
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 107: 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 108: 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 109: 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>source</td>
<td>GlideRecord</td>
<td>The source record that prompted this SMS message, such as an incident.</td>
</tr>
</tbody>
</table>

### Table 110: 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 111: 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 112: 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("0f4f5863ff13310014ecffffffff28");

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 113: 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 114: 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 115: 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 116: 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 117: 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 118: 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.

// 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 119: 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 120: 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>[{sys_id: &quot;...&quot;, // user's sys_id name: &quot;...&quot; // user's name}]</td>
</tr>
</tbody>
</table>

Notify - conferenceCall()

Create a new conference call GlideRecord.

Table 121: 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 122: 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 conference call.</td>
</tr>
</tbody>
</table>

```
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 123: 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 124: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```java
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 125: 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 126: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

```java
var call = new GlideRecord('notify_call');
call.get('some sys_id');
if (call.isValid()) {
    new SNC.Notify().dequeueCall(call);
```
Notify - kick(GlideRecord participant)

Kicks a specified user from a Notify conference call.

Table 127: Parameters

<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 128: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```javascript
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)

Forwards a call to connect that call with a different recipient.

Table 129: 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 130: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></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>
<thead>
<tr>
<th>Table 131: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 132: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>DialAction</td>
</tr>
</tbody>
</table>

```
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>
<thead>
<tr>
<th>Table 133: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 134: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>GatherAction</td>
</tr>
</tbody>
</table>

```
// 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 135: 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 136: Returns

<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 137: 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 138: 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>

```javascript
// 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 139: 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 140: 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>

```javascript
// 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>
<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 142: 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>

// 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>
<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 144: 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.
// 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 kann 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 145: 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 146: 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)

Deserializer a NotifyAction object from a JSON string.
Table 147: 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>

Table 148: 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 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":true,"fQueueName":"myQueueName"}]}
*** Script: new serialization result: {"fClassName":"NotifyAction","fActions": [{"fClassName":"QueueAction","fDequeue":true,"fQueueName":"myQueueName"}]}
*** Script: the same: true

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NotifyAction - toJson()

Serialize the NotifyAction object to a JSON string.

Table 149: 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 150: 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":null}
NotifyAction - addConference()

Add a call to a Notify conference call.

Table 151: 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 152: 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 153: 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 154: 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 155: 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 156: 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 157: 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 158: 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 159: 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 160: 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, such as the Twilio service.</td>
</tr>
</tbody>
</table>

NotifyPhoneNumber - getTerritory()

Returns the country associated with the phone number.

Table 161: 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 162: 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 163: 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 164: 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 165: 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 166: 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 167: 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 168: 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 169: 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 170: 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 171: 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 172: 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 173: 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 174: 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 175: 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 176: 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 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 177: 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() {},
};
```
onError: function( message ) {},
onConnect: function( status ) {},
onDisconnect: function() {},
on Incoming: function( {from, to, callSid} ) {},
on Outgoing: function( callSid ) {},
on Accept: function() {},
on Mute: function() {},
on Unmute: function() {},
on Cancel: function() {};

$j(function()
    notifyClient = new SNC.Notify.Client(notifyConfig);
    notifyClient.init();
});

Notify Client - call(Object identifier)

Call a specified phone number or the phone number associated with a specified user.

<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>
<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.

notifyClient.call({
    phoneNumber: "+18001112223"
});

This example demonstrates passing a user record sys_id as the function parameter.

notifyClient.call({
    userId: "6816f79cc0a8016401c5a33be04be441"
});
Notify Client - `hangupCall()`

End the current call.

Table 180: 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 181: 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.

```javascript
$j("#pickupCallBtn").on("click", function() {
    notifyClient.hangupCall();
});
```

Notify Client - `pickupCall()`

Answers and connects to an incoming call from a Twilio WebRTC client.

Call this method when there is a notification of an incoming call.

Table 182: 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 183: 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)`

Mutes or unmutes the current client.

Table 184: 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 185: 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 186: 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 187: 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 188: 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>
</tbody>
</table>
Table 189: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</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 a telephony provider such as the Twilio 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 190: Parameters

<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 191: 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>

**Note:** When evaluating call status, use the constants provided by SNC.Notify.Status.

```javascript
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 192: 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>

```javascript
onIncoming: function(callInfo) {
    gs.log('incomming 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 193: Parameters

<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 ) {},
  disconnect: function() {},
  onIncoming: function( {from, to, callSid} ) {},
  onOutgoing: function( callSid ) {},
};
```
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 194: Plugins for Notify

<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E164 Compliant Phone Number [com.glide.phone_number]</td>
<td>Provide 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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.

Automatic changes

Several automatic changes occur when you activate Notify if the legacy Notify functionality is already enabled.

- The legacy Notify application menu is removed.
• Two separators are added to the new Notify application 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 application menu. Any customizations made to the legacy Notify modules are not preserved.

• The notify_admin role allows access to Notify modules.
• 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.

Legacy Notify

Notify enables organizations with a Twilio account to send notifications using text and voice messages.

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 on page 403.

It also allows conference calls between ServiceNow users to enable quick communications.

When Notify is active, you can configure ServiceNow to automatically generate and send notifications to selected contacts, for instance when a new incident alert is raised in the incident alert management process.

Users with the notifynow_admin role can set properties and monitor message and conference call activities.

Notify has been implemented for use within incident alert management. Refer to the Notify API documentation for details on how to implement Notify for use within other ServiceNow applications.

Working with Legacy Notify

Follow this process to enable and use Notify.

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 on page 403.

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 alert 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
**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* on page 403.

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.

![Figure 161: Notify Question](image)

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

**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 on page 403.

1. Navigate to Notify Questions.
2. Click New.
3. Fill in the fields, as appropriate.

<table>
<thead>
<tr>
<th>Table 195: Notify New Question form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>Params</td>
</tr>
<tr>
<td>Response Action</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
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 on page 403.

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>
<thead>
<tr>
<th>Table 196: Notify New Response Choice form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
</tr>
<tr>
<td>Code</td>
</tr>
<tr>
<td>Text</td>
</tr>
<tr>
<td>Order</td>
</tr>
</tbody>
</table>

5. Click Submit.

View Legacy Notify messages

Applications implementing Notify, such as incident alert management, can send Short Message Service (SMS) text messages to relevant contacts under predefined conditions, such as when a new incident alert has been created.

Role required: notifynow_admin

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 on page 403.

1. Navigate to Notify Messages.
2. Click a message to see the message details.
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

**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 on page 403.

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 nn.thread.release.age property.

1. Navigate to Notify Conversations.
2. Click a conversation record to see the conversation details.
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>

**Note:** The mode of conversation cannot be changed during one conversation thread. For example, you cannot switch between SMS and email during one conversation.

**View Legacy Notify conference calls**

Applications that use Notify, such as incident alert management, can launch and maintain conference calls between involved parties.

Role required: notifynow_admin

**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 on page 403.

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 alert record.
2. Click a conference call in the list to view 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 on page 403.

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 Alert 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.

**Administering Legacy Notify**

An administrator can set up Notify, manage Notify properties and conference call participants.
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.

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

1. Navigate to Notify Administration Properties.
2. Enter the AccountSID, AuthToken and phone number values. These values can be obtained from the Twilio dashboard:
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 on page 403.

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 168: 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
View and edit legacy Notify properties

You can view and edit Notify properties.

Role required: notifynow_admin

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 on page 403.

1. Navigate to Notify Administration Properties.

Figure 169: Notify Properties form
2. Fill in the fields.

### Table 198: 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 199: 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

**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 on page 403.

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 on page 403.

### Tables

Notify adds or modifies the following tables.

#### Table 200: 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>
</tbody>
</table>
### Properties

Notify adds the following system properties.

#### Table 201: 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 202: 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 203: 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 Alert [incident_alert]</td>
<td>Adds a link to the Incident Alert 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 204: 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 205: 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 Alert</td>
<td>Incident Alert [incident_alert]</td>
<td>Sends an SMS to any default contacts added when an incident alert record is created.</td>
</tr>
</tbody>
</table>
| Conference Call Allowed            | Incident Alert [incident_alert] | Displays or hides the initiate conference call UI action by storing true or false in `g_scratchpad.conferenceCallAllowed`.
| Update Conference Call Started IA Activity | NotifyNow Conference Call [notifynow_conference_call] | Logs when a conference call started by writing to an incident alert's comment field if the source record is from the incident_alert table. |
| Update Conference Call Finished IA Activity | NotifyNow Conference Call [notifynow_conference_call] | Logs when a conference call ended and what actions the conference call participants took by writing to an incident alert's comment field if the source record is from the incident_alert table. |

### Workflow Activities

Notify adds the following workflow activities.

### Table 206: 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>
</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>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>Boolean</td>
<td>True if Notify is set up correctly, otherwise false.</td>
<td></td>
</tr>
</tbody>
</table>

```
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>
<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 210: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>One of the possible status messages.</td>
<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></td>
<td></td>
<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></td>
<td></td>
<td>ACCOUNT_OK_MESSAGE</td>
<td>The account is active and ready for use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACCOUNT_NO_AUTH</td>
<td>The Twilio AuthToken is not valid.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACCOUNT_NOT_CONFIGURED</td>
<td>AccountSID or AuthToken is not valid.</td>
</tr>
</tbody>
</table>

```javascript
var nn = new SNC.NotifyNow();
gs.log(nn.getStatus());
```

NotifyNow - initiateConferenceCall(String[] conferenceCallParticipants, String conferenceCallTitle)

Initiate a new conference call.

Table 211: 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>
conferenceCallTitle
String
Title of the conference call. This parameter has a maximum length of 40 characters.

Table 212: 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(String[] conferenceCallParticipants, String conferenceCallTitle, GlideRecord sourceRecord, Boolean private)

Initiate a new conference call.

Table 213: 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>
Table 214: 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 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.

```java
// 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 215: 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 216: 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>

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 217: 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 218: 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>

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 219: 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 220: 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>

```
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 221: 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 222: 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>

```
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 223: 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 224: 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 225: 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 226: 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 227: 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 228: 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>

```javascript
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 229: 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 230: 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>

```javascript
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 232: Returns

<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",
```
"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 233: 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 234: 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 235: 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 237: Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>phoneNumber</td>
<td>String or GlideRecord</td>
<td>An E.164-compliant phone number to send the message 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>String or GlideRecord</td>
<td>An optional source record to associate to the SMS question, such as an incident.</td>
</tr>
</tbody>
</table>

**Table 238: Returns**

<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>
<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>

// 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()) {

Table 239: Parameters

<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>
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'));
if (null) {
    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 241: 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 242: 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);
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gs.log('converted: ' + localPhoneNumber + ' 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 243: Parameters
Name

Type

Description

conferenceCallId

String

The ID of the conference call.

isCallable

Boolean

An optional flag to return either
only the users you can call
(true) or those you cannot call
(false).

Table 244: Returns
Type

Description

GlideRecord

The participants

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'));
}
}

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'));
}
}

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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 245: 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 246: 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>

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 247: 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 248: 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>

```
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 249: 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 250: 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>

```
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 251: 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 252: 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>

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);

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 life cycle.

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

Explore

- [CMDB release notes](#)
- Upgrade to Istanbul
- Configuration Management and the CMDB on page 494
- [CMDB Identification and Reconciliation](#) on page 545

Set up

- Populate the CMDB on page 498
- Whitepaper: CMDB Design & Configuration
- Whitepaper: CMDB Design
- Whitepaper: Improving Configuration Item Data Quality

Administer

- [Baseline CMDB](#) on page 501
- CI relationships in the CMDB on page 508
- CMDB classifications on page 520
- Video: CMDB Health dashboard
Configuration Management and the CMDB

The Configuration Management database (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.

Relationships between CI's can be displayed in a hierarchical fashion, and adding or removing relationship instances is done with a simple double-click of your mouse.

**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.

**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.

ITIL

The IT Infrastructure Library (ITIL) is an integrated, process-based framework for managing IT services. ITIL 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 ServiceNow 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 ServiceNow 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 ServiceNow 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 ServiceNow 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 a CI.

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, etc.), 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.
Use 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 of the items found. This information is sent back to the ServiceNow instance, and is used to populate the CMDB.

Figure 170: 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.
Manually create a CI

Create a single CI for a specific class.

1. Identify the table for which you want to create a CI.
2. 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`).
3. In the list view of the table click New and fill out the form fields for the table.
4. Click Submit.

Baseline CMDB

CMDB baseline provides capabilities that help you to 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=f4463879a9fe3dba01b30bc100cbf404 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.
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 510.

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

Figure 173: Details of baseline differences

![Baseline differences](image)

<table>
<thead>
<tr>
<th>Baseline differences</th>
<th>For: SQL Baseline</th>
</tr>
</thead>
</table>

Figure 174: Basic Attribute Changes

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 516.
   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>Table 253: Proposed Change Verification Rules form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Rule name</td>
</tr>
<tr>
<td>Table name</td>
</tr>
<tr>
<td>Filter condition</td>
</tr>
<tr>
<td>Active</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 505.

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 254: 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.
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 a particular 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 CI relationships

The system keeps a table of relationship types that are appropriate for a CI type, based on its class. You can view these relationships by navigating to Configuration Suggested Relationships. You can also create additional suggested relationships.

### 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 Linux100 CI, then Linux100 becomes the base CI. Also, every CI in the system has a type (class). For example, bond Linux100 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
```

Looking at a 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, when 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
```

### 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

A user defines the following relationship between two items as follows:

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

But neither of the following definitions would be appropriate:
• a rack runs on a server
• a server runs on a database

Add a suggested CI relationship

You can define suggested relationships that can be selected when new CI relationships are created.

Role required: admin
2. Click New.
3. Complete the form.

Table 256: 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>

You can add suggested relationships such as the following

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Relationship</th>
<th>Dependent 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.

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:**
- 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 513.
- CIs not extended from the Configuration Item [cmdb_ci] table, are not displayed in Dependency Views maps and in CI relation formatters.

### Table 257: 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 516.</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 258: 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>
</tbody>
</table>
### Setting | Description
--- | ---
**Show Relations in Split/Merge Layout** | 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.

**Filter Relations by Max Level** | Select the number of levels in the hierarchy to include when displaying CIs in a flat view.

**Filter Relations by Relationship Type** | Select the types of relationships to view.

**Filter Relations by CMDB View** | Filter by tables specified in CMDB views, if any relationship filters exist.

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

#### Table 259: Icons related to CIs

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recently closed changes</td>
<td></td>
</tr>
<tr>
<td>Planned changes</td>
<td></td>
</tr>
<tr>
<td>Currently open changes</td>
<td></td>
</tr>
<tr>
<td>Recently closed outages</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td></td>
</tr>
<tr>
<td>Incidents</td>
<td></td>
</tr>
<tr>
<td>Planned outages</td>
<td></td>
</tr>
<tr>
<td>Currently open outages</td>
<td></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 260: 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>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.max_relation_levels</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>
<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>
Figure 175: 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.

Figure 176: Flat layout view

**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.

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: asset, itil, or admin

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. If you want to use suggested relationships then you need to first select a relationship type, and then select one or more CIs to be the child CIs in the relationship:
   a) Check Use suggested relationship.
   b) From the Suggested relationship type list, select a relationship type.

When you 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>Filter option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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. If you do not want to use suggested relationships, then you need to first select one or more CIs to be the child CIs in the relationship, and then select the relationship type.
   a) Uncheck 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 Configurations 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 CI's that are appropriate for the relationship you suggested. The left hand select box will contain a list of CI's that might reasonably be linked via this relationship, while the right hand box contains a list of those CI's which are already linked.

1. Link or unlink items.

<table>
<thead>
<tr>
<th>Link new items</th>
<th>Move that CI from the left hand box to the right hand box.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlink existing items</td>
<td>Move them from the right hand box to the left.</td>
</tr>
</tbody>
</table>

Result: When you make either type of change, a message appears indicating that you have pending changes.
2. Apply or cancel your changes.

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click the Save button.</td>
<td>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).</td>
</tr>
<tr>
<td>Click the Cancel button.</td>
<td>This causes you to exit without saving your changes.</td>
</tr>
</tbody>
</table>

### 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 549.

### CI relationship security

When applying security to CI relationships, it is important to apply the access controls both to the cmdb_rel_ci table (which stores the relationships) as well as creating 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 261: 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 includes computers and devices on the network, software contracts and licenses, business services, and more. The IT desk can use the CMDB to understand better their network users’ equipment, and the relationships between them. The CMDB can also 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.

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.

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.
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 of 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 record types**

The CMDB contains the following major 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>
<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.

<table>
<thead>
<tr>
<th>Router Interfaces</th>
<th>Exit Interface Routing Rules</th>
<th>Next Hop Routing Rules</th>
<th>Network Adapters</th>
<th>Serial Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New</td>
<td>Configuration Item = snc-tc01 &gt; Status = Absent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
</tr>
<tr>
<td></td>
<td>192.168.0.0/16</td>
<td>Direct</td>
<td>Direct</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.10.31/32</td>
<td>Direct</td>
<td>Direct</td>
<td>bridge0</td>
</tr>
<tr>
<td></td>
<td>172.0.0.1/32</td>
<td>Direct</td>
<td>bridge0</td>
<td>bridge0</td>
</tr>
<tr>
<td></td>
<td>10.10.10.23</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.10.3/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.11.42/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.11.255/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.10.39/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.10.91/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.10.10.92/32</td>
<td>Direct</td>
<td>bridge0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 179: CI Related Lists

Create CI class

Use the CI Definition form view to create a new CI class (table) that is an extension of an existing CI class. Role required: itil_admin (on top of itil) or admin. Or personalize_dictionary if using the CI Class Manager.

The CI Definition view serves as a centralized location from which you can create a new table that is derived from the CMDB table, and configure additional CMDB-related configurations for the CI.

1. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) In the Class Hierarchy, right-click the class that the new class will be extended from. Click Extend.

   Extends table is populated with the selected class.

2. Fill out the Table form. The table that you specify in Extends table can for example, be an extension of the CMDB table.
   See Create a table for details about the Table form.

3. On the context menu, click Save.

4. Scroll to the bottom of the Table view to use any of the CI Definition form view specific controls, such as CI Identifiers, Reconciliation Definition, or Icon.

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.

More specifically, 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 562.

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.

View table definitions

Use the CI Class Manager as a central location to explore tables and CI definitions, and to search through the CI class hierarchy. View the details of each table such as the table's label and field definitions, and all related definitions and scorecards.

For each table, you can directly access additional CMDB health metrics and scorecards such as datasource precedence rules, orphan scorecard and certificate template defined for the table class.

1. Navigate to Configuration CI Class Manager.
2. Select a class from the Class Hierarchy list to display its table columns and other details.
   See control descriptions in Create a table.
3. Check Advanced at the top of the right sidebar and ensure that Fields is selected.

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 displays a 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 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.

**Build a CMDB query using the CMDB Query Builder**

Build a CMDB query in the CMDB Query Builder.

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 CMDB Query as the Query type, and click Create.
   b) Click on a widget of a saved query to continue building an existing query.
   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.
   - 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>
<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.

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:
  1. Click the Settings icon to display the Query Builder Settings dialog box.
2. Toggle the Display Relationships in Results setting to indicate whether to display the relationship between CIs in the query results.

3. Click the settings icon again to close the Query Builder Settings dialog box.

- Click Save.
  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 time, 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. Also, in the query results pane you can 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 schedule** to run the query at a future time, and to email the results to interested parties.
- Click the Export icon in the query results pane. 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 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.
   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 264: 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.

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:

    1. Click the Settings icon to display the Query Builder Settings dialog box.
    2. Toggle the Display Relationships in Results setting to indicate whether to display the relationship between CIs in the query results.
    3. Click the settings icon again to close 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. Also, in the query results pane you can 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 schedule** to run the query at a future time, and to email the results to interested parties.
• Click the Export icon in the query results pane. 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 sample queries below to build your own CMDB queries.

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.

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.

Role required: cmdb_query_builder (contained for itil and asset)

A saved CMDB query that was built in the CMDB Query Builder.

The query results are attached to the email as a .CSV file identical to the file generated when exporting the query results. 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 265: 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>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>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>
</tbody>
</table>

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

<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>• Type: Numeric</td>
<td></td>
</tr>
<tr>
<td>• Default value: 1800</td>
<td></td>
</tr>
<tr>
<td>• Location: System Property [sys_properties] table.</td>
<td></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. 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 thier 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);
System properties associated with CI Lifecycle Management

CI Lifecycle Management uses the following system properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
<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>
</tbody>
</table>

Tables installed with CI Lifecycle Management

CI Lifecycle Management adds the following tables.

<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>CI Actions</td>
<td>A set of CI actions that can be applied to a CI during its lifetime.</td>
</tr>
<tr>
<td>CMDB CI Actions</td>
<td>Active/inactive CI actions set by a specific requestor for a specific CI. You cannot manually add new records to this table.</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>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>Internal Operational States</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>Renewal 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>
</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.

### Table

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
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.

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. 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.

A 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>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.

Populate a CMDB group

You can populate a CMDB group by manually adding individual CIs and by associating it with saved CMDB queries whose resulting CIs are added as members to the group.

Roles required:

• To use a CMDB saved query - cmdb_query_builder
• 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 page click New.
3. Fill in the Group Name, right-click the title bar, and select Save.
4. To use a saved CMDB query:
   a) In the CMDB Group Contains Saved Queries section, click New.
   b) Select a query from the Query Builder Saved Query drop down 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 Edit Manual CI.
   b) Optionally add filters.
   c) Select CIs in the Configuration Items list and click the ‘+’ icon in the Group members section.
   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.

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 Discovery, import sets, and manual entries 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 will not be considered duplicate CIs because their domain IDs do not match.

**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 process relies 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 548 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.
Process flow of Identification and Reconciliation

Activate Configuration Management For Scoped Apps (CMDB)

You can activate the Activate Configuration Management For Scoped Apps (CMDB) plugin (com.snc.cmdb.scoped) 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features
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to be installed, cancel this activation, activate the necessary plugins, and then return to activating the
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 policy 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.

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

```
(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;
})(source, map, log, target);
```

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

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.

Note:

- 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.
- 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. Each identification rule consists of one or
more identification entries and related entries.

Identification rules apply to a CI class and comprises of 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 give the highest priority to 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 assist in the identification process of dependent CIs, add Service rules metadata on page 563 that define the dependency structure of CI types and the relationship 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 table in the CMDB can be associated with a single identification rule.

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

**Note:** Users with the itil role have read access to the CI identification rules.
In a CI identification rule, specify identifier entries and related entries that uniquely identify the CI. Review the following before creating identification rules:

- **CMDB identification rules** on page 549
- **Effective usage of CMDB Identification** on page 567

1. Use the CI Class Manager:
   a) Navigate to **Configuration CI Class Manager**.
   b) Select a class in the Class Hierarchy.
   c) On the right, click Advanced and expand Correctness.
   d) Select CI Metadata Editor, and click the Identification tab.

2. Or, navigate to **Configuration Identification/Reconciliation CI Identifiers**.

3. Click New, Add New Rule, or select an existing rule.

4. Complete the form.

### Table 267: Identifier form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of CI identifier.</td>
</tr>
<tr>
<td>Applies to</td>
<td>Class that this CI identifier applies to.</td>
</tr>
<tr>
<td>Description</td>
<td>Description of the CI identifier.</td>
</tr>
<tr>
<td>Independent</td>
<td>Check box indicating that the CI identifier can identify the CI independently of other CIs.</td>
</tr>
</tbody>
</table>

5. Click Submit, and then click the identification rule to load its related lists.

6. In the Identifier Entries related list, click New or open an existing entry to specify criteria for matching the CI. Fill out the form, and then click Submit.

### Table 268: Identifier Entry form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Check box that specifies the identifier entry is active.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Criterion attributes</td>
<td>The set of attributes to uniquely identify the CI. 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. 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>Identifier</td>
<td>The CI identifier to which this identifier entry belongs to. By default it is set to the identifier you previously selected.</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. 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>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>Allow fallback to parent's rules</td>
<td>Check box to specify 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>
<tr>
<td>Allow null attribute</td>
<td>Check box to allow null values for criterion and unique attributes.</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 CI. Applied only to lookup based identification.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Enforce exact count match (Lookup)</td>
<td>Check box for specifying that for lookup identification, match only on exact lookup records count match.</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. 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 269: 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>Optional condition</td>
<td>Use the Add Filter Condition and the Add “OR” 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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_serial_number",
          "values": {
            "serial_number": "VMware-42 21 e3 da 44 14 5a a6-56 48 2b 0a 28 53 42 4c",
            "serial_number_type": "system",
            "valid": "true"
          }
        },
        {
          "className": "cmdb_serial_number",
          "values": {
            "serial_number": "4221E3DA-4414-5AA6-5648-2B0A2B53424C",
            "serial_number_type": "uuid",
            "valid": "true"
          }
        }
      ]
    }
  ]
}
```

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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.

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.

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**

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: admin, or itil_admin (on top of itil)

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

1. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Reconciliation Definitions from the Correctness group.

2. Or, navigate to Configuration Identification/Reconciliation Reconciliations Definitions.

3. Click New, and fill in the fields as appropriate.

**Table 270: Data Source Definition form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data source</td>
<td>The data source that you are configuring this rule for.</td>
</tr>
<tr>
<td>Applies to</td>
<td>The table that the selected data source can update.</td>
</tr>
<tr>
<td>Filter condition</td>
<td>Conditions that the CI must meet, if you want to apply this rule to only specific CIs. For example, to apply this rule only to CIs that are associated with the Finance department, select this condition: [Department] [is] [Finance]</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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. To authorize the data source to update all table attributes, leave this field empty.</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>
<tr>
<td>Domain</td>
<td>Domain that the reconciliation rule is enforced in, if the Domain Support domain separation plugin is enabled.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate this reconciliation rule.</td>
</tr>
</tbody>
</table>

4. Click Submit.

#### Define or edit data source precedence

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: admin, or itil_admin (on top of itil)

After an attribute is updated by an authorized data source, any 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 the CI attribute was previously updated by a higher priority data source and it became stale based on staleness 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 staleness 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 same data source that was the last to update the CI, within the Effective Duration defined in the staleness rule for the class for that specific 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. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Datasource Precedence from the Correctness group.

2. Or, navigate to Configuration Identification/Reconciliation Datasource Precedences.
3. Click New or open an existing data precedence definition.
4. Complete the form.

**Table 271: Data Source Precedence form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>The table that this precedence rule applies to.</td>
</tr>
<tr>
<td>Data source</td>
<td>The data source that this precedence rule applies to.</td>
</tr>
<tr>
<td>Order</td>
<td>Priority of this precedence rule within the set of precedence rules for the specified table. Smaller numbers designate higher priority. Data sources without a precedence rule are assigned the lowest priority.</td>
</tr>
<tr>
<td>Application</td>
<td>Domain that this precedence rule applies to, if Domain Separation is enabled.</td>
</tr>
<tr>
<td>Active</td>
<td>Check box to activate this precedence rule.</td>
</tr>
</tbody>
</table>

5. Click Submit.

**Resolve de-duplication tasks**

When the instance encounters duplicate CIs during identification and reconciliation, it groups each set of duplicate CIs into a de-duplication task for review. Use de-duplication tasks to track the duplicate CIs until they can be resolved. A large number of duplicate CIs might be due to weak identification rules.

De-duplication tasks provide details about the duplication, including a list of all the duplicate CIs and the internal payload used during the identification process. Review the details of each duplicate CI in the task and the data that was used to determine that the CI is a duplicate.

If the 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.

**Skip duplication**

Processing of sets of duplicate CIs depends on the system 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 in a set.

- 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'.

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If glide.identification_engine.skip_duplicates is false, then matching of duplicate CIs fails with an error, and none of the duplicate CIs is updated.

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

To modify these properties, you need to first add them to the System Properties [sys_properties] table. For more information, see *Properties installed with Identification and Reconciliation* on page 570.

Role required: admin or itil

1. Navigate to Configuration Identification/Reconciliation De-duplication Tasks.
2. Select a task.

### Table 272: De-duplication Task fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>A unique task number.</td>
</tr>
<tr>
<td>Assigned to</td>
<td>A person that is responsible for resolving the task.</td>
</tr>
<tr>
<td>Short description</td>
<td>A short description for the task.</td>
</tr>
<tr>
<td>Internal payload</td>
<td>Payload that was used in the identification process, during which the de-duplication task was generated.</td>
</tr>
<tr>
<td>Description</td>
<td>Full description for the task.</td>
</tr>
<tr>
<td>Work notes</td>
<td>Notes to keep track of the decisions and steps of resolving the task.</td>
</tr>
<tr>
<td>Priority</td>
<td>Task priority.</td>
</tr>
<tr>
<td>State</td>
<td>State of the de-duplication task as it progresses through resolution.</td>
</tr>
</tbody>
</table>

3. In the Duplicate Audit Results section, click a CI in the Duplicate CI column to view the details about how the CI was identified as a duplicate.

### Table 273: Duplicate Audit Results list columns

<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>
</tbody>
</table>

**Note:** 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 will be empty.
<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depend on</td>
<td>If the duplicate CI is a dependent CI, then this field displays the depend on CI.</td>
</tr>
<tr>
<td>Qualifier chain</td>
<td>If the duplicate CI is a dependent CI, then this field shows a list of sys_ids of qualifier CIs, if it exists.</td>
</tr>
<tr>
<td>Follow on task</td>
<td>The associated de-duplication task that captures the duplication.</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>
</tbody>
</table>

Based on your analysis of de-duplication tasks, you can determine which CI should remain active and which of the duplicate CIs in the Duplicate Audit Results records are stale or incorrect. Determine if it is appropriate to delete or inactivate any of these CIs.

**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 524.

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 re-classification. To disable automatic CI re-classification, set the respective properties to false.

Alternatively, in the input payload of the createOrUpdateCI() API you can temporarily override a false value of the glide.class.upgrade.enabled property for individual CIs. In the payload, set these properties to true to enable automatic reclassification.

- 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 274: 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 524.

Service rules metadata

Service definitions consist of CI types and relationship types. Service rules metadata define the dependency structure of the CI types and the relationship types in these service definitions, assisting in CI identification and in the construction of business service maps. The Metadata Rules Editor is used to configure and manage service rules metadata.

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

Service rules metadata consist of hosting rules and containment 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.

The plugins that have been activated on an instance determine which hosting and containment rules exist out-of-box.

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 will be 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, need to 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, and 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.

**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 Rules Editor.

- Given a CI type that is as a child in a containment rule: It cannot 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 can’t 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 can not 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
  - Outbound

Valid set of rules

Tomcat Hosted Linux
Linux Hosted Computer

The second metadata entry triggers the 3rd. requirement, which is satisfied (it’s a hosting rule, not a containment rule).

Create or edit containment service rule metadata

Create containment service rule metadata for CIs to assist in correctly identifying dependent CIs during the business discovery process and service mapping. Discovery calls the identification API that applies business metadata rules.

Role required: admin

A containment rule is a relationship definition 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 type as 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. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Metadata Rules Editor in the Correctness
group.

2. Or, navigate to Configuration Identification/Reconciliation Metadata Rules Editor.

3. Click Add New Rule at the top of the Containment Rules list.

4. In the Add Top-Level Containment Rule dialog box, select the Configuration Item Type for which you
   want to create the top-level rule.

5. Complete the following steps to select a top-level containment rule and add a child rule.
   a) Click the green ‘+’ icon.
   b) Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item Type</td>
<td>The CI for 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>A check box to use the reverse relationship in the rule.</td>
</tr>
</tbody>
</table>

   c) Click Create.

6. Complete the following steps to select a child rule and add an endpoint
   a) Click the blue ‘+’ icon.
   b) Complete the 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>

   c) Click Create.

Create or edit a hosting service rule metadata

Create hosting service rules metadata for CIs to assist in correctly identifying dependent CIs during
the business discovery process and service mapping. Discovery calls the identification API that applies
business metadata rules.
A hosting rule is a relationship definition 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.

Role required: admin

1. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Metadata Rules Editor in the Correctness group.

2. Or, navigate to Configuration Identification/Reconciliation Metadata Rules Editor.
3. Click Add New Rule at the top of the Hosting Rules list.
4. In the Add Top-Level Hosting Rule dialog box, select the Configuration Item Type for which you want to create the rule.
5. Complete the following steps to select the top-level hosting rule and add a child rule:
   a) Click the green ‘+’ icon.
   b) Complete the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Item Type</td>
<td>The CI for 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>A check box to use the reverse relationship in the rule.</td>
</tr>
</tbody>
</table>

c) Click Create.

Effective usage of CMDB Identification

Use CMDB Identification effectively for optimal accuracy and performance.

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 for performance reasons. 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 reduces 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:'09876tysueyt6345laku6'
        }
    }],
    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.

### Installed with Identification and Reconciliation

CMDB Identification and Reconciliation adds tables, properties, and script includes.

### Tables installed with Identification and Reconciliation

Identification and Reconciliation uses the following tables.
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifier</td>
<td>Identification rule sets defined for different classes of CIs.</td>
</tr>
<tr>
<td>[cmdb_identifier]</td>
<td></td>
</tr>
<tr>
<td>Reconciliation Definition</td>
<td>Reconciliation rules defined for different classes of CIs at the table and field level.</td>
</tr>
<tr>
<td>[cmdb_reconciliation_definition]</td>
<td></td>
</tr>
<tr>
<td>Identifier Entry</td>
<td>Rule entries with different priorities assigned to each identifier.</td>
</tr>
<tr>
<td>[cmdb_identifier_entry]</td>
<td></td>
</tr>
<tr>
<td>Data Source 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>[cmdb_datasource_precedence]</td>
<td></td>
</tr>
<tr>
<td>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>[duplicate_audit_result]</td>
<td></td>
</tr>
<tr>
<td>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>[reconcile_duplicate_task]</td>
<td></td>
</tr>
<tr>
<td>Reclassification Task</td>
<td>Reclassification tasks that were generated during the identification process.</td>
</tr>
<tr>
<td>[reclassification_task]</td>
<td></td>
</tr>
<tr>
<td>Data Source History</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>[cmdb_datasource_last_update]</td>
<td></td>
</tr>
<tr>
<td>Data Source Staleness Definition</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>[cmdb_datasource_staleness]</td>
<td></td>
</tr>
</tbody>
</table>

Properties installed with Identification and Reconciliation

Identification and Reconciliation uses the following properties. 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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>glide.class.upgrade.enabled</td>
<td>Flag for allowing class upgrade during identification and reconciliation.</td>
</tr>
</tbody>
</table>
|                                                    | • Type: true | false  
|                                                    | • Default value: true  
|                                                    | • Location: System Properties [sys_properties] table.                                                                                                                                                     |
| glide.class.downgrade.enabled                      | Flag for allowing class downgrades during identification and reconciliation.                                                                                                                                   |
|                                                    | • Type: true | false  
|                                                    | • Default value: true  
|                                                    | • Location: System Properties [sys_properties] table.                                                                                                                                                     |
| glide.class.switch.enabled                         | Flag for allowing class switching during identification and reconciliation.                                                                                                                                   |
|                                                    | • Type: true | false  
|                                                    | • Default value: true  
|                                                    | • Location: System Properties [sys_properties] table.                                                                                                                                                     |
| glide.reconciliation.override.null                 | Flag for allowing the update of an empty field by a lower priority data source.                                                                                                                                   |
|                                                    | • Type: true | false  
|                                                    | • Default value: true  
|                                                    | • Location: System Properties [sys_properties] table.                                                                                                                                                     |
| glide.identification_engine.skip_duplicates       | Controls how identification processes a small set of duplicate CIs.                                                                                                                                            |
|                                                    | • 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'.  
|                                                    | • When false: Matching a CI fails, and an error is logged.                                                                                                                                                   |
|                                                    | • Type: true | false  
|                                                    | • Default value: true  
<p>|                                                    | • Location: Add to the System Properties [sys_properties] table.                                                                                                                                          |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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. 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>• Type: Integer</td>
<td>• Default value: 5</td>
</tr>
<tr>
<td>• Location: Add to the System Properties</td>
<td>[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>• Type: Integer</td>
<td>• Default value: 20</td>
</tr>
<tr>
<td>• Location: Add to the System Properties</td>
<td>[sys_properties] table.</td>
</tr>
<tr>
<td>glide.identification_engine.distributed_locking</td>
<td>By default, identification/reconciliation processes acquire a global lock. Enable this property to allow acquiring mutex lock faster, and at a more granular level.</td>
</tr>
<tr>
<td>• Type: true</td>
<td>false</td>
</tr>
</tbody>
</table>
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 in four parent metrics, 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.

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 metric at every level of the aggregation. For most health tests, you can configure the health tests themselves.

Initially, the CMDB Health-related jobs (CMDB Health Dashboard jobs) are disabled, and you must enable them to start gathering and aggregating health data. See Setup and initial configuration on page 577 for details about enabling these jobs and about configuring CMDB Health settings.

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.

The following dashboards display CMDB health reports and let you configure the CMDB health metrics that CIs are evaluated for. View the Video: CMDB Health dashboard for information about the configuration of the CMDB Health dashboard.

<table>
<thead>
<tr>
<th>Dashboard</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDB Dashboard</td>
<td>Main CMDB health dashboard:</td>
</tr>
<tr>
<td>Configuration CMDB Dashboard CMDB View</td>
<td>• Overall CMDB and class level aggregated CI health. Aggregation is</td>
</tr>
<tr>
<td></td>
<td>displayed from the sub-metric level up to the overall CMDB level.</td>
</tr>
<tr>
<td></td>
<td>• Aggregated health for CI relationships, and sub-metrics.</td>
</tr>
<tr>
<td></td>
<td>• Displays the tasks that were generated for CIs that failed a health</td>
</tr>
<tr>
<td></td>
<td>test.</td>
</tr>
<tr>
<td></td>
<td>• Drill down for each parent metric to a detailed report of</td>
</tr>
<tr>
<td></td>
<td>associated sub-metrics, broken by class.</td>
</tr>
<tr>
<td></td>
<td>• Manage the CMDB Health Dashboard jobs.</td>
</tr>
</tbody>
</table>

<p>| CI Dashboard &lt;CI form&gt; Dashboard                | Health reports at the CI level:                                     |
|                                                 | • Pass/fail results for each sub-metric, per CI.                   |
|                                                 | • Displays incidents, changes, and other tasks affecting the CI,   |
|                                                 | and business services affected by the CI.                          |</p>
<table>
<thead>
<tr>
<th>Dashboard</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI Class Manager</td>
<td>Central location to manage a CI and to configure CMDB health settings:</td>
</tr>
<tr>
<td>Configuration CI Class Manager</td>
<td>• Configure scorecard thresholds of all metrics and sub-metrics.</td>
</tr>
<tr>
<td></td>
<td>• Configure weight of metrics and sub-metrics in health aggregation.</td>
</tr>
<tr>
<td></td>
<td>• Manage rules and definitions that are used for health tests, such as orphan rules, audit certificates, and recommended fields rule.</td>
</tr>
<tr>
<td></td>
<td>• Configure CMDB health properties.</td>
</tr>
<tr>
<td></td>
<td>• Explore the class hierarchy.</td>
</tr>
<tr>
<td></td>
<td>• Update and extend a CI class.</td>
</tr>
<tr>
<td></td>
<td>• Delete all records for a class.</td>
</tr>
<tr>
<td>CMDB Health Properties</td>
<td>Central location for configuring CMDB Health settings:</td>
</tr>
<tr>
<td>Configuration Health Properties</td>
<td>• Configure CMDB Health properties.</td>
</tr>
<tr>
<td></td>
<td>• Manage the CMDB Health Dashboard jobs.</td>
</tr>
<tr>
<td></td>
<td>• Activate a metric and configure weighted averages for its sub-metrics.</td>
</tr>
<tr>
<td>CMDB Service Dashboard</td>
<td>Main CMDB service health dashboard:</td>
</tr>
<tr>
<td>Configuration CMDB Dashboard</td>
<td>• Overall service aggregated health and detailed health for CIs per service.</td>
</tr>
<tr>
<td>Service View</td>
<td>Aggregation is displayed from the sub-metric level up to the overall services level.</td>
</tr>
<tr>
<td></td>
<td>• Displays the tasks that were generated for CIs in a service that failed a health test.</td>
</tr>
<tr>
<td></td>
<td>• Drill down for each parent metric to a detailed report of associated sub-metrics, broken by class.</td>
</tr>
<tr>
<td></td>
<td>• Manage the CMDB Health Dashboard jobs.</td>
</tr>
</tbody>
</table>

**CMDB remediation**

CMDB Health provides a framework for configuring CI remediation. This allows you to proactively apply corrective actions to unhealthy CIs in a managed and standardized fashion.

**CMDB health metrics**

The overall CMDB health score consists of three parent metrics which are correctness, compliance and completeness, each further consisting of sub-metrics. Each metric is associated with a scorecard that determines the contribution of the metric to the aggregated health at the overall CMDB level, class, and CI level.
You can configure which metrics and sub-metrics are included in the aggregated calculation, and set their weight in the aggregation. In the base system, all of the parent metrics and sub-metrics are included in the aggregated health report.

**Overall**

An aggregation of the parent metrics correctness, completeness and compliance, according to their overall scorecard weight settings.

**Correctness**

An aggregation of the following sub-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 matches the criteria in an orphan rule.
- The CI doesn’t have any relationship in the relationship table.
- 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. CI staleness is determined using reconciliation and staleness rules for the CI’s class if exist, and the glide.cmdb.health.staleness property. A CI is determined to be stale if it was not updated by the data source that was the last to update the CI, within a certain length of time. The length of time is determined either by the Effective Duration field in the staleness rule, or by the CMDB health system property glide.cmdb.health.staleness as follows:

- If a staleness rule is not defined for the CI’s class, then the glide.cmdb.health.staleness is used for testing the CI.
- If a staleness rule is defined for the CI’s class, then it is used for testing:
  - If the CI fails that test, then the CI is determined to be stale.
  - If the CI passes the test, then it is further tested using the glide.cmdb.health.staleness property.

For more information about how CI staleness and data source precedence rules affect each other, see *Define or edit data source precedence* on page 559.
In addition, a relationship in which a stale CI is a parent or a child, is determined to be a stale relationship.

**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**

An aggregation of the following sub-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 defined as recommended, are not populated. Out-of-box, no recommended fields are specified.

**Compliance**

Based on an audit of the CMDB.

**Audit**

Compares actual values of specified fields, against expected values defined in template audits (scripted audits are not supported). For more information see [Create an audit](#). Create a compliance-type audit, for which the results are calculated into the compliance CMDB health metric.

**Relationships**

Measures the health of CI relationships, consisting of the following sub-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.

Setup and initial configuration

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 and data is not collected. To display valuable and meaningful data, you should review and adjust settings.

1. For each metric and sub-metric that you want reported, define rules and fulfill other needed requirements. For example, create rules for evaluating orphan records and recommended fields, if you are interested in these metrics - see **CMDB health metrics** on page 574

2. 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 583

3. Set metric aggregation preferences, deactivate metrics that you are not interested in reporting, and adjust weighted averages of aggregation - see **Configure CMDB Health metrics aggregation preferences** on page 583.

4. Enable the Health Dashboard jobs for the metrics that you want reported - see **Enable and configure a CMDB Health Dashboard job** on page 582

5. **Customize the CI dashboard** on page 588

Monitor CMDB health in the CMDB dashboard

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 lets you drill down to take actions to address health issues, and to improve CMDB health.

The CMDB dashboard requires some configuration before it can display meaningful data. Once configured, the dashboard displays data that is automatically collected and calculated on a recurring schedule. The CMDB dashboard is based on the Performance Analytics dashboard framework, and uses its capabilities. 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 it needs to be set to true. For more information, see **Enable responsive dashboards**.

Access the CMDB dashboard by navigating to Configuration CMDB Dashboard CMDB View. On the CMDB dashboard:

- Click CMDB Health Scheduled Jobs to 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, and also per health metric. Additionally 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 of 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 metric. Health results of sub-metrics are displayed underneath, each contributing according to the configuration of the metric scorecard, and its threshold.

With the exception of 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 metric.
• In a charts widget: Click on 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.

Note: Directly clicking a scorecard on the CMDB dashboard, and then clicking a bar to display a list of all the records that the bar represents, is currently not supported. Instead, in the CMDB dashboard, select CMDB Correctness/Completeness/Compliance Dashboard from the dashboard drop-down list in the upper left corner. Then click a bar to display a list of all the records that the bar represents.

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>
<th>Color code</th>
<th>Definition</th>
<th>Default threshold setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Best</td>
<td>Less than or equal to 33</td>
</tr>
<tr>
<td>Orange</td>
<td>At risk</td>
<td>More than 33 and less than or equal to 67</td>
</tr>
<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 sub-metric are halted for this cycle, and all associated aggregated summaries display 0%. Review the scorecard rules which might be ineffective, or the CMDB might be in an unstable state.

### 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 allows a user to 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 metric settings specific to the needs in their domain. So different domains can have different metrics settings such as active/inactive, and thresholds.
- A child domain derives its immediate parent's domain health configurations if the child domain doesn't configure its own. A child domain can override parent's configurations by modifying them.

### Monitor services health in the CMDB service dashboard

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.

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 Properties page. Once configured, 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.

Using the CMDB dashboard requires the asset or itil role, and 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.

Access the CMDB service dashboard by navigating to Configuration CMDB Dashboard Service View.

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 metric. Health results of submetrics 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 metric.
- 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.

<table>
<thead>
<tr>
<th>Color code</th>
<th>Definition</th>
<th>Default threshold setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
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<tr>
<td>Orange</td>
<td>At risk</td>
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</tr>
<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>

The icon is a notation that the maximum failure threshold for the scorecard has been reached. The tests for the sub-metric are halted for this cycle, and all associated aggregated summaries display 0%.

### Configure metric rules and behavior

Configure CMDB Health related system properties, scheduled jobs, and health metric rules to customize how aggregated data is calculated, and other CMDB Health behavior.

See the following video on YouTube: CMDB Health Dashboard for Helsinki | Overview for information about configuring and using the CMDB dashboard.

### 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>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.cmdb.health.metricProcessor.maxRunningTime</td>
<td>Max time in minutes for which individual metric processor will run in each scheduled cycle. If processing of a sub metric exceeds the specified time, CMDB health processing halts until the next CMDB health job is scheduled to run.</td>
<td>If you enter an invalid value, the default value is used.</td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Default value: 120</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Location: Navigate to Configuration Health Properties. In the right hand-side navigator, click System Properties.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For performance reasons, it is recommended not to set this property to a value greater than 120.</td>
<td></td>
</tr>
<tr>
<td>glide.cmdb.health.staleness</td>
<td>The length of time that is used for testing CI staleness.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Used for CIs:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For which a staleness rule is not defined for the CI's class.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For which a staleness rule for the CI's class exist, and the CI passed that test. In this case, the CI is further tested for staleness using the value of the glide.cmdb.health.staleness property.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Type: Numeric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Default value: 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Location: Navigate to Configuration Health Properties. In the right hand-side navigator, click System Properties.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For performance reasons, it is recommended not to set this property to a value greater than 60.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If you enter an invalid value, the default value is used.</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</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 the jobs that process CMDB health tests, to start calculating CMDB health metrics that will be aggregated into the overall CMDB health report.

Role required: admin

In the base system, CMDB Health Dashboard jobs are disabled by default. Enable the respective job for the CMDB health metric 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 CMDB Dashboard and click CMDB Health Scheduled 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 metric of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Compliance Score Calculation</td>
<td>Script for calculating the compliance metric of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Correctness Score Calculation</td>
<td>Script for calculating the correctness metric of CMDB health.</td>
</tr>
<tr>
<td>CMDB Health Dashboard - Relationship Score Calculation</td>
<td>Script for calculating the CI relationships metric 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 corresponding health metric results 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 CMDB health metrics scorecards. You can configure these settings globally for the entire CMDB, or individually per class.

Role required: itil_admin (on top of itil)

Adjust scorecard thresholds to reflect the range of failures that should be used for each health state.

1. Navigate to Configuration CI Class Manager.
2. In the CI Class Manager expand the Class Hierarchy:
   - To configure thresholds for the completeness, correctness and compliance parent metrics, select the top-level Configuration Item class. When you select the top-level Configuration Item class, threshold settings to any scorecard apply to the entire class hierarchy.
   - To configure thresholds for a specific class, select that class from the list.
3. Check Advanced on the right-hand side bar. Click Correctness and all other strip headers to display all scorecards.
4. Select a scorecard such as Required Fields Scorecard or CMDB Correctness Scorecard.
5. Double-click the metric for the cmdb_ci class, or click New to create scorecard thresholds only for the selected class.
   - If you select the global metric for the cmdb_ci class, the threshold setting will apply to the entire class hierarchy.
6. 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.
7. Click Save.

**Configure CMDB Health metrics aggregation preferences**

Sub-metrics health scorecards are aggregated into their respective parent metric, which in return are aggregated into the overall CMDB Health report. Set metric aggregation preferences for the parent metrics, and for each of their sub-metrics, deactivate metrics that you are not interested in reporting, and adjust weighted averages of aggregation.
To start collecting and reporting CMDB health metrics, you must first enable and configure the CMDB health dashboard jobs.

Role required: itil_admin (on top of itil)

The completeness metric for example, consists of the sub-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 metrics are displayed on the CMDB dashboard in faded coloring, displaying the most recent aggregations that were calculated when the metric was active.

If Domain Support - Domain Extensions is activated, then you can configure health metric settings per domain.

In the ServiceNow base system, the weights of the main metrics have default settings, and each sub-metric is globally set.

1. Navigate to Configuration Health Properties.
2. Select Health Metrics on the right-hand side navigator.
3. Expand Select Metric and select one of the main metrics such as Completeness, or a sub-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 metric to include it in the aggregated CMDB health report.</td>
</tr>
<tr>
<td>Weighted Averages</td>
<td>Specify the weight of each sub-metric in the aggregated health report for the metric. The sum of weighted averages for all sub-metrics should be 100.</td>
</tr>
</tbody>
</table>

For a sub-metric:

<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 metric.</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 field to be mandatory

Configure a CI field as mandatory so it is included in the CMDB Health tests for the required metric if enabled. Required is a sub-metric of the CMDB Health completeness metric.

When a field is configured as mandatory, the CMDB health tests check whether the field is populated or not. The CI dashboard then displays the number of required fields that are left empty. 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. Select a class from the Class Hierarchy.
3. Select Fields on the right-side bar.
4. Select a table column.
5. In the Dictionary form, select the Mandatory check box.
6. Click Update.

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 in a form.

Set a CI field to be recommended

You can 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 health metric to include recommended fields in its aggregated health reports.

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.

1. Navigate to Configuration CI Class Manager.
2. Select a class from the Class Hierarchy.
3. Check Advanced on the right-hand side bar, and select Recommended Fields from the Completeness group.
4. In the slushbucket 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 metric, 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: admin

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. Select a class from the Class Hierarchy.
3. On the right-hand side navigation pane, check Advanced, expand the Correctness strip, and click Orphan Rule.
   If an orphan rule exists for the class, then double-click it to edit.
4. Complete or edit the CMDB Health Orphan Rule form.

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>The class for which the orphan rule applies.</td>
</tr>
<tr>
<td>Condition</td>
<td>The filter that determine which CIs are considered orphans. 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>No Relationship</td>
<td>Select to add the requirement that the CI should have no relationships to be considered an orphan CI.</td>
</tr>
</tbody>
</table>

5. Click Submit or Update to save the rule.

Create or edit a CMDB Health staleness rule

If the CMDB Health sub-metric staleness 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 metric, and weighs into the overall CMDB health calculation. Staleness rules are defined per class per data source.

Role required: admin

A staleness rule that is defined for a specific class is used in conjunction with a reconciliation rule for the same class to determine the staleness status of CIs from that class.

If the fields specified in the reconciliation rule for the CI's class were not updated by the specified data source within a certain time period - the CI is determined to be stale. The time period is determined by the glide.cmdb.health.staleness property or by the Effective Duration field in the staleness rule. If a staleness rule exist for a CI's class, then if a CI passes the rule's test, the CI is further tested using the glide.cmdb.health.staleness property value. A CI then, might initially pass the staleness test and then fail the subsequent staleness test that uses the glide.cmdb.health.staleness property.

1. Navigate to Configuration CI Class Manager.
2. Select a class from the Class Hierarchy.
3. On the right-hand side navigation pane, check Advanced, expand the Correctness strip, and click Staleness Rule.
   If a staleness rule exists for the class, then double-click it to edit.
4. Complete or edit the CMDB Health Staleness Rule form.

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applies to</td>
<td>The class for which the rule applies.</td>
</tr>
<tr>
<td>Data source</td>
<td>The data source for which the rule applies.</td>
</tr>
<tr>
<td></td>
<td>This data source correlates to the Discovery source field on a CI. These two must match for the staleness rule to be applied to a CI. Ensure that the Discovery source field is properly populated either by Identification and Reconciliation processes, or manually.</td>
</tr>
<tr>
<td>Control</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Effective Duration</td>
<td>The time period that is used for the initial CI staleness test.</td>
</tr>
<tr>
<td></td>
<td>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 default value of 0 is used.</td>
</tr>
<tr>
<td>Active</td>
<td>Select to activate the rule.</td>
</tr>
</tbody>
</table>

5. Click Submit or Update to save the rule.

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 metrics and scorecards. 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 metrics are always up to date, but for other metrics, 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 metrics 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 metric test (for example, it is not a duplicate).
- Red: The CI failed the 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: Not applicable notification appears.
- If only dependent identification rules are defined: Not applicable notification appears.

**Orphan**
If no orphan rules ([cmdb_health_orphan_rule]) are defined for the CI's class or its ancestors: Not applicable notification appears.

**Audit**
If no desired state audits ([cert_audit]) are defined for the CI: 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.

### 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 metric health tests.

Role required: itil or asset

CMDB Health measures CI relationship health in its own metric and sub-metrics.

**Orphan relationship**
A relationship that is missing a parent or missing a child.

**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.

1. Navigate to Configuration CMDB Dashboard CMDB Health.
2. Select the Relationship Health tab.
Explore and modify CI class

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 define metadata for a class, such as reconciliation rules, required 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 new class.

In the CI Class Manager, you can review and manage the health rules and settings for all CMDB Health metrics, at the class level. You can configure scorecard settings for calculating overall health for a class, and overall health for the entire CMDB.

1. Navigate to Configuration CI Class Manager.
2. Check Advanced and expand all strips that are closed.
3. Select any scorecard to review and update its setting for the class.
4. Expand the Class Hierarchy to explore the class hierarchy and to select a class to modify.
5. Modify any class detail as needed, and click Update.

Delete all records for a CMDB class

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

Role required for the Configuration Item [cmdb_ci] table: itil or asset

1. Navigate to Configuration CI Class Manager.
2. Expand the Class Hierarchy and select the class for which you want to delete all records.
3. On the Table form, click Delete All Records.

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

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 dot-walking on CI fields so that remediation is applied to tasks associated with matching CIs.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</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>Orchestration 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

1. Navigate to Configuration CMDB Dashboard.
2. Click on the metric tile that is associated with the remediation that you want to apply. For example, to remediate an orphan CI, click the Completeness tile.
3. In the detailed report, scroll to the CMDB Health Results list. In the Task column, select the task that is associated with the CI that you want to remediate.
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.

### Tables installed with CMDB Health

CMDB Health tracks and reports various metrics that monitor the health of the CMDB. CMDB Health adds the following tables.

<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 metric is enabled, maximum failure threshold, and other settings for all CMDB Health metrics and sub-metrics.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CMDB Health Result</td>
<td>Results from the most recent CMDB Health processing cycle.</td>
</tr>
<tr>
<td>[cmdb_health_result]</td>
<td></td>
</tr>
<tr>
<td>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_scorecard]</td>
<td></td>
</tr>
<tr>
<td>CMDB Health Orphan Rule</td>
<td>Rules for calculating orphan records per class.</td>
</tr>
<tr>
<td>[cmdb_health_orphan_rule]</td>
<td></td>
</tr>
<tr>
<td>CMDB Recommended Fields</td>
<td>Recommended fields per class.</td>
</tr>
<tr>
<td>[cmdb_recommended_fields]</td>
<td></td>
</tr>
<tr>
<td>CMDB Health Metric Status</td>
<td>Internal table that tracks the status of each metric that is being processed. Includes metric status, processing time, and processing start date.</td>
</tr>
<tr>
<td>[cmdb_health_metric_status]</td>
<td>A metric state changes from ‘In Progress’ to either of:</td>
</tr>
<tr>
<td></td>
<td>• Complete</td>
</tr>
<tr>
<td></td>
<td>• MaxFailures</td>
</tr>
<tr>
<td></td>
<td>• Daily Processing Time Out</td>
</tr>
<tr>
<td></td>
<td>Processing of a timed out metric continues on the following day.</td>
</tr>
<tr>
<td>CMDB Health Processor Status</td>
<td>Internal table that tracks the processing progress of each metric. Contains a list of tables that are processed for each metric, and processing status. Classes are processed sequentially, changing status from Draft -&gt; In Progress -&gt; Complete.</td>
</tr>
<tr>
<td>[cmdb_health_processor_status]</td>
<td></td>
</tr>
</tbody>
</table>

**CMDB Health troubleshooting**

Use the following information to track and troubleshoot 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), you need to update the system property glide.cmdb.logger.use_syslog.CMDBHealth. For information about using this property, see [CMDB health system properties](#) on page 580.

**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 [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 sub-metric:

**Complete**
All classes are processed and the number of failures is under the maximum failures threshold.

**Max Failures**
The number of failures for this metric reached the maximum failures threshold. Processing has been aborted and will start over in the next run.

**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 parent metric depends on the final state of its sub-metrics. Possible final state of a parent metric:

**Complete**
All sub-metrics are in Complete state and score calculation is complete.

**Incomplete**
Score is not calculated because one of the sub-metrics reached its maximum failure thresholds.

**Daily Time Out Pause**
Timed out because one of the sub-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. This will help you 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 will not be 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. This is 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 need to be deleted directly from the database. Therefore, in this case, in order to delete an orphan CI from the database you will need to 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 needs to 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.)

**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 585.
  - 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 592 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.

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)

**Note:** In Helsinki, many of the tables from the Extended CMDB plugin were moved to the core Configuration Management (CMDB) (com.snc.cmdb) plugin, or to one of the newly added plugins. See the **Helsinki release notes** for details about those tables.

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 596
- Basic access authentication for Help the Help Desk on page 598

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: \n
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 596 or Basic access authentication for Help the Help Desk on page 598.

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're logged in to your instance. If you choose to use a different browser and download the script file to run at a later time, 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 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 Definition 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/";

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:
   var httpUsername = "user_on_your_instance";
   var httpPassword = "user's_password";

8. Create a Logon.bat script to run helpthehelpdesk.js as follows.
   @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.

   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 598.

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:

```javascript
// **************************** Required Variables ****************************
// * The following section should be modified if the information is not correct.
// ****************************

// The variable should point to your instance URL, such as https://demo.service-now.com
var server = "https://demo.service-now.com/";

// If SOAP authentication is turned on on the instance. The http authentication should be provided here.
var httpUsername = "username";
var httpPassword = "encrypted0Fnc1dYmQ=";
```

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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 DefinitionHelp 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>
<tr>
<td>glide.discovery.assigned_user_match_field</td>
<td>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.</td>
</tr>
</tbody>
</table>

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/"

```javascript
/* ****************** 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:

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 Service Rules 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.

Content packs for Configuration Management (CMDB)

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 content packs and in-form analytics on instances that have not licensed Performance Analytics Premium to evaluate the functionality. However, to start collecting data you must license Performance Analytics Premium.

Content packs

The Performance Analytics widgets on the dashboard visualize data over time. These visualizations allow you to analyze your business processes and identify areas of improvement. With content packs, you can get value from Performance Analytics for your application right away, with minimal setup.

**Note:** Content packs 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 content pack 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

Dependency Views graphically displays an infrastructure view for a configuration item (CI) and the 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 business services.

If Service Mapping is activated, Dependency Views maps are enhanced to display dependencies that reflect connections in service maps.

Explore
- Dependency Views release notes
- Upgrade to Istanbul

Administer
- Create or modify Dependency Views map indicators on page 627
- Create or modify map icons on page 629
- Create a predefined filter on page 630
- Create or modify Map Related Items on page 632
- Create or modify Dependency Views menu actions on page 634
- Create or edit a dependency type on page 636

Use
- Dependency Views map on page 612
- Dependency Views map menus and controls on page 613
- View a Dependency Views map on page 622
- Change the layout of Dependency Views map on page 623
- Filter the view of a Dependency Views map on page 623
- Perform actions on nodes in a Dependency Views map on page 625
- Supported browsers for Dependency Views on page 618

Develop
- Developer training
- Developer documentation
- Components installed with Dependency Views on page 607

Integration
- Display metrics for CIs in a Dependency Views map on page 625

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

The Dependency Views plugin adds tables and system properties.

Tables installed with Dependency Views

Dependency Views adds the following tables.
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available CI icons  [ngbsm_ci_icons]</td>
<td>Stores all available CI class icons.</td>
</tr>
<tr>
<td>Icons for CI types  [ngbsm_ci_type_icon]</td>
<td>Maps icons to CI class names.</td>
</tr>
<tr>
<td>Map Script  [ngbsm_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>Map View  [ngbsm_view]</td>
<td>Serialized map views saved by users.</td>
</tr>
<tr>
<td>Map Filter  [ngbsm_filter]</td>
<td>Filters saved by users.</td>
</tr>
<tr>
<td>Menu Action  [ngbsm_context_menu]</td>
<td>Default and custom context menu actions that appear when users right click a map.</td>
</tr>
<tr>
<td>Related Item  [ngbsm_related_item]</td>
<td>Stores which reference fields should be treated as relationships when building the map. This allows users to include CI's that are related via a reference field instead of a relationship.</td>
</tr>
<tr>
<td>Edge Colors  [bsm_edge_color]</td>
<td>Color definitions to use when drawing the relationships between nodes based on relationship type.</td>
</tr>
<tr>
<td>Map Indicator  [bsm_indicator]</td>
<td>Stores all map indicators.</td>
</tr>
<tr>
<td>BSM Saved Map  [bsm_graph]</td>
<td>Details of maps.</td>
</tr>
<tr>
<td>BSM Map Actions  [bsm_action]</td>
<td>Actions on the map.</td>
</tr>
<tr>
<td>BSM Map View  [map_view]</td>
<td>Parents' predefined filters.</td>
</tr>
<tr>
<td>Map View Configuration Types  [map_view_ci_type]</td>
<td>Configuration type filters, limiting the CI class types to be displayed, per predefined filter.</td>
</tr>
<tr>
<td>Map View Relationship Types  [map_view_rel_type]</td>
<td>Relationship type filters, limiting the links to be displayed between CIs, per each predefined filter.</td>
</tr>
<tr>
<td>[map_viewroles]</td>
<td>Roles that a specific predefined filter should be applied to.</td>
</tr>
</tbody>
</table>
### Table

| CI Filters [map_filter] | CI attribute filters, limiting the CIs to be displayed, per predefined filter. |

### Properties installed with Dependency Views

Dependency Views adds the following properties.

**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.bsm.max_nodes</td>
<td>Maximum number of CIs to display on a map at once. The maximum number of nodes to retrieve from the database for a CI. If more nodes exist in the database, they are not displayed in the map.</td>
</tr>
<tr>
<td>glide.bsm.max_levels</td>
<td>Maximum level depth from the root CI that is initially displayed in Dependency Views maps. Level depth is the graph distance between the root CI and a node.</td>
</tr>
<tr>
<td>glide.bsm.show_virtual_node_children</td>
<td>Show children of virtual groups 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>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| glide.bsm.too_many_children | 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.  
  - Type: Integer, valid values 1 or greater  
  - Default value: 10  
  - Location: Dependency Views Map Properties |
| glide.ngbsm.filters_remove_filtered_items | Filtered out items should be removed from the graph along with any disjoint children.  
  - Type: Yes | No  
  - Default value: No  
  - Location: Dependency Views Map Properties |
| glide.bsm.max_num_rels | Maximum number of relations per node. Maximum number of relations to display per node. 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 | When filters are changed, the graph recalculates the layout using the currently selected layout algorithm.  
  - Type: Yes | No  
  - Default value: No  
  - Location: Dependency Views Map Properties |
| glide.ngbsm.filters_fit_to_screen_automatically | When filters are changed, the graph should be fit to the screen.  
  - Type: Yes | No  
  - Default value: No  
  - Location: Dependency Views Map Properties |
| glide.ngbsm.performance_allow_curves | Allow links between nodes to be drawn using smooth curves (May impact performance).  
  - Type: Yes | No  
  - Default value: Yes  
  - Location: Dependency Views Map Properties |
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ngbsm.notification_display_time</td>
<td>Amount of time in milliseconds a notification stays on the screen.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5000</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>glide.ngbsm.search_ci_limit</td>
<td>Maximum amount of results displayed when searching for CIs.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 10</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>glide.ngbsm.search_rel_type_limit</td>
<td>Maximum amount of results displayed when searching for Relationship Types.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>glide.ngbsm.show_class_labels</td>
<td>When available, the map should display the class labels for each CI.</td>
</tr>
<tr>
<td></td>
<td>• Type: Yes</td>
</tr>
<tr>
<td></td>
<td>• Default value: Yes</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>glide.bsm.layout_horizontal_spacing_x</td>
<td>Minimum horizontal distance between nodes in horizontal layout,</td>
</tr>
<tr>
<td></td>
<td>The distance is measured in pixels between one node's center to another node's center.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 200</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>glide.bsm.layout_horizontal_spacing_y</td>
<td>Minimum vertical distance between nodes in horizontal layout. The distance is measured in pixels between one node's center to another node's center.</td>
</tr>
<tr>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 100</td>
</tr>
<tr>
<td></td>
<td>• Location: Dependency Views Map Properties</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| glide.bsm.layout_vertical_spacing_x | Minimum horizontal distance between nodes in vertical layout. 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 |
| glide.bsm.layout_vertical_spacing_y | Minimum vertical distance between nodes in vertical layout. 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 |
| glide.ngbsm.truncate_long_labels | 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.  
Set to No to display node labels in their entirety, and to use multiple lines and wrapping as needed, so that label width does not exceed the maximum width available to the left of a CI node.  
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 |

Dependency Views map

ServiceNow® Dependency Views maps graphically display configuration items that support business services and the relationships between the configuration items.

A ServiceNow 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 181: 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.
<table>
<thead>
<tr>
<th>Number</th>
<th>Opened</th>
<th>Short Description</th>
<th>Caller</th>
<th>Priority</th>
<th>State</th>
<th>Category</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>INC000001</td>
<td>2017-01-01 09:47:39</td>
<td>SAP Sales app is not accessible</td>
<td>Carol Coughlin</td>
<td>Critical</td>
<td>In Progress</td>
<td>Service Desk</td>
<td></td>
</tr>
<tr>
<td>INC000006</td>
<td>2016-11-02 22:48:56</td>
<td>SAP Materials Management is slow or there is an outage</td>
<td>Christopher Mitchell</td>
<td>Critical</td>
<td>On-Hold</td>
<td>Software</td>
<td>Service Desk</td>
</tr>
<tr>
<td>INC000002</td>
<td>2017-01-23 22:48:46</td>
<td>The SAP HR application is not accessible</td>
<td>Margaret Gray</td>
<td>Critical</td>
<td>In Progress</td>
<td>Inquiry / Help</td>
<td>Software</td>
</tr>
<tr>
<td>INC000003</td>
<td>2017-01-02 22:48:48</td>
<td>SAP Financial Accounting application appears to be down</td>
<td>Bud Robinson</td>
<td>Critical</td>
<td>In Progress</td>
<td>Software</td>
<td></td>
</tr>
<tr>
<td>INC000004</td>
<td>2017-01-02 22:48:32</td>
<td>Manager can’t access SAP Controlling application</td>
<td>Joe Employee</td>
<td>Critical</td>
<td>In Progress</td>
<td>Software</td>
<td></td>
</tr>
</tbody>
</table>

### Context Menu
- Run Layout
- Fit To Screen
- Filter Filters

### Node Menu
- Expand
- Run Layout From Here

### Map Settings
- Custom Settings Name
- Save
- Load
- Dependency Type
- Apply
- Max Levels
- Min
- 3
- Max
- Apply

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## 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>![Menu icon]</td>
<td>Menu to save, load and export views of the map.</td>
</tr>
<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>![Search for CI]</td>
<td>Enter the name of a CI or a business service to load into the map. Alternatively, you can start typing to have the auto-complete feature present a list of CIs and businesses service 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 Business Services that are associated with the selected CI.</td>
</tr>
<tr>
<td></td>
<td>• Click on a business service, to highlight the CIs that are associated with that business service.</td>
</tr>
<tr>
<td></td>
<td>• Click Related Business Services, then double-click a business service to display the business service map in the Event Management dashboard.</td>
</tr>
<tr>
<td></td>
<td>If the Event Management plugin is active, then events and alerts are also displayed.</td>
</tr>
<tr>
<td>Settings</td>
<td>Set filters for the map.</td>
</tr>
</tbody>
</table>
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>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>View Related Outages</td>
<td>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.</td>
</tr>
<tr>
<td>Add Relationship</td>
<td>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.</td>
</tr>
<tr>
<td>Expand</td>
<td>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.</td>
</tr>
<tr>
<td>Collapse</td>
<td>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.</td>
</tr>
<tr>
<td>Run Layout From Here</td>
<td>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.</td>
</tr>
<tr>
<td>Load More</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Relationship menu**

The following options are available if you right-click a relationship link.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>View Relationship Form</td>
<td>Opens the CI Relationship form. You can modify the Parent, Type, and Child of the relationship from this form.</td>
</tr>
<tr>
<td>Modify Relationship</td>
<td>Searches for and selects a new relationship for this link.</td>
</tr>
</tbody>
</table>
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 version 25 or later (latest version recommended)
- Safari version 6 or later
- Microsoft Internet Explorer (IE) version 9 or later

The Dependency Views module is not supported on tablets and on mobile devices.

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 182: 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 then represent CIs of a similar CI type but are not CIs 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.
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 ITOM Metric Management 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 business services in the Details section includes business services that were discovered by Service Mapping.

Maps provided by Service Mapping are for business services, including comprehensive maps from the perspective of business 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 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 business services. If Service Mapping is activated, then the list of related business services includes business services that were discovered by Service Mapping.
     Click Related Business Services and then double-click a business service to display the business service 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. Custom settings can be loaded by using the Load Saved Custom Settings option. 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, and relationship filters. You can Set a predefined filter as default on page 631. 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. On: Do not display filtered items on the map.</td>
</tr>
<tr>
<td>Run Layout Automatically</td>
<td>Off: The configured layout to the map is reapplied whenever the filter is changed. 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>
</tr>
</thead>
<tbody>
<tr>
<td>Fit to Screen Automatically</td>
</tr>
<tr>
<td>On: The map magnification will increase or decrease automatically to display all CIs on the map.</td>
</tr>
<tr>
<td>Off: The map magnification remains unchanged when the map is reloaded.</td>
</tr>
</tbody>
</table>

---

### Display metrics for CIs in a Dependency Views map

Operational Metrics 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 Metrics Explorer that displays metrics data for CIs on the map.

The ITOM Metric Management (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 Metrics Explorer functionality that is tailored to the map. In this mode, you can access Metric 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 Metrics 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 Metrics 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 Metrics 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 275: 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>
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 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

Nodes can display in a collapsed format to avoid unnecessary clutter in large maps.

1. To expand a cluster or collapsed node, right-click the CI and select Expand from the context menu.
2. To collapse a cluster or a 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 Dependency Views map indicators

Dependency Views maps uses 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 indicator.

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 Settings menu. Also, you can create a map indicator to define additional record types, such as trouble sources for business service CIs. 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 Dependency Views map, the Affected CI’s indicator displays for all affected CIs for as long as the parent task is active. On a Dependency Views 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 618.

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>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>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.</td>
</tr>
<tr>
<td>Name</td>
<td>Name of the indicator.</td>
</tr>
<tr>
<td>Order</td>
<td>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.</td>
</tr>
<tr>
<td>Node color</td>
<td>This field is used for backward compatibility.</td>
</tr>
</tbody>
</table>
### Field Descriptions

<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 <a href="#">Create or modify map icons</a> on page 629</td>
</tr>
<tr>
<td></td>
<td>• To create or use a system image see .</td>
</tr>
<tr>
<td>Active</td>
<td>Name of the field on the selected table to be associated with the map indicator.</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>This field is used for backward compatibility.</td>
</tr>
<tr>
<td>End field</td>
<td>This field is used for backward compatibility.</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 Dependencies</td>
<td>Check box to enable display of the indicator in a Dependency Views map.</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>
<tr>
<td>Tooltip Info</td>
<td>The suffix 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 ecmdb_admin roles are required to access the records in this table [ngbsm_icon] to upload new icons.

1. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager .
   b) Select a class in the Class Hierarchy.
   c) In the sidebar on the right, select Icon.

2. Or, navigate to Dependency Views Map Icons , and click New to create a new map icon or click the name of an existing icon from the Label column to modify an existing icon.

3. Fill in the fields on the form, as appropriate.

   Table 277: Map Icons form

<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>

4. 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 button 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 184: Dependency Views Configuration Item field](image)

The Dependency Views map for the *JEMPLOYEE-IBM computer shows the network adapter attached to the computer.
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 278: 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>
</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 279: 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>Condition</td>
<td>Condition that triggers the display of this menu option. If the condition</td>
</tr>
<tr>
<td></td>
<td>evaluates to false the menu option does not display. Script is evaluated</td>
</tr>
<tr>
<td></td>
<td>in JavaScript in the user's browser and does not have access to all the</td>
</tr>
<tr>
<td></td>
<td>APIs that Business Rules do. For details on available parameters, see</td>
</tr>
<tr>
<td></td>
<td>Condition Parameters.</td>
</tr>
<tr>
<td>Control</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Item    | Map element for which the menu option displays. Valid values are:  
  • Canvas for the menu on the map background.  
  • Node for the menu on a CI.  
  • Relationship for the menu on a relationship link. |
| Order   | 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. |
| Script  | 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. |
| Type    | 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. |

Condition and script parameters for menu actions

You can use these 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 280: 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>Text</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>item.name</td>
<td>Name of CIs. CI’s type name or the table label, such as Business Service.</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 281: 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>
<tr>
<td>item.manufacturer_id</td>
<td>The sys_id of the CI’s manufacturer.</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.

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>
<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>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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 283: 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>Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</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 284: 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 285: 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>Show User field</td>
<td>Audit [cert_audit]</td>
<td>Shows or hides fields based on the Assignment type selected. The system shows the User field when you select the following assignment types:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User Field if the Assign to empty option is Create Assigned Task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Specific User</td>
</tr>
<tr>
<td>Show Assign to fields</td>
<td>Audit [cert_audit]</td>
<td>Shows or hides fields based on the Assignment type selected. The system shows the Assign to field when the assignment type is User Field.</td>
</tr>
<tr>
<td>Show Assignment Fields</td>
<td>Audit [cert_audit]</td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• User Field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Group Field</td>
</tr>
</tbody>
</table>

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### Table 286: 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 287: 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>
<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>
</tbody>
</table>

## Business rules

### Table 288: Compliance Certification Core business rules

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</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>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 Compliance Overview.
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 module roles

Only users with certain roles can access the Overview module.
The different levels of access are:

Table 289: 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>
<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, customize</td>
</tr>
<tr>
<td></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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 290: 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) |
| 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 291: 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.
### Upcoming Desired State Audits

<table>
<thead>
<tr>
<th>Date</th>
<th>Task Description</th>
<th>Last Audit Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-04-17</td>
<td>Data Center Zone Consumption Monitor the data center power consumption</td>
<td>2013-04-09 11:21:14</td>
</tr>
<tr>
<td>2013-04-17</td>
<td>Critical Business Services Ensure the critical business services are running</td>
<td>2013-04-09 11:21:14</td>
</tr>
<tr>
<td>2013-04-17</td>
<td>Database Audit All databases need their manager, server, and server type</td>
<td>2013-04-09 11:21:14</td>
</tr>
</tbody>
</table>

### Desired State Discrepancies

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>50</td>
</tr>
<tr>
<td>Database</td>
<td>40</td>
</tr>
<tr>
<td>Connectivity</td>
<td>30</td>
</tr>
<tr>
<td>Reporting</td>
<td>20</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>15</td>
</tr>
<tr>
<td>Applications</td>
<td>10</td>
</tr>
<tr>
<td>Compliance</td>
<td>5</td>
</tr>
</tbody>
</table>

### Outstanding Desired State Tasks

<table>
<thead>
<tr>
<th>Task ID</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure the database has all support staff listed, manager, support group, etc. (10)</td>
</tr>
<tr>
<td>2</td>
<td>Review access power consumption with stakeholders (5)</td>
</tr>
<tr>
<td>3</td>
<td>Ensure the audit results below for the discrepancies that must be addressed (15)</td>
</tr>
<tr>
<td>4</td>
<td>Update this server to match the conditions listed in the audit results (17)</td>
</tr>
</tbody>
</table>
Desired State Overview module roles

Only compliance 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>
</tbody>
</table>
| certification_admin | • View (view overview page and refresh reports)  
|                  | • Customize (refresh, add, delete, and rearrange reports) |
| 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 188: Desired State threshold report
Table 293: Desired state report table

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired State Discrepancies</td>
<td>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.</td>
<td>Audit Result</td>
</tr>
<tr>
<td></td>
<td>• Type: bar chart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Table: Audit Result [cert_audit_result]</td>
<td></td>
</tr>
<tr>
<td>Desired State Result with Stability Unstable</td>
<td>This report displays all audit results where the Stability field has the value Unstable. This report displays by CI and stacked by audit.</td>
<td>Audit Result</td>
</tr>
<tr>
<td></td>
<td>• Type: bar chart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Table: Audit Result [cert_audit_result]</td>
<td></td>
</tr>
<tr>
<td>Desired State Result with Threshold Exceeded</td>
<td>This report displays all audit results where the Threshold field has the value Exceeded. This report displays by CI and stacks by each audit.</td>
<td>Audit Result</td>
</tr>
<tr>
<td></td>
<td>• Type: bar chart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Table: Audit Result [cert_audit_result]</td>
<td></td>
</tr>
<tr>
<td>Upcoming Desired State Audits</td>
<td>This report displays the desired state audits that are scheduled to run in the next two quarters.</td>
<td>Audit</td>
</tr>
<tr>
<td></td>
<td>• Type: List (tabular) report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Table: Audit [cert_audit]</td>
<td></td>
</tr>
<tr>
<td>30/60/90 Day Desired State Task Aging</td>
<td>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.</td>
<td>Follow On Task</td>
</tr>
<tr>
<td></td>
<td>• Type: Horizontal bar chart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Table: Follow On Task [cert_follow_on_task]</td>
<td></td>
</tr>
</tbody>
</table>
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.

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) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Audit in the Compliance group.

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.

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 294: 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>
</table>
| Health window unit  | Unit of measurement that defines the duration of a health window. The default value for this field is Days. Choices are:  
|                     | • 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. 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.
Certification 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

Figure 189: Audit Running
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.

![Figure 190: Audit Type filter](image)

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 191: 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.</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>
</tbody>
</table>
| Stability | 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:  
  - Stable  
  - Unstable |

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 193: Audit Result Delete Available](image)

**Figure 192: Audit Result Delete List**

**Figure 193: 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 194: List v2: select View Compliance

The Audit Results Compliance View appears.
### Table 296: 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](image)

**Figure 196: 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.

**Figure 197: 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 198: Desired State Health Window

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.
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>
<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 298: 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 299: Compliance

<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.
Figure 201: Desired State Filter Clone

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 202: 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 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. Use the CI Class Manager:
   a) Navigate to Configuration CI Class Manager.
   b) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Certification Filter in the Compliance group.

2. Or, navigate to one of these modules:
   • Compliance Filters
   • IT GRC Administration Filters
   • Data Certification Schedules Certification Filters

3. Click New.
4. Fill in the fields (see table).
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.

**Note:** You can change a filter Description without incrementing a version.

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 300: 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.

   ![Figure 205: Desired State Filter Delete All](image)

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.
Figure 206: Desired State Filter Delete

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 208: 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 209: Follow-on Task
3. Open records from the Audit Results related list to see each discrepancy.

![Figure 210: Audit Result Detail](image)

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.

![Figure 211: Follow-on Task Activity](image)

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 212: 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 638 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) Select a class from the Class Hierarchy.
   c) In the sidebar on the right, check Advanced. Click Certification Template in the Compliance group.

3. Or, navigate using one of these paths:
   - Compliance Architecture Compliance Templates
   - Compliance Desired State Templates
   - Compliance 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 214: Filter Field](image)

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**: 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 **Dot-walking**.

- **Certification CI Relationship Conditions**: 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 215: Clear Check

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.

![Condition Marked as Inactive](image)

**Figure 216: Condition Marked 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.

   ![Warning](image)

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 217: 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 218: 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.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Filter</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESXi Server Attributes</td>
<td>Attributes for all ESXi servers in the UK office</td>
<td>ESXi Servers - UK/OEV2</td>
<td>2</td>
</tr>
<tr>
<td>ESXi Server Attributes</td>
<td>Attributes for all ESXi servers in the UK office</td>
<td>ESXi Servers - UK/OEV2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Certification Attribute Conditions**

- "CPU count" is "2"
- "Disk space (GB)" greater than "40"
- "RAM (MB)" greater than "2000"

**Certification CI Relationship Conditions**

Select versions to display

**Related Links**

Delete inactive versions
4. To make an inactive template the current version, open that version, edit it if desired, and then click Revert.
<table>
<thead>
<tr>
<th>Certification Template</th>
<th>= Required field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>TEM0001003</td>
</tr>
<tr>
<td>Active:</td>
<td></td>
</tr>
<tr>
<td>Name:</td>
<td>ESX Servers at HQ</td>
</tr>
<tr>
<td>Description:</td>
<td>All ESX servers at HQ</td>
</tr>
<tr>
<td>Filter:</td>
<td>ESX Filter - 1</td>
</tr>
<tr>
<td>Table:</td>
<td>cmdb_ci_esx_server</td>
</tr>
<tr>
<td>Version:</td>
<td>1</td>
</tr>
<tr>
<td>Audit type:</td>
<td>Desired State</td>
</tr>
</tbody>
</table>

**Certification Attribute Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk space (GB) greater than &quot;200&quot;</td>
</tr>
<tr>
<td>RAM (MB) greater than &quot;8000&quot;</td>
</tr>
</tbody>
</table>

**Certification CI Relationship Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert a new row...</td>
</tr>
</tbody>
</table>

**Certification User Relationship Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert a new row...</td>
</tr>
</tbody>
</table>

**Certification Group Relationship Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select an inactive version as the current version</td>
</tr>
</tbody>
</table>

**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 221: 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.
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.
<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Description</th>
<th>Filter</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESX Server Attributes</td>
<td>TEM001005</td>
<td>Attributes for all ESX servers in the UK office</td>
<td>ESX Servers - UK - 1</td>
<td>1</td>
</tr>
<tr>
<td>ESX Server Attributes</td>
<td>TEM001005</td>
<td>Attributes for all ESX servers in the UK office</td>
<td>ESX Servers - UKDEV2 - 3</td>
<td>2</td>
</tr>
</tbody>
</table>

*Delete unused and inactive versions of this template*
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 225: 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.
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.

![Control Form Image]

Figure 227: ITGRC Control

Table 301: 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 228: IT GRC Control Test Def
### Table 302: Defining A Control Test

<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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sample size</td>
<td>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.</td>
</tr>
<tr>
<td>Control test conditions</td>
<td>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.</td>
</tr>
<tr>
<td>In scope definition</td>
<td>A reference to a condition collection if Include supporting data is selected and Condition type is set to Advanced.</td>
</tr>
<tr>
<td>Configuration to retrieve</td>
<td>Method for using the Configuration reference field if Include supporting data is selected and Condition type is set to Advanced or Template.</td>
</tr>
<tr>
<td></td>
<td>• None: Returns all records in scope.</td>
</tr>
<tr>
<td></td>
<td>• Matching: Returns all matching records in scope.</td>
</tr>
<tr>
<td></td>
<td>• Non-matching: Returns all non-matching records in scope.</td>
</tr>
<tr>
<td></td>
<td>For more information, see Defining Advanced Conditions.</td>
</tr>
<tr>
<td>Template</td>
<td>[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.</td>
</tr>
<tr>
<td>Configuration</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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.
   The list is filtered by an audit type of Scripted.
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
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
```
// 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 229: Scripted audit

Table 303: 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>
</tbody>
</table>

**Assignment type**

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:

- **User Field**
  - 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.

- **Specific User**
  - Select a specific user to perform the tasks. This selection displays the User field.

- **Group Field**
  - 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.

- **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.

**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.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 assign 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.</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>
<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 audit automatically creates follow-on tasks for all records that have Assign to populated, regardless of which selection you make for Assign to empty. The possible selections are:</td>
</tr>
<tr>
<td></td>
<td><strong>Do Not Create Task</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Create Unassigned Task</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Create Assigned Task</strong></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>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>
</tbody>
</table>
### Field | Description
--- | ---
**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 entered in time, days, or both. 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 on which 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 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 304: Script methods**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>getFilterRecords</td>
<td>public GlideRecord getFilterRecords(String filterId)</td>
<td>filterId: The sys_id of the filter to use.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Parameters</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 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. |
| 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. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>createFollowOnTask()</td>
<td>public String createFollowOnTask(String auditId, String cId, String assignedTo, String assignmentGroup, String shortDescr)</td>
<td>auditId: Sys_id of the audit record executed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cId: Sys_id of the configuration item. This string is empty when the table is not extended from the cmdb_ci table.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>assignedTo: Sys_id of the assigned user of the task. This string can be empty.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>assignmentGroup: Sys_id of the group the task is assigned to. This string can be empty.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>shortDescr: The text to use for the short description of the follow-on task.</td>
</tr>
</tbody>
</table>

**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 sub-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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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>
### Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</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>Make table name read only</td>
<td>Certification Schedule [cert_schedule]</td>
<td>Makes the Table field read-only.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hide Table field</td>
<td>Certification 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</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</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</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</td>
<td>Shows the User field when the assignment type is User.</td>
</tr>
<tr>
<td>Show Assignment Fields</td>
<td>Certification 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</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</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</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</td>
<td>Sends a failed event when an element of a certification is marked as failed.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</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>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>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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 305: 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 306: Properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.ui.cert_task_activity.fields</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 307: User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Contains Roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>certification_admin</td>
<td>certification</td>
<td>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</td>
</tr>
<tr>
<td>certification_filter_admin</td>
<td>certification</td>
<td>Can create and manage all data certification filters.</td>
</tr>
<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>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.
The minimum requirements for Unix Servers are:

- CPU Speed: 3ghz
- Ram: 16gb
- CPU Core Count: 4

Task description: Ensure that all Unix Servers in South America data center meet minimum req

Related Links
Preview Certification Tasks
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 231: 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 232: Certification Elements

Certification instances

A certification instance is the collection of certification tasks for one execution of a certification schedule.
Figure 233: Certification Instances

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.
Certification audit definition

A certification audit definition is a collection of certification schedules that can be run at once.
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>Role</td>
<td>Access</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------</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 reports)</td>
</tr>
</tbody>
</table>

**Data Certification Overview Module**

The Overview module includes the following reports:

**Table 309: Data Certification Overview Module Description**

<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>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>
</tbody>
</table>
### Hierarchical Roll Up

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).

### Upcoming Schedules

Lists all schedules that are scheduled to run within the next 30 days.

<table>
<thead>
<tr>
<th>report</th>
<th>Description</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<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

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.
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.

Figure 237: 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 238: 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.

7. To delete a single filter version, open that version record and click Delete.

8. To delete all versions of a filter, click Delete all 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 310: 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>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>
</tbody>
</table>
Table 311: 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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>do not require certification themselves. For example, although users are not</td>
</tr>
<tr>
<td></td>
<td>required to certify the Name field of a record, it displays so that users</td>
</tr>
<tr>
<td></td>
<td>know what record they are certifying.</td>
</tr>
<tr>
<td>Certification</td>
<td>The fields to certify on this certification schedule.</td>
</tr>
<tr>
<td>fields</td>
<td></td>
</tr>
</tbody>
</table>

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.

Field | Description
--- | ---
Filter condition | 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.

Figure 242: 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%.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>User</td>
<td>This field appears when:</td>
</tr>
<tr>
<td></td>
<td>• Assignment type is Specific User. This system assigns this user to all certification tasks for this schedule.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>You can only select users with the certification role.</td>
</tr>
<tr>
<td>Assign to group</td>
<td>The group field that defines the group assigned to the certification tasks. This field is available only when the Assignment type is Group Field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Group</td>
<td>The specific group to which certification tasks are assigned for this schedule. This field is available only when the Assignment type is Specific Group.</td>
</tr>
<tr>
<td>Assign to</td>
<td>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.</td>
</tr>
<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 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:</td>
</tr>
<tr>
<td></td>
<td>• Do Not Create Task: No task is created when the Assign to or Assign to group field is empty.</td>
</tr>
<tr>
<td></td>
<td>• Create Unassigned Task: Create a task, but do not assign it to any user or group. The task can be manually assigned later.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>The schedule automatically creates certification tasks for all records that do have &quot;Assign to&quot; populated, regardless of which selection you make for &quot;Assign to empty.&quot;</td>
</tr>
<tr>
<td>Days to complete</td>
<td>[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.</td>
</tr>
<tr>
<td>Active</td>
<td>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.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Run                      | How often to run the schedule that generates certification tasks:  
- Daily  
- Weekly  
- Monthly  
- Periodically  
- Once  
- On Demand  |
| Day                      | 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. |
| Repeat Interval          | 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. |
| Starting                 | When Run is Periodically or Once, the date and time the schedule runs and generates certification tasks.                                                                                                                                                                       |
| Time                     | When Run is Daily, Weekly, Monthly, or Once, the time of day, on a 24-hour clock, the schedule runs and generates certification tasks.                                                                                                                                                                                               |
| Last run date            | [Read-only] The date and time that the schedule ran last, either on its regular schedule or manually, and generated certification tasks.                                                                                                                                                                                          |
| Next scheduled run       | [Read-only] The next date and time the schedule runs and generates certification tasks.                                                                                                                                                                                                                                                   |
| Task Description         | A description to add to the Short Description field of the certification task.                                                                                                                                                                                                                                                      |
| Instructions             | An HTML field for providing instructions to the user or group performing the certification.                                                                                                                                                                                                                                           |
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.

![Figure 243: Certification Info Message](image)

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.

Table 313: Defining and Creating a Certification Audit

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the audit definition.</td>
</tr>
<tr>
<td>Days to Complete</td>
<td>The number of days that task owners have to complete the certification tasks created by this audit definition. Overrides the identical field on the certification schedule.</td>
</tr>
<tr>
<td>Description</td>
<td>A short description of the intended audit.</td>
</tr>
</tbody>
</table>

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 314: 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.

   ![Figure 245: Certification list 3](image)

   **Figure 245: Certification list 3**

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 246: Certification list](image)

   **Figure 246: Certification list**

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.

![Certification list complete](image)

**Figure 247: Certification list complete**

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.
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 315: Certification instance

<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 181.

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

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 181.

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 316: 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>
</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

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

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.

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 317: IT environment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content built for</strong></td>
</tr>
<tr>
<td>End user</td>
</tr>
<tr>
<td>IT professional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 318: General groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose of site</strong></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>
```

<?xml version= "1.0" encoding= "utf-8" ?>
<j:jelly trim = "false" xmlns:j = "jelly:core" xmlns:g = "glide" xmlns:j2 = "null" xmlns:g2 = "null" >
<div class = "cms_knowledge_list customer_success" ><g:for_each_record file = "${current}" max = "${jvar_max_entries}" ><br /><table cellspacing = "0" cellpadding = "0" border = "0" class = "background_transparent" ><tr><td class = "cms_knowledge_list_image"
<j:if test = "${current.u_logo.getDisplayValue() != ''}" ><div class = "knowledge_article_logo" ><a href = "knowledge.do?sysparm_document_key=kb_knowledge,${current.sys_id}" > <img src = "${current.u_logo.getDisplayValue()}" alt = "${current.text}" width = "110px" /></a></div></j:if></td><td width = "100%" ><a href = "knowledge.do?sysparm_document_key=kb_knowledge,${current.sys_id}" target = "_top" ><span class = "cms_knowledge_list_link" >${current.short_description}</span></a><p class = "kb_description" >"${current.description}"
</p></td></tr><tr><td width = "100%" colspan = "2" class = "kb_learn_more" ><p class = "kb_learn_more" ><a href = "knowledge.do?sysparm_document_key=kb_knowledge,${current.sys_id}" >Learn More</a></p></td></tr></table>
</g:for_each_record></div>
</j:jelly>
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 sub-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 subscription, 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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

Content Management adds the following tables.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Page</td>
<td>Provides an inventory list of pages within the system</td>
</tr>
<tr>
<td>[content_page]</td>
<td></td>
</tr>
<tr>
<td>Content Css</td>
<td>Stores internal or external CSS for the page</td>
</tr>
<tr>
<td>[content_css]</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</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>
<tr>
<td>Content Block Static [content_block_static]</td>
<td></td>
</tr>
<tr>
<td>Content Type Detail [content_type_detail]</td>
<td></td>
</tr>
<tr>
<td>Content Page Meta [content_page_meta]</td>
<td></td>
</tr>
<tr>
<td>Content Config [content_config]</td>
<td></td>
</tr>
<tr>
<td>Content Type [content_type]</td>
<td></td>
</tr>
<tr>
<td>Content Theme Css [content_theme_css]</td>
<td></td>
</tr>
<tr>
<td>Content Block Lists [content_block_lists]</td>
<td></td>
</tr>
<tr>
<td>Content Block Sized [content_block_sized]</td>
<td></td>
</tr>
</tbody>
</table>

**Roles installed with Content Management**

Content Management adds the following roles.
<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 ContentManagement**

Content Management adds the following script includes.

<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 Script installed with Content Management**

Content Management adds the following client script.

<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 [content_block_header]</td>
<td>Changes the background color of the control to what the user selected</td>
</tr>
</tbody>
</table>

**Business Rules installed with Content Management**

Content Management adds the following business rules.

<table>
<thead>
<tr>
<th>Business rule</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace Stub</td>
<td>Content Block [content_block]</td>
<td>Replaces a placeholder widget with a content widget.</td>
</tr>
<tr>
<td>Unload Page</td>
<td>Page [content_page]</td>
<td>Unloads content from the page.</td>
</tr>
<tr>
<td>Bump Parent if Content</td>
<td>Portal [sys_portal]</td>
<td>Replace content in the current page.</td>
</tr>
<tr>
<td>Remove Block from Pages</td>
<td>Content Block [content_block]</td>
<td>Removes a block from pages where it is placed.</td>
</tr>
<tr>
<td>Validate Suffix</td>
<td>Content Page [content_page]</td>
<td>Validates a suffix so that a page name or a page suffix cannot match a table name.</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 766. For more information on copying a site, see Copy a site on page 769.
3. Add pages to the site.
   Pages contain blocks of information for the site. For more information, see Create a content page on page 771.
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 782.
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 812.
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.
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

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 319: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>URL suffix</td>
<td>The URL suffix that identifies the site. The URL suffix is case-sensitive, the suffix you enter impacts the CMS site URL used to launch the site. It is incorporated into the 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 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: 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 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 in to access the pages on the site. If left blank, no login is required to 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 new site, the gauge target page opens to show the gauge content. The gauge 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 Name.</td>
</tr>
<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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>

4. Click Submit.

The following is the site record for the ESS Portal:
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>
<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>
<tr>
<td>Content site</td>
<td>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 <code>&lt;site_suffix&gt;</code> in the page URL, as follows: <code>http://&lt;instance name&gt;.service-now.com/site_suffix/page_suffix.do</code></td>
</tr>
<tr>
<td>Read roles</td>
<td>Users with the selected roles can view the page. Click the lock icon to select roles.</td>
</tr>
<tr>
<td>Model document</td>
<td>A document ID of a record to display by default.</td>
</tr>
<tr>
<td>Page status</td>
<td>The status for the page, such as Draft or Published.</td>
</tr>
<tr>
<td>Created by</td>
<td>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.</td>
</tr>
<tr>
<td>Title</td>
<td>The title for the page. The title displays on the browser tab when the page is accessed.</td>
</tr>
<tr>
<td>Description</td>
<td>Type a description of the page that displays for users when they access the page.</td>
</tr>
</tbody>
</table>

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 ManagementPages.
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
   <?xml version="1.0" encoding="utf-8"?><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:

   %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 251: 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 812.

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 782.

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 771.

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 775.

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 766.

### 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>
<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>
<tr>
<td>Media type</td>
<td>Enter one of the following media types to use with this content type or leave the field blank to use the UI11 interface.</td>
</tr>
<tr>
<td></td>
<td>• doctype: UI115 desktop interface only</td>
</tr>
<tr>
<td></td>
<td>• m: Smartphone interface only (not for CMS use)</td>
</tr>
<tr>
<td></td>
<td>• tablet: Tablet interface only (not for CMS use)</td>
</tr>
<tr>
<td>Default detail page</td>
<td>Select which page loads after a user clicks a link.</td>
</tr>
<tr>
<td>Gauge page</td>
<td>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.</td>
</tr>
<tr>
<td>Summary Template</td>
<td>Write an XML script that determines how the list is displayed in the list block, if the link is displayed in a list block.</td>
</tr>
<tr>
<td>Detail Template</td>
<td>Write an XML script that determines how to display the associated information after a user clicks the link.</td>
</tr>
</tbody>
</table>

**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 labelled 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 which directs all content there
- specify an alternate page to use to display the drill-through 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 will be 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 is a market block telling 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.

2. Under Get Help, click Issue Status. 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.

3. From https://<instance name>.service-now.com, navigate to Blocks Lists Portal - Common Answers. 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 integral 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 dropzones. For more information, see Add content to a page on page 773.

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 <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, <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.

```
<style>
DIV.cms_administration_home {
  background: url(gray_${current_page.getURLSuffix()}.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.getParentPage().getURLSuffix()}=='administration'">
  <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="${current_page.getURLSuffix()}=='administration'">
  <g:content_block type="content_block_menu" id="7afc342def002000914304167b2256ac"/>
</j:if>
<j:if test="${current_page.getURLSuffix()}=='community_inspired'">
  <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 322: Header 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

Table 323: 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>
</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 324: 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>
### 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><img src="image" alt="Super Menu" /></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><img src="image" alt="Drop-Down Menu" /></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><img src="image" alt="Tab Menu" /></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="image1.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="image2.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="image3.png" alt="Image" /></td>
<td>The vertical list menu renders the menu sections as headings with menu items as links below them.</td>
</tr>
<tr>
<td>Type</td>
<td>Image</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Vertical Blocks</td>
<td><img src="image.png" alt="Image" /></td>
<td>The vertical blocks menu renders the menu sections as block headings with menu items as links within the block. The blocks are arranged vertically.</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.

```javascript
// ********************************************************************************
// 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;
  padding: 0px 0px 0px 0px;
}
```
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.pngx) 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 253: 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 254: 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>
<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 813.</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>
<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>
<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 801.</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 814.</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>
<tr>
<td>Table</td>
<td>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 <em>Configure a content type</em> on page 779. <strong>Note:</strong> The list shows only tables and database views that are in the same scope as the list block.</td>
</tr>
<tr>
<td>Conditional</td>
<td>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.</td>
</tr>
</tbody>
</table>

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>
<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.</td>
</tr>
<tr>
<td></td>
<td>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 <em>Format a frame</em> on page 813.</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 <em>HTML code</em> 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

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 332: 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.

Role required: content_admin or admin

Configure an iframe with forms you create in the instance and link to the page in which the iframe resides.

**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 2197 instead.

1. Navigate to Content Management Specialty Content iFrames.
2. Click New.
3. Complete the iframe form fields.
### Table 333: 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: sc_req_item_list.do Queries can be applied to the URL. For instance, to display a list of open requested items, the URL is: sc_req_item_list.do?sysparm_query=active=true For more information, see URL schema.</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>
<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=d258b953c611227a014b44101f1b7e731&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 779.

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 335: 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 813.</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, XHTML, 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: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" >
        ${current_page.getDescription()}
      </p>
    </j:if>
    <j:if test = "${current_page.getName()=='IT 3.0'}" >
      <h1 class = "page_name" > <b> <a href = "solutions.do?" title = "${gs.getMessage('Solutions')}">${gs.getMessage('Solutions')}</a> </b> | ${current_page.getName()}</h1>
      <p class = "page_description" >
        ${current_page.getDescription()}
      </p>
    </j:if>
  </j:jelly>
</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" >
  <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>
</j:jelly>
```

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
<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:jelly>
```

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
<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:jelly>
```

```xml
<table>
<tr>
  <th>Name</th>
  <th>Incidents</th>
</tr>
<j:while test="${jvar_groups.next()}">
  <tr>
    <td>${HTML:jvar_groups.getValue('name')}</td>
    <td>
```

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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**

**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.

- <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**

Style 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:
   
   ```
   div.FRAME_NAME{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="FRAME_NAME">
   ```

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.

```xml
<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-Compatibly 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>Site Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Content</td>
<td></td>
</tr>
<tr>
<td>breakfast</td>
<td>eggs</td>
<td></td>
</tr>
<tr>
<td>lunch</td>
<td>sandwich</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
<td></td>
</tr>
</tbody>
</table>

Example: page level tag overrides site level tag

<table>
<thead>
<tr>
<th>Site Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Content</td>
<td></td>
</tr>
<tr>
<td>breakfast</td>
<td>eggs</td>
<td></td>
</tr>
<tr>
<td>lunch</td>
<td>sandwich</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page Level</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lunch</td>
<td>tacos</td>
<td>overrides site level</td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Content</td>
<td></td>
</tr>
<tr>
<td>breakfast</td>
<td>eggs</td>
<td></td>
</tr>
<tr>
<td>lunch</td>
<td>tacos</td>
<td></td>
</tr>
<tr>
<td>dinner</td>
<td>steak</td>
<td></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 [URL schema](#) 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=` 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 (gsft_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.

---

**Figure 255: Example links to system data**
Static methods

Static methods in the CMS application were created for ease of use. Form-based menu management and WYSIWYG 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 785.

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...
Istanbul 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 799.

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 800.
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 801.

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 807.

Example integration points

Each element on the page links to a specific URL point.

Figure 259: 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.
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- **Target page iFrame URL**: catalog_home.do?sysparm_nameofstack=aabdae07ef22100091430167b22557d&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=d67c446ec0a8016500335aa37eafbc1&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=d67a86b6c0a80165009386c752cd4a09
  - **Electronic Messaging URL**: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=533798810a0a0b26001a037e7a3ac2
  - **VPN RSA Token URL**: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=d67b099ac0a80165019d0c276b772502
  - **Shared Storage (SAN) URL**: catalog.do?uri=com.glideapp.servicecatalog_cat_item_view.do?
sysparm_id=cedd458a0a0b8300c3b1e32e7a3ac2

**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=8b7b11f6c611228901ff3cfcbdb3cc8f
  - **Portfolio Overview URL**: catalog_home.do?sysparm_view=business
  - **Service Availability URL**: ../home.do?sysparm_userpref_homepage=8ee77200000a0bad00c3eb7e68b93d0
  - **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 in 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 *Internationalization support*.

- 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.

**Credentials**

Credentials, such as user names and passwords, or certificates, are required to gain access to a computer or network device for Discovery or to perform work on a computer using Orchestration.

**Explore**

- [Credentials release notes for Orchestration and Discovery](#)
- [Upgrade to Istanbul](#)
- [Introduction to credentials](#)
- [Credential affinity for Discovery and Orchestration](#)

**Set up**

- [Create credentials for Orchestration and Discovery](#)
- [Check IP service affinity for Discovery and Orchestration](#)

**Integrate**

- [External credential storage](#)
- [CyberArk credential storage integration](#)

**Troubleshoot and get help**

- [Credentials troubleshooting](#)
- [Search the HI knowledge base for known error articles](#)
- [Contact ServiceNow Support](#)
Introduction to credentials

Credentials are used by Discovery, Orchestration, and Service Mapping to access the external devices that they explore or manage.

Credential types

<table>
<thead>
<tr>
<th>Credential type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicative Credentials</strong></td>
<td>The credentials to explore the applications on a device or computer. <em>Patterns</em> often need applicative credentials.</td>
</tr>
<tr>
<td><strong>AWS Credentials</strong></td>
<td>The Amazon Web Services (AWS) master account, access key ID, and secret access key.</td>
</tr>
<tr>
<td><strong>Azure Service Principal</strong></td>
<td>The Azure service principals required for an Azure subscription.</td>
</tr>
<tr>
<td><strong>Basic Authentication Credentials</strong></td>
<td>A user name and password.</td>
</tr>
<tr>
<td><strong>CIM Credentials</strong></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>
</tr>
<tr>
<td><strong>Cloud Management Credential</strong></td>
<td>Credentials that Orchestration uses to access cloud resources.</td>
</tr>
<tr>
<td><strong>JDBC Credentials</strong></td>
<td>A user name and password to access a Java Database Connectivity (JDBC) connection.</td>
</tr>
<tr>
<td><strong>JMS Credentials</strong></td>
<td>A user name and password to access to a Java Message Service (JMS).</td>
</tr>
<tr>
<td><strong>SNMP Community Credentials (Password Only)</strong></td>
<td>The community string to access devices via SNMP.</td>
</tr>
<tr>
<td><strong>SNMPv3 Credentials</strong></td>
<td>The user name and keys required to access devices on your SNMP v3 network.</td>
</tr>
<tr>
<td><strong>SSH Credentials</strong></td>
<td>The user name and password to access Linux and Unix devices.</td>
</tr>
<tr>
<td><strong>SSH Private Key Credentials</strong></td>
<td>The private key credentials to access Linux and Unix devices.</td>
</tr>
<tr>
<td><strong>VMware Credentials</strong></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>
</tr>
<tr>
<td>Credential type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Windows Credentials</td>
<td>The user name and password required to access Windows computers. Several permission requirements must be met to use Windows credentials.</td>
</tr>
</tbody>
</table>

**How MID Server uses credentials**

Windows MID Servers use the login credentials of the MID Server service on the host machine to discover Windows devices in the network. This login is configured when the MID Server is installed and must 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 ServiceNow instance in Discovery > Credentials.

MID Servers used by Orchestration 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, and 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 Discovery and Orchestration 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.
If Orchestration and Discovery are installed, and **credential tagging** 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.

**Tagging**

**Credential tagging** allows 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. Credential tagging also works with credential affinities.

**Create credentials for Orchestration and Discovery**

Your instance provides default credential types that Discovery and Orchestration can use to communicate with external systems.

Role required: admin

1. Navigate to one of these modules:
   - Orchestration Credentials
   - Discovery Credentials
2. Click New.
3. On the Credentials page click a link for the credential type and complete the form.
4. Click Submit.

*Test Discovery and Orchestration credentials* on page 859.

**Applicative credentials**

Applicative credentials access applications that reside on devices.

Patterns can use applicative credentials in addition to the SNMP or SSH credentials that are required to access the device.

These fields are available in the 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>
</tbody>
</table>
### AWS credentials for Discovery and Orchestration

The AWS credential type manages access to services within AWS.

The Credentials table can store existing AWS credentials. This credential type is available for Discovery and Orchestration.

These fields are available in the Credentials form for AWS:

<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 AWS Main Account.</td>
</tr>
<tr>
<td>Active</td>
<td>Enable or disable these credentials for use.</td>
</tr>
<tr>
<td>AWS Account</td>
<td>Select the name of the AWS account that uses this credential.</td>
</tr>
<tr>
<td>Access Key ID</td>
<td>Enter the access key ID generated from the AWS Management Console, for example, APIAIOSFODNN7EXAMPLE.</td>
</tr>
<tr>
<td>Secret Access Key</td>
<td>Enter the secret access key ID generated from the AWS Management Console for example, wPralXUtFEMI/K7MDENG/ bPxrFtICYEXAMPLEKEY.</td>
</tr>
</tbody>
</table>
Basic authentication credentials for Discovery and Orchestration

The Basic Auth credential type manages access to store basic authentication credentials. This credential type is available for Discovery and Orchestration.

These fields are available in the Credentials form for basic authentication.

Table 337: Basic Auth credentials form

<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>
<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: &lt;safe name&gt;:&lt;Credential ID&gt;. 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 ext.cred.safe_name parameter. 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>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 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>
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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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 in activated.</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>
</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>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 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>

Configuration 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 Management credentials form

The Cloud Management credential type manages access to a cloud-based application. This credential type is available for Orchestration.

These fields are available in the Credentials form for cloud management.

**Table 338: 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>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td>Tag</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>
</tbody>
</table>
Order

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.

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>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>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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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>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. 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 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>

**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>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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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 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>
</tbody>
</table>
### Field

<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>

### 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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 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**. |
| 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. |
| Order                    | 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. |

**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>
</tbody>
</table>
| User name              | 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. 
The VMware credentials must have the read-only role in vCenter. |
| Password               | Enter the password.                                                                                                                           |
| Credential ID          | 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. |
| 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 is activated. |

**Note:** Currently, the only supported external storage system is CyberArk.

<table>
<thead>
<tr>
<th>Applies to</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<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>
### Field | Description
---|---
Order | 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.

---

### 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 339: 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 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>
<tr>
<td>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</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>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>Tag</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**

The SSH credential type manages access for Unix and Linux devices that use the Secure Shell (SSH).

**Note:** For increased security, ServiceNow recommends the use of SSH private key credentials rather than SSH password credentials.

These fields are available in the Credentials form for SSH.
<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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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 in activated. <strong>Note:</strong> 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>
</tbody>
</table>
### Field | Description
--- | ---
Order | 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.

### SSH private key credentials form

These fields are available in the Credentials form for SSH private keys.

SSH private key credentials are recommended over SSH password credentials for security reasons.

**Table 340: SSH private key credentials 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 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. This field is available only for SSH Private Key credentials. 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-----MIIEogIBAAKCAQEAsEK65scPsPsoOoOoDFOmR+Btv3MS4Q7NF8ERaStrZsh3IWz+x... ...7hrxV2dbSug60FahyupGWBGTnP Xm5PaE2X5WPLuUj94n-----END RSA PRIVATE KEY-----The ServiceNow 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. |
<p>| 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. 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. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>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>

### UNIX and Linux credentials

Discovery and Orchestration explore UNIX and Linux devices by using commands executed over Secure Shell (SSH), so they need SSH credentials.

The user can be any user. Both applications must run commands on UNIX and Linux systems with root privileges. There are two general approaches to accomplishing this:

- 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>Application</td>
<td>File or Directory</td>
<td>Access Required</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------</td>
<td>-----------------</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>

**UNIX and Linux commands requiring root privileges for Discovery and Orchestration**

These commands require root privileges in Discovery and Orchestration.

The examples here assume that the user name in the credentials is Disco. Substitute the actual user name and ensure that the paths for the commands match the path on the systems.

**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 341: 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>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>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>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>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>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>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>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>/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><code>/usr/ucb/ps</code></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/ucb/ps</td>
<td>Discovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The use of the <code>/usr/ucb/ps</code> 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 <a href="https://kb.servicenow.com">KB0564262</a>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>fdisk</code></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>
</tbody>
</table>
 Privileged commands for Discovery

To discover certain information on a host server, Discovery must run SSH commands with higher privilege.

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.

For a list of possible SSH commands requiring root privileges, see UNIX and Linux commands requiring root privileges for Discovery and Orchestration on page 847.

**Note:** You can have different privileged commands set up for different hosts. However, Discovery supports only one privileged command per host.

### Table 342: 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>. |
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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`. |

Add a new privileged command

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
• 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.

*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`.

### VMware credentials

The VMware credentials type manages access to vCenter 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) provides the globally unique serial number for computer CIs. CIM credentials are not needed to allow access to each VMWare host.

**Note:** 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).

These fields are available in the Credentials form for VMware.

<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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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. 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>
</tbody>
</table>
### Windows credentials

The Windows credential type manages access to Windows computers. This credential type is available for Discovery and Orchestration.

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. The VMware credentials must have the read-only role in vCenter.</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>Tag</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>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. External credential storage is only available when the <strong>External Credential Storage plugin</strong> is activated.</td>
</tr>
<tr>
<td>Note:</td>
<td>Currently, the only supported external storage system is <strong>CyberArk</strong>.</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 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>

**Permission requirements for Windows credentials**

Provide the proper permissions for the Windows credentials.

To provide sufficient permissions, Windows credentials must be one of the following:

- A domain administrator.
- A domain user with local administrator access on the target Windows hosts.
- A user who meets the requirements of Discovery Windows **probes and permissions** (Discovery only).
- A user who meets the requirements of the **Orchestration activity** to be run (Orchestration only).

**Domain requirements for Windows credentials**

To enable Windows credentials to function across multiple domains, make sure to use the correct name formats and MID Server configuration.

**Supported User Name Formats**

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.

You can also provide a local account by using the . \ user name.

For information about credential requirements, see Permission requirements for Windows credentials on page 857.

Windows Domain Requirements

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 Microsoft SQL Servers</td>
</tr>
</tbody>
</table>

Windows credential requirements for Discovery and Orchestration

Add Windows credentials to specific locations for Discovery and Orchestration.

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.

Configure MID Server credentials from the credentials table

Configure the MID Server to use Windows credentials from the Credentials [discovery_credentials] table.

To have the MID Server use credentials from the Credentials [discovery_credentials] table:

1. 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.

2. [Optional] Configure the MID Server to use Powershell by setting the mid.use_powershell parameter to true. See MID Server Configuration.

3. [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.

Configure MID Server credentials from the service account

Configure the MID Server to use the credentials of its own Windows service.
To have the MID Server use credentials from the MID Server service account:

1. Set the **MID Server service account** to a user who meets the permission requirements.
2. Verify the username meets the name format requirements.
3. Fill in the fields on the form, as appropriate.
4. Verify the credentials meet domain requirements.

**Test Discovery and Orchestration credentials**

You can test your credentials directly from the Credentials record without launching a Discovery or an Orchestration workflow.

**Role required:** discovery_admin, admin

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.

---

**Note:** Credentials are encrypted at all times during the test.

---

Credential testing is supported for these credential types:

- SSH (including private keys)
- Windows
- SNMP (including v3)
- VMware
- JDBC
- JMS
- AWS

This procedure assumes you are testing the credential before submitting it.

1. Navigate to **Discovery Credentials**, and click New.
2. Select the type of credentials to create.
3. Enter your credentials in the record fields.
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.

5. For all other credential types, complete the fields in the Test Credential dialog box.
### Figure 262: Test credentials dialog box

### Table 343: Credential test fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Credential type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target</td>
<td>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.</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
<td></td>
</tr>
<tr>
<td>Port</td>
<td>Port on the target to use for this test. The system pre-populates this field with the default port for the selected credential type.</td>
<td>All</td>
</tr>
<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>
</tbody>
</table>
### Field | Description | Credential type
--- | --- | ---
DB Type | Type of database on which to test these credentials. | JDBC
DB Name | Name of the database on which to test these credentials. | JDBC
Initial Context Factory | 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 org.apache.activemq.jndi.ActiveMQInitialContextFactory | JMS

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 263: TCP connection failure](image)

- Incorrect user name or password:
  ![Figure 264: Authentication failure](image)

- Incorrect MID Server for Windows credentials:
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.

**Credential affinity for Discovery and Orchestration**

It is not necessary to associate credentials with a device within Discovery.

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.

**Note:** If Orchestration and Discovery are installed, and **credential tagging** 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.
Credential tagging for Orchestration activities

Credential tagging 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 tagging interacts with credential affinity to determine which credentials should be used for an Orchestration activity.

How credential tagging 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 in the generated probe. When the platform encounters an affinity with a credential tag value defined (credential_tag in the business rule), the business rule determines if the credential referenced by the affinity has the specified tag. If it does, the business rule selects the credential_id of the tagged credential and passes that value to the probe. If the credential does not have the specified tag, 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.
Caution: You should not modify IP services unless your organization uses custom ports.

1. Navigate to Discovery 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 268: IP Service Affinities](image)

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.

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 Discovery Definition Properties and Orchestration MID Server Properties, and is enabled when you activate the plugin.

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.

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:

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>
</tbody>
</table>

Note: Plugins are activated in two batches each business day in the Pacific timezone, 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 | Any information that would be helpful for the ServiceNow personnel activating the plugin such as if you need the plugin activated at a specific time instead of during one of the default activation windows. |

3. Click Submit.

**External credential storage architecture**

External credential storage requires a properly configured MID Server to retrieve the credentials from the external store.

**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.
Architecture

Figure 269: ServiceNow external credential storage architecture

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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>
<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>
<tr>
<td>Name</td>
<td>Enter a name for this key.</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.

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 these 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 = "authproto";

    // 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 = "privproto";

    // 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 FileInputSteam(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)+"/"+
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 270: 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>
</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.

<p>| 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. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 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 345: 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
- Windows

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
  - Cred Obj

IP Devices
- Windows Server
- Linux/Unix Server
- Storage
- Network Devices
- Hypervisor

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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, 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 347: Required configuration parameters

<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>ext.cred.use_cyberark</td>
<td>true</td>
<td>Boolean parameter indicating that this MID Server is integrated with CyberArk.</td>
</tr>
</tbody>
</table>

### Table 348: Optional configuration parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.</td>
</tr>
</tbody>
</table>

**Note:** 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:

```
    safe.cred.split.string=<string>.
```
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>ext.cred.type_specifier</td>
<td>true</td>
<td>Forces the lookup to return credentials that match both the CyberArk credential ID and the IP address. For example, if an IP address is shared by both Windows and Tomcat, a credential policy 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</td>
</tr>
<tr>
<td>ext.cred.check_ssh_type</td>
<td>false</td>
<td>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.</td>
</tr>
</tbody>
</table>

*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 in the credential 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 349: 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>
<tr>
<td>Name</td>
<td>Enter a name for this key.</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.

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, PowerShell, JMS, or SSHCommand.
- 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.

---

### 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**

- **Understanding Edge Encryption** on page 886
- **Edge Encryption components** on page 889
- **Encryption configurations and patterns** on page 890

**Set up**

- **Planning for Edge Encryption** on page 895
- **Edge Encryption system requirements** on page 895
- **Edge Encryption proxy server setup and installation** on page 900
- **Edge Encryption proxy server upgrades** on page 928

**Administer**

- **Key management** on page 890
- **Encrypt fields using encryption configurations** on page 905
- **Encrypt attachments using standard encryption** on page 935
- **Tokenize strings using encryption patterns** on page 937

**Use**

- **Define a custom encryption rule** on page 941
- **Schedule an encryption job** on page 933
- **Repair or recover order-preserving encrypted data** on page 939

**Integrate**

- **Edge Encryption ODBC driver integration** on page 924
- **Edge Encryption MID Server integration** on page 928

**Troubleshoot and get help**

- **Ask or answer questions in the Edge Encryption community**
- **Edge Encryption logging** on page 969
- **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.
- 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 889.
Edge Encryption on the ServiceNow 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 895.

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 895
- Sizing your Edge Encryption environment on page 897
- Edge Encryption limitations on page 898
- Key management on page 890
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>token_map</td>
<td>Order-preserving encryption data</td>
</tr>
</tbody>
</table>

Backing 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 NAE.
• 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.

• 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 system. A single Java KeyStore can store multiple keys and the keys are identified by a key alias, making it easier to manage multiple keys.
• NAE (Network Attached Encryption) key store: Keys are stored and retrieved with SafeNet's KeySecure key management.
• File system: 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.

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.

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 351: 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>Encryption type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------------</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 customer's 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 889.

**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>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Configuration</td>
<td>Contains encrypted fields and tables for which attachments are encrypted.</td>
</tr>
<tr>
<td>[sys_encryption_configuration]</td>
<td></td>
</tr>
<tr>
<td>Edge 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>[sys_encryption_rule]</td>
<td></td>
</tr>
<tr>
<td>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>[sys_edge_encryption_invalid_insert_log]</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------------------------------------------------------------</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>
<tr>
<td>Scheduled Encryption Job [sysauto_encryption_job]</td>
<td>Lists scheduled jobs for encryption, decryption, key rotation, order token repair, and database recovery.</td>
</tr>
<tr>
<td>Encryption Key Configuration [sys_encryption_key_configuration]</td>
<td>Lists default encryption keys.</td>
</tr>
<tr>
<td>Encryption Key [sys_encryption_key]</td>
<td>Lists available keys and key attributes.</td>
</tr>
<tr>
<td>Proxy Encryption Key [sys_encryption_proxy_key]</td>
<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>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>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 354: 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>
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?
• If an order preserving encryption type or encryption patterns are to be used, where is the MySQL instance located?
• Which key management system is to be used?
• How are browsers to be set up to access an Edge Encryption proxy?

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 network addresses for proxy servers, and the proxy database server 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.
  • Deal with the issues of using multiple encryption proxy applications.

• Your security administrator must determine the encryption types to be assigned to each field.

Edge Encryption system requirements

The Edge Encryption proxy application can run on servers or virtual machines running Windows or Linux.

The Edge Encryption proxy distribution comes with JRE 1.8. Out of the box, the Edge Encryption proxy uses the JRE bundled with the distribution. You can change this by modifying the wrapper.conf file in the <installation dir>/conf directory.

Proxy server minimum configuration

The minimum configuration includes:

• A minimum of 4 GB of available RAM per proxy server (6 GB is recommended for most deployments).
Note: The host machine running the proxy server must have at least 1 more GB of RAM available for OS services than is needed to run the proxy server. Specifically, if a proxy server is set to use 4 GB of RAM, the VM or hardware must have at least 5 GB of RAM installed.

- 3+ GHz CPU, with a 4-core CPU preferred.
- Multiple proxy servers behind a load balancer. The number of proxy servers will depend on the number of application nodes, number of simultaneous users, and failover needs. See Sizing your Edge Encryption environment on page 897 for considerations.
- Ability to ride-along with other services, depending on the server utilization and resource availability.
- Java 8 is required to run the installer.

Proxy server supported systems

The following systems are supported.

- Windows Server
  - All Windows Server 2012-R2 editions or later
  - Virtual machines or physical hardware
  - 32-bit and 64-bit systems

- Linux
  - Virtual machines or physical hardware
  - 32-bit and 64-bit systems

Note: Because the proxy server requires access to at least 4 GB of RAM, a 64-bit operating system and JVM is recommended.

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`

Note: Because the Edge Encryption proxy server resides in your network, its host IP and port may be subject to vulnerability scans by your network software. The Edge Encryption proxy server will forward such scan requests to your ServiceNow instance. To prevent IP scanner or similar requests from being forwarded to your ServiceNow instance, make sure to configure your network scanner to skip the Edge Encryption proxy server port or IP address. Alternatively, you can configure a firewall utility on the host machine to prevent the proxy server from forwarding requests from specific addresses to the instance.

Proxy database minimum configuration

Order-preserving encryption and encryption patterns require a MySQL database configured for the Edge Encryption proxy. Use a dedicated machine to run the order-preserving and tokenization database. The minimum requirements include.

- Version: MySQL database versions 5.5 to 7.x
- OS: 64-bit systems
- CPU: 2+ GHz CPU, with a 4-core CPU preferred
- RAM: 16 GB
- Disk: SAN or local storage (RAID 10 recommended)
• **Size**: Determined by the number of potential records multiplied by record size. *Calculate the proxy database size* on page 898.

• **Configuration**: High Availability cluster. If you are unsure of how to configure your MySQL server, contact MySQL for configuration information.

### Encryption 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:

• **Firewall access**: Configure any firewalls between the proxy server and the client 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 proxy server to a machine within the DMZ.

• **Network access**: Configure each client to let the proxy server connect with it. If network security prevents you from configuring new machines that can connect to the targets, install the proxy server on an existing machine with connection privileges.

• **Network account**: Install the proxy server with the proper account, either local or domain administrator.

Additionally, for the proxy server to access your instance:

• Ensure network access to the instance. Make sure that the network used by the proxy server is configured to allow traffic over TCP port 443.

### 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. 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 proxy 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.

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 proxy 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.

- Only string fields can be encrypted. Choice fields, virtual fields, journal fields, and any fields other than string fields cannot be encrypted. See Field types for more information.
- String fields that include more than five multi-byte characters cannot be encrypted.
- 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.
- 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 short description in the Incident table is marked to be encrypted, then 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.
- 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 what the user expects.
- Encrypted data cannot be copied to 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, and SafeNet, no third-party software, or hardware encryption key management is supported.
- While multiple encryption proxies connected to a single instance are supported, encryption proxy cluster management and monitoring are not available. Each proxy must be managed separately.
- There can be a performance impact to encrypting fields. System configuration can affect the performance, workload, and the number of fields encrypted.
• 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.

Integration restrictions

Restrictions on data integrations with Edge Encryption.
• Attachments uploaded via REST or SOAP cannot be uploaded to tables marked for attachment encryption.
• Importing data from or exporting data to Excel, CSV, XML, or other file types to or from fields with encryption configurations defined is not supported.

Edge Encryption proxy server setup and installation

Install one or more Edge Encryption proxy applications on your network.

Installing a Edge Encryption proxy includes these steps.
• Install the Edge Encryption proxy application on a server in your network.
• 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 key store.
• If order preserving encryption types or encryption patterns are to be used, set up a MySQL database instance on a machine in your network.
• Set up the edgeencryption.properties configuration file.
• Set up each user’s browser to point to an Edge Encryption proxy.

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. See Edge Encryption proxy server properties on page 916.

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</td>
<td>Date and time must be at least 2 business</td>
</tr>
<tr>
<td>plugin to be enabled</td>
<td>days from the current time.</td>
</tr>
<tr>
<td>Reason/Comments</td>
<td>Any information that would be helpful for the</td>
</tr>
<tr>
<td></td>
<td>ServiceNow personnel activating the plugin</td>
</tr>
<tr>
<td></td>
<td>such as if you need the plugin activated at</td>
</tr>
<tr>
<td></td>
<td>a specific time instead of during one of the</td>
</tr>
<tr>
<td></td>
<td>default activation windows.</td>
</tr>
</tbody>
</table>

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.
3. On each proxy, update the edgeencryption.properties file with the properties for the user account.
   a) Change to the <installation directory>/conf/ directory.
   b) Open the edgeencryption.properties file.
   c) Enter the properties for the user account.
Table 355: User account properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.target.username</td>
<td>The user name that the proxy uses to log in to the instance. The user must have the edge_encryption role.</td>
</tr>
<tr>
<td>edgeencryption.target.password</td>
<td>The password that the proxy uses to log in to the instance.</td>
</tr>
</tbody>
</table>

4. Save and close the edgeencryption.properties file.

Download the Edge Encryption proxy application

Download the Edge Encryption proxy application from your instance, and then copy the ZIP 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. Select the OS version for your proxy server.
3. Copy the ZIP file to each computer that is to run the Edge Encryption proxy server.

Install the Edge Encryption proxy server

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.

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 897 to determine the number of additional proxy servers needed.

Install the Edge Encryption proxy server on Linux or Windows

You can install an Edge Encryption proxy on a 32-bit or 64-bit 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.

1. Create the installation directory.
2. Copy the Edge Encryption 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 the appropriate command for the target machine and change the variables according to your configuration.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>java -jar edgeencryption-dist-&lt;version&gt;-windows-x86-64.zip -m install -n &lt;ProxyName&gt; -h &lt;host&gt; -p &lt;port&gt; -proto https</td>
</tr>
<tr>
<td>Linux</td>
<td>java -jar edgeencryption-dist-&lt;version&gt;-linux-x86-64.zip -m install -n &lt;ProxyName&gt; -h &lt;host&gt; -p &lt;port&gt; -proto https</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>version</td>
<td>The version number of the Edge Encryption release.</td>
</tr>
<tr>
<td>ProxyName</td>
<td>The name of the encryption proxy instance.</td>
</tr>
<tr>
<td>host</td>
<td>Your instance.</td>
</tr>
<tr>
<td>port</td>
<td>The port of your instance. When the protocol is https, the port is normally 443.</td>
</tr>
</tbody>
</table>

To see the help screen, execute the appropriate command without arguments:
- Windows: java -jar edgeencryption-dist-<version>-windows-x86-64.zip
- Linux: java -jar edgeencryption-dist-<version>-linux-x86-64.zip

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 (Optional)</td>
<td>Proxy server description.</td>
</tr>
</tbody>
</table>

If this step is not performed, the Edge Encryption proxy service installs 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 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. You generate an encryption key pair by using the keytool command.

If the proxy was installed on SElinux (e.g. CentOS), to use the keytool utility you must enable loading of shared libraries from the proxy java-installation directory. To do this, run the following command as root.

```
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.

   ```
   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.

   ```
   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 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>
Make sure 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

If you want to use AES 256-bit encryption, you must install the Java Cryptography Extension (JCE) jurisdiction policy files by copying them into each Edge Encryption proxy installation directory.

Edge Encryption ships with the AES 128 policy files, which you must overwrite with the AES 256 policy files. It is only necessary to download the JCE once, but every Edge Encryption proxy must be updated.

1. Download the JCE policy 8 ZIP file from Oracle.
2. Unzip the file.
3. On each proxy server, copy the `local_policy.jar` and `US_export_policy.jar` files into the `<proxy-dir>/java/jre/lib/security` folder.

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>
</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>NAE (Network Attached Encryption) key store</td>
<td>Keys are stored and retrieved with SafeNet KeySecure key management. 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>File system</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>

**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 key store*
You can use a Java KeyStore key store 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`.

1. Set up the key store properties.
   a) Change to the `<installation directory>/conf/` directory.
   b) Open the `edgeencryption.properties` file.
   c) Enter the properties for the key store.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.keystore.path</td>
<td>Path and Java KeyStore file name.</td>
</tr>
<tr>
<td>edgeencryption.keystore.password</td>
<td>Password the proxy uses to connect to the KeyStore.</td>
</tr>
</tbody>
</table>

   An example for a Java KeyStore key store.
   ```
   edgeencryption.keystore.path = keystore/keystore.jceks
   edgeencryption.keystore.password = password
   ```

2. Save and close the `edgeencryption.properties` file.

*Create encryption keys using the Java KeyStore keytool*
You can use the keytool shipped with the encryption proxy distribution to create AES 128 and AES 256 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`. 
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 key store 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 key store directory, that is you skipped the previous step, you must change the -keystore option to include the path from your current directory to the key store 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>keytool -genseckey -alias 128bitkey -keyalg aes -keysize 128 -keystore keystore.jceks -storetype jceks</td>
</tr>
<tr>
<td>AES 256</td>
<td>keytool -genseckey -alias 256bitkey -keyalg aes -keysize 256 -keystore keystore.jceks -storetype jceks</td>
</tr>
</tbody>
</table>

You add the alias on the instance when you assign default keys.

**Set up a SafeNet KeySecure key store**

If you are using a SafeNet key store, 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 `<installation directory>/lib` directory:
   - ingrian-nae-<version>.jar
   - ingrian-log4j-api-<version>.jar
   - ingrian-log4j-core-<version>.jar

2. Change to the `<installation directory>/conf` directory, and open the `edgeencryption.properties` file.
3. Enter the properties for the SafeNet key store.

**Table 357: Properties for an NAE device**

<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>If an NAE device is available.</td>
</tr>
<tr>
<td>edgeencryption.nae.server</td>
<td>Name of the NAE server.</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 key store on the NAE server.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>edgeencryption.nae.keystore.password</td>
<td>NAE key store 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>
</tbody>
</table>

An example for a SafeNet key store.

```plaintext
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
```

4. Add or create a key in the SafeNet key store.
   You add the key name (alias) on the instance when you assign default keys.

5. Save and close the edgeencryption.properties file.

Create an encryption key stored in a file

You can use a file as a key store. Each file holds a single encryption key.

This step creates both the key storage and the encryption key.

**Note:** The name of the key file must match the key alias specified in the encryption keys table in the instance. See Configure encryption keys on the instance on page 908.

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, you must do the following.
1. Create the new encryption key.

2. Make the new key available to all encryption proxies. This could be copying the file or Java KeyStore file to each proxy, or ensuring that each proxy has access to the Java KeyStore or NAE 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
The Encryption Key Configuration - Created form is shown.

2. Add new keys
Rows in the list with an X in the left column can be deleted. Keys that have been used as the default, or are in the Available state cannot be deleted.

   a) In the row that says Insert a new row... double-click.
      An edit box is shown.

   b) 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 Submit. Key aliases must be unique.

   c) In the same row, double-click in the Key size column.
      A select box is shown.

   d) 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.
      A select box is shown.

   f) Select a key type, either File, Keystore, or SafeNet, 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.
      The form moves to the Key Status step.

3. When the key status becomes Available, click Next Step.
   The instance tracks the status of every encryption key available to any proxy. When a key alias is available on all proxies, its state becomes Available. If, after a few minutes, the state does not change, 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 alias.

Table 358: 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 tab, either type in the key alias, or click the spy glass icon and select an alias, and then click Next Step.
   The form moves to the Schedule Key Rotation step.

5. If desired, create and run a mass encryption job to encrypt existing data using the new encryption key.
   If you do not run a mass encryption 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 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 and upper bound memory limits

The proxy server must have a minimum of 4 GB of RAM available (6 GB recommended). The initial and upper bound memory limits determine how much memory the proxy server can consume.

1. In your proxy server directory, open <install dir>/conf/wrapper.conf.
2. Set the proxy server’s initial memory limit.
   a) Locate the line: #wrapper.java.initmemory=3.
   b) Replace it with: wrapper.java.initmemory=6144.
3. Optionally set the upper bound memory limit.
   Because an upper bound memory limit is not set in the base system, the proxy server may utilize all available memory. If other services are running on the server, you may want to set the upper bound memory limit.
   a) Locate the line: wrapper.java.maxmemory=<max_memory_specified_in_MB>.

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b) Set the max memory to the desired number.

4. Save and close the file.

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 want not 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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On a Linux machine</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>cd to ServerName_port</td>
</tr>
<tr>
<td>2.</td>
<td>Execute ./startup.sh</td>
</tr>
<tr>
<td><strong>On a Windows machine</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>cd to ServerName_port/bin</td>
</tr>
<tr>
<td>2.</td>
<td>Execute edgeencryption.bat start</td>
</tr>
</tbody>
</table>

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 913.

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 911.
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 897 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 command for Linux. See Install the Edge Encryption proxy server on Linux or Windows on page 902.
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. Do not change this property if installing the proxy server on the same machine the properties file was copied from.</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 911.

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>On a Linux machine</td>
<td>Execute ./shutdown.sh</td>
</tr>
<tr>
<td>On a Windows machine</td>
<td>Execute edgeencryption.bat stop</td>
</tr>
</tbody>
</table>

2. Check the log on the proxy server to verify 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.
Lock the proxy configuration

If you want to prevent encryption configuration changes to the proxy in production, set the proxy locked property.

1. Change to the <installation directory>/conf/ directory.
2. Open the edgeencryption.properties file.
3. Set the proxy 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. Use this on the production instance after all fields and tables that are to be encrypted have been configured.</td>
</tr>
</tbody>
</table>

4. Save and close the edgeencryption.properties file.

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 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 proxy server setup and installation* on page 900.

- 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: https://&lt;proxy hostname&gt;:&lt;port&gt;/navpage.do</td>
</tr>
<tr>
<td>Entity ID / Issuer</td>
<td>https://&lt;proxy hostname&gt;:&lt;port&gt;</td>
</tr>
<tr>
<td>Audience URI</td>
<td>https://&lt;proxy hostname&gt;:&lt;port&gt;</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>https://&lt;instance&gt;.service-now.com/navpage.do</td>
</tr>
<tr>
<td>Entity ID / Issuer</td>
<td>https://&lt;instance&gt;.service-now.com/navpage.do</td>
</tr>
<tr>
<td>Audience URI</td>
<td>https://&lt;instance&gt;.service-now.com/navpage.do</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.notNil(samlResponseTxt)) {
       var idpRecord = this.getIdPRecord(request);
       if (idpRecord) {
           SSO_Helper.debug("IdP found based on SAML response: " +
           idpRecord.getUniqueValue());
           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.notNil(samlResponseTxt)) {
Istanbul    ServiceNow    Now Platform Capabilities

/* // 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());
  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>
<thead>
<tr>
<th>Table 360: Login URLs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<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>
</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.

<table>
<thead>
<tr>
<th>Table 361: Target (instance) properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>edgeencryption.target.host</td>
</tr>
</tbody>
</table>
### Table 362: User account properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
<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 901.</td>
</tr>
<tr>
<td>edgeencryption.target.password</td>
<td>Password that the proxy uses to log in to the instance.</td>
</tr>
</tbody>
</table>

### Table 363: 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. It 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>

### Table 364: 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>
### Table 365: 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>

### Table 366: 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.

### Table 367: 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>
### Table 368: 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>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 key store 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. Set this property to authenticate using a certificate instead of a username and password.</td>
</tr>
</tbody>
</table>

### Table 369: 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.encrypter.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>

### Table 370: Password property

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.encrypter.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>
### Table 371: Web proxy properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.webproxy.host</td>
<td>Web proxy name or IP address.</td>
</tr>
<tr>
<td>edgeencryption.webproxy.port</td>
<td>Port on the web proxy.</td>
</tr>
<tr>
<td>edgeencryption.webproxy.user</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>edgeencryption.webproxy.password</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>

### Table 372: Java KeyStore properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.keystore.path</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: edgeencryption.keystore.path = keystore/keystore.jceks</td>
</tr>
<tr>
<td>edgeencryption.keystore.password</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>

### Table 373: File store properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.keyfile.directory</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: edgeencryption.keyfile.directory=keys</td>
</tr>
</tbody>
</table>
### Table 374: General configuration properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>edgeencryption.config.poll.interval</td>
<td>The 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.</td>
</tr>
<tr>
<td>edgeencryption.rules.dir</td>
<td>Folder where the encryption rules are stored on the proxy.</td>
</tr>
<tr>
<td>edgeencryption.encryption.order_preserving.cache.enable</td>
<td>Whether caching is used to support order preserving encryption types.</td>
</tr>
<tr>
<td>edgeencryption.encryption.order_preserving.cache.size</td>
<td>Maximum cache size, in bytes.</td>
</tr>
<tr>
<td>edgeencryption.jobs.concurrency</td>
<td>Maximum number of mass encryption jobs that can run concurrently on this proxy.</td>
</tr>
<tr>
<td>edgeencryption.jobs.requests_per_second</td>
<td>Number of http job requests per second that can be sent to the instance by this proxy.</td>
</tr>
<tr>
<td>edgeencryption.attachments.request.timeout.seconds</td>
<td>Attachment upload request timeout in seconds.</td>
</tr>
<tr>
<td>edgeencryption.request.buffer.size</td>
<td>If an encryption request is larger than this size, the excess is saved to disk. You should not change this number.</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>
</tbody>
</table>

### Table 375: Deprecated proxy 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>
</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. However, you must either configure the environment to return responses to the load balancer instead of the proxy server and configure load balancer iRules, or run the proxy servers on the same port as the load balancer. Otherwise, users cannot view the responses to their requests.

**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 Edge Encryption instance.
4. The 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 the Virtual Server.
   - Host: edgencryption.proxy.host
   - HTTP port: edgeencryption.proxy.http.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 on 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.

**Solutions**

To return responses from the load balancer to the clients in your network, determine whether to use proxy servers on the same port as the load balancer, or to configure the load balancer environment instead.

**Use proxy servers on the same port as the load balancer**

Because the proxy servers and load balancer use the same port, the client browser receives the response on the same port identified in the response header. This solution requires less maintenance and is more performant than configuring the load balancer environment.

Verify that the host and port properties in the edgeencryption.properties file point to the port running both the load balancer and Edge proxies. The host must point to the load balancer. Properties to configure include:

- `edgencryption.proxy.host`: Set the value to the load balancer host machine.
- `edgeencryption.proxy.http.port`: Set the value to the port used by both the load balancer and the Edge proxies.
- `edgeencryption.proxy.https.port`: Set the value to the port used by both the load balancer and the Edge proxies.

For more information on Edge Encryption properties, see [Edge Encryption properties](#).

**Configure the load balancer to rewrite the response**

If the load balancer and proxy servers are using different ports, configure the load balancer to rewrite the response before forwarding it to the client browser. The load balancer must terminate the SSL connection with the Edge proxy, rewrite the response using an iRule, and recertify and forward the response to the browser. This solution enables you to configure proxy servers on different ports from the load balancer, but can cost more in maintenance and performance. In this configuration:

1. The instance sends a response to the Edge proxy, which forwards the response to the load balancer.
2. The load balancer terminates the SSL connection.

3. The load balancer uses an iRule to rewrite the response, changing the port in the response location header to the load balancer port.

4. The load balancer recertifies the response and forwards it to the client browser. To recertify the response, the load balancer must host the servicenow certificate and private key.

Configure the load balancer

If the load balancer and proxy servers are using different ports, configure the load balancer to rewrite the response before forwarding it to the client browser. The load balancer must terminate the SSL connection with the Edge proxy, rewrite the response using an iRule, and recertify and forward the response to the browser. This solution enables you to configure proxy servers on different ports from the load balancer, but can cost more in maintenance and performance.

Role required: admin

1. Add the servicenow certificate and private key to the load balancer. These files must be maintained and up-to-date.

2. Configure the load balancer to terminate the SSL connection, modify the response from the instance, and recertify and forward the response to the client browser.

   Create scripts or iRules on the load balancer to rewrite the response location header to use the load balancer port. This enables the client browser communicating with the load balancer to receive the response. To learn more about iRules, see F5 load balancer documentation.

The load balancer intercepts each response from the proxy server and rewrites the response location header before forwarding it to the client.

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>:
Figure 272: DataSourceIPProperties

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DataSourceIPType</td>
<td>String</td>
<td>DAMP</td>
</tr>
<tr>
<td>DataSourceIPSchemaPath</td>
<td>String</td>
<td>C:\Program Files\ServiceNow\ODBC\schema\ServiceNow.sql</td>
</tr>
</tbody>
</table>
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 proxy server upgrades**

You must manually update each Edge Encryption proxy.

When you update a proxy, a backup is made, new encryption properties are added to the bottom of the encryption.properties file, the proxy shuts down, and the proxy restarts. The proxy is offline for only a short time.
Mixed proxy-version environments

You can run old versions of the proxy with new versions of the proxy on the same instance with the following limitations:

- If a proxy running the Geneva version of software is registered with the instance, you cannot use the instance to assign a default key.
- If you have assigned a default key using the instance, a Geneva version of the proxy cannot register with the instance.

Update a proxy running on Linux

Update a proxy running on Linux.

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.zip -m upgrade -d <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.zip

The old proxy is backed up, the proxy is updated, shutdown, and restarted.

4. Check the proxy log and the instance to verify that the proxy has been updated and is running.

Update a proxy running on Windows

Update a proxy running on Windows.

Role required: admin

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.zip -m upgrade -d <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>-windows-x86-64.zip

The old proxy is backed up, the proxy is updated, shutdown, and restarted.
5. Check the proxy log and the instance to verify that the proxy has been updated and is running.

Rollback a proxy update

If a proxy update is unsuccessful, you can go back to the earlier version.

The old proxy is stored in a backup directory unmodified. The backup directory is in the proxy installation directory with a name in the form `<proxy name>_backup`.

1. Shut down the proxy.
2. Delete the new proxy directory.
3. Rename the backup directory to the proxy name.
   The backup directory has the form `<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 proxy server setup and installation on page 900 before creating encryption configurations and encryption patterns on the instance.

**Note:** To access Edge Encryption configuration, you must log in through the proxy server and elevate to the security_admin role.

Rotate encryption keys

You can perform encryption key rotation from the instance. You can 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 it can be assigned as the default key.

**Note:** Before removing a key from the proxy, ensure that no data on the instance uses the key. You can do this by setting up and running a mass key rotation job.

Schedule a single key rotation job

You can 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, make sure you 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>
</tbody>
</table>
### Schedule a mass key rotation job

You can schedule a job to find data encrypted with old keys 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>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.
4. To see an estimated count of records to be updated, click Estimate Record Count.

### Schedule an attachment key rotation job

You can 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>
</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.
Encrypt fields using encryption configurations

Configure Edge Encryption by defining encryption keys, assigning fields and attachments to be encrypted, and specifying encryption patterns.

To configure Edge Encryption, you must be connected to the instance through the proxy. Test all changes on a sub-production instance before making the changes to the production instance.

Define encryption keys

After setting up one or more proxies, you must configure the instance to use the encryption keys. This means entering the key alias (name), the key's size (128 or 256), and key type (file, Keystore, or Safenet) on the instance. After configuring the encryption keys, 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.

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.

Specify encryption patterns

The encryption patterns are string patterns to be replaced by tokens before being sent to and stored in the instance. You can define a string pattern or use one of the predefined patterns.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>Starting</td>
<td>Enter the date and time to run the job for the first time.</td>
</tr>
</tbody>
</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>Column</td>
<td>The table field to be encrypted. 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>

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, the records are encrypted as they are saved to the instance.
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.

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>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 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>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) before the decryption job runs, otherwise, nothing happens.

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>
</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 377: 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>
</tbody>
</table>
Field | Description
---|---
Encryption type | The encryption type to use. For attachments, only Standard AES128 and Standard AES256 are allowed.

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
To change a field or attachment's encryption type, you must deactivate the current encryption configuration, and then create an encryption configuration for the field or attachment.

Role required: security-admin
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.
5. If needed, run a Decryption job or an Attachment Decryption job.
   It is not necessary to run a decryption job. If you do not run a decryption job, the field or attachment is encrypted using the new encryption type the next time the field or attachment is changed.
7. Create a new encryption configuration for the field or attachment.
8. 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.

Tokenizer strings using encryption patterns
You can specify string patterns to be replaced by tokens before being sent to and stored in the instance.
You can pick patterns provided out of the box, or create your own patterns. You can create a basic pattern by specifying a sequence of characters. You create an advanced pattern by specifying a Java RegEx expression. The out of the box patterns are advanced patterns.

Encryption pattern limitations.

- A pattern of all alpha characters is not allowed.
- The minimum pattern size is 5 characters. This can be changed using a system property.
- The asterisk (*) and plus (+) characters are not allowed in patterns.

When the proxy matches a pattern in a request going to the instance, the proxy replaces the string with a token the same size as the string being replaced, and sends the token to the instance. The string matching the pattern is not sent to the instance. When the response is sent from the instance to the browser of HTTP client, the proxy replaces the token with the string so you see the clear text.

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.

The string matching the pattern is not encrypted, it is replaced with a token. The clear text never leaves your network. If the same string is sent to the instance multiple times, it is replaced with the same token. This means that you can perform text searches for strings that have been replaced with a token. While the search happens on the instance with tokens, the query string is changed to a token when the query is sent to the instance, the search is performed on tokens, and when the search results are sent back to you, the tokens are replaced with the clear text. Searches are done on exact matches; features such as stemming do not work.

The encryption pattern feature uses the same MySQL database used for order-preserving encryption.

**Note:** Encrypted fields are not checked for encryption patterns.

Configure basic encryption patterns

You can build a pattern character by character.

In order to use encryption patterns, you must install and set up a proxy database in your network. This is the same database used for order-preserving encryption. In order to create or edit encryption patterns, you must be connected to the instance through the proxy.

Role required: security-admin

The input type defines how you are going to enter the pattern. It does not impact how the pattern is used. To enter a series of character types use the basic input type. To enter a Java RegEx expression use the advanced input type. To use one of the preconfigured patterns, edit one of the patterns on the Advanced Patterns list.

1. Navigate to Edge Encryption Configuration Encryption Patterns Create New.
2. Enter the pattern name.
3. Create a pattern by clicking the Add button, and then selecting a character type.
   - The Sample pattern shows what your pattern looks like as you add characters and specify the character type.
   - You can use the New Block button to move the next character to the next line. This allows you to group characters in a long pattern.
   - Click the X button to delete the last character in the pattern.
4. Click Submit.

Configure advanced encryption patterns

You can build a pattern using a Java RegEx expression.
In order to use encryption patterns, you must install and set up a proxy database in your network. This is the same database used for order-preserving encryption. In order to create or edit encryption patterns, you must be connected to the instance through the proxy.

Role required: security-admin

The input type defines how you are going to enter the pattern. It does not impact how the pattern is used. To enter a series of character types use the basic input type. To enter a Java RegEx expression use the advanced input type. To use one of the preconfigured patterns, edit one of the patterns on the Advanced Patterns list.

1. Navigate to Edge Encryption Configuration Encryption Patterns Create New.
2. Enter the pattern name.
3. In the Edge pattern input type list, select Advanced.
4. When the Convert basic pattern to advanced dialog is shown, click OK.
5. In the Sample match edit box, enter a sample pattern.
   Use this sample pattern to test the RegEx expression you enter. You cannot save the pattern until the pattern matches the sample.
6. In the Pattern edit box, enter a Java RegEx expression.
7. Click the Validate button to verify that the expression matches the sample pattern.
8. Click Submit.

Configure predefined encryption patterns

Edge Encryption ships with a set of predefined encryption patterns. You can activate these patterns instead of creating your own patterns.

In order to use encryption patterns, you must install and set up a proxy database in your network. This is the same database used for order-preserving encryption. In order to create or edit encryption patterns, you must be connected to the instance through the proxy.

Role required: security-admin

The input type defines how you are going to enter the pattern. It does not impact how the pattern is used. To enter a series of character types use the basic input type. To enter a Java RegEx expression use the advanced input type. To use one of the preconfigured patterns, edit one of the patterns on the Advanced Patterns list.

1. Navigate to Edge Encryption Configuration Encryption Patterns Advanced Patterns.
2. Click on the pattern you want to use.
   You can change the pattern to match your specific requirements.
   The Encryption Pattern form is shown.
3. Click Active, and then click Update.
   The Encryption Patterns list is shown.

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.

<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 Order Token Repair.</td>
</tr>
<tr>
<td>All fields</td>
<td>Select this check box to repair all tables.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table.</td>
</tr>
<tr>
<td>Column</td>
<td>Select a column.</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.
4. To see an estimated count of records to be updated, click Estimated Record Count.

### 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>
</tbody>
</table>
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 Glide 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 installed 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 must 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.
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 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 945.

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 942 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 HTTP Post or HTTP Get.
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 on page 945 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 945 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;
    } else {
        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;
    } else {
        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 942.
- 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 945 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 950 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 or POST.</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 957 to iterate over the object and encrypt fields.

<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 380: 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 950 to iterate over the object and encrypt fields.

<table>
<thead>
<tr>
<th>Table 381: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 382: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>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>
<thead>
<tr>
<th>Table 383: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>path</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 384: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Boolean</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.

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.

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 385: 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 386: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The parameter value as a string.</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 950 to iterate over the object and encrypt fields.

Table 387: 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 388: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>XMLContent</code></td>
<td>The request as an iterable object of type <code>XMLContent</code>.</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 957 to iterate over the object and encrypt fields.

Table 389: 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 390: 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>

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 391: 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 392: 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 393: 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 394: 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.

Note: This rule finds all description tags within all record tags in the XML payload. If there is only one occurrence of a tag 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 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>
  <record>
    <name filter="false">'Test Record 2'</name>
    <description filter="false">'Test Record 2 Description'</description>
    <query filter="true">category=2^severity=3</query>
  </record>
</data>
```
The following encryption rule action can apply:

```javascript
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 = childElement.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>
<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 396: 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 397: 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 398: 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 399: 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 400: 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 401: 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 402: 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>
<thead>
<tr>
<th>Table 403: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>xPath</td>
</tr>
</tbody>
</table>

XMLElement - getIteratorOverAllChildren()
Returns an XMLElementIterator object that includes all subelements for the XML element based on the specified parameter.

<table>
<thead>
<tr>
<th>Table 405: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 406: Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>XMLElementIterator</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 407: Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>tableName</td>
</tr>
<tr>
<td>fieldName</td>
</tr>
</tbody>
</table>

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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 408: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

Table 409: 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 410: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

XMLElement - getName()
Returns the element name.

Table 411: 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 412: 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 413: 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 414: 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: [
      {
        "name": "Test Record 1",
        "description": "Test Record 1 Description",
        "tag": "security"
      },
      {
        "name": "Test Record 1",
        "description": "Test Record 1 Description",
        "tag": "security"
      }
    ],
    "query": "assigned_to=3D4860165813e63a00d00abd322244b092^category=vulnerability",
    "source": "10.11.13.14"
  }
}
```

The following rule can apply:

```javascript
function sampleJsonAction1() {
  var jsonContent = request.getAsJsonContent();
  // This loop iterates over all description elements in the records array
```
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()) {
        var jsonNode = jsonNodeIterator.next();
        encryptFieldsInRecord(jsonNodeIterator.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();
        if (fieldName == 'description') {
            field.valueFor(tableName, 'short_description');
        } else {
            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 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')
        encryptRecors(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>
<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>
<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 417: 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 418: 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 419: 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 420: 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 421: 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 422: 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 423: 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 424: 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 425: 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 426: 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 427: 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>
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 428: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

Table 429: 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 430: 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 431: 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 432: 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>

Global methods
Several global methods can be used in encryption rules.

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 433: Parameters

<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 434: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>void</td>
<td></td>
</tr>
</tbody>
</table>

endsWith(String toMatch)

Determines if the string ends with the specified string.

This method is available only in an Edge Encryption rule action script.

### Table 435: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>toMatch</td>
<td>String</td>
<td>The string to match.</td>
</tr>
</tbody>
</table>

### Table 436: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>True if the specified string matches the end of the target string.</td>
</tr>
</tbody>
</table>

This example is from the Vacation encryption rule condition.

```javascript
function VacationCondition(request) {
  if (endsWith(request.path, '/service_catalog.do') &&
      request.postParams.sysparm_action == 'execute_producer' &&
      request.postParams.sysparm_id ==
        'c322301653a33100c0eca5f4a11c084d')
    return true;
  return false;
}
```

string.replace(String old, String new)

Creates a new string by replacing an existing sub-string with a new sub-string.

This method is available only in an Edge Encryption rule action script.

### Table 437: Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>old</td>
<td>String</td>
<td>The sub-string to be replaced.</td>
</tr>
</tbody>
</table>
Table 438: Returns

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>The string with the new sub-string.</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 439: 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>
<tr>
<td>prototype</td>
</tr>
<tr>
<td>RegExp</td>
</tr>
<tr>
<td>setPrototypeOf</td>
</tr>
<tr>
<td>this</td>
</tr>
</tbody>
</table>
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 933. To encrypt attachments from a record producer, Configure attachment encryption on page 935.

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.

<table>
<thead>
<tr>
<th>Encryption rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;RecordProducerName&gt;</td>
<td>Rule created to process POST parameters from the Service Catalog and map variables to fields in the instance.</td>
</tr>
<tr>
<td>&lt;RecordProducerName&gt;Json</td>
<td>Rule created to process a JSON payload from the Service Portal and map variables to fields in the instance.</td>
</tr>
</tbody>
</table>

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. If using the record producer in the Service Portal, add a sys_id URL parameter to the widget client script record producer function. Then, in the <RecordProducerName>Json encryption rule condition, add a check for the correct record producer sys_id.
   Checking for the record producer sys_id ensures that the correct record producer is associated with the rule.
   a) Open the widget that uses the record producer in the widget editor.
      To edit a base system widget, you must first clone the widget.
   b) Examine the client script and locate the record producer function. For example, if updating a clone of the SC Catalog Item widget, the postCatalogFormRequest() function calls the record producer.
c) Add a statement to the function to add a sys_id URL parameter to the record producer.

```javascript
var url = spUtil.getURL('sc_cat_item') + "&sys_id=" + $scope.data.sc_cat_item.sys_id;
```

d) Save the widget.

e) Open the `<RecordProducerName>Json encryption rule`.

f) In the condition, add a check for the record producer sys_id.

```javascript
function RecordProducerNameJsonCondition(request) {
  if(request.path.indexOf("angular.do") > -1 && request.urlParams.sys_id == '<record_producer_sys_id>' && request.urlParams.type == 'sc_cat_item') {
    return true;
  }
  return false;
}
```

The record producer sys_id is a unique identifier for the Edge Encryption rule condition. Adding this parameter guarantees that the correct Edge Encryption rule is executed, regardless of the underlying variable mappings.

7. Examine the encryption rule Action field and replace 'FILL ME IN' with the target field for any scripted variables.

   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 scripts on the platform, you may need to update the rules to map each variable to the correct field. The variable sys_id is provided to ensure that the correct variable is mapped to the target field.

The two encryption rules enable the record producer to insert values into fields marked for encryption from either the Service Catalog or Service Portal.

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>
<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</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</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>

**Edge Encryption monitoring**

You can monitor sessions that use Edge Encryption proxies.

The instance tracks all encryption proxies. Each encryption proxy registers when it starts up. The instance is notified when:

- A new encryption proxy starts up.
- An encryption proxy is intentionally shut down.

If an encryption proxy 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 file is not audited.

You can also monitor the following lists and files for information about your proxies:

<table>
<thead>
<tr>
<th>List</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Configuration Diagnostics And Troubleshooting Invalid Insert Attempts</td>
<td>List of attempts to save the following data to encrypted fields:</td>
</tr>
<tr>
<td></td>
<td>• Unencrypted data.</td>
</tr>
<tr>
<td></td>
<td>• Data that did not come from an Edge Encryption proxy.</td>
</tr>
<tr>
<td></td>
<td>The instance rejects and then logs any attempts to save this data. If you have the security-admin role, you can view the logs in the Invalid Insert Attempts list.</td>
</tr>
<tr>
<td>Edge Encryption Configuration Proxies Online</td>
<td>List of online proxies.</td>
</tr>
<tr>
<td>Edge Encryption Configuration Proxies All</td>
<td>List of all proxies.</td>
</tr>
<tr>
<td>System log</td>
<td>The instance periodically checks for messages from each encryption proxy, and it logs an error if a proxy has not sent a message in the required time frame. The log message contains information about the encryption proxy and the last time the proxy</td>
</tr>
</tbody>
</table>
Istanbul  ServiceNow  Now Platform Capabilities

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.

<table>
<thead>
<tr>
<th>xmlstats</th>
<th>Information about the number of registered encryption proxies, and the number of pending and running mass encryption jobs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Encryption Configuration Maintenance Scheduled Jobs</td>
<td>A list of jobs that are scheduled to run.</td>
</tr>
<tr>
<td>Edge Encryption Configuration Maintenance Job Executions</td>
<td>A list of jobs about that have run.</td>
</tr>
<tr>
<td>Edge Encryption Configuration Diagnostics And Troubleshooting Job Failures</td>
<td>A list of jobs that did not execute successfully.</td>
</tr>
</tbody>
</table>

Edge Encryption logging

Edge Encryption logs information on the instance and on each proxy server.

You can view a log file listing all cases of when an attempt was made to save unencrypted data to an encrypted field. Navigate to Edge Encryption Configuration Diagnostics And Troubleshooting Invalid Insert Attempts. An administrator can trace back to why data was not saved.

There are encryption log files on each proxy server.

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 Istanbul
- Knowledge Management v3
- Knowledge homepage on page 975
- Knowledge search on page 977
- Contextual search
- Social Q&A on page 979

Set up

- Video: Getting Started with Knowledge Management v3
- Knowledge Management setup guide for admins on page 970
- Knowledge base setup guide for knowledge admins and managers on page 972

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 1001
- Pin a knowledge article on page 991
Use

- Knowledge Management roles on page 974
- Knowledge Management guide for users on page 973
- Use knowledge on mobile devices on page 1018

Migrate

- Knowledge Management v3 migration on page 1022
- Video: Migrating from Knowledge Management v2 to v3
- Video: Managing Article-Level Access Controls During Migration from KM v2 to v3
- Webinar: Knowledge v3 - Features and Upgrade Best Practices
- Blog: All things Upgrade considered on Knowledge v2 to v3

Troubleshoot and get help

- Ask or answer questions in the Knowledge Management community
- Search the HI knowledge base for known error articles
- Duplicate knowledge article numbers
- Contact ServiceNow Support

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

Meeting 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>

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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 974 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 972.
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 979.

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 973.

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 991.

**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 979 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 on page 988
- Retire a knowledge article on page 988
- Request a knowledge base on page 985

**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>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>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.

---

**Figure 273: The Knowledge homepage**
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 1022 and *Knowledge manager* on page 991.

You can select a knowledge base to browse articles and questions within that knowledge base. You can view only knowledge bases you can access.

![Figure 274: Browsing articles by category](image)

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 442: 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.</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. When you enable the language plugin and set the system property for multi-language search to True, the search query returns the results in all available languages simultaneously. If you set the system property for multi-language to False, the search query returns the results based on the language selected with this filter option. Refer to <em>Knowledge search properties</em> on page 1009 for more information.</td>
</tr>
</tbody>
</table>
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

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.

## Ask 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 443: Question 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 used 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 use, 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. 

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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 Articles All Flagged. 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.
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.

All comments can be viewed by admin, knowledge_admin, and knowledge_manager roles by navigating to Knowledge Articles All Flagged.

**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](image)

**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 1022 and Knowledge manager on page 991.

3. 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>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>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>Image</td>
<td>An image that appears beside the article when searching from the legacy knowledge portal.</td>
</tr>
<tr>
<td>Article type</td>
<td>The type of article, either HTML or wiki.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</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 HTML editor to create content. A preview of the content appears when browsing and searching knowledge.</td>
</tr>
</tbody>
</table>

4. 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 no longer available for users to view.

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.

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.

When you import a document, text content from the document is used to create the knowledge article. 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 the 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.
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.

The following podcast offers additional information on using the Knowledge Management.

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.
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

No User Criteria

If a knowledge base has no user criteria, 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. This video demonstrates how to control Knowledge Management access through user criteria.

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>
</tr>
</thead>
<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

Yes

User has Blacklisted role

No

User has Whitelisted role, or KB requires no role

No

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>
<thead>
<tr>
<th>Contribute</th>
<th>Read</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>cantContribute (1)</td>
<td>canContribute (2)</td>
<td>cantRead (3)</td>
</tr>
<tr>
<td>empty</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>empty</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>empty</td>
<td>empty</td>
<td>User B</td>
</tr>
<tr>
<td>empty</td>
<td>empty</td>
<td>User B</td>
</tr>
<tr>
<td>empty</td>
<td>User C</td>
<td>empty</td>
</tr>
<tr>
<td>empty</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>Contribute</td>
<td>Read</td>
<td>Result</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>canContribute (1)</td>
<td>cantRead (3)</td>
<td>canRead (4)</td>
</tr>
<tr>
<td>empty</td>
<td>User C</td>
<td>empty</td>
</tr>
<tr>
<td>empty</td>
<td>User C</td>
<td>User B</td>
</tr>
<tr>
<td>empty</td>
<td>User C</td>
<td>User B</td>
</tr>
</tbody>
</table>

Permissions on KB (in the following order):
1. User C # Create, Read
2. User A # Read
3. All Other Users # Read

<table>
<thead>
<tr>
<th>Contribute</th>
<th>Read</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>canContribute (1)</td>
<td>cantRead (3)</td>
<td>canRead (4)</td>
</tr>
<tr>
<td>User D</td>
<td>empty</td>
<td>empty</td>
</tr>
</tbody>
</table>

Permissions on KB (in the following order):
1. User D # Denied Create
2. All Other Users with role # Create
3. All Users # Read
<table>
<thead>
<tr>
<th>Contribute</th>
<th></th>
<th>Read</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>cantContribute (1)</td>
<td>canContribute (2)</td>
<td>cantRead (3)</td>
<td>canRead (4)</td>
</tr>
<tr>
<td>User D</td>
<td>empty</td>
<td>empty</td>
<td>User A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User D</td>
<td>empty</td>
<td>User B</td>
<td>empty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User D</td>
<td>empty</td>
<td>User B</td>
<td>User A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contribute</td>
<td>Read</td>
<td>Result</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>cantContribute (1)</td>
<td>canContribute (2)</td>
<td>cantRead (3)</td>
<td>canRead (4)</td>
</tr>
<tr>
<td>User D</td>
<td>User C</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User D</td>
<td>User C</td>
<td>empty</td>
<td>User A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User D</td>
<td>User C</td>
<td>User B</td>
<td>empty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User D</td>
<td>User C</td>
<td>User B</td>
<td>User A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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).
<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>Read</td>
<td>N/A</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Yes</td>
<td>empty</td>
<td>empty</td>
</tr>
<tr>
<td>empty</td>
<td>User</td>
<td>empty</td>
</tr>
<tr>
<td>User</td>
<td>empty</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 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.

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

c_RetiredKnowledgeArticles

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.</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>Title</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>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>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>
<tr>
<td>Workflow</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>

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 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></td>
<td><strong>Note:</strong> This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</td>
</tr>
<tr>
<td>Maximum number of articles per content block on the home page</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>(glide.knowman.content_block_limit)</td>
<td><strong>Note:</strong> This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</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>
<tr>
<td></td>
<td><strong>Note:</strong> This property does not apply to the News category.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<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:</td>
</tr>
<tr>
<td>(glide.knowman.show_descriptions)</td>
<td>1. Edit an existing knowledge article.</td>
</tr>
<tr>
<td></td>
<td>2. Right-click the Topic field label and choose Show Choice List.</td>
</tr>
<tr>
<td></td>
<td>3. Open the record for the topic name and enter the description into the Hint field.</td>
</tr>
<tr>
<td></td>
<td>Clear the check box to omit section descriptions from the knowledge portal.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> This property applies only to Knowledge v2 pages. This property is not supported on Knowledge v3 pages.</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.</td>
</tr>
<tr>
<td>(glide.knowman.section_limit)</td>
<td><strong>Note:</strong> 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.</td>
</tr>
<tr>
<td>(glide.knowman.section_sort)</td>
<td>• Published: uses the date published.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• Alphabetically: uses the first letter of the article title (Short description field).</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
<tr>
<td>(glide.knowman.section_sort_direction)</td>
<td><strong>Note:</strong> 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>
</tbody>
</table>
| Show unpublished articles in Knowledge Base portal and topic lists.      | 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 designated 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.  
  (glide.knowman.show_unpublished)                                                                                                           |
| List of roles (comma separated) that can see articles in the Review workflow state in the Knowledge portal and Topic list. | 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.  
  (glide.knowman.section.view_roles.review)                                                                                                    |
| List of roles (comma separated) that can see articles in the Draft workflow state in the Knowledge portal and Topic list. | 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.  
  (glide.knowman.section.view_roles.draft)                                                                                                    |
| Define roles that can view articles in other/custom workflow states.     | 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.  
  Do not include Draft and Review states, as they are already defined in other properties.  
  (Format - stage:[roles];) For example:                                                                                                           |
| The number of articles that are asynchronously loaded when scrolling down in the new search results page. | Enter the number of articles to be displayed during a search.  
  (glide.knowman.search.articles_per_page)                                                                                                            |
| Show only Knowledge topic titles on portal page (no article links).      | 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.  
  (glide.knowman.home_titlesonly)                                                                                                              |

**Note:** This property applies only to Knowledge v3 pages. This property is not supported on Knowledge v2 pages.
### Property: 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.

**Description:**
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. Enter 0 to have ServiceNow consider all views, regardless of date.

**Example:**
```glide.knowman.view_age.days```

### Property: Automatically place cursor in Knowledge portal search box.

**Description:**
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.

**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>
<tbody>
<tr>
<td>Knowledge search result order.</td>
<td>Select the order for displaying search results:</td>
</tr>
<tr>
<td>(glide.knowman.order.search)</td>
<td>- Number of Views: orders search results based on the Number of days used when summing article views property.</td>
</tr>
<tr>
<td></td>
<td>- Relevancy: orders search results based on content that is similar to the search term.</td>
</tr>
<tr>
<td></td>
<td>- Last Modified: orders search results based on modification date.</td>
</tr>
</tbody>
</table>

| Search method used when searching Knowledge from a task or directly in the Knowledge Base. | Select the search approach to use when the search term includes multiple words. |
| (glide.knowman.search.operator)                                               |   - 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. |

| Show author in knowledge search results. | Select this check box to include the author of each article in knowledge search results. |
| (glide.knowman.search.show_author)     |                                                                                             |

| Show last modified date and time in knowledge search results. | Select this check box to include the date and time each article was last edited in knowledge search results. |
| (glide.knowman.search.show_last_modified) |                                                                                                           |

<p>| Show publish date in knowledge search results. | Select this check box to include the date each article was published in knowledge search results. |
| (glide.knowman.search.show_published) |                                                                                                     |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 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.                                                |
| 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:** This property does not apply to contextual search results.

**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.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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. |

**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>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>
</tbody>
</table>
| Show article rating section, which may optionally include yes/no rating, star rating, and flagging options. (glide.knowman.show_rating_options) | 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. |
| 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) | Enter role names exactly as they appear in User Administration > 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. |
<p>| Show the &quot;Was this article helpful?&quot; yes/no rating option. (glide.knowman.show_yn_rating) | Select the Yes check box to display the “Was this article helpful?” rating to users with roles set in the associated property. This appears only if the Show article rating section... property is selected. |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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...&quot;property.</td>
</tr>
<tr>
<td>Show &quot;Create Incident&quot; link after a Knowledge article is rated not helpful. (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 after rating a Knowledge article not helpful. (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...&quot; 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>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. (glide.knowman.show_star_rating.roles)</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...&quot;property.</td>
</tr>
<tr>
<td>Show &quot;Flag Article&quot; option to identify incomplete/inaccurate articles. (glide.knowman.show_flag)</td>
<td>Select the Yes check box to display the flag article option 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 flag incomplete/inaccurate articles. (glide.knowman.show_flag.roles)</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...&quot;property.</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Show user comments on knowledge articles.  
(.glide.knowman.show_user_feedback)                                       | Select an option for showing user comments When article loads, When user clicks link to show comments, or Never for users with roles set in the associated property:                                          |
| List of roles (comma separated) that can see user comments on an article.  
(.glide.knowman.show_user_feedback.roles)                               | Enter role names exactly as they appear in User Administration > Roles. If the Show user comments on knowledge articles property is selected, users with the roles listed here see user comments in article view. |
| Maximum number of user comments displayed on a knowledge article.  
(.glide.knowman.feedback.display_threshold)                              | Set a maximum number of user comments to display. This property applies only to the legacy Knowledge article view.                                                                                          |
| Use Live Feed for Knowledge feedback.  
(.glide.knowman.use_live_feed)                                             | Set the property to True to use live feed to manage and display feedback on knowledge articles.                                                                                                               |
| • Type: true|false  
• Default value: false  
• Location: System Properties                                                 |                                                                                                                                                                                                        |

Knowledge homepage properties

Knowledge homepage properties control the featured content on the knowledge homepage.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
</table>
| Default keyword for getting pinned articles.  
(.glide.knowman.default_keyword)                                        | Enter a default keyword for pinned articles. Articles pinned with the specified keyword appear in the Featured Content section of the knowledge homepage.                                                   |
| Default header title for the pinned articles section on knowledge home pages.  
(.glide.knowman.default_pinned_section_header_title)                   | Enter a title for the Featured Content section of the knowledge homepage.                                                                                                                                 |
| Display or hide the count of articles and questions in the category and child categories  
(.glide.knowman.show_number_on_categories)                             | Select to display the count of articles and questions within each category, including subcategories, when browsing or searching knowledge bases.                                                            |

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</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>field. (glide.knowman.attach.fields)</td>
<td></td>
</tr>
<tr>
<td>Knowledge Management logo to display if running out of the ServiceNow</td>
<td>Click the reference lookup tool (Figure 277: 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.</td>
</tr>
<tr>
<td>Hide the 'Import' functionality (button and drag-n-drop) for all users.</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.</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.</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</td>
<td>Enter the sys_id of the knowledge base to put new knowledge articles created from tasks in.</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. 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. 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 977 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.

Importing translated articles created before plugin activation

When you activate the I18N: Knowledge Management Internationalization plugin, knowledge article translations created prior to plugin activation are not imported. Refer to KB0550855 for information on how to import those articles.

Note: You need access to HI to be able to view KB articles.

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 (see ).
• 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.

**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.
Figure 278: Mobile Knowledge View

Browse Knowledge by tapping on a category and browsing articles or subcategories.
Figure 279: 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 979, you can perform all functions such as adding and editing questions, answers, and comments through the mobile interface.

Figure 280: Mobile Knowledge Article View

Search knowledge on mobile devices

Find a specific article or question by searching on a particular term.
Knowledge Management v3 migration

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 449: 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.

**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 true 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.

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 450: 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>
</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.

Content packs for Knowledge Management

Content packs 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 content packs and in-form analytics on instances that have not licensed Performance Analytics Premium to evaluate the functionality. However, to start collecting data you must license Performance Analytics Premium.

Content packs

The Performance Analytics widgets on the dashboard visualize data over time. These visualizations allow you to analyze your business processes and identify areas of improvement. With content packs, you can get value from Performance Analytics for your application right away, with minimal setup.

Note: Content packs 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 content pack 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.

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 452: 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 453: 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>
<tr>
<td>Concept</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>Collection [dms_collection]</td>
<td>The document groups created by the user.</td>
</tr>
</tbody>
</table>

Scripts

<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>
<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>Script include</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------------------------------------------------</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 457: 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 458: 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

1. Navigate to Managed Documents Create 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.
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>
</tbody>
</table>
Field | Description
--- | ---
Order | A number indicating the type's sequence in the choice list.

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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------------</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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Short Description</td>
<td>A short description of the name component value.</td>
</tr>
</tbody>
</table>
| Value          | 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. |

**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 282: 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 459: Tables

<table>
<thead>
<tr>
<th>Display Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Records</td>
<td>A many-to-many table storing the relationship between a document and a knowledge article.</td>
</tr>
</tbody>
</table>

#### UI Actions

#### Table 460: 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 461: 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 283: 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:

![Document Management Default workflow result](image)

**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 on page 2028 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 285: Digital signature](image_url)
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:

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Revision number</th>
<th>Author</th>
<th>Note</th>
<th>Checked out by</th>
<th>Stage</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Security_POL_0.1</td>
<td>0.1</td>
<td>System Administrator</td>
<td>First draft</td>
<td>Retired</td>
<td>2011-07-07 16:40:04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Security_POL_0.2</td>
<td>0.2</td>
<td>System Administrator</td>
<td>Edited section 2.3</td>
<td>Retired</td>
<td>2011-07-07 16:40:04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Security_POL_0.3</td>
<td>0.3</td>
<td>System Administrator</td>
<td>Fixed typos</td>
<td>Retired</td>
<td>2011-07-07 16:40:04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Security_POL_0.4</td>
<td>0.4</td>
<td>System Administrator</td>
<td>Added graphics</td>
<td>Published</td>
<td>2011-07-07 16:40:04</td>
<td></td>
</tr>
</tbody>
</table>

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 463: New document fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Input value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>An identifying number for the document. Automatically generated using number maintenance.</td>
</tr>
<tr>
<td>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Name</td>
<td>A name for the document. Note that the name for the document is combined with other naming components (as defined by the name format) to create the names for each document revision.</td>
</tr>
<tr>
<td>Requested by</td>
<td>The person asking that the document be created or updated.</td>
</tr>
<tr>
<td>Owner</td>
<td>The approver of the document request. Also responsible for setting completion date with requesters and authors.</td>
</tr>
<tr>
<td>Reviewers</td>
<td>The user or users who review the document and provide feedback to owners and authors.</td>
</tr>
<tr>
<td>Department</td>
<td>The department responsible for the document.</td>
</tr>
<tr>
<td>Type</td>
<td>The document purpose. This is a choice list derived from the type parameters.</td>
</tr>
<tr>
<td>Classification</td>
<td>The document classification, based on security, audience, and confidentiality. This is a choice list derived from the classification parameters.</td>
</tr>
<tr>
<td>Audience</td>
<td>The document readers, such as external or internal. This is a choice list derived from the audience parameters.</td>
</tr>
<tr>
<td>State</td>
<td>The current status of the document in the editing and publication process.</td>
</tr>
<tr>
<td>Checked out by</td>
<td>The user who currently has the document checked out.</td>
</tr>
<tr>
<td>Description</td>
<td>A short description of the document.</td>
</tr>
<tr>
<td>Revision Settings</td>
<td></td>
</tr>
<tr>
<td>Name format</td>
<td>The format for the name of each individual revision of the document. For more information, see Defining Name Formats.</td>
</tr>
<tr>
<td>Revision format</td>
<td>A choice between the two digit (0.x) or the three digit (0.0.x) revision format.</td>
</tr>
<tr>
<td>Auto increment revision</td>
<td>If selected, the revision number automatically increments each time the document is revised.</td>
</tr>
</tbody>
</table>

The User Permissions related list determines which users have rights to view and contribute to the document:
Table 464: 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>
</tbody>
</table>
| Type  | A choice list describing how the user can interact with the document. Options are:  
- Reader - The user can read the document versions.  
- Editor - The user can upload new versions.  
- Owner - The user can edit the document. |

The Group Permissions related list determines which groups have rights to view and contribute to the document:

Table 465: 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>
</tbody>
</table>
| Type  | A choice list describing how group members can interact with the document. Options are:  
- Reader - Group members can read the document versions.  
- Editor - Group members can upload new versions.  
- Owner - Group members can edit the document. |

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 287: 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.

   ![Rollback to revision dialog box](image)

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.
2. Right-click the header bar and select Cancel Document.
   An info message confirms the cancellation:
   The State is set to Cancelled:

   ![Figure 288: MDOC cancel 3](image)

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.

   ![Check out latest revision of document: Intranet Security](image)

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:

![Document Collection](image)

**Figure 289: 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.
MID Server

The ServiceNow® MID Server facilitates communication and movement of data between the platform and external applications, data sources, and services.

Explore
- MID Server release notes
- Upgrade to Istanbul
- Introducing the MID Server on page 1057

Set up
- MID Server installation on page 1067
- Create the MID Server user and grant the role on page 1074
- Specify MID Server applications on page 1110
- Configure an IP address range for the MID Server on page 1111

Administer
- MID Server properties and parameters on page 1113
- MID Server cluster configuration on page 1176
- Privileged commands for the MID Server on page 1154
- MID Server capabilities on page 1179

Use
- The MID Server dashboard on page 1102
- View MID Server statistics on page 1176

Troubleshoot and get help
- MID Server troubleshooting on page 1181
- 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>Service Analytics</td>
<td>LANDesk Maintenance Suite</td>
</tr>
<tr>
<td>Event Management</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 1171 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 1106 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 290: 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.

MID Server heartbeat

The ServiceNow 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 MID Server connection prerequisites on page 1065 and MID Server system requirements on page 1061 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 291: MID Server heartbeat trigger interval

MID Server system requirements

Use these minimum system requirements to allocate resources for computers hosting ServiceNow® MID Servers.
MID Server supported systems

The following systems support the MID Server.

  
  **Note**: .NET Framework version 3.5, 4.0, or 4.5 is required for Service Mapping support and for Windows pattern-based discovery.

- **Linux**: 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 installs with JRE version 1.8. If you upgrade with a MID Server using JRE 1.6, the system automatically upgrades that MID Server to use version 1.8. Both the 32 bit and 64 bit MID Servers use JRE 1.8.

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 MID Server memory size on page 1167 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:

- Content Management Platform (CMP)
- 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

Service Analytics and Operational Metrics 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.

Table 466: MID Server minimum system requirements for 25 concurrent threads (base system)

<table>
<thead>
<tr>
<th>Product</th>
<th>Disk space (GB)</th>
<th>Memory (GB)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS</td>
<td>MID Server + product</td>
<td>Total</td>
<td>OS memory</td>
<td>JVM memory</td>
<td>Total</td>
</tr>
<tr>
<td>Service Analytics</td>
<td>36 GB</td>
<td>10 GB</td>
<td>46 GB</td>
<td>4 GB</td>
<td>8 GB</td>
<td>12 GB</td>
</tr>
<tr>
<td>Operational metrics</td>
<td>36 GB</td>
<td>16 GB</td>
<td>52 GB</td>
<td>4 GB</td>
<td>8 GB</td>
<td>12 GB</td>
</tr>
<tr>
<td>Standard</td>
<td>36 GB</td>
<td>4 GB</td>
<td>40 GB</td>
<td>4 GB</td>
<td>1 GB</td>
<td>5 GB</td>
</tr>
</tbody>
</table>

Table 467: MID Server minimum system requirements for 200 concurrent threads (customer configured)

Use case 1: Single MID Server deployed for multiple standard products

In this example, CMP, 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 468: One MID Server for multiple standard products

Use case 2: Multiple MID Servers deployed to a single host

In this example, three MID Servers for standard products 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 469: 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>1 GB</td>
</tr>
<tr>
<td>MID Server 3</td>
<td>4 GB</td>
<td>1 GB</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 upgrades_ on page 1097.

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 icon 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 upgraded 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](https://example.com) for additional MID Server troubleshooting information.

### MID Server connection prerequisites

You must install a MID Server on a local network resource and configure it to communicate with the machines it probes.

#### Network privileges

The local network resource 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 InstancelInfo 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 a 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 syntax:

- `<source IP> to <any>`
- `<source IP> to <ServiceNow> any established`
- `<source IP> to <instance_name.service-now.com> 443`

**Important:** Ensure that the MID Server can connect to install.service-now.com to download and install updates.

**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.

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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**: 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 on page 839 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.

**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 service on a host machine.

You can perform the installation prerequisites and install the MID Server manually or use the MID Server Guided Setup utility, which streamlines the entire process and allows you to set up a basic MID Server quickly.

The manual process requires these setup tasks, performed in the order shown here:

1. **Configure communication between the MID Server and the instance on the appropriate port and enable required web services.** See Configure MID Server connection prerequisites on page 1074 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 several aspects of MID Server functionality, including proxy servers, debugging, and upgrade.
Use guided setup for MID Server and Discovery

Discovery guided setup provides a sequence of tasks that help you configure Discovery on your ServiceNow® instance.

Role required: admin

You are guided through configuration activities that create, download, and validate a MID Server. When you have completed those tasks, you can add credentials and create a Discovery schedule. A progress indicator on each screen allows you to monitor your progress for each task and for the entire process.

Each configuration activity provides the following resources to help you:

- Contextual embedded help.
- Links to comprehensive documentation on the ServiceNow product documentation site.

**Important:** You must complete MID Server configuration before you can launch the Discovery guided setup.

1. Navigate to Guided Setup ITOM Guided Setup.
   The ITOM Guided Setup welcome screen appears.

   **ITOM Guided Setup**

   **Getting started**
   Welcome to ServiceNow’s Guided Setup wizard. The goals of Guided Setup are to help you:

   - Setup
     Setup and configure various ITOM solutions
   - Learn
     Learn more about ITOM
   - Be empowered
     Empower you to make additional configuration changes later

2. Click Get Started.
   The ITOM Guided Setup category screen appears, with controls for starting the MID Server and Discovery guided setup procedures.
ITOM Guided Setup

### MID Server

The MID Server runs as a Windows service or a UNIX daemon to facilitate communication and the movement of data between a ServiceNow instance and external applications, data sources, and services. Complete the activities in this category to create a user for the MID Server, download the installation package, and validate the MID Server after installation.

0 / 3 Tasks completed
- Create MID User
- Download & Install MID
- Validate MID

### Discovery

Discovery finds computers and other devices connected to an enterprise’s network and populates the CMDB with such things as hardware attributes, software data, active business services, and the relationships between these configuration items. Complete the activities in this category to create the credentials Discovery needs to gain access to a computer or network device and to create the schedule that determines when Discovery runs and what MID Server it uses.

Unlock by completing MID Server

0 / 2 Tasks completed
- Add Credentials
- Add Schedules

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3. In the MID Server pane, click Get Started.
   The MID Server task list appears with a description of each task.
MID Server

The MID Server runs as a Windows service or a UNIX daemon to facilitate communication and the movement of data between a ServiceNow instance and external applications, data sources, and services. Complete the activities in this category to create a user for the MID Server, download the installation package, and validate the MID Server after installation.

Create MID User

Create the user account that the MID Server needs to authenticate on the ServiceNow instance.

Download & Install MID

Select and download the appropriate MID Server installer archive for the operating system.

Validate MID

You must validate the network connection between the MID server and your instance before the MID server is permitted to access automation credentials or execute any outbound ECC probes.
4. Click Configure to create the MID Server user and follow the instructions in the help pane that appears on the right edge of the screen.

5. When you have provided the requested information for the MID Server user, click Submit, and then click Mark as Complete at the bottom of the help pane.

The view returns to the task list. Notice that the circular progress indicator for the category shows 33% of the MID Server configuration complete. The progress indicator on the left edge of the screen shows the completion percentage for all the MID Server and Discovery tasks, with each category contributing 50% of the total. In the case of the MID Server, the completed task represents 16% of that category's 50% contribution to the whole.
The MID Server runs as a Windows service or a UNIX daemon to facilitate communication and the movement of data between a ServiceNow instance and external applications, data sources, and services. Complete the activities in this category to create a user for the MID Server, download the installation package, and validate the MID Server after installation.

Create the user account that the MID Server needs to authenticate on the ServiceNow instance.

Select and download the appropriate MID Server installer archive for the operating system.

You must validate the network connection between the MID server and your instance before the MID server is permitted to access automation credentials or execute any outbound ECC probes.
6. Click Configure to begin the next task, that of downloading and installing the MID Server.
7. Continue working on the configuration tasks until your MID Server is running and has been successfully validated.
8. Return to the list of ITOM guided setup categories. Notice that the Discovery setup procedure is now available, and the progress indicators have been updated appropriately.
9. Click Get Started in the Discovery pane and complete the configuration tasks in the order prescribed, using the same general process for completing the procedure as you did for the MID Server. The progress indicator updates as you complete the Discovery setup tasks.

Configure MID Server connection prerequisites

You must perform several prerequisite tasks to allow the MID Server to connect to the 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
   • MIDServerCheck
   • MIDServerFileProvider
5. Navigate to sys_public.list and verify that the InstanceInfo public page is active to allow the MID Server to validate its version.
6. Make sure that the MID Server computer can access install.service-now.com.

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>The same user ID that will be specified in the mid.instance.username parameter of config.xml. If you use special characters, such as an ampersand (&amp;), you must encode the special character using character references in the config.xml file.</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>The same password that will be specified in the mid.instance.password parameter of config.xml. If you use special characters, such as an ampersand (&amp;), you must encode the special character using character references in the config.xml file.</td>
</tr>
</tbody>
</table>

4. To configure your MID Server to use special characters in the user name or password, such as `passw&rd`:
   a) Open the config.xml file and find these lines:
      ```xml
      <parameter name="mid.instance.username" value="mid_user"/>
      <parameter encrypt="false" name="mid.instance.password" value="passw&rd"/>
      ```
   b) Make the following change:
      ```xml
      <parameter encrypt="false" name="mid.instance.password" value="passw&amp;rd"/>
      ```
   c) Save the file.

   **Note:** For examples of the character references required for well-formed XML, see [Character Entity References](#).

5. Right-click the header and select Save.
6. Under the Roles related list, click Edit.
7. Select the mid_server role for this user.
   Each MID Server account must have this role to access protected tables.
8. Click Save.
9. To see if the Logged in user is the same as the user in the configuration file, look in the MID Server dashboard or view the list view of MID Servers.
   The icon in the Logged in user column indicates the following:
   - 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.
10. Confirm that the MID Server account was created successfully and the account has connectivity to the instance.
a) On the MID Server host, Open a supported web browser on the MID Server host and navigate to the instance.
b) If the account is already logged into the instance, log out.
c) Right-click the header and select Save.
d) Use the previously created MID Server user credentials and sign in. If the user name or password includes special characters, make sure that you edit the config.xml file to allow for well-formed XML.

Download the MID Server files

The MID Server application is downloadable from the ServiceNow service instance.

The IP address of the MID Server download site (install.service-now.com) can change without notice. To ensure that you can download the MID Server installation package and receive automatic MID Server upgrades, allow local network access to these IP addresses:
149.96.5.98 and 149.96.6.98

You download the MID Server and then enable Discovery, Orchestration, or any integration that requires the use of the MID Server.

1. On the ServiceNow instance, navigate to Mid Server Downloads on your instance.
2. Select and download the MID Server for the appropriate operating system.
   If the download does not begin immediately, try again later when the system is not as busy.

   ![Download MID Server](image)
   The MID server is regularly tested against Windows Server (2012, 2008) and Linux (RedHat 6, Ubuntu 12, CentOS 6).

   **Figure 292: 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.
Install a MID Server on Linux

This MID Server installer automates the installation of a MID Server on a Linux computer.

Role required: admin, mid_server

**Important:** Verify that the computer meets the MID Server system requirements.

You can install a MID Server on a 32-bit or 64-bit Linux computer. Click this link to view the installation video:

1. 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.

2. 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`.

3. 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.

4. 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>Note: 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.</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>

5. Click Test your connection to validate the credentials and instance information. If you encounter any errors, verify the information that you input.

6. Click Next.

7. Configure the MID name parameters (see table).
Table 470:

<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>

8. Click Next to view the summary.
9. Click Start MID Server.
   The local host starts the MID Server.

10. Click Mid Servers List Page.
    The installer opens the MID Server list from your instance.

11. 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.

12. From Related Links, click Validate.
    The MID Server Validated changes to Yes.
13. 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

14. If you configured the MID Server manually, finalize the configuration as follows:
   a) Execute the shell script start.sh.
      The system starts the new MID Server.
   b) Log into the instance.
   c) Navigate to MID Servers Servers.
      The system displays a list of MID Server records.
   d) Select the record matching your new MID Server and verify that the Status is listed as Up.

15. 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.

Configure MID Server parameters, which control several aspects of MID Server functionality, including proxy servers, debugging, and upgrade.

Install a MID Server on Windows

This MID Server installer automates the installation of a MID Server on a Windows computer.
Role required: admin or mid_server
You can install one or more MID Servers on a supported Windows computer. Click this link to view the installation video:

1. Log in to the Windows host machine where you want to install the MID Server.
2. Create a folder for the MID Server on the top level of the drive such as ServiceNow\MID Server1.
3. Download the MID archive file into the new folder.
4. Right-click the archive and select Extract All.
5. Navigate to the \agent folder that was created when the file was extracted.
6. Change directories to the service-now\mid server name\agent folder, and enter the following command to start the MID Server installer: installer.bat.
   To configure the MID Server manually, skip to this step.
7. 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>ServiceNow MID Server password</td>
<td></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.</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>

8. Click Test your connection to validate the credentials and instance information. If you encounter any errors, verify the information that you input.

9. Click Next.

10. Configure the MID name parameters (see table).
Table 471:

<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>

11. Click Next to view the summary.
12. Click Start MID Server.
The local host starts the MID Server.

13. Click Mid Servers List Page.
The installer opens the MID Server list from your instance.

14. 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.

15. From Related Links, click Validate.
The MID Server Validated changes to Yes.
16. 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

17. If you configured the MID Server manually, finalize the configuration as follows:
   a) Execute the batch file start.bat.
      The system starts the new MID Server.
   b) Log into the instance.
   c) Navigate to MID Servers Servers.
      The system displays a list of MID Server records.
   d) Select the record matching your new MID Server and verify that the Status is listed as Up.

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


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.

Configure Windows MID Server service credentials

MID Server service credentials are required so the MID Server can communicate with devices on your network.
By default, the MID Server service runs as a Local System account. This account only grants access to the machine on which the MID Server is running, not to other systems on the network. Therefore, you must change the service credentials to one of the following types:

- A Domain User account. This account should have local admin rights to allow automatic MID Server upgrade.
- A specific user account that has local admin access to the MID Server machine as well as access to other systems on the network.

**Note:** Service credentials are not the same as the MID Server user credentials: the service credentials allow communication between the MID Server and your network, while the MID Server user credentials 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 1074 for instructions on MID Server user credentials.

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 Domain User or another user account that has local admin access to the MID Server machine as well as access to other systems on the network.
   Whatever account you choose, verify that is has local admin access and access to other systems on the network. For local admin access, you can use Windows Explorer to grant write permissions to the MID Server agent folder.
5. In the General tab, set Startup type to Automatic.
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 this MID Server is connected to, navigate to MID Server Servers. If Discovery is installed, 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.

Test MID Server connectivity

Confirm network connectivity to the MID Server for automatic upgrades, and then ensure that the MID Server can communicate with the instance.

Role required: admin

The system that hosts the MID Server must be able to access one of these URLs to automatically upgrade:

- 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 and launched for the first time. It cannot execute any automation tasks until it is validated.

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 1106 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 upgrades on page 1097 for more information.

1. Install the MID Server using the instructions in MID Server installation on page 1067. 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 Service Analytics, 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.

6. Click Cancel. The validation continues but none of the capabilities, applications, or IP ranges are added.

7. Click OK. The Validated field on the dashboard is set to Validating, and then set to Yes after the validation completes.

8. 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.

![Diagram of domain separation](image)

**Figure 294: Deploying MID Servers with domain separation**

**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 MIDS\_Server\_SMS\_Int or MIDS\_Server\_Disc1.

3. Extract the downloaded MID Server archive file into each MID Server directory. 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.
Uninstall a 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. Do one of the following to stop the running MID Server service.
   • 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.
   • Linux: From the MID Server home directory, for example the agent folder, type stop.sh.

2. From a command prompt, go to the \agent\bin directory in the MID Server installation directory.

3. Do one of the following:
   • Windows: Double-click the UninstallMID-NT.bat file.
   • Linux: Confirm that the MID Server is stopped by executing the bin/mid.sh status shell script. After the MID Server stops, delete the files in the agent directory.

4. On Windows machines, 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, double-click uninstall_wmi.bat

Post installation MID Server administration

You can manually start, stop, restart, and monitor the MID Server after it is installed.

The status of each MID Server activity appears in the MID Servers page. Additional log information appears in the following places:
   • The MID Server log is available on the instance.
   • The corresponding agent0.log.0 and wrapper logs (wrapper.log) are available in the MID Server agent \logs folder.

Start the MID Server

Manually start the MID Server to initiate communication with the instance.

Role required: admin

You can manually start the MID Server.

1. Do one of the following:
   • Windows command line: From the MID Server home directory, for example the agent folder, type start.bat.
   • Windows Services console: From the Windows Services console, right-click the ServiceNow MID Server name and then select Start.
   • Linux: From the MID Server home directory, for example the agent folder, type start.sh.

2. Monitor the MID Server to ensure that it is operating properly.
Stop the MID Server

Stop the MID Server to terminate communication with the instance.
Role required: admin
Consider pausing the MID Server instead. Pausing the MID Server from the instance still allows you to run certain commands on the MID server.

1. Do one of the following:
   • Windows command line: From the MID Server home directory, for example 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.
   • Linux: From the MID Server home directory, for example the agent folder, type stop.sh.

2. Restart the MID Server when ready.

Restart the MID Server

You can restart the MID Server if it has been stopped.
Role required: admin
You can manually restart the MID Server.

1. Do one of the following:
   • MID Server instance: Navigate to the MID Servers and click a Name. Under Related Links, click Restart MID.
   • Windows command line: From the MID Server home directory, for example the agent folder, type Restart.bat.
   • Windows Services console: From the Windows Services console, right-click the ServiceNow MID Server name and then select Start.
   • Linux: From the MID Server home directory, for example the agent folder, run the restart-service.sh script using one of these commands:
     • ./restart-service.sh
     • sh restart-service.sh
     • bash restart-service.sh

2. Monitor the MID Server to ensure that it is operating properly.

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
   • \agent\logs\wrapper.txt

   See Access MID Server log entries from the ECC queue on page 1176 to see how to open log entries from the instance.


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 181 for details.

**MID Server upgrades**

MID Servers are automatically upgraded. But you can also manually upgrade each MID Server separately.

**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.

- 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 1100 for instructions.

**Upgrade version**

You can configure a property that specifies the version to upgrade to if you do not want to use the default MID Server version that is determined by the instance. See Set the MID Server version on page 1099 for more information.
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 Helsinki 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 473: Upgrade error messages**

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to refresh packages</td>
<td>The MID Server displays this message as a generic error when the error is not handled by a defined error message.</td>
</tr>
<tr>
<td>Message</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</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>
</tbody>
</table>

Set the MID Server version

You can specify which version the MID server should upgrade to using a property.

Role required: admin

ServiceNow does not recommend pinning the MID Server to a specific version for a significant amount of time, especially if you upgrade the instance. Under most circumstances, you should let the instance determine which MID Server version to use.

These properties control the MID Server version:

- **mid.buildstamp**
  
  The mid.buildstamp property 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**
  
  Use this property to set an override condition for the current MID Server version. When the MID Server checks the version each hour, it looks at the mid.version.override property first. If this property is empty, the MID Server will get its version information from the mid.buildstamp property. If an override version is configured, the MID Server uses this value and ignores the version information in the mid.buildstamp property. This override value remains when the instance is restarted and is passed to the MID Server. However, the version in the mid.version.override property is deleted during an upgrade, allowing the MID Server to reset itself to the version in the mid.buildstamp property.
  
  The MID Server cannot be upgraded until the parameter is cleared.

**Note:** Downgrades are only possible within the same major release, such as Helsinki or Istanbul.

1. In the Navigation pane filter, type sys_properties.list.
   
   The list of system properties appears.
2. Click New.
3. Type mid.version.override in the Name field.
4. Enter a description, such as, Set an override value for the current MID Server version.
5. Enter a version for the MID Server to use that is different from the version ServiceNow has selected in the mid.buildstamp property.
   
   The date and time format is yyyy-mm-dd-hhmm.
6. Click Submit.
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 upgrade to the Istanbul release

The Istanbul release of the MID Server introduces features such as application assignment and changes the way various applications select MID Servers.

When your instance and MID Servers upgrade to the Istanbul (and later) releases, an application (such as Discovery, or Service Analytics) is assigned to the MID Server depending on what plugins you have active and what capabilities are already assigned to the MID Server. This application, along with IP range settings, determine which MID Server is eligible for an application to use. Service Analytics, Service Mapping, and Orchestration no longer use the combination of capabilities and IP ranges to determine which MID Server to use. The upgrade removes certain capabilities such as Analytics and ServiceMapping from MID Servers after assigning correct applications.

Capabilities for Service Analytics and Service Mapping

The upgrade process checks for existing capabilities assigned to MID Servers. If no Service Mapping or Service Analytics capabilities are applied to MID Servers, then the upgrade allows ALL applications to use MID Servers, meaning any application can use the MID Server. If the upgrade detects capabilities, note the following:

• For the Analytics capability: If the upgrade detects a MID Server with the Analytics capability, the Service Analytics application is assigned to the MID Server. Only the Service Analytics application can use that MID Server.
• For Service Mapping capabilities: If the upgrade detects that a MID Server has Service Mapping capabilities, then the Service Mapping application is assigned to the MID Server. If the upgrade detects that no MID Servers have Service Mapping capabilities, then any MID Server that does not already have the ServiceAnalytics capability is available for Service Mapping, but the application assignment depends on the other items mentioned in this topic.

Discovery schedules

Any MID Server that is specified in a Discovery schedule is assigned the Discovery application (unless it is already assigned the ALL application.)

The Discovery Schedule form is upgraded to the new version, which specifies the MID Server selection method field. The value for this field is set to:

• Use Behavior if a behavior was already specified.
• Auto-Select MID Server if no MID Server is specified.
• Specific MID Server if a MID server is referenced and is not part of a cluster. The reference to the same MID Server is retained. The Discovery application is also applied to the specified MID Server if the ALL application had not already been applied.
• Specific MID cluster: if a MID Server is referenced and it is part of a cluster. The specific MID Server reference is not retained. If the MID server belongs to both load balancing and a failover clusters, the failover cluster is used. If no failover cluster is available, a load balance cluster is used.

**Orchestration**

If a MID Server does not have the Analytics capability, the upgrade assigns the Orchestration application. Any existing Orchestration capabilities are retained. If a MID Server is specified, the upgrade preserves the same MID Server as the default for the Orchestration application.

**IP Ranges**

The upgrade preserves any IP ranges that are already configured for a MID Server. If no IP ranges are specified, the ALL IP range is assigned. The ALL IP range allows the MID Server to pass the IP range criteria used for selection.

**Pre-upgrade testing**

Before you upgrade an instance, run these manual tests to ensure that the MID Servers for that instance can upgrade successfully. Testing helps you identify issues that could cause a MID Server outage or require reinstallation.

1. Log in to each MID Server using the appropriate user account for that MID Server.
2. Check that there is at least 1GB of free disk space. This is necessary to accommodate the download package required for the upgrade.
3. From the MID Server host, use a browser to open [https://install.service-now.com/test/test.html](https://install.service-now.com/test/test.html). You must have access to this server to download the installation package.
4. Check that the MID Server user account has the correct file permissions on the server.
   • Navigate to the agent folder where the MID Server is installed to ensure access.
   • Create a new text file in the folder and then delete it to ensure the account has rights to manage the temporary folder created during installation.
5. For Windows MID Servers, verify that the Log on as user for the Windows service is either:
   • Local System (default)
   • A user who is part of the local Administrators group. Domain administrators are part of the local Administrators group by default.

**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:** Using special characters in an XML configuration file requires you to encode them.

**Important:** All new MID Servers must be validated before use. This ensures that the MID Server is trusted to access credentials used by the instance for automations. For instructions, see *Validate the MID Server* on page 1089.

### 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>
</tbody>
</table>
| Scripted Web Service [sys_web_service] | • InstanceInfo  
|                           | • GetMIDInfo                |
|                           | • MIDAssignedPackages       |
|                           | • MIDFieldForFileProvider   |
|                           | • MIDFileSyncSnapshot       |
|                           | • MIDServerCheck            |
|                           | • MIDServerFileProvider     |

### 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.
### Figure 295: 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 last 24 hours.</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 last 24 hours.</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>
<tr>
<td>Version</td>
<td>The version of the MID Server. An icon indicates the validity of the MID Server:</td>
</tr>
<tr>
<td></td>
<td>• 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 <code>mid.version.override</code> property. The MID Server will not be upgraded until the parameter is cleared.</td>
</tr>
<tr>
<td></td>
<td>• Yellow: Compatible, but upgraded is recommended. This indicates that the MID Server version belongs to the same family as the instance, but not the same version.</td>
</tr>
<tr>
<td></td>
<td>• Green: Compatible. No upgrade necessary.</td>
</tr>
<tr>
<td></td>
<td>• Gray: Incompatible. The instance cannot detect the version.</td>
</tr>
<tr>
<td>User</td>
<td>The login name of the user. An icon indicates the validity of the user:</td>
</tr>
<tr>
<td></td>
<td>• Red: Incompatible. The user does not have the <code>mid-server role</code> or the user does not match the value in the <code>mid.instance.username parameter</code> (in the config.xml configuration file). Reconfigure the MID Server user and verify that it works.</td>
</tr>
<tr>
<td></td>
<td>• Green: Compatible. The user has the mid_server role and matches the user in the configuration file.</td>
</tr>
</tbody>
</table>

**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.
Figure 296: CPU memory used

MID Server selection

You can configure applications to select MID Servers in a variety of ways.
MID Server criteria

MID Servers offer these types of criteria that help an application determine which MID Server to use:

- **Application**: the ServiceNow application that you specify on the MID Server (starting with the Istanbul release). You can designate these applications for a specific MID Server:
  - Discovery
  - Orchestration
  - Service Mapping
  - Service Analytics
  - Event Management
  - Cloud Management

An ALL application option is also available. By default, the ALL option includes all applications except Service Analytics, which requires an exclusive MID Server. You can configure which applications are included in ALL.

- **IP address or range**: The IP address or the IP ranges that the MID Server is allowed to work within. You specify an IP address or IP range in two places: in the application, such as on a Discovery schedule or an Orchestration activity, and on 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.

- **Capabilities**: the network capability an application needs to use, such as the Powershell Orchestration activity. Discovery does not use capabilities.

**Note**: Discovery and Service Mapping can also use behaviors that 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</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 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>not applicable</td>
</tr>
</tbody>
</table>

**Note**: Any configured behaviors are ignored.
### Application | Supported Application on the MID Server | IP address range | Capability
--- | --- | --- | ---
Orchestration | The Orchestration or ALL application must be specified on the MID Server. | 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. | 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.

Service Analytics

Service Mapping

Event Management

<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>Service Analytics</td>
<td>The Service Analytics application must be specified on the MID Server.</td>
<td>not applicable</td>
<td>One of these capabilities must be present on the MID Server: the RCA capability for Service Analytics and the ITOA metrics capability for operational metrics.</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 ranges 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. Functionality differs for new installs and upgrades.</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 ranges configured on the MID Server.</td>
<td></td>
</tr>
</tbody>
</table>

### Specifying a default MID Server for each application

A default MID Server is the last choice MID Server that an application uses if it cannot find a suitable MID Server during auto selection. You specify a default MID Server on the application record for all applications except Event Management. 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.

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.
### 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.

<table>
<thead>
<tr>
<th>Application</th>
<th>How you specify a specific MID Server</th>
<th>Criteria that the default MID Server must meet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery</td>
<td>Choose the MID Server on the Discovery schedule.</td>
<td>You can use any MID Server as long as it does not have the RCA capability for Service Analytics. If you select a MID Server without the Discovery or ALL application, it automatically adds the Discovery application.</td>
</tr>
<tr>
<td></td>
<td><a href="#">Note: You can also specify a cluster of MID Servers.</a></td>
<td></td>
</tr>
<tr>
<td>Orchestration</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Service Analytics</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Service Mapping</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Event Management</td>
<td>Choose one or more MID Servers on the connector instance event collection, such as <em>HPOM.</em></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
**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*.

**Upgrading to Istanbul**

When you upgrade to Istanbul, the upgrade scripts attempt to generate the necessary application records. For information on the changes that are made when you upgrade to Istanbul, see *MID Server upgrade to the Istanbul release* on page 1100.

**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.

**Specify MID Server applications**

You can specify which applications can use MID Servers.

Role required: agent_admin or admin

Applications are only available when their respective plugin is activated.

1. Open a MID Server record.
2. On the Supported Applications related list, click Edit.
3. In the left column of the slushbucket, click the applications that you want to be able to use this MID Server and move them to the right column.
   - You can define which applications are included in the ALL option.
4. Click Save.

**Set a default MID Server for an application**

You can choose a MID Server that acts as the default for each application that uses MID Servers.

Role required: agent_admin or admin

The default MID Server is used when applications fail to find a suitable MID Server that matches *configured criteria during auto-select*.

1. Navigate to MID Server Applications.
   - The list of installed applications that can use MID Servers appears.
2. Click the name of the installed application.
3. On the MID Server Application form, select the MID Server in the Default MID Server field.
4. Click Update.
Configure an IP address range for the MID Server

Configure an IP address range on the MID Server to limit the MID Server to work with only a specific set of IP ranges.

Role required: agent_admin or admin

Applications, such as Discovery and Orchestration, can specify an IP range or a specific IP address of a target. When the application looks for a MID Server to use during auto-selection, it chooses a MID Server that has corresponding IP range that includes the application's IP range or specific IP address. Applications also use other criteria, such as the MID Server supported application and capabilities. See MID Server selection on page 1106 for more information.

**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. The MID server would need to have access to the IP ranges that the applications need for it to be actually used. The ALL IP range is new, starting with the Istanbul release.

**Orchestration**

Use the IP address of the target machine (together with the capability) to select the correct MID Server for Orchestration activities. See the steps below to configure the IP address.

**Service Mapping**

Eлектs 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 also use this IP address range, starting with the Istanbul release. Discovery can also use the quick IP range that you specify in the Discovery schedule.

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
  - 0x0A0B909B
  - 0A0B909B

- 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
  - 10.11.144.0/0xFFFFFFF0
  - 0xA0B9000/24
- 0xA0B9000/0xFFFFFFFF00

1. Navigate to MID Server IP Ranges.
2. Click New.
3. Fill out the form fields (see table).

4. Click Save.

Open the ALL IP range and configure the MID Servers that you want to use with any set of IP addresses.

Configure applications included in the definition of ALL Applications
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 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.

![Included in application ALL](image)

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).

**MID Server properties and parameters**

You can control several aspects of MID Servers by using properties and parameters.

**MID Server properties**

Properties control the behavior of all MID Servers or a particular MID Server. MID Server properties override MID Server parameters. You can add or MID Server properties from the MID Server Properties module.

**MID Server parameters**

Parameters control the behavior of a particular MID Server. They have lower precedence compared to MID Server properties. You modify MID Server parameters in the following locations:

- The Configuration Parameters related list in the MID Server record.
- The `config.xml` file in the `\agent` directory of your MID Server installation.

**Note:** Changes to parameters only take effect when the MID Server is started (or restarted).
MID Server properties

Use properties to control the behavior of probes and payloads on MID Servers.
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 474: MID Server properties

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mid.discovery.max_payload_size</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer (bytes)</td>
</tr>
<tr>
<td></td>
<td>• Default value: 5000000</td>
</tr>
<tr>
<td></td>
<td>You can also configure this as a configuration parameter on a individual MID Server.</td>
</tr>
<tr>
<td>mid.eccq.max_payload_size</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer (bytes)</td>
</tr>
<tr>
<td></td>
<td>• Default value: 2000000</td>
</tr>
<tr>
<td></td>
<td>You can also configure this as a configuration parameter on a individual MID Server.</td>
</tr>
<tr>
<td>mid.discovery.max_pattern_payload_size</td>
<td>Defines the maximum overall payload size for the payload of results that come from patterns.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer (bytes)</td>
</tr>
<tr>
<td></td>
<td>• Default value: 300000</td>
</tr>
<tr>
<td></td>
<td>You can also configure this as a configuration parameter on a individual MID Server.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 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. |
| mid.property.jdbc_operations | 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.  
• Type: string  
• Default value: select,update,insert,delete,show,create,describe,begin,if,end,not,exists |
| mid.property.jms.command.allowed_factory_names | Comma delimited list of. This property requires the Orchestration plugin.  
• Type: string  
• Default value: connectionFactory, queueConnectionFactory, topicConnectionFactory |
<p>| mid.property.powershell.command.script.parameter_passing | |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mid.property.ssh.use_snc</td>
<td>Enables the use of the SNCSSH 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 SNCSSH 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>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 if 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>
</tbody>
</table>

**Create MID Server properties**

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 475: MID Server Properties Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Enter the property name. See the Name(s) column in <em>MID Server parameters</em> on page 1117 or <em>Optional Configuration</em> parameters for a list of parameter and property names.</td>
</tr>
<tr>
<td>Value</td>
<td>You can enter the value you want the property to have.</td>
</tr>
<tr>
<td>MID Server</td>
<td>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.</td>
</tr>
</tbody>
</table>

After setting any MID Server properties, restart the MID Server to ensure the properties sync with the instance.

**MID Server parameters**

These parameters are available for MID Servers.

**Required parameters**

*Note:* Using special characters in an XML configuration file requires you to encode them.
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Instance URL        | url           | Specifies the URL to the associated ServiceNow 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 ServiceNow instance, use the URL set by your organization.  
  - Type: string  
  - Default value: none                                                                                                                                                                                                                                                                                                                                                                                 |
| MID Server ID       | mid_sys_id    | Records 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)                                                                                                                                                                                                                                                                                                                                                             |
| MID Server name     | name          | 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.  
  - Type: string  
  - Default value: YOUR_MIDSERVER_NAME GOES_HERE }
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Instance user name  | mid.instance.username or glide.glidesoap.username | 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.  
   • Type: string  
   • Default value: none |
| Instance password   | mid.instance.password or glide.glidesoap.password | 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.  
   • 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 |
### Istanbul ServiceNow Now Platform Capabilities

#### Label
**The maximum amount of simultaneous connections allowed per CIMOM.**

<table>
<thead>
<tr>
<th>Names</th>
<th>mid.cim.host.connection.limit</th>
</tr>
</thead>
</table>
| **Description**           | 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><strong>Description</strong></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 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 become 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 |
| 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 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID Server maximum number of probe threads</td>
<td>threads.max</td>
<td>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 <a href="#">Set MID Server Thread Use</a>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (threads)                                                                                                    • Default value: 25</td>
</tr>
<tr>
<td>Maximum amount of interactive messages to queue in memory for processing.</td>
<td>threads.interactive.max</td>
<td>Sets the maximum amount of interactive messages to queue in memory for processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (threads)                                                                                                    • Default value: 4</td>
</tr>
<tr>
<td>Maximum amount of expedited messages to queue in memory for processing.</td>
<td>threads.expedited.max</td>
<td>Sets the maximum amount of expedited messages to queue in memory for processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (threads)                                                                                                    • Default value: 4 (threads)</td>
</tr>
<tr>
<td>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 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 | Class that the MID server uses to generate secure key pairs.  
| | | • Type: String  
| | | • Default value: com.service_now.mid.keypairs.provider.standard.StandardKeyPairsProvider |
### Debug parameters

#### Table 476: MID Server 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 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 10.10.10.0/24 scans 24 bits of IP addresses from 10.10.10.0 to 10.10.10.254.  
• 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. |

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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                                                                                                                                                    |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNS scanning additional name servers</td>
<td>mid.dns_scan.additional_name_servers</td>
<td>Specifies the host names or IP addresses of any additional name servers.</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>DNS scanning load balancing enable</td>
<td>mid.dns_scan.load_balancing_enable</td>
<td>Specifies whether to enable load balancing of name servers.</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>

**FTP connection parameters**

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max size of the FTP Connection Pool</td>
<td>mid.ftp.max_pool_size</td>
<td>Specifies the maximum size of the FTP Connection Pool, in megabytes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 25</td>
</tr>
<tr>
<td>Max number of the FTP connections per target</td>
<td>mid.ftp.max_per_target</td>
<td>Specifies the maximum number of the FTP connections per target.</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>Max amount of time that an FTP connection can sit idle in the pool</td>
<td>mid.ftp.max_conn_idle_time</td>
<td>Specifies the maximum amount of time, in milliseconds, that an FTP connection can sit idle in the pool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 300000</td>
</tr>
<tr>
<td>Max number of files that can be returned in the filesystem list directory command</td>
<td>mid.filesystem.max.ls</td>
<td>Specifies the maximum number of files that can be returned in the filesystem list directory command.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 10000</td>
</tr>
</tbody>
</table>
## Logging parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable monitor checking</td>
<td>disable_monitors</td>
<td>Specifies whether to disable the MID Server from actively checking for monitors on the instance.</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>Query logging enable</td>
<td>mid.show.queries</td>
<td>Instructs the MID Server whether to log details about every query it makes to the ServiceNow instance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typically this parameter is only used by developers, but it is occasionally useful when troubleshooting a problem.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Be aware that setting this parameter to true causes intensive logging on the MID Server, potentially using considerable disk space.</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>Remote logging disable</td>
<td>disable.remote.logging</td>
<td>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 to the instance.</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>Status sending disable</td>
<td>disable.status</td>
<td>Prevents the MID Server from sending a status report to the instance every 10 minutes.</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>
# Proxy server parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Instance proxy enable| mid.instance.use_proxy or mid.proxy.use_proxy | 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.  
• Type: True | False  
• Default value: false |
| Instance proxy host  | mid.proxy.host                             | If your MID Server must go through a web proxy to access the ServiceNow instance, set this parameter to define the proxy’s host.  
• Type: String  
• Default value: none |
| Instance proxy password| mid.proxy.password                        | 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.  
• Type: String  
• Default value: none |
| Instance proxy port  | mid.proxy.port                             | If your MID Server must go through a web proxy to access the ServiceNow instance, set this parameter to define the proxy’s port.  
• Type: Integer (0-65535)  
• Default value: 80 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Instance proxy user name             | mid.proxy.username                   | 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.  
• Type: String  
• Default value: none                                                                                                                                                                                                                                                                                                      |

**Shazzam parameters**

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Port probe packet interval              | mid.shazzam.regulator.interval_ms    | 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 this interval. By default, Shazzam launches one packet each millisecond.  
• Type: Integer  
• Default value: 1                                                                                                                                                                                                                                                                                                           |
| Port probe packets launched per regulator interval | mid.shazzam.regulator.packets_per_interval | Sets the 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.  
• Type: Integer  
• Default value: 1                                                                                                                                                                                                                                                                                                       |
| Shazzam chunk size                      | mid.shazzam.chunk_size               | Specifies the maximum number of IP addresses that Shazzam scans in parallel. This parameter primarily controls outbound port consumption.  
• Type: Integer  
• Default value: 100                                                                                                                                                                                                                                                                                                          |
### SSH Discovery parameters

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| MID Server connection cache                     | mid.connection_cache                       | Specifies whether to cache connections. Set to false to disable connection caching. This parameter applies to SSH connections only.  
• Type: true | false  
• Default value: true                            |
| Decide if the PATH environment variable should be set for SSH commands | mid.ssh.set_path                           | Specifies whether to set the PATH environment variable for SSH commands.  
• Type: true | false  
• Default value: true                            |
| Process commands against localhost via SSH rather than console | mid.ssh.local                              | 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.  
• Type: true | false  
• Default value: false                           |
| MID Server SSH connection per host               | mid.ssh_connections_per_host               | Controls the number of concurrent probes the MID Server can run against a given host. Lowering the number of concurrent connections can slow Discovery.  
• Type: integer  
• Default value:  
  • 7 for the ServiceNow client  
  • 3 for the legacy SSH client |
| Enable (or disable) sudo to preserve environment (-E) for SSH | mid.ssh.sudo_preserve_environment         | Specifies whether to use `sudo` to preserve the environment for SSH.  
• Type: true | false  
• Default value: false                            |
<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. The ServiceNow SSH client accepts the following prefixes in front of the path_overide 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_overide 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><strong>Important:</strong> 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>
</tbody>
</table>
|                                                |                              | • Default value: false
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>Sets a different SSH remove file command.</td>
</tr>
<tr>
<td></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>Delay sending any SSH commands to a server after connecting</td>
</tr>
<tr>
<td></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>Suppresses the generation of the SSH history file. This parameter applies to the legacy SSH client only.</td>
</tr>
<tr>
<td></td>
<td>mid.ssh.suppress_history</td>
<td>Suppression is true or false.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Timeout in ms for SSH socket read</td>
</tr>
<tr>
<td></td>
<td>mid.ssh.socket_timeout</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (milliseconds)</td>
</tr>
<tr>
<td>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Timeout in ms for SSH channel activity</td>
<td>mid.ssh.channel_timeout</td>
<td>Specifies the amount of time that the MID Server waits for activity on the SSH socket before closing 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.</td>
</tr>
</tbody>
</table>
|                                           |                              | • 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)                                                                                                             |
| Use keyboard interactive authentication for SSH | mid.ssh.use_keyboard_interactive | Uses the keyboard interactive authentication mode in SSH daemons on which it is activated.  |
|                                           |                              | • Type: true | false  
<p>|                                           |                              | • Default value: false                                                                                                                             |</p>
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min size of DH group in bits</td>
<td>mid.ssh.dh_group_length_min</td>
<td>Specifies the minimum group length in bits used for generating a &quot;shared secret&quot; key in Diffie-Hillman key exchange. The larger the key the more secure the SSH connection is but at the cost of performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (bits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1024</td>
</tr>
<tr>
<td>Max size of DH group in bits</td>
<td>mid.ssh.dh_group_length_max</td>
<td>Specifies the maximum group length in bits used for generating a &quot;shared secret&quot; key in Diffie-Hillman key exchange. The larger the key the more secure the SSH connection is but at the cost of performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer (bits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 2048</td>
</tr>
<tr>
<td>List of bourne-compatible shells</td>
<td>mid.ssh.shells_supported</td>
<td>Defines the bourne-compatible shells supported by the MID Server. This value is a comma-separated list of supported shells, such as ksh, dsh, bash and sh.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: string</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: ksh,bash,sh</td>
</tr>
<tr>
<td>Discard long running command error output</td>
<td>mid.ssh.discard_lrc_error</td>
<td>Discard long running command error output, emulating legacy behavior.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: String</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: j2ssh - true, sncssh - false</td>
</tr>
<tr>
<td>Ratio of ssh session pool capacity to mid</td>
<td>mid.ssh.pool_thread_ratio</td>
<td>The ratio of SSH session pool capacity to the MID Server thread number, in percentage. The pool capacity is at least 25%.</td>
</tr>
<tr>
<td>thread number in percentage.</td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 75</td>
</tr>
<tr>
<td>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Disable the privilege check for SSHCommand.         | mid.ssh.disable_privilege_check            | 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**

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed MID Server version</td>
<td>mid.pinned.version</td>
<td>Name of the version to which this MID Server is pinned.</td>
</tr>
</tbody>
</table>
|                                |                      | • Type: string  
  • Default value: build timestamp                                                                  |
| Upgrade proxy enable           | mid.upgrade.use_proxy| 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

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Upgrade proxy host     | glide.mid.autoupgrade.proxy_host or glide.glidesoap.proxy_host | 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>
| Enable or disable Powershell parameter passing via the command line. | mid.powershell.command.parameter_passing | Enable or disable Powershell parameter passing via the command line.  
  - Type: True | False  
  - Default value: false |

<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| Enable or disable the Powershell script parameter passing via the command line. | mid.powershell.command.script.parameter_passing | Enable or disable the Powershell script parameter passing via the command line.  
  - Type: True | False  
  - Default value: true |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 PowerShell for Discovery.                                     | mid.use_powershell                   | Specifies whether to enable PowerShell for Discovery. The MID Server requires PowerShell version 2 to operate. If the MID Server cannot find the correct version of PowerShell, it uses WMIRunner instead.  
  • 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                                                                 |
| Timeout for Windows probes.                                          | mid.windows.probe_timeout            | Specifies the timeout value for the Windows probe, in seconds. The default value is 5 minutes.  
  • Type: Integer  
  • Default value: 600 seconds                                                                 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powershell use credentials table.</td>
<td>mid.powershell.use_credentials</td>
<td>Specifies whether PowerShell Discovery should use the Windows credentials from the credentials table. To use PowerShell Discovery on a single domain, set this parameter to false, and then restart the MID Server. In this case, the MID Server runs the probes with the credentials of the user for the MID Server process.</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>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Path to Powershell executable | 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 directory containing the PowerShell executable, for example, C:\mypowershell or C:\mypowershell. ServiceNow automatically appends the string powershell.exe to the path. This parameter might be necessary when both 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. Note that 64-bit Windows employs file system redirection and the MID Server runs as a 32-bit application. If the path is in %WinDir%\System32, Windows automatically redirects to %WinDir%\SysWOW64. To avoid redirection, specify the path as %WinDir%\Sysnative. An example would be to specify C:\WINDOWS\sysnative\WindowsPowerShell\v1.0\ instead of C:\WINDOWS\system32\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 capability.

- Type: String (path)
- Default value: none
<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 |
| Set the port WinRM will use to connect to remote hosts.              | mid.powershell_api.winrm.remote    | Specifies the communications port the MID Server uses to communicate with Windows Remote Management (WinRM) protocol.  
  - Type: Integer  
  - Default value: 5985 |
| 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 |
| 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 |
### Istanbul ServiceNow Now Platform Capabilities

<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 |
| 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 |
<table>
<thead>
<tr>
<th>Label</th>
<th>Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum time to wait for a response for the first OID request.</td>
<td>mid.snmp.request.timeout</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can override this parameter with the timeout SNMP probe parameter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 1500</td>
</tr>
<tr>
<td>Maximum time to wait for responses to OID requests once a session has been established.</td>
<td>mid.snmp.session.timeout</td>
<td>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 as that used for mid.snmp.request.timeout.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can override this parameter with the establish_session_timeout SNMP probe parameter.</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>Use the Snmp4j library for SNMP communication.</td>
<td>mid.snmp.use_snmp4j</td>
<td>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.</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>Label</td>
<td>Names</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Use SNMP v1 and v2c for probes.</td>
<td>mid.snmp.use_snmp_v1_v2c</td>
<td>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.</td>
</tr>
</tbody>
</table>
|                                                |                                        | • 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 477: Event Management parameters**

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk size for sending events</td>
<td>mid.probe.event.bulk_size</td>
<td>Specifies the maximum size of an event payload, in MB.</td>
</tr>
</tbody>
</table>
|                                                |                                     | • Type: Integer  
|                                                |                                     | • Default value: 120                                                                                                                                                                                       |
| 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  
<p>|                                                |                                     | • Default value: 100,000                                                                                                                                                                                   |</p>
<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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                                                                                           |
| 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:     Integer  
• Default value: 200,000                                                                                           |
| Number of seconds to wait before resending unhandled event            | mid.em.metric_binding_timeout_seconds                                | 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_seconds                                | Specifies the maximum number of seconds to wait before resending unhandled events.                                                                                                                                                                                                                               | • Type:     Integer  
• Default value: 10800                                                                                           |
| Max number of seconds before refreshing the metric source type cache in memory | mid.em.metric_max_elapsed_time                                       | 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.matric_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                                                                                           |
<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Period, in seconds, between statistics reports to the instance. | mid.em.statistics_report_period_seconds | 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_minutes | 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 MID Server parameters**  
Use a MID Server parameter to control the behavior of a particular MID Server.  
Role required: admin  
You can set MID Server configuration parameters in either of the following places:  
- From the Configuration Parameters related list in the MID Server record.  
- From the config.xml file in the `agent` directory of your MID Server installation.
You can view and manage MID Server configuration from the ServiceNow instance.

1. Navigate to the list of MID Servers using one of the following paths:
   - MID Server Servers
   - Discovery MID Servers
   - Orchestration MID Servers

2. From the list of MID Servers, select a MID Server to configure.
   The Configuration Parameters 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.

3. 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.
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:** The sample file here is from FireFox. Conventional text editors, such as Notepad, Wordpad, or TextEdit, do not display colors and variable fonts.
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:

- Grab MID 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 1153 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.

When the MID Server connects to the instance, the MID Server record is created 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. The system overrides the global domain configuration with your domain and saves a new copy of the record. The MID Servers in your domain can only access records in the global domain and records overridden by your specific domain.

   **Note:** Attachments on MIB or JAR file records might not appear as they did in a non-domain separated environment. This occurs 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.

### Privileged commands for the MID Server

The ServiceNow 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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sudo</td>
<td>Host must support the <code>sudo -S -p &lt;password&gt;</code> command and return the correct list of allowed SSH commands. Credentials provided for Discovery must be able to run the command <code>sudo -S -p &lt;password&gt; &lt;commands&gt;</code>. Possible SSH commands are those listed in <em>Unix and Linux commands requiring root privileges for Discovery and Orchestration</em> on page 847.</td>
</tr>
<tr>
<td>pbrun</td>
<td>Host must support the <code>pbrun -v</code> command and return the correct version of PowerBroker. Credentials provided for Discovery must be able to run <code>pbrun &lt;commands&gt;</code>. Possible SSH commands are those listed in <em>Unix and Linux commands</em>. Discovery does not support any other <code>pbrun</code> options, such as a password prompt. The instance must be able to reach the target host via SSH.</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| **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>. Possible SSH commands are those listed in *Unix and Linux 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>. Possible SSH commands are those listed in *Unix and Linux commands*.  
• Discovery does not support any other dzdo – options, but Discovery supports password authentication for dzdo. |

### Add a new privileged command

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.

### 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.

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.

Figure 301: Selecting the Advanced view

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.

Figure 302: List of privileged commands to use for a MID Server

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 1158.

**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 organizations security requirements. See *Rekey a MID Server* on page 1159 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 1159 for instructions.

**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 *Use basic authentication credentials for a MID Server* on page 1160 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**

The MID Server login credentials appear in the config.xml file in clear text. If access to the MID Server host machine is not secure, store the login credentials in this file in encrypted form.

Role required: admin
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:

```xml
<!-- 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.

```xml
<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.

The password is now encrypted.

```xml
<parameter name="mid.instance.username" value="midsrvadmin" />
<parameter name="mid.instance.password" encrypt="true" value="encrypted:rhrfUNYRzZAI8/BkTtZmNA=="/>
```

The password cannot be decrypted (or displayed 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.

### Rekey a MID Server

Rotate the MID Server keypairs, if necessary, to satisfy your organization's security requirements.

Role required: admin

Rekeying a MID Server forces it to restart and generate a new private key. 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`.
   An example path might be: `C:\Program Files (x86)\ServiceNow\<MidServer(s)>\agent\jre\bin`
2. Enter the following keytool command to import a certificate into the MID Server's cacerts keystore:
keytool -import -alias <certificate alias> -file "<path to certificate>" -keystore "<path to MID Server(s)>\agent\jre\lib\security\cacerts"

For example, you might enter: keytool -import -alias MyCA -file "C:\myca.cer" -keystore "C:\Program Files (x86)\ServiceNow\MIDserver\agent\jre\lib\security\cacerts"

**Note:** Keytool prompts for a certificate password. If the certificate is for a CA, keytool also asks whether to trust the certificate authority. To add a certificate to an instance, see *Upload a certificate to an instance.*

---

**Use basic authentication credentials for a MID Server**

You can enforce basic authentication on each request.

Role required: admin

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 set basic authentication credentials for SOAP requests. Each SOAP request contains an Authorization header as specified in the *Basic Authentication protocol.*

**Note:** The setting for enforcing strict security controls how ServiceNow 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.

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"/>`.

---

**Advanced MID Server configuration**

There are several advanced options available for you to customize and configure the MID Server.
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.

Enable script file synchronization for Windows browser 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:
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:
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 1163 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 1153.

### Attach a script file to a MID Server

Attach a script file to a MID Server to keep script files in synch with the instance without having to download the file. Do this when your browser security settings are blocking the downloading of files that your MID Server needs from the instance.

**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.
Note: The script file attachment name must match the MID Server script file name, since the record can contain other attachments.

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 Service Analytics RCA

To activate the Service Analytics root cause analysis (RCA) feature, 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 479: 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 480: 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></td>
<td>32-bit or 64-bit version of the MID Server</td>
</tr>
<tr>
<td></td>
<td>• Red Hat Enterprise Edition Linux 6.6 or later</td>
<td></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 Service Analytics 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 Service Analytics RCA, and an attempt to add additional supported applications to the same MID Server is prevented. It is recommended that Service Analytics Metrics is also implemented with its own dedicated Metrics MID Server. These recommendations ensure high level of performance. However, if needed, you can modify this default behaviour and configure the RCA MID Server or the Metrics MID Server with additional supported applications. For information about modifying the behaviour of the ALL option when selecting supported applications, see Configure applications included in the definition of ALL Applications on page 1112.

1. Ensure that the MID Server is validated. For more information, see Validate the MID Server on page 1089.
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 1178.

**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:

```javascript
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 more information, see MID Server domain separation on page 1153.

**Caution:** Attaching 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 MID Server memory size

The MID Server starts with a default memory allocation, but you can modify this setting in the configuration file.

Role required: admin

In the base ServiceNow system, the MID Server memory is set to 1024MB, which can be configured in the `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. Or perhaps the MID Server is located in a small branch office with very few devices, and runs in an environment where memory allocation is shared between a print server, mail server, or web proxy server. In this situation, the MID Server memory allocation might have to be reduced.

**Note:** For a complete list of minimum MID Server requirements, see *MID Server system requirements* on page 1061.

1. Navigate to `\ServiceNow\<MID Server name>\agent\conf` and open the `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.
You may also display the current list of retry activities and their states by selecting the Queue Retry Activity module.

**Figure 303: Queue Retry Activity**

Here is a table demonstrating a typical Queue Retry Activity:

<table>
<thead>
<tr>
<th>Created:</th>
<th>2011-03-07 00:01:58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy:</td>
<td>SOAPClient.java.net.Unkn</td>
</tr>
<tr>
<td>Status:</td>
<td>Succeeded</td>
</tr>
<tr>
<td>Retry count:</td>
<td>3</td>
</tr>
<tr>
<td>Input queue:</td>
<td><a href="http://www.webservicex.net">http://www.webservicex.net</a></td>
</tr>
<tr>
<td>Output queue:</td>
<td><a href="http://www.webservicex.net">http://www.webservicex.net</a></td>
</tr>
<tr>
<td>Retry queue entry:</td>
<td><a href="http://www.webservicex.net">http://www.webservicex.net</a></td>
</tr>
</tbody>
</table>
Figure 304: 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.

<table>
<thead>
<tr>
<th>Name:</th>
<th>SOAPClient.java.net.UnknownHostException</th>
<th>Agent:</th>
<th>SOAPClient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum retry:</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retry interval:</td>
<td>Days 0 Hours 00:00:15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active:</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Condition:**

State: is error

**Condition script:**

\[
\text{answer} = \text{current.error_string.toString().startsWith('java.net.UnknownHostException');}
\]

**Figure 305: 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 ECC Queue is the normal connection point between an instance and other systems that integrate with it, most commonly a MID Server. Messages are classified as Input (from a MID Server to the instance) or Output (from the instance to a MID server).
View the ECC queue by navigating to one of the following:

- Discovery Output and Artifacts ECC Queue.
- Discovery Discovery Schedules {schedule name} {Discovery status record}.

The following image is an example of a record in the ECC queue. This record shows that a WMI classifier probe was instructed to run and has been processed.

**ECC Queue form fields**

<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 contents of this field is arbitrary; it's intended as a way to inform the recipient of the message about what kind of message it is. In Discovery, it is name of the probe the MID server is to run (or ran, if this message is a response from a MID server).</td>
</tr>
<tr>
<td>Name</td>
<td>The contents of this field is arbitrary; it's intended as a way to inform the recipient of the message of more detail than the Topic field provides. In Discovery, it is either a descriptive name for human use, or the actual command the probe is to run (or ran). For example, if Topic is SSHCommand, then the Name field contains the actual shell command to run.</td>
</tr>
<tr>
<td>Source</td>
<td>The contents of this field is arbitrary; it's intended as a way to inform the recipient of the detailed recipient or target of this message. In Discovery, the Source field usually contains the IP address that the probe is to run against (or ran 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.</td>
</tr>
<tr>
<td>Queue</td>
<td>This field determines whether this message is an input message or an output message, by being set to input or output, respectively.</td>
</tr>
<tr>
<td>State</td>
<td>This field is initially set to ready when any message is inserted into the ECC Queue. For</td>
</tr>
<tr>
<td>Field</td>
<td>Input Value</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>output messages, the recipient of the message is responsible for updating this field to processing (when it starts processing the message) and processed (when it has completed processing the message). For input messages, the base system instance is responsible for updating this field to processing or processed as it begins and completes processing of the message. Generally speaking, this processing occurs in business rules (on the ECC Queue) that watch for incoming messages being inserted. Note that in all cases, the processing state is optional – it is perfectly acceptable for message states to be updated directly from ready to processed.</td>
</tr>
<tr>
<td>Created</td>
<td>The time when this message was created.</td>
</tr>
<tr>
<td>Processed</td>
<td>The time when this message was processed</td>
</tr>
<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. The contents of this field is arbitrary; generally it is different for each system that messages are being exchanged with. Discovery uses XML documents for the payload. The returned XML document 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>

Access the ECC queue

Open ECC queue records to see details of the details of a discovery. You can view ECC queue records while a discovery is in process.

Role required: admin

1. Navigate to one of the following:
   - Discovery Output and Artifacts ECC Queue
   - Discovery Discovery Schedules {schedule name} {Discovery status record}
   - ECC Queue
   - {Discovery Status record} ECC Queue
2. Sort the list by any column that interests you, such as Created or Queue.
3. Open an ECC queue record (see table for field descriptions).

<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, <code>HorizontalDiscoveryProbe</code> 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. See <code>The ECC queue for Discovery</code> for a brief overview of the process flow.</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>
<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>Field</td>
<td>Input value</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>

4. Click any of 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>

Create an ECC Queue message

One of the capabilities of the MID Server is to be able to send remote commands through the MID Server to the hosting device, and then gather the response.

This feature enables an administrator to issue remote commands directly from the ECC Queue without running Discovery.

1. Navigate to Discovery > Outputs and Artifacts > ECC Queue.
2. Click New.
3. Create a message with the following 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>
```
The MID Server takes the XML entry in the ECC Queue and processes the command-line call locally. The STDOUT is returned to the ECC Queue as an Input queue entry.

**Note:** The command specified through the Payload field takes precedence over the command specified in the Name field.

Access MID Server log entries from the ECC queue

You can access entries in the ECC Queue that show agent0.log.0 logs and wrapper.log logs for an individual MID Server.

Role required: admin or mid_user

After you install and configure your MID Servers, there are several tasks you can perform to monitor the MID server, including viewing the logs to find warnings and errors.

1. Open a MID Server record.
2. 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.
3. To open a log entry, click the link under the Created column.

View MID Server statistics

You can access entries in the ECC Queue that belong to the queue.stats topic for an individual MID Server. Use these statistics for monitoring and troubleshooting your MID Server.

Role required: admin or mid_user

Useful MID Server statistics include memory and CPU usage data.

1. Open a MID Server record.
2. 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 cancelled. 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 support 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>
<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.

![Figure 306: MID Server failover example](load_balance.png)

**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, and Orchestration can use capabilities, IP ranges, and the supported application to narrow the pool of MID Servers it uses. At least one capability is required for each MID Server used by Orchestration. See Orchestration MID Servers on page 1766 for more information.

The following capabilities are available by default with Discovery:

- SSH
- SNMP
- VMware
- PowerShell
- WMI
- SOAP
- REST
- JDBC
- Resolve DNS
- AWS
- Azure
- Cloud Management
- All

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.

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, Service Mapping, and Service Analytics.

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.

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 CIs being duplicated during discovery.</td>
</tr>
</tbody>
</table>

**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 1185 for details.

<table>
<thead>
<tr>
<th>Explore</th>
<th>Set up</th>
<th>Administer</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Orchestration release notes</em></td>
<td><em>Orchestration MID Servers</em> on page 1766</td>
<td><em>Orchestration ROI standard reports</em> on page 1577</td>
</tr>
<tr>
<td><em>Upgrade to Istanbul</em></td>
<td><em>Activate an Orchestration workflow</em> on page 1190</td>
<td><em>Orchestration ROI premium reports</em> on page 1588</td>
</tr>
<tr>
<td><em>Introduction to Orchestration</em> on page 1182</td>
<td><em>Activate an activity pack</em> on page 1216</td>
<td></td>
</tr>
<tr>
<td><em>List of Orchestration plugins</em> on page 1186</td>
<td><em>Orchestration ROI</em> on page 1570</td>
<td></td>
</tr>
<tr>
<td><em>Orchestration Runtime plugin</em> on page 1188</td>
<td><em>Client software distribution</em> on page 1591</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use</td>
<td>Develop</td>
<td>Integrate</td>
</tr>
<tr>
<td><em>Orchestration activities</em> on page 1199</td>
<td><em>Orchestration activity designer</em> on page 1359</td>
<td><em>Client software distribution from SCCM</em> on page 1603</td>
</tr>
<tr>
<td><em>Orchestration activity packs</em> on page 1215</td>
<td><em>Client software distribution extension framework</em> on page 1621</td>
<td><em>Legacy: Configuration Automation</em> on page 1624</td>
</tr>
</tbody>
</table>
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, with best practices every time.

Orchestrated solutions aide collaboration among teams by providing reusable data and versioning for both the workflows and the activities within them. This allows subject matter experts to create activities that are consumed by 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 require human intervention when automation errors arise.

Orchestration tools

Orchestration provides the ability to make calls outside of a ServiceNow instance, directly to SOAP and REST web services or to systems within an enterprise’s corporate firewall through the MID Server. Orchestration extends the workflow editor by providing these features:

- Activity packs containing ready-to-use activities.
- An activity designer that allows developers to create custom activities without having to rely on scripting.
- Ability to create activity packs using scoped applications.
- A databus for reusable data.

Systems that Orchestration can automate

Orchestration can automate tasks such as employee onboarding, user access rights, server management, and managed file transfers. 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 on page 1359.

These are the external systems that Orchestration can automate:
• **VMware** (through vCenter)
• **Amazon EC2 instances**
• Any system presenting web services
• Windows **Active Directory**
• Microsoft **Exchange** mail servers
• Puppet Labs **Puppet** (with configuration automation)
• **Chef** (with configuration automation)
• Any system accessible from the command line
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.

![Orchestration workflow diagram]

**Figure 308: Orchestration workflow**

**Orchestration video tutorial**

Watch the introductory video for Orchestration.

**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>
<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 timezone, 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.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration [com.snc.runbook_automation]</td>
<td>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.</td>
<td>• Orchestration - ROI  • Orchestration - Runtime</td>
</tr>
<tr>
<td>Orchestration - Active Directory [com.snc.orchestration.ad]</td>
<td>Installs the Active Directory activity pack. These activities create, delete, and manage objects in Windows Active Directory.</td>
<td>Orchestration</td>
</tr>
<tr>
<td>Orchestration - Asset Lease Management [com.snc.orchestration.asset_lease_management]</td>
<td>Provides the software lease functionality for Client Software Distribution Agent. This activity allows administrators to select the start and end dates of software leases and to request an extension of a lease.</td>
<td>None</td>
</tr>
<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>
</tbody>
</table>

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.

**Note:** This list does not include plugins used by Cloud Provisioning features, such as VMware or Amazon EC2.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
</table>
| Orchestration - Client Software Distribution [com.snc.orchestration.client_distribution] | Allows the distribution of software from the service catalog using third-party systems, such as Microsoft System Center Configuration Manager (SCCM) | • Orchestration - System Center Configuration Manager  
• Orchestration - Asset Lease Management  
• Service Catalog Scoped API  
• Software Asset Management |
| Orchestration - Exchange [com.snc.orchestration.exchange] | Installs the Exchange activity pack. These activities manage Microsoft Exchange mail systems.                                                                                                           | Orchestration                                                                                   |
| Orchestration - F5 network management [com.snc.orchestration.f5] | 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. | Orchestration                                                                                   |
| Orchestration - Infoblox DDI Activity Pack [com.snc.orchestration.infoblox_ddi] | Installs the Infoblox DDI activity pack. These activities support Infoblox DDI management.                                                                                                             | Orchestration                                                                                   |
| Orchestration - PowerShell [com.snc.orchestration.powershell] | Installs the PowerShell activity pack. These activities control and automate the administration of Windows machines and applications, using the Windows .NET Framework. | Orchestration                                                                                   |
| Orchestration - Probe [com.snc.orchestration.probe] | Installs the Probe activity pack. These activities run ServiceNow® probes on target hosts to return specific information.                                                                                     | Orchestration                                                                                   |
| Orchestration - ROI [com.snc.runbook_automation.roi] | 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. | • Performance Analytics  
• Cost Management                                                                                                                                   |
| Orchestration - ROI Premium [com.snc.runbook_automation.roi_premium] | Installs a premium dashboard that displays detailed reports on calculated savings, estimating actualized tasks over time. The Orchestration - ROI Premium plugin requires purchase and activation of the Performance Analytics - Premium plugin to display its reports. | • Orchestration - ROI  
• Performance Analytics - Premium                                                                   |
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<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 • 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_mgnt]</td>
<td>Installs the System Center Configuration Manager (SCCM) activity pack. These activities manage 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, which gives users access to custom activities for their applications and allows 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.
Dependencies

The Orchestration - Runtime plugin is activated by 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 Activity designer components on page 1359.
Activate an Orchestration workflow

Users can activate a workflow using the Workflow Editor.

Request the Orchestration - Examples plugin to install sample Orchestration workflows on your instance. The following Orchestration example workflows are installed in an inactive state to prevent them from running unexpectedly during routine operations:

- Request Password Reset Incident
- MySQL - Get processlist

1. Navigate to Workflow Workflow Editor.
2. Select the Workflows tab in the palette and click an inactive workflow in the list.
   The selected workflow opens in the workflow canvas.
3. Click the menu icon and select Set Active from the context menu.

Figure 310: Activating a workflow

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 1219 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>
<tr>
<td>Domain controller</td>
<td>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: <code>${workflow.inputs.u_user.ldap_server.server_url}</code></td>
</tr>
<tr>
<td>Type</td>
<td>Type of AD object. In this case, the type is User, which is the default.</td>
</tr>
<tr>
<td>Object name</td>
<td>This example assumes that the ServiceNow user name matches the Active Directory sAMAccountName. Enter the following: <code>${workflow.inputs.u_user.user_name}</code></td>
</tr>
<tr>
<td>Object data</td>
<td>Updates the user's account in Active Directory, if the user exists. In this example, the user's title is updated: <code>{&quot;title&quot;: &quot;QA&quot;}</code></td>
</tr>
</tbody>
</table>

10. Click Submit.

The workflow looks like this:

Figure 312: 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>Same as for the update activity. ${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>Same as for the update activity. ${workflow.inputs.u_user.user_name}</td>
</tr>
<tr>
<td>Object data</td>
<td>Creates an account with only the user name in it. For the purpose of this example, you can enter {&quot;givenName&quot;: &quot;${workflow.inputs.u_user.first_name}&quot;, &quot;SN&quot;: &quot;${workflow.inputs.u_user.last_name}&quot; }</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><code>${workflow.inputs.u_user.ldap_server.server_url}</code></td>
</tr>
<tr>
<td>Properties</td>
<td>A comma-separated list of Active Directory properties to return. For example, givenName, SN, title. If the parameter field is blank, then all properties are returned. In this workflow, we leave the field blank.</td>
</tr>
<tr>
<td>Search filter</td>
<td>An LDAP filter string that defines the search parameters. Use any valid LDAP filtering criteria. To find user accounts matching the input record, we use: (samaccountname= <code>${workflow.inputs.u_user.user_name}</code>)</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]

Figure 314: Querying AD for user accounts

The Query AD activity returns its results as a JSON string in the workflow data bus. This JSON string is always an array of objects. Each object corresponds to an Active Directory entry that matched the query. Our workflow should branch, whether that array is empty or not.

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 = 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.
Orchestration activities perform these automated tasks when added to a workflow.

Orchestration automates simple or complex, multi-system tasks on remote servers that are normally done manually.

For instructions on using activities to construct a workflow, see Add an activity to a workflow on page 2815.

Workflow designers can construct custom activities using the Orchestration activity designer. Activities created by the activity designer can:

- Be uploaded and shared in the ServiceNow App Store.
- Parse data from standard input formats.
- Share data between activities.
- Use versioning.

**Note:** A number of activities have been converted to use the new template format and databus offered with the activity designer. These custom activities are organized into activity packs that are easier to use than their legacy counterparts and do not require scripting. Workflows in upgraded instances that use legacy activities will continue to work normally. However, all new workflows must use activities from the activity packs.

Credential tagging for Orchestration activities

Credential tagging 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 tagging interacts with *credential affinity* to determine which credentials should be used for an Orchestration activity.

**How credential tagging 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 in the generated probe. When the platform encounters an affinity with a credential tag value defined (credential_tag in the business rule), the business rule determines if the credential referenced by the affinity has the specified tag. If it does, the business rule selects the credential_id of the tagged credential and passes that value to the probe. If the credential does not have the specified tag, 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.
Figure 317: Orchestration credential tagging logic

List of Orchestration activities

Orchestration provides the following activities for use in workflows:

A number of the 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.
Deprecation 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 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. This activity is replaced by the SOAP Message 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 Run SCP activity is replaced by the Secure Copy activity.</td>
</tr>
<tr>
<td>Run Powershell</td>
<td>Executes Windows PowerShell commands on a MID Server.</td>
</tr>
</tbody>
</table>

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 determine if 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>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</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>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 additional 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 determine if 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's status.</td>
</tr>
<tr>
<td>Delete F5 Pool Member</td>
<td>Deletes an F5 pool member.</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 a 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>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</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 new 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.
### Activity List

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Address List</td>
<td>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.</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>Creates a new Active Directory user, if that user does not already exist, and a Exchange mailbox for that user.</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 new 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 a 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>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.
### Istanbul

### ServiceNow

### Now Platform Capabilities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolve DNS Name</strong></td>
<td>Resolves an IP address or a fully qualified domain name (FQDN) into one or more IP addresses.</td>
</tr>
<tr>
<td><strong>SNMP Query</strong></td>
<td>Queries a 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><strong>Add to Device Collection</strong></td>
<td>Adds a device to a Microsoft System Center Configuration Manager (SCCM) device collection.</td>
</tr>
<tr>
<td><strong>Add to User Collection</strong></td>
<td>Adds a user to a Microsoft System Center Configuration Manager (SCCM) user collection.</td>
</tr>
<tr>
<td><strong>Get Applications</strong></td>
<td>Returns a list of all the applications available on a Microsoft System Center Configuration Manager (SCCM) server.</td>
</tr>
<tr>
<td><strong>Get Deployments</strong></td>
<td>Returns the list of deployments performed by Orchestration using a Microsoft System Center Configuration Manager (SCCM) server.</td>
</tr>
<tr>
<td><strong>Get Device Collections</strong></td>
<td>Returns the list of available device collections on a Microsoft System Center Configuration Manager (SCCM) host.</td>
</tr>
<tr>
<td><strong>Get User Collections</strong></td>
<td>Returns the list of available user collections on a Microsoft System Center Configuration Manager (SCCM) host.</td>
</tr>
<tr>
<td><strong>Remove from Device Collection</strong></td>
<td>Removes a device from a Microsoft System Center Configuration Manager (SCCM) device collection.</td>
</tr>
<tr>
<td><strong>Remove from User Collection</strong></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><strong>File Copy</strong></td>
<td>Copies a file on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td><strong>File Read</strong></td>
<td>Reads a file on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td><strong>File Write</strong></td>
<td>Writes a file on a Linux or UNIX computer.</td>
</tr>
<tr>
<td><strong>File Replace String</strong></td>
<td>Finds and replaces a string in a file on a Linux or UNIX computer.</td>
</tr>
<tr>
<td><strong>Files Compare</strong></td>
<td>Compares two files on a Linux or Unix computer, via SSH.</td>
</tr>
<tr>
<td><strong>Reset Linux User Password</strong></td>
<td>Resets the password for a given user on a Linux computer.</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><strong>Copy File</strong></td>
<td>Copies a file from an SFTP server (source host) to another SFTP server (target host).</td>
</tr>
<tr>
<td><strong>Create Directory</strong></td>
<td>Creates a new directory on an SFTP server.</td>
</tr>
<tr>
<td><strong>Get File List</strong></td>
<td>Returns a list of files from a given directory and its subdirectories on an SFTP server (source host).</td>
</tr>
<tr>
<td><strong>Remove File or Directory</strong></td>
<td>Removes a file or a directory on an SFTP server, including subdirectories, when configured.</td>
</tr>
<tr>
<td><strong>Rename File or Directory</strong></td>
<td>Renames a file or directory to a new name on an SFTP server.</td>
</tr>
<tr>
<td><strong>Set File Attributes</strong></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><strong>Get Employee Info</strong></td>
<td>Gets an employee's information from Workday.</td>
</tr>
<tr>
<td><strong>Update Employee Contact</strong></td>
<td>Updates employee contact information in Workday.</td>
</tr>
<tr>
<td><strong>Update Employee Work Email</strong></td>
<td>Updates an employee's work email address in Workday.</td>
</tr>
<tr>
<td>GlideActions</td>
<td></td>
</tr>
<tr>
<td><strong>Check User Exists</strong></td>
<td>Checks the ServiceNow sys_user table to determine if a record exists for a new employee named in a Workday onboarding notification.</td>
</tr>
<tr>
<td><strong>Create User in Users Table</strong></td>
<td>Uses the employee information returned from Workday to create a user record in the ServiceNow sys_user table.</td>
</tr>
<tr>
<td><strong>Update User in Users Table</strong></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>
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.

Orchestration basic activities

This topic provides reference information on orchestration basic activities. Basic Orchestration activities are not intended for any type of special configuration.

**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 activity designer `Probe template` to create a custom activity. Workflows from a previous release that use the Run Probe activity can continue to do so.

<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>
</tbody>
</table>
### Field

<table>
<thead>
<tr>
<th>Source for probe</th>
<th>Enter the IP address of the host system against which the probe runs (the probe's target).</th>
</tr>
</thead>
<tbody>
<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 1209 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 484: 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>

### 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 485: 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>Field</td>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
</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. |
| Use MID Server        | use_midserver      | 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. |
### Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Parameter</th>
<th>Description</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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>use_midserver parameter is disabled. No: 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></td>
<td></td>
<td><strong>Note:</strong> 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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Server selection criteria available starting with the Istanbul release.</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>

### 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 1296.

### 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.
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 designer* 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.

```powershell
get-date
```

// Save full output for a later processing in a scratchpad variable 'currentdatetime'
workflow_scratchpad.currentdatetime = activity.output;

// Process the output and fetch the time and store it in a scratchpad variable 'time'
var time = get-date.systime().tostring();
workflow_scratchpad.time = time[1] + 'No time found';

**Figure 318: PowerShell activity**
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 486: 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 $computer variable for use in commands (see the example in the Command field). A PowerShell credential variable called $cred that is based on information in the ServiceNow Credentials table will authenticate on the computer pointed to by Hostname.</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:  
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.
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:

```
get-wmiobject $ {workflow. inputs. myclass } -computer $computer -credential $cred
```

Similarly, if the variable is a scratchpad variable named `myclass`, the command would look like:

```
get -wmiobject $ {workflow. scratchpad. myclass } -computer $computer -credential $cred
```

### 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 provider template** in the ServiceNow® activity designer.

### 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>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
<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>

**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](page 1343) replaces the Run SCP activity in the Geneva release.

**Input variables**

**Table 489: Run SCP 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 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 a number of common business processes, such as managing Active Directory accounts and Exchange server mailboxes. Additionally, activity packs can automate IT functions such as starting and stopping Windows servers, joining domains, assigning IP addresses, and configuring load balancers.
Note: A number of activities have been converted to use the new template format and databus offered with the activity designer. These custom activities are organized into activity packs that are easier to use than their legacy counterparts and do not require scripting. Workflows in upgraded instances that use legacy activities will continue to work normally. However, all new workflows must use activities from the activity packs.

Activate an activity pack

Activity packs are available by request with a subscription to Orchestration.

Role required: admin

You can request any of these activity pack plugins:

- 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 1264 (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.</td>
</tr>
<tr>
<td>Reason/Comments</td>
<td>Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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.

Global activity pack

The Global activity pack contains Orchestration activities that are 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.

**Note:** The Global activity pack is included with the base Orchestration plugin and does not require activation of any other plugin.
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 designer on page 1502, 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>
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 a 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 Powershell activity designer template, 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 493: 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 494: 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 1381.</td>
</tr>
</tbody>
</table>

Conditions

Table 495: 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 1445.
Input variables

Table 496: 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 497: 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 1381.</td>
</tr>
<tr>
<td>hresult</td>
<td>Powershell command result.</td>
</tr>
</tbody>
</table>

Conditions

The activity provides the following conditions:

Table 498: 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1445.

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 nameattribute 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 500: 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 1381.</td>
</tr>
</tbody>
</table>

Conditions

**Table 501: 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1445.

Input variables

Table 502: 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 503: 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 Activity designer parsing sources on page 1381.</td>
</tr>
</tbody>
</table>

Conditions

Table 504: 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 Istanbul.
upgrading to Istanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1445.

### Input variables

**Table 505: 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 506: 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 1381.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 507: 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1445.

### Input variables

**Table 508: 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 509: 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 Activity designer parsing sources on page 1381.</td>
</tr>
<tr>
<td>output</td>
<td>The query result.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 510: 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 Istanbul 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 *PowerShell activity designer* on page 1445, which stores input and output variables in the *databus* instead of the scratchpad.

### Input variables

**Table 511: 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 512: 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 <em>Activity designer parsing sources</em> on page 1381.</td>
</tr>
<tr>
<td>output</td>
<td>The query result.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 513: 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1445.

### Input variables

**Table 514: 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 515: 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 1381.</td>
</tr>
</tbody>
</table>

### Conditions

**Table 516: 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 517: Remove User from 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 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 518: Remove User from 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 1381.</td>
</tr>
</tbody>
</table>

Conditions

Table 519: Remove User from Group 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.</td>
</tr>
<tr>
<td></td>
<td>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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the *PowerShell activity designer* on page 1445.

### Input variables

**Table 520: 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 521: 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 <em>Activity designer parsing sources</em> on page 1381.</td>
</tr>
<tr>
<td>hresult</td>
<td>Powershell command result.</td>
</tr>
</tbody>
</table>
Conditions

Table 522: 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</td>
</tr>
<tr>
<td></td>
<td>requirements.</td>
</tr>
<tr>
<td>Failure</td>
<td>An error occurred while attempting to reset the password. Additional</td>
</tr>
<tr>
<td></td>
<td>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 1225 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the PowerShell activity designer on page 1445.

Input variables

Table 523: 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 524: 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</td>
</tr>
</tbody>
</table>

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### Conditions

**Table 525: 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 Istanbul. However, all new workflows must use the custom version of this activity, which was built with the [PowerShell activity designer](#) on page 1445.

### Input variables

**Table 526: 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 527: 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</td>
</tr>
<tr>
<td></td>
<td>Activity designer parsing sources on page 1381.</td>
</tr>
</tbody>
</table>

Conditions

Table 528: 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 activity designer 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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

Input variables

Table 529: 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>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>group_id</td>
<td>Object ID (GUID) of the target group.</td>
</tr>
</tbody>
</table>

**Output variables**

Table 530: Add User to 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 531: 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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.
Input variables

Table 532: 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 533: 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 534: 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 assign 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 designer on page 1463 template.
**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

### Input variables

**Table 535: 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 536: 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 537: 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>
<tr>
<td>Conditions</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------</td>
</tr>
<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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

**Input variables**

**Table 538: 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 539: 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 540: 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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

### Input variables

**Table 541: 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>

### Output variables

**Table 542: 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>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>
### Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
</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 543: 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's 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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.

### Input variables

Table 544: 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>
</tbody>
</table>
### Output variables

Table 545: Remove User from 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>
<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 546: 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 designer on page 1463 template.

**Important:** The REST message used for this activity must be configured to use OAuth2 authentication.
Input variables

Table 547: 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 548: 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 549: 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 designer on page 1463 template.
Important: The REST message used for this activity must be configured to use OAuth2 authentication.

Input variables

Table 550: 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 551: 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 552: 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 the PowerShell activity designer on page 1445, 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 1445, 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><strong>Variable</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>domain</td>
<td>The name of the Exchange server's assigned domain.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the new address list to create.</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 554: Create Address List output variables

<table>
<thead>
<tr>
<th><strong>Variable</strong></th>
<th><strong>Description</strong></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 555: Create Address List conditions

<table>
<thead>
<tr>
<th><strong>Condition</strong></th>
<th><strong>Description</strong></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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

**Table 556: 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 557: 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 558: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 559: 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 | Description
--- | ---
container | 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.

### Output variables

**Table 560: Get Address List output variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Descriptions</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 561: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.
Input variables

Table 562: 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 563: 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 564: 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 1445, 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 566: Set 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 567: Set Address List 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 568: Update 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>
</tbody>
</table>
### Variable Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>identity</td>
<td>Name of the address list to update.</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>A 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 569: 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 570: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 571: 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_initial</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 572: 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. This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

Conditions

Table 573: 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. If no Active Directory account existed for that user, this activity 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 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.
Input variables

Table 574: 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>
<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 575: 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>
### Conditions

Table 576: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

Table 577: 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 578: 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 579: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

#### Table 580: Enable 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 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 581: Enable 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 582: 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 1445, which gives workflow administrators the ability to store input and output variables in the *databus*.

Input variables

Table 583: 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>
</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 584: Get 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. This data includes all Exchange attributes.</td>
</tr>
</tbody>
</table>

Conditions

Table 585: Get Mailbox 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 586: 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 587: 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 588: 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 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 designer on page 1463. 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 589: 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 590: 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 591: 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 designer on page 1463. 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 592: 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 593: 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 594: 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 designer on page 1463. 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 595: 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 596: 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 597: 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 designer on page 1463. 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 598: 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 599: 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 600: 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 designer on page 1463. 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
Input variables

Table 601: 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 602: 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 603: 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 designer on page 1463. 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 604: 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 605: 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 606: 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 designer on page 1463. 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 607: 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 608: 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 609: 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 designer on page 1463. 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 610: Delete 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>
<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 611: Delete 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>
</tbody>
</table>

Conditions

Table 612: Delete F5 Pool Member output variables

<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 designer on page 1463. 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 613: 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 614: 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 615: 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 designer on page 1463. 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 616: 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 617: 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 618: 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 WAPI REST web services to access the Infoblox GRID server.

**Important:** Managing IP addresses through the Infoblox server requires a fully functional MID Server.

Supported for Infoblox:
- Web API 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 Infobox 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 619: 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 620: 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**
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 321: Infoblox permissions
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 designer** on page 1463 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 621: 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>
</tbody>
</table>

**Output variables**

**Table 622: 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>
<tr>
<td>error</td>
<td>Displays the message for any REST error encountered.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 623: 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>
</tbody>
</table>
### Variable Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 designer](#) on page 1463 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 624: 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>

#### Output variables

**Table 625: 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 626: 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 designer on page 1463 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 627: 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>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>

### Output variables

### Table 628: 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 doman associated with the network returned.</td>
</tr>
</tbody>
</table>
## Conditions

### Table 629: 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 designer on page 1463 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 630: List DNS C-records 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>
</tbody>
</table>

## Output variables

### Table 631: List DNS C-records 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:dbname/</td>
</tr>
<tr>
<td></td>
<td>ZG5zLmJpbmRfY25hbWUkJkZmZdhWx0LmNyS50ZXN0LmNh</td>
</tr>
<tr>
<td>cannononicalName</td>
<td>CNAME record.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>name</td>
<td>Name of the network option returned, such as domain-name-server.</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 designer on page 1463 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>
Output variables

Table 634: 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 635: 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 designer on page 1463 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 636: 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>
</tbody>
</table>
Output variables

Table 637: 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>DNSCRecord</td>
<td>Name of the CNAME record registered, expressed in the format: record:cname/</td>
</tr>
<tr>
<td></td>
<td>&lt;encrypted code&gt;:&lt;network name&gt;/default.</td>
</tr>
</tbody>
</table>

Conditions

Table 638: 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 designer on page 1463 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 639: 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>
</tbody>
</table>
Output variables

Table 640: 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/ZG5zLmJpbmRfY25hbWUkJkZVdXqWxO0LmNvbS50ZXN0LmNuYW1l: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 641: 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 designer on page 1463 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 642: 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/ ZG5zLmJpbmRfY25hbWUkl9kZWZhdWx0LmNvbS50ZXN0LmNvbnNlbnRuLmRwYWdlLmRvdG8%</td>
</tr>
<tr>
<td>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>

Output variables

Table 643: 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 644: 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 designer* on page 1463 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 645: 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>
</tbody>
</table>

**Output variables**

**Table 646: 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>
<tr>
<td>IPAddressRecord</td>
<td>IPAM record of the registered IP address.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 647: 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 designer on page 1463 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 648: 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>
</tbody>
</table>

### Output variables

**Table 649: 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 650: 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 designer on page 1463 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 651: 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>restCredentials</td>
<td>The sys_id of the REST credentials from the ServiceNow instance.</td>
</tr>
</tbody>
</table>

### 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 652: 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/ZG5zLmZpeGVkX2FkZSJlc3MkMTAuMC4xMDMuMTEuMC4u:0.0.0.11/default ipv4addr: &quot;0.0.0.11&quot;</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 653: 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>
Variable | Description
---|---
Failure | Activity failed to retrieve the list of reserved IP addresses from the Infoblox server.

**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 designer* on page 1463 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 654: IPAM 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>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>
</tbody>
</table>

**Output variables**

Table 655: IPAM Delete 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 656: 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>
</tbody>
</table>
Infoblox network activities

The Infoblox network activities manage networks using an Infoblox DDI Grid Server.

Use these activities to create, list, or delete networks on an Infoblox server.

Create Network activity

The Create Network activity creates new networks on a specified Infoblox server.

The network activities use the [REST Web Service activity designer](#) on page 1463 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 657: Create 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>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>
</tbody>
</table>

**Output variables**

Table 658: 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 659: 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>
</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 designer on page 1463 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 660: 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>
</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 661: 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>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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/ZG5zLm5idHdvcmsskMTAums4wLjAvMTYvMA: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 662: 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 designer* on page 1463 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 663: 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/ZG5zLm5ldHdvcmSkMTUuMC40NS4wLzI0LzA: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>
</tbody>
</table>

Output variables

Table 664: 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 665: 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 designer on page 1463 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 666: 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>
</tbody>
</table>

Output variables

Table 667: 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 doman 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 668: 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.

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 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 number of 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 322: Using credType in execution parameters

#### General

- **Target host**: $(activityInput.sccmServer)
- **Script type**: MID Server script file
- **MID Server script file**: AddToDeviceCollection.ps1

#### Execution Command

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>collection</td>
<td>$(activityInput.collection)</td>
<td>Plain</td>
</tr>
<tr>
<td>device</td>
<td>$(activityInput.device)</td>
<td>Plain</td>
</tr>
<tr>
<td>credType</td>
<td>SCCM</td>
<td>Plain</td>
</tr>
</tbody>
</table>

#### Credential tag

- **Required MID Server capabilities**: PowerShell

---

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These are the possible credential types:

### Table 669: PowerShell credTypes

<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 670: PSScript.ps1 exit codes

<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 the 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>

### 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 hardcoded to use a specific credential type. As a result, the MID Server only tests credential access against the designated function.

### Table 671: 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>
</tbody>
</table>
### Function Table

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>testCredentilAD</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 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 323: 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 324: Credential tag definition
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 326: 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.

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.

**Note:** Ensure that the error is NOT WinRM cannot process the request.

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.

Response

---

Authenticate failure with the local MID server service credential.

---

Figure 328: 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.

```plaintext
Running command: "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe -executionpolicy remotescript.ps1 -computer '10.11.129.140' -script 'C:\users\joel.zamalloa.adm\desktop\x.ps1' -useCred True -isDiscovery $false -debug True; exit $LASTEXITCODE"

Attempting to use credential with username 'service-now\joel.zamalloa'.

Running command: C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe -executionpolicy remotescript.ps1 -computer '10.11.129.140' -script 'C:\users\joel.zamalloa.adm\desktop\x.ps1' -useCred True -isDiscovery $false -debug True; exit $LASTEXITCODE"

Thread name is Powershell.exe is executing...

Figure 329: MID Server error code

The exit value from waitfor() is 1.

The status code returned from running the command is 1. Windows credentials all failed... Attempting to use the credential from the local MID server.
```
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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

### Input variables

**Table 672: 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 673: 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 Activity designer parsing sources on page 1381. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>
## Conditions

### Table 674: 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 1445, which gives workflow administrators the ability to store input and output variables in the databus.

## Input variables

### Table 675: 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 MID Server capability 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 676: 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 677: 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 designer on page 1445, which gives workflow administrators the ability to store input and output variables in the databus.

Input Variables

Table 678: 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 679: 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 1381. If there is no error, this value is null.</td>
</tr>
</tbody>
</table>

Conditions

Table 680: 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 designer** on page 1445, which gives workflow administrators the ability to store input and output variables in the **databus**.

**Input variables**

**Table 681: 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 682: 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 <strong>Activity designer parsing sources</strong> on page 1381. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 683: 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 designer* on page 1445, which gives workflow administrators the ability to store input and output variables in the *databus*.

### Input variables

Table 684: 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 685: 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 <em>Activity designer parsing sources</em> on page 1381. If this variable is not null, the operation has failed.</td>
</tr>
</tbody>
</table>

### Conditions

Table 686: 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 unistalling 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 Probe activity designer on page 1502, 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 designer on page 1502, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 687: 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 688: 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>
<tr>
<td>result</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td>• resolved: Able to resolve the specified DNS name.</td>
</tr>
<tr>
<td></td>
<td>• unresolved: Unable to resolve the specified DNS name.</td>
</tr>
</tbody>
</table>
Conditions

Table 689: 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 designer on page 1502, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 690: 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 691: 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 692: 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.
- 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_mgnt] 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>
### Istanbul

#### ServiceNow

#### Now Platform Capabilities

<table>
<thead>
<tr>
<th>Specify the date and time you would like this plugin to be enabled</th>
<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 timezone, 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 | Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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 designer* on page 1445 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.

---

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Input variables

Table 693: 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 694: 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 695: 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 designer on page 1445 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 696: 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 697: 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 698: Add to User Collection conditions

<table>
<thead>
<tr>
<th>Success</th>
<th>Activity successfully added a user to the SCCM user collection.</th>
</tr>
</thead>
<tbody>
<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 designer on page 1445 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 699: 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 700: 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 701: 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 designer* on page 1445 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 702: 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 703: Get Deployments output variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>deployments</td>
<td>The deployments array contains these attributes:</td>
</tr>
<tr>
<td></td>
<td>• id: Primary key of the SCCM application.</td>
</tr>
<tr>
<td></td>
<td>• applicationId: Primary key of the SCCM application.</td>
</tr>
<tr>
<td></td>
<td>• softwareName: Name of the software that will be deployed.</td>
</tr>
<tr>
<td></td>
<td>• collectionId: Primary key of the SCCM collection.</td>
</tr>
<tr>
<td></td>
<td>• collectionName: Name of the SCCM collection.</td>
</tr>
<tr>
<td></td>
<td>• desiredConfigType: Possible values are: Install (1) and Uninstall (2).</td>
</tr>
<tr>
<td></td>
<td>• deploymentIntent: Intended purpose of the deployment. Possible values are: Available (1) and Required (2).</td>
</tr>
<tr>
<td></td>
<td>• numberSuccess: Number of clients that successfully installed the deployment.</td>
</tr>
<tr>
<td></td>
<td>• numberErrors: Number of clients with an error when installing the deployment.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td>error</td>
<td>Variable that contains the activity output error message.</td>
</tr>
</tbody>
</table>

Conditions

Table 704: 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 designer on page 1445 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 705: 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 706: 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>
</tbody>
</table>
### Conditions

#### Table 707: 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 designer* on page 1445 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 708: 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 709: 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 710: 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>

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 designer on page 1445 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 711: 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 712: 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 713: 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 on page 1445 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 714: 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 715: 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 716: 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 717: SFTP File Transfer workflow 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 semicolons. 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 semicolons. 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>Variable</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<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:  
  - $\{\text{DateTime}\}$: Current timestamp, using the format defined in the Datetime format field.  
  - $\{\text{SourceFile}\}$: Complete file name.  
  - $\{\text{SourceFile:Base}\}$: Base file name without the extension.  
  - $\{\text{SourceFile:Ext}\}$: File extension only.  
  
  A target file name with the timestamp added as a prefix is expressed as: $\{\text{DateTime}\}_{\{\text{SourceFile}\}}$. 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: $\{\text{SourceFile:Base}\}_{\{\text{DateTime}\}\{\text{SourceFile:Ext}\}}$. 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.                                                                          |               |
| 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>desc</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>2</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>
</tbody>
</table>
| Duplicate file action                         | Action to take if a file being moved already exists in the target directory. The choices are:  
  • Overwrite if file exists (default)  
  • Rename with index  
  • Do not move                                                                                                                                                                                                                                                                                                                      | overwrite     |
| Preserve file attributes                      | 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.  
  **Note:** This timestamp is a file attribute and is not appended to the file name.                                                                                                                                                                                                                                                | false         |
<p>| Upon success, remove files from source        | 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.                                                                                                                                                   | false         |
| Upon failure, keep moved files on target      | 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.                                                                                                                   | true          |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credential tag for source</td>
<td>Specific credential tag 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>
<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>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>tempFileSuffix</td>
<td>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.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific [credential tag] this activity must use to run SSH commands on the source host.</td>
</tr>
<tr>
<td>targetCredentialTag</td>
<td>Specific credential tag this activity must use to run SSH commands on the target host.</td>
</tr>
</tbody>
</table>

### Output variables

Table 719: 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 <a href="#">Activity designer parsing sources</a> on page 1381. 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 720: 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 721: 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 credential tag this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

Output variables

Table 722: 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 1381. 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 723: 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 724: 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 tag this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

Output variables

Table 725: 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 1381. 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 726: 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 727: 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 tag this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>
Output variables

Table 728: 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 1381. If this variable is not null, the operation has failed.</td>
</tr>
<tr>
<td>result</td>
<td>Either success or failure.</td>
</tr>
</tbody>
</table>
| deletionResults | The deletionResults array contains these attributes:  
|               | • fullPath: Full path to the file or directory targeted.  
|               | • status: Either succeeded or failed.  
|               | • reason: Text message describing the cause of a failure. |

Conditions

Table 729: 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 730: 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>
</tbody>
</table>
### Output variables

**Table 731: Rename File or Directory output variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>targetFilePath</td>
<td>Full path to the renamed file or directory.</td>
</tr>
<tr>
<td>sourceCredentialTag</td>
<td>Specific credential tag this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>

**Variable**

<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 1381. 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 732: 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 733: 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: <code>rwxr-xr-x</code>.</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 tag this activity must use to run SSH commands on the host.</td>
</tr>
</tbody>
</table>
Output variables

Table 734: 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 1381. 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 735: 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 SSH activity designer on page 1517, 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 on page 1517, which gives workflow administrators the ability to store input and output variables in the databus.
Input variables

Table 736: 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 737: 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 1381.</td>
</tr>
<tr>
<td>output</td>
<td>The executionResult.output from the parsing sources.</td>
</tr>
</tbody>
</table>

Conditions

Table 738: 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` on page 1517, 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 739: 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 740: 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 <code>executionResult.errorMessages</code> from the <code>Activity designer parsing sources</code> on page 1381.</td>
</tr>
</tbody>
</table>

**Conditions**

**Table 741: 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 on page 1517, 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>
<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>
<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 1381.</td>
</tr>
</tbody>
</table>

**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 designer on page 1517, which gives workflow administrators the ability to store input and output variables in the databus.

**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>
<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 747: 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 on page 1517, 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 748: 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 749: 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 750: 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 designer](#) on page 1517, which gives workflow administrators the ability to store input and output variables in the [databus](#).

**Input variables**

**Table 751: 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>
</tbody>
</table>
| options     | Replacement options:  
  • first: Replaces the first occurrence of the pattern.  
  • all: Replaces all occurrences of the the pattern. |
Output variables

Table 752: 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 753: 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 designer on page 1517, which gives workflow administrators the ability to store input and output variables in the databus.

Input variables

Table 754: 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 755: 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 756: 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 1558.

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 designer on page 1389 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 757: 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 758: 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. 73528cac9c871079a947ebe00c72de2).</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 759: 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 designer on page 1389 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 760: 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 761: 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 762: 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 designer on page 1389 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 763: 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 764: 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 765: 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 Run Script activity designer on page 1534.

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, Orchestration 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 766: 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 767: 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 768: 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>
**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>
<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 sys_user table.</td>
</tr>
<tr>
<td>last_name</td>
<td>Last name of the employee that the activity is adding to the sys_user table.</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>New user's email address.</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 new employee record in the ServiceNow instance.</td>
</tr>
</tbody>
</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 772: Update 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 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 773: Update 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 sys_user record in the ServiceNow instance.</td>
</tr>
</tbody>
</table>

Conditions

Table 774: Update User in Users 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>

**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 and revert to 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 2734.

For a list of available activity templates provided with Orchestration, see *Activity designer components* on page 1359.

**Activity designer components**

Orchestration installs the activity templates and provides access to the controls required to create and manage custom activities in the Workflow Editor.

Orchestration also installs the activity_creator role, which gives users the ability to create custom activities. The activity_creator role is included with the activity_admin role and provides access to the Custom tab in the Workflow Editor.

**Activity templates**

ServiceNow provides the following templates for creating custom activities:

- SOAP
- JDBC
- JavaScript Probe
- Powershell
- REST
- Probe
- SFTP
- Run Script
- SSH
- JMS
Custom activity controls

Use the following tabs in the workflow editor palette to create and manage custom activities.

- Packs: View all activity packs downloaded from the ServiceNow Store or created for upload.
- Custom: Create custom activities for use in workflows. Access to the Custom tab is limited to users with the activity_creator role. This role is included in the activity_admin role.
- Data: View all activities on the current workflow that produce data. Workflow designers can use the data from these activities as the input for other activities.

Use an activity designer 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.
Create custom activities

From the Custom tab, you can create and update custom activities without leaving the workflow editor.

Roles required: admin, workflow_admin, activity_creator

Custom activities can:

- Share data between activities in a workflow.
- Parse data from standard input formats.
- Be purchased from and shared on the ServiceNow Store.
- Be versioned.
- Be copied.

**Note:** The information displayed in the Custom tab depends on the current view in the workflow editor. When you display a workflow on the canvas, the Custom tab shows all available custom activities categorized by application, but does not display any input or output data.

1. Click the + icon to create a new activity and 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 is indicated by a blue underscore.
2. Enter a name for your activity and click Continue. This action saves the activity and opens the Inputs form.

3. Create the input variables for your activity.
   For additional information about configuring variables in custom activities, see Activity designer variables on page 1368 and Orchestration activity parsing rules on page 1376.

4. Proceed to the next stage by taking one of these actions:
   • Click Continue to open the Execution Command form and map the variables to input fields. To save the activity from this point on, you must click Save.
   • Click Go to Pre-Processing (Advanced) to create a pre-processing script. If you create a script, Orchestration adds this step to the indicator.

5. In the Execution Command form, map the input variables by dragging and dropping them into the activity’s input fields.
6. Complete the other fields and click Continue.
7. In the Outputs form, create the output variables and map them to the output fields by dragging and dropping the variables into the parsing rules structure.
8. Proceed to the next stage by taking one of these actions:
   • Click Continue to open the Conditions form.
   • Click Go to Post-Processing (Advanced) to create a post-processing script. If you create a script, Orchestration adds this stage to the indicator.

9. Create exit conditions for your activity and click Save.

**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 333: Naming an activity copy](image)

   **Figure 333: 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 334: Creating a new activity version](image)

   **Figure 334: 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 1359. 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.
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.

Activity designer variables

The ServiceNow Activity Designer enables users with the activity_creator role to create input variables, map them to values on a target host or endpoint, and then pass the data returned to other activities in a workflow through output variables.

The system populates these output variables with selected data from payloads returned from the target hosts through the use of parsing rules.

**Note:** Variable strings in the Inputs tab of the activity designer have a 255 character limit.
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.

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.
Map to optional variables

Several activity templates offer a list of optional variables that you can pass to the host.

Roles required: activity_admin, activity_creator

In most cases, the list allows you to define the variable and a value only.

1. Use the following controls to populate the list:
   - Click the add icon + to add new rows to the list.
   - Click the delete icon (−) to delete a variable from the list.
   - Click the clear icon (☐) to clear the contents of a row without removing the row.
2. To see a complete variable name if it is not entirely visible in the field, point at the value to display the name in a pop-up window.

Map to PowerShell variables

Map to the specific data types that PowerShell requires.

Roles required: activity_admin, activity_creator

Specify a data Type that PowerShell requires for certain variables. The following choices are available.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain</td>
<td>Plain text value in the ServiceNow ECC Queue.</td>
</tr>
<tr>
<td>Encrypted</td>
<td>Encrypted value in the ECC Queue. Use this type for PowerShell passwords.</td>
</tr>
<tr>
<td>Boolean</td>
<td>Specific type expected by PowerShell for true and false values.</td>
</tr>
<tr>
<td>Null</td>
<td>Specific variable type expected by PowerShell.</td>
</tr>
</tbody>
</table>
Map to SOAP and REST web service attributes

Specify the attributes that SOAP and REST variables require.

Roles required: activity_admin, activity_creator

Specify an additional attribute for this variable. The following choices are available.

<table>
<thead>
<tr>
<th>None</th>
<th>Do not escape text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The system does not escape the value specified for the value attribute. For details see either Create a JavaScript array in a REST template on page 1477 or Create a JavaScript array in a SOAP template on page 1405.</td>
</tr>
</tbody>
</table>

Map variables to a check box

If you map a variable to a check box, the variable value is always used to determine if the field is true or false.

Roles required: activity_admin, activity_creator

Check boxes mapped to a variable are marked with a link icon and set to read-only. If the check box is already selected when you map a variable to it, the system clears the check box, adds the link icon, and then makes the field read-only.

1. Point the cursor to the link icon to see the variable name.
2. Click the icon to delete the mapping.

Map a variable to a reference field

Several of the activity templates contain reference fields in the Inputs tab that require a sys_id to function properly.

Roles required: activity_admin, activity_creator
Examples of these fields are the Web Service message field in the REST template and the MID Server script include field in the JavaScript Probe template.

1. Select a value using the lookup icon in the field.
   The system populates the field with the appropriate sys_id.

2. Drag a variable from the variable builder and drop it into a reference field.
   The system populates the field with an empty variable string, such as ${activityInput.Amazon}, and not the sys_id.

   **Note:** The activity cannot run correctly unless you manually assign the appropriate sys_id as the variable value. The best practice is to always select your reference values from the list populated from the lookup icon.

---

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 parsing rules 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.
7. To delete a variable, click the delete icon (−) in the row.

Create an object or an array output variable

You can create output variables that are objects or arrays.

Role required: activity_admin, activity_creator

1. To create an object in the data structure, double-click the Type value and select Object from the choice list.
2. Click the + icon in the object to add variables, arrays, or other objects.

![Diagram showing object structure with variables and arrays]

3. Move individual variables between objects as needed.
   The system prevents you from moving a variable to an object if a variable with the same name already exists in the object.

4. To add an array to the structure or to an object, select a data type of Array.
   The system automatically opens an array element row that allows you to select the data type for the array.

![Diagram showing array structure with variable and array elements]

5. To delete an object or an array, click the delete icon in the row.
   When you delete an object, you also delete all the elements it contains.
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 *Orchestration activity parsing rules* on page 1376 for instructions on configuring parsing for output variables.

Orchestration activity parsing rules

Activity designer parsing rules populate output variables defined in a custom activity with payload data returned from an external host or endpoint.
You can populate output variables directly from payload data or create and test expressions that isolate specific data from a payload. For instructions about creating output variables in the activity designer, see *Create an output variable* on page 1373.

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 336: Mapping variables to parsing rules](image)
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>executionResult.body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Name:</td>
<td>activityLocal.localBody</td>
</tr>
<tr>
<td>Parse sample data:</td>
<td>Get sample payload from test</td>
</tr>
</tbody>
</table>

#### Sample payload data

```xml
<xml version="1.0"?>
<data>
  <user>
    <user one>
      <name>user one</name>
      <age>42</age>
    </user>
  </user>
  <user>
    <name>user two</name>
    <age>27</age>
  </user>
  <user>
    <name>user three</name>
  </user>
</data>
```

### Parsing result

```
27
```
## Table 775: Parsing rules fields

<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 1381.</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.</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>
</tbody>
</table>
Field | Description
---|---
Sample payload data | 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.

Parsing results | Displays the data returned from the source by the selected expression. This field is not available for Direct parsing types.

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>
</table>
| SOAP Web Service  | • executionResult.body (Default)  
                   | • executionResult.status_code  
                   | • executionResult.header  
                   | • executionResult.error  |
| JDBC              | • executionResult.output (Default)  
                   | • executionResult.errorMessages  
                   | • executionResult.probeCompletedEccId  
                   | • executionResult.totalRows  |
| JavaScript Probe  | • executionResult.payload (Default)  
                   | • executionResult.output  
                   | • 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.

<table>
<thead>
<tr>
<th>Template</th>
<th>Source</th>
</tr>
</thead>
</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 |
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.

---

**Figure 337: Parsing rule PowerShell inputs command**

If ($cred) {
    $networkAdapter = Get-WmiObject WIN32_NetworkAdapterConfiguration -ComputerName $computer -Credential $cred | where {$_ IPAddress} | Select-Object -first 1
} else {
    $networkAdapter = Get-WmiObject WIN32_NetworkAdapterConfiguration | where {$_ IPAddress} | Select-Object -first 1
}

write-host "<adapter><ip type='ipv4'">"$networkAdapter.IPAddress[0]"</ip><ip type='ipv6'>"$networkAdapter.IPAddress[1]"</ip><domain>"$networkAdapter.DNSDomain"</domain><adapter>"
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.
Use the Simple Object Access Protocol (SOAP) Web Service template to create activities that return data from a SOAP endpoint.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

Prerequisites

To create and use a SOAP Web service workflow activity, you must first do the following:

- Create a SOAP 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 SOAP activity.
- Determine an application, or scope, for this activity.
- Determine the SOAP endpoint to use for the activity. Use this value to override the endpoint configured in the SOAP message.
- Optionally, create basic authentication credentials. Use this value to override the credentials configured in the SOAP message.

Create a SOAP web service activity

Use this procedure to create a custom SOAP Orchestration activity.

Role required: web_service_admin, activity_admin, activity_creator

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the SOAP Web Service template.
The template opens in the General stage.

<table>
<thead>
<tr>
<th>General</th>
<th>Inputs</th>
<th>Execution Command</th>
<th>Outputs</th>
<th>Conditions</th>
</tr>
</thead>
</table>

**Figure 338: Activity designer stage indicator**

5. Complete the fields shown in the table.
Table 777: 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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property: • None: Script is unprotected. • Read-only: Script is in plain text, but read-only. • Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td><strong>Important:</strong></td>
<td>Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current scope 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: • All application scopes: This activity is available to all application scopes. • This application scope only: Use of this activity is restricted to the scope named in the Application field.</td>
</tr>
<tr>
<td>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create SOAP template input variables*

Create the variables to pass into the SOAP 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: web_service_admin, activity_admin, 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.

   ![Image of input variable creation](image)

   

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Mandatory</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>{}</td>
<td>input</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 778: 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 ( ) 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.

**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 SOAP activity template inputs on page 1397.

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.
Table 779: 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. <em>Create variables to map</em> to available fields.</td>
</tr>
<tr>
<td>Web service message</td>
<td><em>SOAP message</em> 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><em>SOAP message function</em> 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 <em>variable substitution</em> 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><strong>Note:</strong></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 <em>capabilities</em> 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 in 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. |
Test SOAP activity template inputs

You can test the input parameters of a custom SOAP 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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.

4. 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.

5. 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.
6. 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.

Figure 340: Response payload from inputs test

```json
{
  "status_code": 200,
  "body": "<?xml version="1.0" encoding="utf-8"?>
  <soap:Body>
    <GetQuoteResponse xmlns="http://www.webserviceX.NET/">
      <StockQuotes>&lt;StockGet;&lt;Symbol&gt;NOK&lt;/Symbol&gt;&lt;Last&gt;78.92&lt;/Last&gt;&lt;Date&gt;7/16/2013&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;6654061&lt;/Volume&gt;&lt;Hit1Cap&gt;12.1486&lt;/Hit1Cap&gt;&lt;Hit2Cap&gt;77.5562&lt;/Hit2Cap&gt;&lt;PreviousClose&gt;77.5562&lt;/PreviousClose&gt;&lt;PercentageChange&gt;+1.73%&lt;/PercentageChange&gt;&lt;AnnRange&gt;54.85 - 83.526&lt;/AnnRange&gt;&lt;Earnings&gt;1.31&lt;/Earnings&gt;&lt;P-E&gt;N/A&lt;/P-E&gt;&lt;Name&gt;ServiceNow&lt;/Name&gt;&lt;Stock&gt;&lt;/StockGet&gt;)
    </GetQuoteResult>
  </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-HTTPAPI/2.0",
  "X-Powered-By": "ASP.NET",
  "Cache-Control": "private, max-age=0"
}
}
```
7. To map appropriate parameter values in the payload to variables in the Outputs stage automatically, select an *auto-mapping option*.

8. 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.

9. Click the X in the upper right corner of the window to close it.

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.
Figure 341: Basic authentication for a SOAP message

6. Alternately, you can configure basic authentication credentials in *Configure the SOAP execution command* on page 1393.
   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 342: Override basic auth credentials

*Figure 342: Override basic auth credentials*

**SOAP template pre-processing fields**
From the Pre Processing form of the activity designer, you can 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>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");`
Figure 343: ActivityLogger API

**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 1393.

**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 SOAP 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 SOAP message function.</td>
</tr>
<tr>
<td>Web service endpoint</td>
<td>web_service_endpoint</td>
<td>String</td>
<td>URL of the SOAP 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 <em>Create a JavaScript array in a SOAP template</em> on page 1405.</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>Use mid server</td>
<td>use_mid_server</td>
<td>Boolean</td>
<td>When true, indicates that a MID Server is used.</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>Allowed duration of the SOAP web service request before it times out, in seconds. The default is 10.</td>
</tr>
</tbody>
</table>
| Value Capabilities | valueCapabilities | Array of hashmap         | Capability values used to select the MID Server. For more information, see MID Server capabilities on page 1179. Use this example to customize the MID Server selection if there are additional capabilities that are assigned by value:
```
var valueCapability = {
  'NEW_MID_CAPACITY': 'NEW_MID_CAPACITY_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:
```
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);
```

**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 outputs**

SOAP output variables contain values returned from a host or an endpoint that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see *Activity designer variables* on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see *Orchestration activity parsing rules* on page 1376.

**Table 781: 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>

**SOAP template post-processing fields**

From the Post Processing form, 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>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 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: activityInput.variable. 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");`

![Figure 344: ActivityLogger API](image-url)
**SOAP template post-processing parameters**
Use these parameters to create a post-processing script.

**Table 782: 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>

**SOAP template 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 783: Sample activity conditions**

<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>
</tbody>
</table>
JDBC activity designer

Create a custom JDBC activity to automate database queries and updates in a ServiceNow instance and perform operations on the data from external databases.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

**Note:** If you are transferring data into a ServiceNow instance from an external data source, use Import sets. The JDBC custom activity transfers data between external data sources and is not intended to bring data into ServiceNow tables.

JDBC activities initially used JDBC Data Sources for connection information. The JDBC connection table and JDBC credentials table were introduced to decouple Orchestration Activities from Data Sources. The upgrade process, starting with Helsinki, copies all database connection information from existing JDBC data source records. This data is used to create records in the JDBC connection table and the JDBC credentials table. Existing JDBC custom activities are then updated with the appropriate fields and configured to use the new connection and credential records. Custom JDBC activities use connection information from the JDBC connection table and the **JDBC credentials table.**
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.

Create a JDBC connection

The JDBC Connection [jdbc_connection] table provides the information custom JDBC Orchestration activities need to connect to various target databases.

You need to have an appropriate JAR file, whether it is supplied with the instance or a custom JAR file.

Note: We supply ojdbc6.jar as part of the current release, which supports MySQL, SQLServer, and Oracle databases. Other databases, such as Sybase or DB2 Universal, will need a custom JAR file that must be uploaded to the instance before setting the JDBC connection.

Role required: activity_admin, activity_creator

JDBC connections do not supply credentials. The necessary credentials are retrieved separately by the activity designer template and support external credential storage, such as CyberArk.

Note: The Helsinki upgrade process copies all database connection information from existing JDBC data source records and uses the data to create new records in the JDBC Connection table and the Credentials table. Existing JDBC custom activities are then updated with the appropriate fields and configured to use the new connection and credential records. All new custom JDBC activities must use connection information from the jdbc_connection table and JDBC credentials from the discovery_credentials table. The original JDBC data source records are available for use elsewhere in the ServiceNow platform.

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 subsequently available.

<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: • MySQL • Oracle • SQLServer • None 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>
</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.
Create a JDBC activity

Use this procedure to create a custom JDBC Orchestration activity.

Role required: activity_admin, activity_creator

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select JDBC from the list.
The template opens in the General stage.

5. Complete the fields shown in the table.
<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>
</tbody>
</table>
| Protection policy   | Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:  
  • None: Script is unprotected.  
  • Read-only: Script is in plain text, but read-only.  
  • Protected: Script is encrypted and read-only.  
  **Important:** Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only. |
| Execution template  | Predefined template selected for this activity.                                                                                                                                                                 |
| Application         | Current scope 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. |
| Accessible from     | Accessibility setting for this activity, by scope. The following options are available:  
  • All application scopes: This activity is available to all application scopes.  
  • This application scope only: Use of this activity is restricted to the scope named in the Application field.                                      |
<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

Create JDBC template input variables
Create the variables to pass into the JDBC 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: activity_admin, 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 786: Variable configuration

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></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><strong>Mandatory</strong></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><strong>Default</strong></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 (up/down arrow icon).

6. To delete a variable, click the delete icon 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.

---

**Configure the JDBC execution command**

Use the variables you created to configure the command that Orchestration executes on the JDBC 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 JDBC activity template inputs on page 1420.

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 347: JDBC execution command
2. Complete the fields shown in the table.

**Table 787: JDBC execution command fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Input            | Input variable builder. *Create variables to map* to available fields.  
  Note: The auto-mapping feature provides the variables when enabled. |
| JDBC Connection  | Appropriate *JDBC connection* for the database. The connection selected provides the activity with the following information:  
  • Target database information, such as server and data base names.  
  • Connection URL  
  • Target database port (if different from standard port number)  
  • Database instance name  
  For more information, see JDBC connections. |
| Credential       | JDBC credential to use for this connection. |
| SQL statement    | Customer provided SQL statement. This field is hidden when the Stored Procedure check box is selected.  
  By default, this activity is allowed to run the following SQL statements:  
  • select  
  • insert  
  • update  
  • delete  
  • show  
  • create  
  • describe  
  The JDBC Activity template allows you to execute any ANSI SQL or stored procedure on a target database, if the supplied credential has permission. As an added security measure, the operations that the JDBCOrchestrationProbe can execute are controlled by a MID Server property which restricts the SQL commands that can be used by the JDBC Activity template. This ensures you cannot use potentially destructive commands, such as drop database. The mid.property.jdbc_operations contains the MID Server property controls.  
  Note: 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. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto-map to</strong></td>
<td>Automatically maps the entire payload to selected variables. The choices in this field are:</td>
</tr>
<tr>
<td></td>
<td>• None</td>
</tr>
<tr>
<td></td>
<td>• Local Variable: 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 autopopulated with these default variables:</td>
</tr>
<tr>
<td></td>
<td>• output</td>
</tr>
<tr>
<td></td>
<td>• totalRows</td>
</tr>
<tr>
<td></td>
<td>• errorMessage</td>
</tr>
<tr>
<td></td>
<td>• eccSysId</td>
</tr>
<tr>
<td></td>
<td>• Output Variable: Automatically populates the output variables in the activity with the same default variables used as inputs for the local variable.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>No parsing rules are available with auto-mapping selections.</td>
</tr>
<tr>
<td><strong>Maximum rows</strong></td>
<td>Maximum number of records to retrieve from database.</td>
</tr>
<tr>
<td><strong>Connection timeout</strong></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><strong>Query timeout</strong></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><strong>Required MID Server</strong></td>
<td>MID Server with the appropriate capabilities for connecting to the external data source. By default, the system selects a MID Server with JDBC capabilities.</td>
</tr>
<tr>
<td><strong>capabilities</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Use stored procedure</strong></td>
<td>Selects whether to use a stored procedure that contains preconfigured input parameters. When this check box is selected, the system hides the SQL statement field and displays the Stored procedure name and Stored procedure parameter fields.</td>
</tr>
<tr>
<td><strong>Stored procedure name</strong></td>
<td>Name of your stored procedure. The system populates the input parameters using values from this stored procedure. This field is displayed when the Use stored procedure check box is selected.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>Stored procedures can only execute select statements.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Stored procedure parameters | Parameters from the selected stored procedure. Add the parameter values you want for each type.  
  • Mode: Parameter type.  
  • SQL Type: Data type of the parameter.  
  • Name: Parameter name.  
  • Value: Value you want passed to the parameter. |

3. Click Save.
4. Click Continue to advance to the Outputs stage.

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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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.

![Fill in your test values](image)

**Figure 348: JDBC input test values**

4. Filter the variable list with these controls:
   - All Inputs: Displays all input variables. This is the default view.
   - Mandatory Inputs: Displays only mandatory variables.
   - Inputs Without Defaults: Shows input variables that do not have assigned default values.

5. 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.

6. 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.
7. To map appropriate parameter values in the payload to variables in the Outputs stage automatically, select an auto-mapping option.

8. 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.

9. Click the X in the upper right corner of the window to close it.

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 template pre-processing fields

From the Pre Processing form, you can 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>
</tbody>
</table>
## Field

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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");
You use execution parameters to create the input process script in the Preprocessing form. For detailed descriptions of the JDBC command fields, see the table in Configure the JDBC execution command on page 1416.

**Note:** You must use the executionParam. prefix with all variables in this table.

### Table 788: JDBC execution parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>JDBC connection</td>
<td>jdbc_connection</td>
<td>Reference</td>
<td>Selected JDBC connection. See Create a JDBC connection on page 1410 for details.</td>
</tr>
<tr>
<td>Credential</td>
<td>fixed_credential_id</td>
<td>Reference</td>
<td>Name of the JDBC credential to use. For more information, see JDBC credentials on page 835.</td>
</tr>
<tr>
<td>SQL statement</td>
<td>sql_statement</td>
<td>String</td>
<td>SQL statement executed by the activity.</td>
</tr>
<tr>
<td>Maximum rows</td>
<td>maximum_rows</td>
<td>Integer</td>
<td>Maximum number of rows to return from the SQL statement or stored procedure.</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>Maximum payload size (KB)</td>
<td>maximum_payload_size</td>
<td>Integer</td>
<td>Maximum allowable payload size to return from the SQL statement or stored procedure.</td>
</tr>
<tr>
<td>Connection timeout</td>
<td>connection_timeout</td>
<td>Integer</td>
<td>Length of time to wait for connection to occur.</td>
</tr>
<tr>
<td>Query timeout</td>
<td>query_timeout</td>
<td>Integer</td>
<td>Length of time to wait for the query to return results.</td>
</tr>
<tr>
<td>Stored procedure</td>
<td>stored_procedure</td>
<td>Boolean</td>
<td>Selects whether to use a stored procedure rather than an SQL statement.</td>
</tr>
<tr>
<td>Stored procedure name</td>
<td>stored_procedure_name</td>
<td>String</td>
<td>Names the stored procedure to use.</td>
</tr>
<tr>
<td>Stored procedure variables</td>
<td>stored_procedure_variables</td>
<td>Array of JavaScript objects</td>
<td>Lists the variables from the selected stored procedure.</td>
</tr>
</tbody>
</table>

**JDBC template outputs**

JDBC output variables contain values returned from a database that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.

**Table 789: 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>

**JDBC template post-processing fields**

From the Post Processing form, 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: activityInput.variable. 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");
Figure 351: ActivityLogger API

**JDBC template post-processing parameters**
Use these parameters to create a post-processing script that runs after the activity executes.

<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>Total rows</td>
<td>totalRows</td>
<td>Integer</td>
<td>Number of rows successfully executed by the SQL statement. See the explanation below of how the system calculates the row count.</td>
</tr>
</tbody>
</table>
**Row count calculations**

The total number of rows successfully executed by the SQL statement varies depending on the type of statement or stored procedure that was run. For a select statement, this value could be the Maximum rows configured in the Inputs tab, or the total number of rows in the database that match the query. Stored procedures can only execute select statements.

If the SQL statement executes an insert, update, or delete, the statement might be only partially successful. The total number of successful rows is based on the number of rows matching the statement with respect to the maximum rows allowed by the activity. For example, if the number of rows to be inserted is greater than the maximum rows allowed, not all the desired rows can be inserted. The Total rows number is the number of rows that are successfully inserted, which is equal to or less than the maximum rows. An error message shows the results of the statement when any part of the operation fails.

**JDBC template 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>
JavaScript Probe activity designer

Use the JavaScript Probe template to create an activity that runs a JavaScript probe on a target host that is configured to return specific information.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

Create a JavaScript probe activity

Use these instructions to create a custom JavaScript Probe Orchestration activity.

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the +icon.
4. Select the JavaScript Probe template.
The template opens in the General stage.

Figure 352: Activity designer stage indicator

5. Complete the fields shown in the table.
### Table 792: Fields common to all activity designer templates

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></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><strong>Short description</strong></td>
<td>Brief description of what the activity does.</td>
</tr>
<tr>
<td><strong>Image</strong></td>
<td>Icon that identifies an activity of this type in the workflow palette.</td>
</tr>
</tbody>
</table>
| **Protection policy**   | Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:  
  • None: Script is unprotected.  
  • Read-only: Script is in plain text, but read-only.  
  • Protected: Script is encrypted and read-only. |
| **Important:** Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only. |
| **Execution template**  | Predefined template selected for this activity.                                                         |
| **Application**         | Current scope 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. |
| **Accessible from**     | Accessibility setting for this activity, by scope. The following options are available:  
  • All application scopes: This activity is available to all application scopes.  
  • This application scope only: Use of this activity is restricted to the scope named in the Application field. |
### Fields

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.
7. To configure the input variables for this activity, see *Create JavaScript Probe template input variables* on page 1434.

*Create JavaScript Probe template input variables*
Create the variables to pass into the JavaScript Probe 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: activity_admin, 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.

   ![Variable creation](image)

   Right clicking on () Input allows you to add the variable.

   ![Variable creation](image)

   **Table:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Mandatory</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>{ } input</td>
<td>String</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

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 793: 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 (קודש).)

6. To delete a variable, click the delete icon (ıyor) 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.

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 JavaScript Probe template inputs on page 1437.

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 353: JavaScript Probe execution command

```
var str = new Packages.java.lang.String("TestString");
this.probe.createOutputResult(str);
```
2. Complete the fields shown in the table.

Table 794: 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. <em>Create variables to map</em> to available fields.</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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>parameters manually, or drag input variables into the Parameters fields</td>
</tr>
<tr>
<td></td>
<td>and assign a value.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Test JavaScript Probe template inputs

You can test the input parameters of a custom JavaScript Probe 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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.
   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, the JavaScript probe returns the requested value, ServiceNow, from the host.
4. Filter the variable list with these controls:
   - All Inputs: Displays all input variables. This is the default view.
   - Mandatory Inputs: Displays only mandatory variables.
   - Inputs Without Defaults: Shows input variables that do not have assigned default values.

5. 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.

6. 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.
7. 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.

8. Click the X in the upper right corner of the window to close it.

JavaScript probe template pre-processing fields
From the Pre Processing form of the activity designer, you can 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>Variables</td>
<td>Input variables that are available to use as building blocks in the input process script.</td>
</tr>
<tr>
<td></td>
<td>Click the arrow above the field to open the variables list. Click an item in the tree to add</td>
</tr>
<tr>
<td></td>
<td>it to your script in the appropriate syntax. The list displays execution parameters and input</td>
</tr>
<tr>
<td></td>
<td>variables you passed into the activity on the Inputs form. All activity variables added in the</td>
</tr>
<tr>
<td></td>
<td>Inputs form are read-only and are expressed in the pre-processing script with this syntax:</td>
</tr>
<tr>
<td></td>
<td>activityInput.variable. Before the activity executes and makes a call to the service or host,</td>
</tr>
<tr>
<td></td>
<td>you can override the effective execution value of this variable by assigning values to the</td>
</tr>
<tr>
<td></td>
<td>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");`
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 1435.

**Note:** You must use the `executionParam.` prefix with all variables in this table.

**Table 795: 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><code>script_type</code></td>
<td>Enumerated</td>
<td>Type of script to run. The possible types are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- custom_javascript_type</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- mid_script_include_type</td>
</tr>
<tr>
<td>Script</td>
<td><code>script</code></td>
<td>String</td>
<td>Script that runs custom JavaScript when the <code>script_type</code> is</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>custom_javascript_type</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- mid_script_include_type</td>
</tr>
<tr>
<td>Mid script include</td>
<td><code>mid_script_include</code></td>
<td>Reference</td>
<td>The <code>sys_id</code> reference associated with the MID Server script</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>include to call, when the <code>script_type</code> is <code>mid_script_include_type</code></td>
</tr>
<tr>
<td>Source</td>
<td><code>source</code></td>
<td>String</td>
<td>Target host on which to run the script.</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>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:</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 1179. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection:</td>
</tr>
</tbody>
</table>

**JavaScript probe template outputs**

JavaScript Probe output variables contain values returned from a host or an endpoint that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.
Table 796: 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</td>
</tr>
<tr>
<td></td>
<td>local variable to identify metadata that is processed within an activity</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>workflow.</td>
</tr>
</tbody>
</table>

JavaScript probe template post-processing fields
From the Post Processing form in the activity designer, 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</td>
</tr>
<tr>
<td></td>
<td>process script. Click the arrow above the field to open the variables list.</td>
</tr>
<tr>
<td></td>
<td>Click an item in the tree to add it to your script in the appropriate syntax.</td>
</tr>
<tr>
<td></td>
<td>The list displays execution results and the variables you passed into the</td>
</tr>
<tr>
<td></td>
<td>activity on the Inputs form. All activity variables added in the Inputs form</td>
</tr>
<tr>
<td></td>
<td>are read-only and are expressed in the post-processing script with this syntax:</td>
</tr>
<tr>
<td></td>
<td>activityInput.variable. For parameter descriptions, refer to the table in the</td>
</tr>
<tr>
<td></td>
<td>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");

Figure 355: ActivityLogger API

*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>errorMessage</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>

*JDBC template 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 798: Sample activity conditions

<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>

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 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:
ServiceNow supports PowerShell 2.0 and above. PowerShell 3.0 does not support Windows 2003 Server.

Create a PowerShell activity

Use these instructions to create a custom PowerShell Orchestration activity.

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the PowerShell template.

The template opens in the General stage.
Figure 356: Activity designer stage indicator

5. Complete the fields shown in the table.

Table 799: 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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:</td>
</tr>
<tr>
<td></td>
<td>• None: Script is unprotected.</td>
</tr>
<tr>
<td></td>
<td>• Read-only: Script is in plain text, but read-only.</td>
</tr>
<tr>
<td></td>
<td>• Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td></td>
<td><strong>Important</strong>: Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current scope 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>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create Powershell template input variables*

Create the variables to pass into the Powershell 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: activity_admin, 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>
<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 (−) 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.

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 Powershell activity template inputs on page 1453.

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.

Table 801: 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 selected is MID Server script file.</td>
</tr>
<tr>
<td>Command</td>
<td>Command that this activity runs on the target host. This field is available when the Script type selected is Custom Powershell command. You can drag and drop input variables from the variable builder into this field to 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 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 in this field and 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 of the MID Server service account only, without trying any other credentials. When this check box is selected, the Credential tag field is not available.</td>
</tr>
<tr>
<td>Credential tag</td>
<td>Specific [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 for that tag only and does not try the MID Server service account. This field is not available when the Use MID service 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 system selects a Powershell MID Server.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Test Powershell activity template inputs
You can test the input parameters of a custom Powershell 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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, Powershell values are configured to uninstall WinZip from a target host.

4. Filter the variable list with these controls:
   - All Inputs: Displays all input variables. This is the default view.
   - Mandatory Inputs: Displays only mandatory variables.
• Inputs Without Defaults: Shows input variables that do not have assigned default values.

5. 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.

6. 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
{
  "tags": {
    "__text__": "\n"
  },
  "errorMessages": null,
  "eccSysId": "3eca6f62d7110200f2215a5f75e5083f70",
  "hresult": null,
  "output": "\n"
}
```

If all the credentials available to the activity fail, and the activity cannot authenticate on the target, a message describing the failure appears in the debugMessages tab. The format of the message is identical for all provider templates and displays the target IP address, the credential type (SSH in this example), and the details of all failed credentials, expressed as a JSON string.
Figure 358: Credential debug message

7. 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.

8. Click the X in the upper right corner of the window to close it.

**Powershell template pre-processing fields**

From the Pre Processing form of the activity designer, you can 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");`
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 1450.

**Note:** You must use the executionParam. prefix with all variables in this table.

**Table 802: Powershell 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>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>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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: 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>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 1179. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection: var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
</tbody>
</table>

**Powershell template outputs**

Powershell output variables contain values returned from a host that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.
### Table 803: 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>

*Powershell template post-processing fields*

From the Post Processing form of the activity designer, 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: activityInput.variable. 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");`

Figure 360: ActivityLogger API

*Powershell template post-processing parameters*

Use these parameters to create a post-processing script.
### Table 804: Powershell post-processing parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Variable</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
</table>
| Tags       | tags     | Hashmap of tag values to return from the PowerShell command. Contains the tags used to extract output using the PowerShell commands. The tag output is delimited by double percentage signs, as in %%tagname%% ... %%. Set up the command using the format in this example:  
  ```powershell
  Write-Host %tagname1%%  
  output1 line 1  
  output1 line 2  
  ...  
  Write-Host%%
  Write-Host %tagname2%%  
  output2 line 1  
  output2 line 2  
  ...  
  Write-Host%%
  ```
  
The tags returned are JavaScript hashmap objects in which each key is prefixed with tag appended with the tagname.
  ```javascript
  {"__text__": "",  
  "tagtagname1": "output1 line1
  output1 line2
  
  output1 line1
  output1 line2"
  ,  
  "tagtagname2": "output2 line1
  output2 line2"
  }"`,
| 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.                                                                                                   |
Powershell template 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>
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REST Web Service activity designer

Representational State Transfer (REST) workflow activities are configured to return data to a workflow from a specific endpoint, using a preconfigured REST message.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

• Orchestration activity designer on page 1359
• Activity designer variables on page 1368
• Orchestration activity parsing rules on page 1376

Prerequisites

To create and use a REST Web service workflow activity, you must first do the following:

• 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.

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
For instructions on using the activity template process flow, see *Create custom activities* on page 1361.

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the REST Web Service template.

The template opens in the General stage.

![General stage](image)

**Figure 361: Activity designer stage indicator**

5. Complete the fields shown in the table.
<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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:</td>
</tr>
<tr>
<td></td>
<td>• None: Script is unprotected.</td>
</tr>
<tr>
<td></td>
<td>• Read-only: Script is in plain text, but read-only.</td>
</tr>
<tr>
<td></td>
<td>• Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td>Important:</td>
<td>Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current scope 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>
### Fields

<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create REST template input variables*

Create the variables to pass into the REST 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: web_service_admin, activity_admin, 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.

   ![Input variable creation](image)

   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 807: 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 (🗑️) 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.

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 REST activity template inputs on page 1471.

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 362: REST execution command
2. Complete the fields shown in the table.

### Table 808: REST execution command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Input variable builder. <em>Create variables</em> 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 <em>variable substitution</em> 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 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>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 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 Authentication type set to OAuth 2.0 and its OAuth profile configured appropriately.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
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 | 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.

OAuth profile | Profile for the OAuth provider for this REST message. See Specify an OAuth profile for more information.

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Test REST activity template inputs
You can test the input parameters of a custom REST 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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, the stock symbol name in the REST activity is a variable.
4. Filter the variable list with these controls:
   - All Inputs: Displays all input variables. This is the default view.
   - Mandatory Inputs: Displays only mandatory variables.
   - Inputs Without Defaults: Shows input variables that do not have assigned default values.

5. 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.

6. 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.
7. 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.

8. Click the X in the upper right corner of the window to close it.

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 pre-processing fields
From the Pre Processing form of the activity designer, you can 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: <code>activityInput.variable</code>. 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 <code>executionParam.variable_name</code> 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");`
**Figure 363: ActivityLogger API**

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 1467.

**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 <em>Create a JavaScript array in a REST template</em> on page 1477.</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>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 MID Server capabilities on page 1179. 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>
<tr>
<td>Auth Type</td>
<td>auth-type</td>
<td>Boolean</td>
<td>Type of credentials to use. The choices are: • basic_auth_pick_credentials • use_existing_credentials</td>
</tr>
<tr>
<td>Credentials</td>
<td>credentials</td>
<td>Reference</td>
<td>Contains the credentials to use for this REST message when the auth_type selected is basic_auth_pick_credentials.</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:
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:

    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 outputs**

REST output variables contain values returned from an endpoint that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see *Activity designer variables* on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see *Orchestration activity parsing rules* on page 1376.

**Table 810: 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>

**REST template post-processing fields**

Using the Post Processing form in the activity designer, 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>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 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: activityInputvariable. 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 364: ActivityLogger API*
REST template post-processing parameters
Use these parameters to create a post-processing script.

Table 811: 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 REST web service.</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 <code>executionResult.header[keyName]</code>.</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>

REST template 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 812: Sample activity conditions

<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>Condition</td>
<td>Evaluation</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</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>

### SFTP activity designer

You can use the SFTP activity designer to create custom activities that execute basic SFTP commands on a remote server.

The SFTP activity designer allows you to 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.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

### Create an SFTP activity

Create an activity that executes basic SFTP commands on a remote server.

Roles required: activity_creator or workflow_admin
For instructions on using the activity template process flow, see *Create custom activities* on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the SFTP template.

The template opens in the General stage.

```
| General |   |   |   |
```

**Figure 365: Activity designer stage indicator**

5. Complete the fields shown in the table.
Table 813: 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>
</tbody>
</table>
| Protection policy   | Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:  
  • None: Script is unprotected.  
  • Read-only: Script is in plain text, but read-only.  
  • Protected: Script is encrypted and read-only.  
  
  Important: Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only. |
| Execution template  | Predefined template selected for this activity.                                                                                               |
| Application         | Current scope 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. |
| Accessible from     | Accessibility setting for this activity, by scope. The following options are available:  
  • All application scopes: This activity is available to all application scopes.  
  • This application scope only: Use of this activity is restricted to the scope named in the Application field. |
<table>
<thead>
<tr>
<th>Fields</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create SFTP template input variables*

Create the variables to pass into the SFTP 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: activity_admin, 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 814: 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 ( inconvenience symbol).

6. To delete a variable, click the delete icon 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.

*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 JDBC activity template inputs* on page 1420.

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 366: SFTP execution command**

2. Complete the fields shown in the table.
### Table 815: SFTP command fields

<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:</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>• Copy file</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Create directory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Get file list</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Remove file or directory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rename file or directory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Set file attributes</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The fields displayed on the form depend on the command selected.</td>
<td></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.</td>
<td>Copy file, Remove file or directory, Set file attributes</td>
</tr>
<tr>
<td>Source directory</td>
<td>Path to the directory where the source files are located.</td>
<td>Create directory, Get file list</td>
</tr>
<tr>
<td>Source files</td>
<td>Names of specific source files to include in the management action.</td>
<td>Get file list</td>
</tr>
<tr>
<td></td>
<td>Separate the file names in this list with semi-colons.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This field supports the use of wild cards. If this field is blank, all files are included.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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>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 credential tag 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 1330.</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.

Test SFTP activity template inputs

You can test the input parameters of a custom SFTP 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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, the variables identify the source host and path of the file to copy and the file's destination on the target host.
4. 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.

5. 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.

6. 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.

```
{
  "tags": {
    "__text__": "Transfer complete, 19 bytes transferred"
  },
  "errorMessages": null,
  "eccSysId": "fd8f685a3f11c0b0d0dcf75b1b2e701e",
  "output": "Transfer complete, 19 bytes transferred"
}
```

If all the credentials available to the activity fail, and the activity cannot authenticate on the target, a message describing the failure appears in the debugMessages tab. The format of the message is identical for all provider templates and displays the target IP address, the credential type (SSH in this example), and the details of all failed credentials, expressed as a JSON string.
This MID Server stores the failed credentials in a blacklist cache for a period of 5 minutes. If you repeat the test within this time period, the credential debugger does not display the failed credentials and indicates that blacklisting is being applied. However, if you add or modify a credential for that provider template during the 5 minute blacklist window, and if all credentials are invalid, a test displays the entire list of failed credentials. After the 5 minutes has expired, any new attempt to re-run the invalid credentials results in a full listing. The value of the blacklist cache interval cannot be changed.

7. 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.
8. Click the X in the upper right corner of the window to close it.

**SFTP template pre-processing fields**

Use the Pre Processing form 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>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");`
Figure 369: ActivityLogger API

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 1485.

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>Name</td>
<td>Variable</td>
<td>Type</td>
<td>Usage</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td>----------</td>
<td>----------------------------------------------------------------------</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>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 Rename File or Directory 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>
</tbody>
</table>
## Table 817: 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>
</tbody>
</table>

### SFTP template outputs

SFTP output variables contain values returned from a source host that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see *Activity designer variables* on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see *Orchestration activity parsing rules* on page 1376.
### Local
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.

### Output
Variable that contains a value that is passed to other activities in the workflow.

**SFTP template post-processing fields**

Use the Post Processing form to 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><strong>Output process script</strong></td>
<td>Script to run after the activity executes.</td>
</tr>
<tr>
<td><strong>Variables</strong></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");`
SFTP template post-processing parameters
Use these parameters to create a post-processing script.

Table 818: 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
output1 line2
",
"tagtagname2":"output2 line1
output2 line2
"}
```

**SFTP template 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 819: Sample activity conditions**

<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>
</tbody>
</table>
### Condition Evaluation

<table>
<thead>
<tr>
<th>Condition</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<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>

### Condition defaults

<table>
<thead>
<tr>
<th>Name</th>
<th>Condition</th>
<th>Else</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>activityOutput.cpuCount == 2</td>
<td>false</td>
<td>100</td>
</tr>
<tr>
<td>Retry</td>
<td>activityOutput.cpuCount != 2</td>
<td>false</td>
<td>200</td>
</tr>
<tr>
<td>Failure</td>
<td>true</td>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>

Insert a new row...

---

**Probe activity designer**

Use the Probe template to create an activity that runs a ServiceNow probe on the target host that is configured to return specific information.

For example, you might run a probe that returns all hardware information from a Linux server. You must purchase Orchestration on page 1181 to use the Probe template.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

**Create a probe activity**

Use these instructions to create a custom Probe Orchestration activity.

Role required: activity_creator or workflow_admin
For instructions on using the activity template process flow, see *Create custom activities* on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the +icon.
4. Select the Probe template.

The template opens in the General stage.

![Activity designer stage indicator](image)

**Figure 371: Activity designer stage indicator**

5. Complete the fields shown in the table.
<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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:</td>
</tr>
<tr>
<td></td>
<td>• None: Script is unprotected.</td>
</tr>
<tr>
<td></td>
<td>• Read-only: Script is in plain text, but read-only.</td>
</tr>
<tr>
<td></td>
<td>• Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td></td>
<td><strong>Important:</strong> Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</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>
<tr>
<td>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

Create Probe template input variables
Create the variables to pass into the Probe 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: activity_admin, 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 821: 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 (🗑️) 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.

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 Probe activity designer template inputs on page 1508.

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.

![Probe execution command](image)

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>max_discovery_payload_size</td>
<td>$(activityInput.maxDiscoveryPayload)</td>
</tr>
<tr>
<td>max_exec_payload_size</td>
<td>$(activityInput.maxExecPayload)</td>
</tr>
<tr>
<td>must_sudo</td>
<td>$(activityInput.mustSudo)</td>
</tr>
<tr>
<td>strung/ai</td>
<td>$(activityInput.iaString)</td>
</tr>
</tbody>
</table>

**Figure 372: Probe execution command**
Table 822: 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 variables</a> 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.

Test Probe activity designer template inputs

You can test the input parameters of a custom Probe 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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 Linux - CPU probe, configured to authenticate on the host with sudo, returned CPU information about the host.
4. 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.

5. 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.

6. 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.
If all the credentials available to the activity fail, and the activity cannot authenticate on the target, a message describing the failure appears in the debugMessages tab. The format of the message is identical for all provider templates and displays the target IP address, the credential type (SSH in this example), and the details of all failed credentials, expressed as a JSON string.

None of the credentials are valid for this host. Provide the correct credentials.

"debug_info": [{"credential_type": "SSH"},
{"credential_type": "root"},
{"credential_type": "100"},
{"credential_type": "6383e9913b422003e5f6f32244b0e1"},
{"credential_type": "ssh"},
{"credential_type": "false"},
{"credential_type": "a587cdede8b7b222003f6d177f434de4"},
{"key_to_target_blacklist": true},
{"connection_parameters": [{"credential_type": "SSH Password", "SSH Private Key"}, "target": "10.0.217.131"]}]

Figure 374: Debug payload for blacklisted credentials

This MID Server stores the failed credentials in a blacklist cache for a period of 5 minutes. If you repeat the test within this time period, the credential debugger does not display the failed credentials and indicates that blacklisting is being applied. However, if you add or modify a credential for that provider template during the 5 minute blacklist window, and if all credentials are invalid, a test displays the entire list of failed credentials. After the 5 minutes has expired, any new attempt to re-run the invalid credentials results in a full listing. The value of the blacklist cache interval cannot be changed.
7. 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.

8. Click the X in the upper right corner of the window to close it.

Probe 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>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");`
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 1506.

**Note:** You must use the executionParam. prefix with all variables in this table.

### Table 823: 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>
<tr>
<td>Parameters</td>
<td>parameters</td>
<td>Array of JS 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.parameters array. This assigns additional parameters to the message: var newParameter = {&quot;name&quot;:&quot;parameterName&quot;,&quot;value&quot;:&quot;parameterValue&quot;}; executionParam.parameters.push(newParameter);</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 1179. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection: var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
</tbody>
</table>

**Probe template outputs**

Probe output variables contain values returned from an endpoint that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.
Table 824: 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>

Probe template post-processing fields
Use the Post Processing form of the activity designer to 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: activityInput.variable. 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");`

**Figure 376: ActivityLogger API**

**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 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>EccSysId</td>
<td>eccSysId</td>
<td>String</td>
<td>Contains the reference ID associated with the ECC Queue input message.</td>
</tr>
</tbody>
</table>

**Probe template 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 826: Sample activity conditions

<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>

SSH activity designer

The Secure Shell (SSH) template extracts data from a target host that uses the SSH network protocol.

You must purchase Orchestration on page 1181 to use the SSH template.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376
Create an SSH activity

Use these instructions to create a custom SSH Orchestration activity.

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the SSH template.

The template opens in the General stage.
5. Complete the fields shown in the table.

### Table 827: 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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:</td>
</tr>
<tr>
<td></td>
<td>• None: Script is unprotected.</td>
</tr>
<tr>
<td></td>
<td>• Read-only: Script is in plain text, but read-only.</td>
</tr>
<tr>
<td></td>
<td>• Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td>Important:</td>
<td>Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current <code>scope</code> 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>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create SSH template input variables*

Use the Inputs form of the activity designer to create variables to pass into the SSH activity.

You must name your activity in the General form before you can advance to the Inputs stage.

Roles required: activity_admin, 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 828: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 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.

*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 SSH activity template inputs on page 1524.

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.
### Table 829: 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 variables</em> 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 Orchestration <em>credential tag</em> 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.

**Test SSH activity template inputs**

You can test the input parameters of a custom SSH 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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 Files Compare SSH activity compares two files specified as input variables.

![Fill in your test values](image)

**Figure 379: Testing input variables**

4. 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.

5. 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.

6. 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.

![Response window](image)

Figure 380: Input test payload

If all the credentials available to the activity fail, and the activity cannot authenticate on the target, a message describing the failure appears in the debugMessages tab. The format of the message is identical for all provider templates and displays the target IP address, the credential type (SSH in this example), and the details of all failed credentials, expressed as a JSON string.
This MID Server stores the failed credentials in a blacklist cache for a period of 5 minutes. If you repeat the test within this time period, the credential debugger does not display the failed credentials and indicates that blacklisting is being applied. However, if you add or modify a credential for that provider template during the 5 minute blacklist window, and if all credentials are invalid, a test displays the entire list of failed credentials. After the 5 minutes has expired, any new attempt to re-run the invalid credentials results in a full listing. The value of the blacklist cache interval cannot be changed.

Figure 382: Debug payload for blacklisted credentials

7. 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.
Click the X in the upper right corner of the window to close it.

**SSH 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>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: <code>activityInput.variable</code>. 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 <code>executionParam.variable_name</code> 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");`
Figure 383: ActivityLogger API

**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 1522.

**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>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>
<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>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 1179. If there are additional capabilities that are assigned by value, use this example to customize the MID Server selection: var valueCapability = {'NEW_MID_CAPABILITY': 'NEW_MID_CAPABILITY_VALUE'}; executionParam.valueCapabilities.push(valueCapability);</td>
</tr>
<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>
<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 template outputs**

SSH output variables contain values returned from an endpoint that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see *Activity designer variables* on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see *Orchestration activity parsing rules* on page 1376.

Table 831: 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>
</tbody>
</table>
### Field  Output  Description

<table>
<thead>
<tr>
<th>Field</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>
</tbody>
</table>

**SSH template post-processing fields**

Use the Post Processing form of the activity designer to 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");`
Figure 384: ActivityLogger API

SSH 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>Output</td>
<td>output</td>
<td>String</td>
<td>Contains the output returned from the SSH command.</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 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
",
"tagtagname2":"output2 line1
output2 line2
"}
```

**SSH template 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 833: Sample activity conditions**

<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>Condition</td>
<td>Evaluation</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</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>

**Run Script activity designer**

Use the Run Script template to create an activity that runs any script.

This activity is identical to the Run Script activity provided in the core system, with the advantages of a custom activity. You must purchase Orchestration on page 1181 to use the Run Script template.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

- Orchestration activity designer on page 1359
- Activity designer variables on page 1368
- Orchestration activity parsing rules on page 1376

**Create a run script activity**

Use these instructions to create a custom Run Script Orchestration activity.

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the Run Script template.

5. Complete the fields shown in the table.

<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>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</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>
</tbody>
</table>
| Protection policy| Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:  
  - None: Script is unprotected.  
  - Read-only: Script is in plain text, but read-only.  
  - Protected: Script is encrypted and read-only.  
  **Important:** Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only. |
| Execution template| Predefined template selected for this activity.                              |
| Application      | Current scope 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. |
| Accessible from  | Accessibility setting for this activity, by scope. The following options are available:  
  - All application scopes: This activity is available to all application scopes.  
  - This application scope only: Use of this activity is restricted to the scope named in the Application field. |
| Category         | Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy. |
| Description      | Detailed description of the activity.                                       |

6. Use the variable builder in the Inputs tab to create variables to pass into the script that the activity runs.
   For more information, see *Map an input variable* on page 1369.
7. Create variables in the Outputs tab that contain values returned from the execution script that are available to other activities in a workflow.

   For more information, see Activity designer variables on page 1368.

8. Create a script for this activity to execute.

   You can access the activityInput and activityOutput variables by using activityInput.variableName and activityOutput.variableName, respectively.

Create Run Script template input variables
Create the variables to pass into the Run Script 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: activity_admin, 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>
<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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 (🗑️) in the row.

7. Click Continue to advance to the Outputs stage.

Run Script output variables

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.

Table 836: Activity designer output fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable name</td>
<td>Name of an output variable that this activity passes.</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>

Run Script template processing script

Table 837: Run Script processing script

<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>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 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>

**Run Script template 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 838: Sample activity conditions**

<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>
JMS activity designer

Create a custom JMS activity to retrieve or send messages to external systems using the Java Messaging Service.

You must purchase Orchestration on page 1181 to use this template. For specific information about using the tools in the activity designer, refer to these resources:

• Orchestration activity designer on page 1359
• Activity designer variables on page 1368
• Orchestration activity parsing rules on page 1376

The ServiceNow JMS activity supports third party JMS providers whose JMS client application is written with a typical Java EE pattern and can support these operations:

• Use JNDI to find a ConnectionFactory object.
• Use JNDI to find one or more destination objects.
• Use the connection factory to create a JMS connection object.
• Use the JMS connection to create one or more JMS session objects.
• Use a JMS session and the destinations to create the MessageProducer and MessageConsumer objects.
• Start the JMS connection to enable delivery or consumption of messages.

Note: To connect to a JMS provider, refer to your third party user documentation.

The JMS activity designer has been tested with these providers:

• ActiveMQ
• Tibco EMS
Configure an instance to use JMS

Use this procedure to prepare your system to use Java Messaging Service (JMS) with a custom Orchestration JMS activity.

Role required: admin

Ensure that the MID Server has 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 3rd party JMS provider advertises.

1. Navigate to MID Server JAR Files.
2. Click New.
3. Upload the JMS driver jar file, using the procedures in Synchronize a JAR file to MID Servers on page 1166.

   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 are required by 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.

4. Navigate to Orchestration Definition JMS Connection Factory.
5. Click New.
6. Complete the form using the fields from the table.
Table 839: JMS connection factory

<table>
<thead>
<tr>
<th>Field</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. 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 org.apache.activemq.jndi.ActiveMQInitialContextFactory</td>
</tr>
<tr>
<td>Provider URL</td>
<td>Location of the running JMS Provider installation. 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</td>
</tr>
</tbody>
</table>

7. Click Submit.
8. Navigate to Orchestration Credentials.
9. Click New.
10. In the list of credential types, select JMS Credentials.
11. Provide the user name and password the MID should use to communicate with the JMS provider. For more information, see JMS credentials on page 836.
12. Click Submit.
   You are now ready to create a custom JMS activity.

Create a JMS activity

Use these instructions to create a custom JMS Orchestration activity.

Role required: activity_creator or workflow_admin

For instructions on using the activity template process flow, see Create custom activities on page 1361

1. Navigate to Workflow Workflow Editor.
2. In the workflow palette, select the Custom tab.
3. Click the + icon.
4. Select the JMS template.
The template opens in the General stage.

![Diagram showing Custom Activities with various options like SOAP Web Service, JDBC, JavaScript Probe, Powershell, SAP JCo, REST Web Service, SFTP, SSH, JMS, System Center Configuration Manager (SCCM), SFTP File Transfer, and SSH.]

**Figure 386: Activity designer stage indicator**

5. Complete the fields shown in the table.
<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>Protection policy</td>
<td>Setting that controls access to the code in the Pre Processing and Post Processing script fields of this activity. Use these settings to protect your intellectual property:</td>
</tr>
<tr>
<td></td>
<td>• None: Script is unprotected.</td>
</tr>
<tr>
<td></td>
<td>• Read-only: Script is in plain text, but read-only.</td>
</tr>
<tr>
<td></td>
<td>• Protected: Script is encrypted and read-only.</td>
</tr>
<tr>
<td>Important:</td>
<td>Make sure to set this field properly before submitting the record. After you save the activity, this field becomes read-only.</td>
</tr>
<tr>
<td>Execution template</td>
<td>Predefined template selected for this activity.</td>
</tr>
<tr>
<td>Application</td>
<td>Current scope 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>
<tr>
<td>Fields</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Category</td>
<td>Category for this activity in the Custom and Packs tabs. All categories are listed under their scope in the collapsible hierarchy.</td>
</tr>
<tr>
<td>Description</td>
<td>Detailed description of the activity.</td>
</tr>
</tbody>
</table>

6. Click Continue to advance to the Inputs stage.

*Create JMS template input variables*
Use the Inputs form of the activity designer to create JMS variables to pass into the activity.
You must name your activity in the General form before you can advance to the Inputs stage.
Roles required: activity_admin, 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.

   ![Input variable creation](image)

   - Type your new variable name in the field.
   - 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.
   - Configure your variable using these fields:
Table 841: 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 (étique).

6. To delete a variable, click the delete icon 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.

Configure the JMS execution command

Use the input variables you created to configure the command that Orchestration executes on the JMS provider.

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 JDBC activity template inputs on page 1420.

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.
### Table 842: JMS execution command fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td>Input variable builder. <em>Create variables to map</em> to available fields.</td>
</tr>
<tr>
<td><strong>Connection factory</strong></td>
<td>Connection factory that is configured to connect to a JMS provider. This value contains the name of the initial context factory and the URL of the JMS provider location.</td>
</tr>
<tr>
<td><strong>Destination type</strong></td>
<td>Type of destination used for this message. The choices are:</td>
</tr>
<tr>
<td></td>
<td>• Queue: Message is queued for point-to-point communications. 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><strong>Destination name</strong></td>
<td>Name of the queue or topic destination that is configured on the JMS provider.</td>
</tr>
<tr>
<td><strong>Message type</strong></td>
<td>Type of the message. This is the same as the JMS message type value. Currently, only the TextMessage type is supported. Make sure that a queue or topic destination is configured to receive or send only TextMessage. Other message types are dropped, since the JMS Activity cannot process them.</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>The programatic operation to perform on the destination. The choices are Put and Get.</td>
</tr>
<tr>
<td><strong>Timeout (Secs)</strong></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><strong>Custom message headers</strong></td>
<td>Custom header values in a name/value pair format, that is available on the JMS destination</td>
</tr>
<tr>
<td><strong>Message payload</strong></td>
<td>Actual message content or payload that is sent to the JMS destination.</td>
</tr>
<tr>
<td><strong>Credential tag</strong></td>
<td>Specific <em>credential tag</em> this activity must use to run JMS commands on the host.</td>
</tr>
<tr>
<td><strong>Required MID Server capabilities</strong></td>
<td>MID Server to use, by capabilities.</td>
</tr>
</tbody>
</table>

3. Click Save.
4. Click Continue to advance to the Outputs stage.

Test JMS activity template inputs
You can test the input parameters of a custom JMS 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:** You can test input variables from any stage in the activity designer if you have provided enough information for Orchestration to contact the endpoint or host 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 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, the destination name in the JMS activity is a variable. When the variable is provided with a queue name, it returns the content of the message on that queue.

   ![Fill in your test values](image)

   - **Input Source**: `activityInput.queueName`
   - **Substitute Value**: `IncidentQueue`

4. 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.

5. 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.
6. 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.

```
"messagePayload": "Message with some header value",
"errorMessages": null,
"standardHeaders": "(JMSMessageID=ID:MSANIT1000025-60071-1436479117566-5:1:1:1:1, JMSExpiration=0, JMS
edelivered=true, JMSDeliveryMode=2, JMSPriority=4, JMSTimestamp=1436479633056)",
"status": "success",
"customheaders": "{JMSXDeliveryCount=2, routing_param=incident}",
"cccSysId": "5a4cc5618f110200f58e5f2a37bdec5e"
```

If all the credentials available to the activity fail, and the activity cannot authenticate on the target, a message describing the failure appears in the debugMessages tab. The format of the message is identical for all provider templates and displays the target IP address, the credential type (SSH in this example), and the details of all failed credentials, expressed as a JSON string.
This MID Server stores the failed credentials in a blacklist cache for a period of 5 minutes. If you repeat the test within this time period, the credential debugger does not display the failed credentials and indicates that blacklisting is being applied. However, if you add or modify a credential for that provider template during the 5 minute blacklist window, and if all credentials are invalid, a test displays the entire list of failed credentials. After the 5 minutes has expired, any new attempt to re-run the invalid credentials results in a full listing. The value of the blacklist cache interval cannot be changed.

```

null,
"errorMessages": "SSHCommand: Target is blacklisted. No valid credential found for types [SSH Password, SSH Private Key]",
"debugMessages": "None of the credentials are valid for this host. Provide the correct credentials."
"debug_info": "["10.0.217.131"]",
"credentials_attempted": "["credential_type": "SSH",
"credential_name": "root", "connection_parameters": "["credential_type": "SSH Private Key","target": "10.0.217.131"]",
"credentials_valid": "true", "credentials_exception": "false", "connection_exception": "false", "connection_parameters": "null"
"
```

Figure 388: Credential debug message

7. 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.

```

"output": null,
"errorMessages": "SSHCommand: Target is blacklisted. No valid credential found for types [SSH Password, SSH Private Key]",
"debugMessages": "None of the credentials are valid for this host. Provide the correct credentials."
"debug_info": "["10.0.217.131"]",
"credentials_attempted": "["credential_type": "SSH",
"credential_name": "root", "connection_parameters": "["credential_type": "SSH Private Key","target": "10.0.217.131"]",
"credentials_valid": "true", "credentials_exception": "false", "connection_exception": "false", "connection_parameters": "null"
"
```

Figure 389: Debug payload for blacklisted credentials
8. Click the X in the upper right corner of the window to close it.

_JMS 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>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: <code>activityInput.variable</code>. 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 <code>executionParam.variable_name</code> 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");`
Enter a script to run after the input variable substitutions and before the activity executes. Click variables in the panel on the right have them substituted at the cursor.

```
ActivityLogger.info("Pre Processing Log Message");
```

**Figure 390: ActivityLogger API**

**JMS template execution parameters**

You use execution parameters to create the input process script in the Preprocessing form.

For detailed descriptions of the JMS execution command fields, see *Configure the JMS execution command* on page 1547.

**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>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>
</tbody>
</table>
Istanbul    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 1179. 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);
```

**JMS template outputs**

JMS output variables contain messages returned from a destination that are available to other activities in a workflow or internally to the activity.

For details about creating data structures using output variables, see Activity designer variables on page 1368. These variables can be mapped to all or part of the data returned from a selected payload. For details about mapping output variables to payload data, see Orchestration activity parsing rules on page 1376.

Table 844: 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>

**JMS template post-processing fields**

Use the Post Processing form of the activity designer to 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>
</tbody>
</table>
### Variables

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: `activityInput.variable`. For parameter descriptions, refer to the table in the post-processing parameters topic for this activity.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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");`

![Figure 391: ActivityLogger API](image)
**JMS 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</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>

**JMS template 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 846: Sample activity conditions

<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>

---

**Employee Orchestration**

Employee Orchestration retrieves new employee information from Workday during the onboarding process and updates the ServiceNow sys_user table automatically.

The ServiceNow instance receives a notification from Workday that a new employee has been added. Orchestration analyzes the notification and extracts the identification number of 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 Workday to send onboarding notifications to the ServiceNow instance. Orchestration identifies notifications from a preconfigured Workday source and extracts the ID number of the new employee from delimited text specified in system properties. Configured values on both Workday 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>
<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 timezone, 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 | Any information that would be helpful for the ServiceNow personnel activating the plugin such as if you need the plugin activated at a specific time instead of during one of the default activation windows. |

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.
   The WS-Security Username Profiles form appears, prepopulated for the Workday Orchestration application. If the instance is in any other scope, the form is read-only.
2. To enable editing of the form, click the link at the top.
3. Update 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>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 1561.

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 848: 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>
<tr>
<td>Body</td>
<td>Define the delimiters containing the employee information that Workday will pass to the ServiceNow instance, and name the field containing the data. You can define any delimiters you want, such as #EmpStart# and #EmpEnd# delimiters. Select the Employee ID field as the source for the information. The delimiters you define here must match the values defined in the Workday Orchestration system properties.</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 1560.

### Table 849: 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>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.

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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 393: Workday email trigger

4. Click Submit.
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.

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 396: 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.
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 398: User Provisioning workflow

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 Premium 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 850: 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>
<tr>
<td>Note</td>
<td>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.</td>
</tr>
<tr>
<td>Item</td>
<td>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.</td>
</tr>
<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>
<tr>
<td>Read-only fields</td>
<td></td>
</tr>
<tr>
<td>Start time</td>
<td>Start time for the evaluation period. Configure this value in the Time Range for Calculated Averages module.</td>
</tr>
<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>
</tbody>
</table>
### Field Description

| Calculated average volume per month | Actual average number of times this task is performed manually per month. |

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 851: 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>
</tbody>
</table>
### Read-only fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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**

Orchestration - ROI adds the following tables.

<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>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Savings Report</td>
<td>Contains the number of automations that have been run before the date specified in the Processed On column, based on:</td>
</tr>
<tr>
<td>[savings_report]</td>
<td>• Each automation entry’s associated workflows</td>
</tr>
<tr>
<td></td>
<td>• Estimated savings based on the estimated duration per task.</td>
</tr>
<tr>
<td></td>
<td>• Calculated savings based on calculated duration.</td>
</tr>
<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>[detailed_savings_report]</td>
<td></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>[automation_entry_form]</td>
<td></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>[roadmap_planning]</td>
<td></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>[manual_mapping_records]</td>
<td></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>
<tr>
<td>[manual_mapping_conditions]</td>
<td></td>
</tr>
</tbody>
</table>

**Plugins installed with Orchestration ROI**

These plugins are installed with the Orchestration - ROI plugin, if they are not already active.
Table 853: Plugins for Orchestration ROI

<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>

User roles installed with Orchestration ROI

These roles are installed with the Orchestration - ROI plugin.

Orchestration - ROI adds the following roles.

Table 854: Roles for Orchestration - ROI

<table>
<thead>
<tr>
<th>Role title [name]</th>
<th>Description</th>
<th>Contains Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration manager</td>
<td>Manages all activities in the Orchestration ROI module.</td>
<td>• pa_admin</td>
</tr>
<tr>
<td>[orchestration_manager]</td>
<td></td>
<td>• report_admin</td>
</tr>
</tbody>
</table>

UI actions installed with Orchestration ROI

Orchestration - ROI adds the following UI actions.

Table 855: 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 [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>Estimated and Projected</td>
<td>Automation Entry Form [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>Submit AND process now</td>
<td>Automation Entry Form [automation_entry_form]</td>
<td>Processes this new entry</td>
</tr>
<tr>
<td>Correlated Tasks</td>
<td>Correlated Tasks Rules [manual_mapping_conditions]</td>
<td>Displays all matching tasks from the Correlated Tasks [manual_mapping_records] table.</td>
</tr>
<tr>
<td>Detailed Savings Report</td>
<td>Automation Entry Form [automation_entry_form]</td>
<td>Displays the list of automations that have been run, based on associated workflows.</td>
</tr>
</tbody>
</table>
### UI action

<table>
<thead>
<tr>
<th>Task</th>
<th>Correlated Tasks [manual_mapping_records]</th>
<th>Displays the task record.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit AND process now</td>
<td>Correlated Tasks Rules [manual_mapping_conditions]</td>
<td>Processes a correlated task rule. This action performs matching on the specified table and the filter conditions.</td>
</tr>
</tbody>
</table>

**Script includes installed with Orchestration ROI**

Orchestration - ROI adds the following script includes.

#### Table 856: Script includes for 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**

Orchestration ROI adds the following client scripts.

#### Table 857: Client scripts for 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**

Orchestration ROI adds the following business rules.

#### Table 858: Business rules for 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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Insert into Run Rate &amp; Savings</td>
<td>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</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 399: ROI summary report sample
# Table 859: 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 (Uses Estimated Duration)</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></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 (Uses Calculated Duration)</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></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 400: ROI estimated time and expense report samples
Predicted Hours Spent Annually by Category (Uses Estimated Duration & Volume)

- Datacenter Automation: 4,080.00 hours (64.20%)
- IT Service Management: 1,500.00 hours
- Access & Identity: 500.00 hours
<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 [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 [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 [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><strong>Note:</strong> 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 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 [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><strong>Note:</strong> 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><strong>Note:</strong> 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 401: ROI calculated time and expense report samples
Projected Monthly Expense by Category (Uses Calculated Duration & Volume)

Datacenter Automation = $(6,213.37) (81.96\%)
Table 861: 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 (Uses Calculated Duration & Volume) | 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 (Uses Calculated Duration & Volume) | 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 (Uses Calculated Duration & Volume) | 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]                                                                                                                                                                                                                  |
### Report Description

<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 862: 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 402: Calculated savings monthly by category

Table 863: 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.

![Graph](image)

**Figure 403: Calculated savings for the current month by automation entry**

**Table 864: 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 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>
<tr>
<td>Reason/Comments</td>
<td>Any information that would be helpful for the ServiceNow personnel activating the plugin such as if you need the plugin activated at a specific time instead of during one of the default activation windows.</td>
</tr>
</tbody>
</table>

Note: Plugins are activated in two batches each business day in the Pacific timezone, 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.

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 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.
Client software distribution 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.

Figure 404: Client Software Distribution process flow using SCCM
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 1594.

**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>
<tr>
<td>Reason/Comments</td>
<td>Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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 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 865: 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>
</tbody>
</table>
### Table 866: 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>
</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 1593.
<table>
<thead>
<tr>
<th>Plugin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestration - Asset Lease Management</td>
<td>Installs the lease functionality for software distributed through the Service Catalog. This includes starting, stopping, and extending leases.</td>
</tr>
<tr>
<td>[com.snc.orchestration.asset_lease_management]</td>
<td></td>
</tr>
<tr>
<td>Service Catalog Scoped API</td>
<td>Installs the API to support application creation in the Service Catalog.</td>
</tr>
<tr>
<td>[com.glideapp.servicecatalogscoped.api]</td>
<td></td>
</tr>
<tr>
<td>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>
<tr>
<td>[com.snc.software_asset_management]</td>
<td></td>
</tr>
</tbody>
</table>

**Roles installed with client software distribution**

These roles are installed with the Orchestration - Client Software Distribution plugin.

**Table 867: 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 868: 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>
</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 869: Client software distribution properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status check expiration interval (days)</td>
<td>sn_client_sf_dist.softwareInstallExpDays</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Installation statuses are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not installed: User has not installed requested software prior to the expiration of the configured time limit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Installed: Software was installed within the configured time limit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revoked: Software was revoked by the administrator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 30</td>
</tr>
<tr>
<td>Property</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 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 |
| 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.

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discover SCCM</td>
<td>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 <em>SCCM Server Instance</em> record.</td>
</tr>
</tbody>
</table>
### Workflow and Description

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Client Software</td>
<td>Runs automatically when a user orders software from the service catalog.</td>
</tr>
<tr>
<td>Deploy SCCM Application</td>
<td>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.</td>
</tr>
<tr>
<td>Revoke Client Software</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>Revoke SCCM Application</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.
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.

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 408: 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 409: Connect to PowerShell**

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 856.

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 871: SCCM data populated in ServiceNow tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCCM Application</td>
<td>• name</td>
</tr>
<tr>
<td>[sn_client_sf_dist_sccm_application]</td>
<td>• publisher</td>
</tr>
<tr>
<td></td>
<td>• version</td>
</tr>
<tr>
<td></td>
<td>• model</td>
</tr>
<tr>
<td></td>
<td>• sccm_server</td>
</tr>
<tr>
<td>SCCM Collection</td>
<td>• name</td>
</tr>
<tr>
<td>[sn_client_sf_dist_sccm_collection]</td>
<td>• type</td>
</tr>
<tr>
<td></td>
<td>• sccm_server</td>
</tr>
<tr>
<td>SCCM Deployment</td>
<td>• application</td>
</tr>
<tr>
<td>[sn_client_sf_dist_sccm_deployment]</td>
<td>• collection</td>
</tr>
<tr>
<td></td>
<td>• type</td>
</tr>
</tbody>
</table>
**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 1607 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 411: 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 412: 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 413: SCCM configuration form

Table 872: SCCM configuration fields

<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. For information about common service catalog fields, see *Create or edit a catalog item.*
Catalog items are available to order software applications from the service catalog. Update name and short description to display for the item. Configure approval process, license check, order on behalf of, software configuration and other information as needed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Dropbox - 0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Dropbox</td>
</tr>
<tr>
<td>Price</td>
<td>$</td>
</tr>
<tr>
<td>Recurring price</td>
<td>$</td>
</tr>
<tr>
<td>Recurring price frequency</td>
<td>Monthly</td>
</tr>
<tr>
<td>Get quote in cart</td>
<td>No</td>
</tr>
<tr>
<td>Software configuration</td>
<td>Dropbox</td>
</tr>
</tbody>
</table>

Short description: Web file backup & sharing

Dropbox is a service that keeps your files safe, synced, and easy to share. Bring your photos, docs, and videos anywhere and never lose a file again.
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 873: 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>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
<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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 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 sofware 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, looking 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.

**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 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 1617 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**.

![Sample report from CSD dashboard](image)

**Figure 416: Sample report from CSD dashboard**

<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>
</tbody>
</table>
|                                             | • Type: Line chart  
|                                             | • Table: Requested Software [sn_client_sf_dist_req_software]                                                                                                                                               |
| Requests Completed Report                   | Displays the total of software requests completed each month.                                                                                                                                               |
|                                             | • Type: Line chart  
|                                             | • Table: Requested Software [sn_client_sf_dist_req_software]                                                                                                                                               |
| Installed Software Not Entitled             | Displays installed software that users or devices are not entitled to use. This can be software deployed through CSD or by another process that does not comply with licensing. This report is on a Software Asset Management table. |
|                                             | • Type: List reports  
|                                             | • Table: Software Installation [cmdb_sam_sw_install]                                                                                                                                                       |
| Software Installation Status                | Displays the count of requested software, grouped by installation status, for each month.                                                                                                                                 |
|                                             | • Type: Line chart  
|                                             | • Table: Requested Software [sn_client_sf_dist_req_software]                                                                                                                                               |
| Software Requested Item Stage Report        | Displays the sum of all requested items, grouped by the requested item’s stage, for each month.                                                                                                                                 |
|                                             | • Type: Line chart  
|                                             | • Table: Requested Software [sn_client_sf_dist_req_software]                                                                                                                                               |
| License Counts Available                    | Displays the license counts for all available applications.                                                                                                                                                 |
|                                             | • Type: List reports  
|                                             | • Table: SCCM Application Catalog Item [sn_client_sf_dist_sccm_app_cat_item]                                                                                                                                |

### 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 ServiceNow platform developers only. Instructions for customizing your instance
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 417: Provider information for Casper integration](image)

Table 875: 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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Software configuration</td>
<td>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].</td>
</tr>
<tr>
<td>Deployment extension key</td>
<td>The SetDeploymentData key provided with CSD. This key sets up the data for the software ordering and deployment workflow.</td>
</tr>
<tr>
<td>Deployment workflow</td>
<td>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.</td>
</tr>
<tr>
<td>Revocation extension key</td>
<td>The SetRevocationData key provided with CSD. This key sets up the data for installation revocation.</td>
</tr>
<tr>
<td>Revocation workflow</td>
<td>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.</td>
</tr>
</tbody>
</table>

**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.

Legacy: Configuration Automation

Configuration Automation is deprecated in the Istanbul release. It is still available on instances upgraded from a previous release but is not available for new instances.

Configuration Automation allows you to use Orchestration, Puppet, and Chef to provision and configure individual servers or groups of servers in your network. You define and manage the configuration of Chef and Puppet servers through the service catalog and CMDB. You can configure your ServiceNow instance to act as an external node classifier for Chef and Puppet.

Activating the Provider Configuration Automation plugin also installs the Configuration Automation plugin.

Legacy: Configure properties for Configuration Automation

How to configure Configuration Automation properties.

Navigate to Configuration Automation Properties, edit the properties as described in the table, and then click Save.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[glide.config_auto.node_definition.use_change]</td>
<td>Enables change management to control any updates to node definitions.</td>
</tr>
<tr>
<td></td>
<td>• Type: Yes</td>
</tr>
<tr>
<td></td>
<td>• Default value: No</td>
</tr>
</tbody>
</table>
### Property Description

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[glide.config_auto.ci_assignment_use_change]</td>
<td>Enables change management to control any assignments of Chef definitions to CIs.</td>
</tr>
<tr>
<td></td>
<td>• Type: Yes</td>
</tr>
<tr>
<td></td>
<td>• Default value: No</td>
</tr>
</tbody>
</table>

### Legacy: Chef configuration automation

Chef is a server management application that can use ServiceNow configuration item (CI) data to bring Linux or Windows computers into a desired state by managing files, services, or packages installed on physical or virtual machines.

The ServiceNow system can interact with Chef systems that run on Linux or Windows. The Chef server controls Chef nodes and uses a standalone utility to discover the components in the Chef environment. The system uses information about server CIs from the Chef server to classify the servers as Chef nodes. Chef then evaluates a node’s current state and modifies the node to achieve the desired state.

### How the Chef integration works

To access the Chef server, the ServiceNow admin configures a Chef server and sets up a Chef user. The Chef server evaluates the current and desired state of each node based on the node definition and modifies any nodes that are not in the desired state.

Using the ServiceNow system to control Chef resources allows you to maintain a single source of record within the system.

- You can use the ServiceNow system as an external node classifier for Chef nodes.
- Workflow activities allow you to create workflows that affect Chef behavior.
- You can manage and automate the request and approval process when making changes to Chef resources.

Using the ServiceNow system to manage Chef nodes follows this process:

![Figure 418: Chef Management Process](image)

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Chef terms

- Chef servers: Hubs that store and manage Chef configuration data.
- Node definitions: Details of the configuration items to be applied to nodes for a specific management server.
- Recipes: The most fundamental configuration element. A recipe is a collection of resources. Each recipe is stored in a cookbook.
- Cookbooks: The fundamental unit of configuration. After discovery, the cookbook is populated with version information and one or more recipes.
- Chef roles: A way to define certain patterns and processes that exist across nodes. A Chef role consists of zero or more attributes and a run list. Each node can have zero or more roles assigned to it.
- Chef attributes: Specific details about a node. Attributes are used by the Chef client to understand the current state of the node, the state of the node at the end of the previous Chef client run, and the state the node should be at the end of the current Chef client run.

Legacy: Activate and configure Chef Configuration Automation
To use Chef configuration automation, set up a user account and optionally set whether to enable change management to control any updates to node definitions.

Prerequisites

Before you can use the ServiceNow system as a Chef external node classifier, an administrator must:

Legacy: Activate Chef Configuration Automation
Chef Configuration Automation is deprecated in the Istanbul release. It is still available on instances upgraded from a previous release but is not available for new instances. Activating the Chef Configuration Management plugin, which is available as a separate subscription, also activates the Configuration Automation, Orchestration, and Orchestration Activities - Chef plugins. Chef configuration automation uses Orchestration, which requires 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>
</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 timezone, 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.

<table>
<thead>
<tr>
<th>Reason/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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.

Legacy: Installed with Chef
Activating the Chef Configuration Management plugin adds or modifies tables, user roles, properties, and other components. Demo data that demonstrates the Chef features is available.

### Table 876: Chef tables

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chef Server [cmdb_ci_chef_server]</td>
<td>The server part of a client-server Chef deployment. A Chef server serves the configuration to the Chef client that runs on each client node.</td>
</tr>
<tr>
<td>Chef Node Components [chef_node_components]</td>
<td>The declaration of a node from within a node definition.</td>
</tr>
<tr>
<td>Chef Node Definition [chef_node_definition]</td>
<td>A collection of node information to be applied to a Chef node.</td>
</tr>
<tr>
<td>Chef Node Definition Attribute [chef_node_def_attribute]</td>
<td>The declaration of a Chef node attribute from within anode definition.</td>
</tr>
<tr>
<td>Chef Node Definition Draft [chef_node_definition_draft]</td>
<td>An editable draft of a node definition record. ServiceNow creates these records when modifying a node definition using change management.</td>
</tr>
<tr>
<td>Chef User Account [chef_user_account]</td>
<td>A collection of user information required by Chef to communicate with Chef resources.</td>
</tr>
<tr>
<td>Chef Object [chef_object]</td>
<td>A base class that most of the Chef tables extend. It provides a name and a reference to the parent Chef server.</td>
</tr>
<tr>
<td>Chef Attribute [chef_attribute]</td>
<td>The declaration of an attribute from within a node definition.</td>
</tr>
<tr>
<td>Chef Cookbook [chef_cookbook]</td>
<td>The declaration of a cookbook from within a node definition.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Chef Environment [chef_environment]</td>
<td>The declaration of an environment from within a node definition.</td>
</tr>
<tr>
<td>Chef Recipe [chef_recipe]</td>
<td>The declaration of a recipe from within a node definition.</td>
</tr>
<tr>
<td>Chef Role [chef_role]</td>
<td>The declaration of a role from within a node definition.</td>
</tr>
<tr>
<td>Chef Role Components [chef_map_role_to_object]</td>
<td>The declaration of role components mapped to their objects.</td>
</tr>
</tbody>
</table>

Table 877: Chef properties

<table>
<thead>
<tr>
<th>Property name</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable change management to control any updates to node definitions [glide.config_auto.chef.node_definition.use_change]</td>
<td>Use change management to control any updates to node definitions.</td>
<td>false</td>
</tr>
<tr>
<td>Enable change management to control any assignments of Chef definitions to CIs [glide.config_auto.ci_assignment.use_change]</td>
<td>Use change management to control any assignments of Chef definitions to CIs.</td>
<td>false</td>
</tr>
</tbody>
</table>

Table 878: Chef script includes

<table>
<thead>
<tr>
<th>Script name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChefAjax</td>
<td>Provides client-callable AJAX functions supporting Chef.</td>
</tr>
<tr>
<td>ChefCredentialValidatorUtil</td>
<td>Validates the certificate and keystore alias.</td>
</tr>
<tr>
<td>ChefNodeDefinitionChangeManager</td>
<td>Manages changes to node definitions between the Chef server and the ServiceNow instance.</td>
</tr>
<tr>
<td>ChefNodeDefinitionCSM</td>
<td>Handles the Chef Node Definition Change State Machine.</td>
</tr>
<tr>
<td>ChefNodeDefinitionDiff</td>
<td>Generates the differences between the current and upcoming changes on a Chef node.</td>
</tr>
<tr>
<td>ChefNodeDefinitionDiffByCI</td>
<td>Generates the differences between the current and upcoming changes on a CI.</td>
</tr>
<tr>
<td>ChefObjectRelationship</td>
<td>Checks for a valid Chef object relationship.</td>
</tr>
<tr>
<td>ChefRefQuals</td>
<td>Provides Reference Qualifier utilities for Chef objects.</td>
</tr>
<tr>
<td>ChefRESTMessage</td>
<td>Handles authorization and communication to a Chef server using REST.</td>
</tr>
<tr>
<td>ChefSensor</td>
<td>Handles response from the Chef server for Chef objects.</td>
</tr>
<tr>
<td>Script name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ChefServerChangeManager</td>
<td>Manages the change process between the Chef server and the ServiceNow instance.</td>
</tr>
<tr>
<td>ChefUtil</td>
<td>Provides Chef utilities.</td>
</tr>
</tbody>
</table>

Table 879: Chef user roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Contains roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chef user [chef_user]</td>
<td>config_auto_user</td>
<td>Can assign node definitions to Chef nodes and request changes to existing node definition assignments.</td>
</tr>
<tr>
<td>Chef administrator [chef_admin]</td>
<td>config_auto_user config_auto_admin</td>
<td>Can create and modify node definition records, and perform all Chef User actions.</td>
</tr>
</tbody>
</table>

Table 880: Chef user groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chef Users</td>
<td>Grants the Chef User role.</td>
</tr>
<tr>
<td>Chef Administrators</td>
<td>Grants the Chef administrator role.</td>
</tr>
</tbody>
</table>

Legacy: Set up Chef key stores
The ServiceNow instance requires an X.509 certificate to communicate with Chef resources.

To set up a key store:
1. Navigate to Chef Setup Key Stores.
2. Click New and then enter a Name and Short description for the key store. Fill in the form.

Table 881: X.509 Certificate form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expiration notification</td>
<td>Select the check box to activate the expiration notifications: Notify on expiration, Warn in days to expire, and Expires in days</td>
</tr>
<tr>
<td>Active</td>
<td>Select the check box to activate the key store.</td>
</tr>
<tr>
<td>Format</td>
<td>Key store format. If you select DER, you are prompted to attach a DER-encoded certificate file.</td>
</tr>
<tr>
<td>Type</td>
<td>Key store type.</td>
</tr>
</tbody>
</table>

Note: Attach the chef_user.pkcs12 file in the X.509 Certificate record and not in the user record.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid from</td>
<td>Starting date when the key store is valid.</td>
</tr>
<tr>
<td>Expires</td>
<td>Date that the key store expires.</td>
</tr>
<tr>
<td>Issuer</td>
<td>Key store issuer.</td>
</tr>
<tr>
<td>Subject</td>
<td>Key store subject.</td>
</tr>
<tr>
<td>PEM Certificate</td>
<td>For PEM key store format, the key certificate.</td>
</tr>
<tr>
<td>Key store password</td>
<td>Key store password, if required.</td>
</tr>
</tbody>
</table>

3. To validate the key store alias, click the Validate Stores/Certificates related link.
4. Click Submit.

*Legacy: User roles in Chef Configuration Automation*

**Chef user [chef_user] role**
- Assign node definitions to Chef nodes
- View all Chef records
- Request changes to existing node definition assignments

**Chef administrator [chef_admin]**
- Perform all Chef user actions
- Create and modify node definition records
- Modify Chef properties

*Legacy: Node definitions*
Chef and Puppet management configurations use *node definitions* to group all configuration items to be applied to a group of nodes. A node definition is called a *configuration template* in ServiceNow Provider.

Node definitions allow you to automate the process of maintaining machines by applying a single definition to multiple machines.

The Node Definitions form lists and allows you to edit node definitions.

*Legacy: Managed nodes for Configuration Automation*
Managed nodes are virtual machines (VMs) or machines that are managed by a configuration automation provider.

*Legacy: View a managed node*
Managed nodes are virtual machines (VMs) or machines that are managed by a configuration automation provider.

**Role required: chef_user or chef_admin**
- To view the list of managed nodes, navigate to Configuration Automation Managed Nodes >.
- Click a Name to view or edit the node definition.
- Click a Provider to view or edit the configuration automation provider (Chef, Puppet, or ServiceNow) for the node.
• Click a Management Server to view or edit the settings for the server that manages the node.

Legacy: Use Chef
Chef users can request changes to a Linux computer configuration item (CI) assigned to them.

Chef change management ensures that requested changes go through a controlled change process that includes approvals. After a change is approved and the requesting user proceeds with the change, the Chef server modifies the computer to bring it to the desired state.

Legacy: Work with Chef resources
The ServiceNow system can store data about several Chef resource types including environments, cookbooks, roles, recipes, and attributes.

Legacy: Discover a Chef server
Chef discovery is the process by which a Chef server and Chef resources, including environments, cookbooks, roles, recipes, and attributes, are imported into a ServiceNow instance. Discovery is accomplished by the Discover Chef workflow.

Role required: chef_admin
Chef resources are maintained in Chef and can be viewed in ServiceNow. A Chef administrator can retrieve the records from a Chef server. It is not necessary to activate ServiceNow Discovery to discover the Chef environment.

1. Navigate to Chef Chef Servers.
2. Click New and then enter a Name and Description for the Chef server.
3. Fill in the form.

Table 882: Chef Server form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hosted Chef</td>
<td>Select the check box to indicate that the Chef server is within the Chef hosted environment. Clear the check box to indicate that the Chef server is outside of the Chef hosted environment.</td>
</tr>
<tr>
<td>IP address</td>
<td>IP address of the server. Required if Hosted Chef is not selected.</td>
</tr>
<tr>
<td>Organization</td>
<td>Name of the organization that hosts the Chef server. Required if Hosted Chef is selected.</td>
</tr>
<tr>
<td>User</td>
<td>[Required] User who has been set up to access the Chef server.</td>
</tr>
</tbody>
</table>

4. Save the form.
5. Click the Discover Chef Details related link.
   • The system detects the Chef server and completes the remaining fields in the form.
   • The system discovers the Chef resources and creates records for them in the appropriate tables.

Legacy: Manage a Chef node
You can configure Chef settings for a specific node directly in the CI form.

Role required: chef_admin
To view a list of CIs that use Chef configuration automation and are assigned to the logged-in user, navigate to Configuration Automation Managed Nodes. By default, a Chef user cannot directly modify the Chef fields on the CI form, and must request changes through a controlled change process.

**Note:** Updates to a CI reset the Node group assignment state to Ready. The Ready state ensures that assignment rules are applied and that the CIs are re-assigned based on the new values. For example, updating FQDN or IP address might reassign a CI to a different node group.

1. Navigate to Configuration Automation Managed Nodes or Configuration Servers Linux.
2. Open the node and then edit the fields in the Configuration Automation related list.

### Table 883: CI form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully qualified domain name</td>
<td>FQDN that Chef uses to access this CI.</td>
</tr>
<tr>
<td>Provider</td>
<td>Configuration Automation provider that manages this CI.</td>
</tr>
<tr>
<td>Management Server</td>
<td>Server that manages this CI.</td>
</tr>
<tr>
<td>Node group assignment state</td>
<td>State of automatic assignment of this CI to a node group, as described in the following table.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready</td>
<td>Default state for newly discovered CIs. Assignment rules are applied only to CIs in the Ready state.</td>
</tr>
<tr>
<td>In Progress</td>
<td>CI is currently experiencing a configuration change.</td>
</tr>
<tr>
<td>Assigned</td>
<td>CI is part of one or more node groups.</td>
</tr>
<tr>
<td>Processed</td>
<td>Assignment rules have been applied to the CI. There may or may not be a match.</td>
</tr>
<tr>
<td>Excluded</td>
<td>Configuration admin role can exclude a CI from being processed by the assignment rules.</td>
</tr>
</tbody>
</table>

3. Click Update.

Legacy: Create a Chef node definition
Chef node definitions can be composed of environments, cookbooks, roles, recipes, and attributes.

Role required: chef_admin
A Chef node definition needs to be associated with a specific management server.

1. Navigate to Chef Node Definition.
2. Click New Draft.
3. Fill in the form, as described in the table.
4. Save the form.
5. To add an environment, select the environment in the Environment field.
6. To edit node components, click Edit in the Chef Node Components related list and make any changes on the form.
   The slushbucket shows up to 100 available components. If you do not see a component in the Collection list, search for the component name.

7. To add or modify attributes, click New or Edit under the Chef Node Attribute related list, and update the form.

8. To create a managed node, click New under the Managed Node related list, and fill out the form.

9. Click Publish.

<table>
<thead>
<tr>
<th>Table 884: Chef node definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Environment</td>
</tr>
<tr>
<td>Provider</td>
</tr>
<tr>
<td>Change Request</td>
</tr>
<tr>
<td>Chef Server</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Replaces</td>
</tr>
</tbody>
</table>

Legacy: Add and edit Chef node attributes
Chef node attributes are discovered from the Chef server.

You can add additional attributes within the ServiceNow instance. Attributes that you have created inside a ServiceNow instance are editable; however, you cannot edit discovered Chef attributes.

Legacy: Add a Chef node attribute
How to add a Chef node attribute.

Role required: chef_admin

In a node definition draft, click New from the Chef Node Attribute related list and fill out the form (see table).

If there is an existing attribute with the same path and name as the newly created attribute, the new attribute replaces the old attribute.

<table>
<thead>
<tr>
<th>Table 885: Chef node attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Data Type</td>
</tr>
<tr>
<td>Field</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Attribute level</td>
</tr>
<tr>
<td>Path</td>
</tr>
<tr>
<td>Value</td>
</tr>
</tbody>
</table>

Legacy: Edit a Chef node attribute
How to edit Chef node attributes.

To edit attributes that you have created within the ServiceNow instance, click Edit from the Chef Node Attribute related list In a node definition draft. Then, edit the form and click Submit.

Legacy: Choose the discovered Chef node attributes
You can choose which discovered attributes to include in a node definition.

In a node definition draft, click Edit under the Chef Node Attribute related list. Select the attributes from the discovered collection in the slushbucket, and then click Save.

If you select multiple attributes with the same path and name, only the first is added to the node definition.

Legacy: Edit a CI-level attribute
Chef node attributes can be edited at the CI level.

Role required: chef_admin

Editing CI-level attributes overrides the attributes for a specific CI. For example, if you have applied a node definition to several CIs but want to modify an individual CI to use a different timezone, you can edit the attribute for that CI.

To access CI-level attributes:
1. Navigate to Configuration Automation Managed Nodes or Configuration Servers Linux.
2. Open a server.
3. In the Configuration Automation related list, edit the fields as necessary.
4. Click Update.

Legacy: Use change management with Chef
By default, the system allows changes to Chef configurations only as part of a controlled change management process.

With change management, users cannot directly edit Chef records such as node definitions or the relationships between CIs and node definitions. For all changes to Chef resources, the requesting user's manager must approve the request. If the user record does not have a value in the Manager field, the request is approved automatically.

When a user requests a change, each change management approver and the requesting user receive a notification. Additionally, the Assigned to field on the change request is populated with the requesting user. This user receives a notification when the request is approved or rejected.

Legacy: Modify a Chef node
How to modify a Chef node with change management enabled.
Role required: chef_admin

Change management prevents Chef users from directly editing the Configuration automation or Node definition fields on the CI form. Additionally, the Create New Configuration Change related link appears on the CI form for Chef node CIs.

1. Navigate to Configuration Servers Linux.
2. Select a Linux CI record that is assigned to the logged-in user.
3. Go to the Configuration Automation section to view the current configuration automation settings.
4. Click the Create New Configuration Change related link.
   A new Configuration Automation Change form appears.
5. Edit the fields, as necessary (see table).

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>The phase of the configuration automation change: Draft, Requested, Approved, Rejected, In Progress, Completed, Canceled, or Error.</td>
</tr>
<tr>
<td>Computer</td>
<td>The CI affected by the change.</td>
</tr>
<tr>
<td>Fully qualified domain name</td>
<td>The fully qualified domain name that Chef uses to access this CI.</td>
</tr>
<tr>
<td>Provider</td>
<td>The configuration automation provider managing this CI.</td>
</tr>
<tr>
<td>Management server</td>
<td>The server managing this CI.</td>
</tr>
<tr>
<td>Node definition</td>
<td>The node definition for this CI.</td>
</tr>
<tr>
<td>Change request</td>
<td>The change request number.</td>
</tr>
<tr>
<td>Requested CI Node attributes</td>
<td>Node attributes included in this change request.</td>
</tr>
</tbody>
</table>

6. Click the Request Change related link.
7. Click OK in the confirmation pop-up.
8. Click Update.
   • If there is an active change associated to the CI, the Cancel Change related link replaces Create New Configuration Change on the CI form. Only one active Chef change request for a CI is allowed at any time.
   • After the requesting user’s Manager approves the request, the Proceed with Change related link appears with Cancel Change.

After the user's manager approves the request:
1. Navigate to the relevant CI record.
2. Click the Proceed with Change related link. This link is available only when a change has been approved.
Figure 419: Chef configuration automation change

Legacy: Modify a node definition

The Checkout Draft related link on the Chef Node Definition form creates an editable draft copy of the record. Before a Chef user or Chef administrator can commit changes to a node definition, the user's manager must approve the change request.

Role required: chef_admin
When making a change to a node with one or more associated components and attributes, the system duplicates these related records and associates the duplicate with the new node definition draft record. Use the slushbucket to add or remove roles, recipes, and attributes from Chef node definition.

1. Navigate to Chef Node definition or Configuration Automation Node definition.
2. Select a published node definition.
3. Click the Checkout Draft related link.
   - This creates an editable copy of the current record as a draft and opens the form for that record.
4. Update the draft record.
5. Click the Publish related link.
   - This related link creates a change request record. A draft can have only one active change request at a time.
   - After the requesting user's manager approves the request, the Proceed with Change related link appears on the Chef Node Definition Draft form.

After the user’s manager approves the request:

1. Navigate to the relevant node definition draft record.
2. Click Proceed with Change to push the changes to the original node definition record and delete the draft record.

Legacy: Request a change to Chef using the service catalog

A user can request a change to a Chef node through the service catalog.

Role required: chef_user or chef_admin

Changes to nodes through the service catalog require the same change requests and approvals as changes made through the CI form.

1. Navigate to Self-Service Service Catalog.
2. Click Software.
3. Click Modify computer configuration.
4. Select a Computer to modify.
   - Only computers Assigned to the requesting user can be selected.
   - The Configuration automation provider and Management server are inserted.
5. Select the Node definition to apply to the selected computer.
6. Click Order Now.
When the request is approved, a Proceed with change related link appears on the computer's CI form.

Legacy: Disable change management
Disabling change management with the Chef, Puppet, or ServiceNow provider allows users to make and save changes on the definition forms and templates and the Configuration Automation section of the CI form.

Role required: puppet_admin or chef_admin

1. Navigate to one of the following:
   - Chef Properties
   - Puppet Properties
   - Configuration Automation Properties

2. Separately disable change management for either or both of the properties that are associated with the provider:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable change management to control updates to node definitions (node definitions) [glide.config_auto.chef.node_definition.use_change]</td>
<td>Disable this property for Chef</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Enable change management to control assignments of Chef definitions to CIs [glide.config_auto.chef.ci_assignment_use_change]</td>
<td>Disable this property for Chef</td>
</tr>
<tr>
<td>Enable change management to control updates to node definitions (node definitions) [glide.node_definition_use_change]</td>
<td>Disable this property for Puppet</td>
</tr>
<tr>
<td>Enable change management to control assignments of definitions to CIs [glide.ci_assignment_use_change]</td>
<td>Disable this property for Puppet</td>
</tr>
<tr>
<td>Enable change management to control updates to node definitions (node definitions)</td>
<td>Disable this property for ServiceNow provider</td>
</tr>
<tr>
<td>Enable change management to control updates to CI</td>
<td>Disable this property for ServiceNow provider</td>
</tr>
</tbody>
</table>

**Legacy: Use Chef with Cloud Management**

By using both Chef and cloud management, you can automate the entire provisioning process including installing software packages on provisioned virtual machines.

Using this automation, you can offer fully-configured virtual machines through the service catalog.

You must activate and configure both Chef and VMware for Cloud Management before performing the procedures on this page.

**Legacy: Offer a VM with the Chef client**

All Chef nodes require the Chef client service to communicate with the Chef server.

Role required: chef_admin

1. Create a Linux virtual machine template that includes the Chef client software.
2. After creating the template, create a catalog item for a Linux virtual machine using that template.

For information on creating a virtual machine template, see the [VMware template documentation](#).

**Legacy: Create a Chef virtual catalog item**

Role required: chef_admin

1. Create a catalog item using the new virtual machine template.
2. On the VMware Catalog Item form, select Guest customization to display the Customization specification field.
3. [Required] Select a Customization specification.
4. Click Update.
Legacy: Create a Chef VM template

Role required: chef_admin

1. Provision a virtual machine in vCenter with a name that identifies it as a Chef node. You can use the ServiceNow system to provision the virtual machine, or use vCenter to provision the virtual machine manually.

2. As described in the Chef documentation, install the Chef client software on the new virtual machine.

3. Create a user account on the virtual machine with permission to run Chef. There must be a credential record for this user within the ServiceNow system.

4. In vCenter, mark this virtual machine as an available template.

5. Discover the template to add it to the list of available virtual machine templates. The ServiceNow system cannot detect whether the Chef client is included with a template. It is the responsibility of the vCenter administrator to ensure that the template has the Chef client installed.

Legacy: Provision virtual machines with Chef

The procedure for ordering a virtual machine with Chef is the same as for ordering a standard virtual machine through the service catalog.

Provisioning a virtual machine with Chef does not add the virtual machine information as a virtual machine CI. Instead, the ServiceNow system records the new CI as a Linux server.

Legacy: Complete a provisioning task

A cloud operator must complete the provisioning task generated by the catalog request to provision the virtual machine.

Role required: chef_admin

1. Ensure that Guest customization is set to Yes.
2. Ensure that Node Definition is set to a node definition.

Legacy: New Chef VMs
When provisioning a new virtual machine with Chef, the Chef server can authenticate and configure the virtual machine.

Provisioning a new virtual machine with Chef bypasses the standard Chef approval process. Only cloud provisioning approvals are required.

After the virtual machine has been provisioned, the Chef client included on the virtual machine attempts to retrieve configuration information from the Chef server. If the Chef client and Chef server successfully communicate, the Chef client configures the virtual machine according to the node definition assigned to that virtual machine without further user interaction.

Legacy: Chef Orchestration activities
Chef is a server management application that can use the ServiceNow system configuration item (CI) data to bring computers into a desired state.

The ServiceNow system can interact with a Chef automation server through various Orchestration activities.

Legacy: Shared input variables of chef activities
All Chef activities share certain input variables.

Table 888: shared input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use hosted Chef</td>
<td>Value that indicates if the Chef server is hosted by Opscode. This value can be true, false, or a JavaScript function that returns either true or false.</td>
</tr>
<tr>
<td>Chef server</td>
<td>The IP address of a Chef server hosted in your own environment. This variable is mandatory if Hosted Chef is False. Leave this variable blank if Hosted Chef is True.</td>
</tr>
<tr>
<td>Organization</td>
<td>The Chef organization. Organizations contain groups and users. This variable is mandatory if Hosted Chef is True or when using self-hosted Enterprise Chef. For more information, see the Chef Organizations documentation.</td>
</tr>
<tr>
<td>User account</td>
<td>A Chef user account record. This record holds the information necessary to make Chef API calls including the username, keystore, and alias of a Chef user.</td>
</tr>
<tr>
<td>Sensor script</td>
<td>JavaScript that processes the results of requests made to the Chef server.</td>
</tr>
</tbody>
</table>

Legacy: Chef activity: Chef Request
The Chef Request activity sends a Chef API request to a Chef server.

The Chef Request activity sends a Chef API request to a Chef server. This activity stores returned data in the responses sensor script variable as an array of JavaScript objects. Each object in the array contains the following fields.
Table 889: Array object fields

<table>
<thead>
<tr>
<th>Object</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>response_code</td>
<td>The HTTP response code for the request</td>
</tr>
<tr>
<td>success</td>
<td>A boolean value that indicates whether the request was successful or not</td>
</tr>
<tr>
<td>request_url</td>
<td>The endpoint for the request</td>
</tr>
<tr>
<td>response_body</td>
<td>The raw data returned from the Chef server</td>
</tr>
</tbody>
</table>

**Note:** All other Chef activities implement a specific Chef request and contain these fields in their sensor script variable. Some activities also contain additional fields in their sensor script variable.

Table 890: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef server returned a response. The activity returns a successful result even if one or more Chef requests failed. To determine the success of a specific request, use the success value from an object stored in the responses variable</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef server was not available or rejected the supplied credentials</td>
</tr>
</tbody>
</table>

Table 891: Input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>The type of REST function to execute. Possible values are GET, POST, PUT, and DELETE</td>
</tr>
<tr>
<td>Target data</td>
<td>An array of JavaScript objects. Each object specifies these values:</td>
</tr>
<tr>
<td></td>
<td>• targetPath: the target endpoint for this request. See the Chef API endpoint documentation for information on specifying an endpoint.</td>
</tr>
<tr>
<td></td>
<td>• content: the body of the message, written in JSON, when using a PUT or POST REST message.</td>
</tr>
</tbody>
</table>

Legacy: Chef activity: Get Cookbooks

The Get Cookbooks activity retrieves name and version information about cookbooks installed on a Chef server.

The activity stores the retrieved cookbook information in the cookbooks sensor script variable as an array of JavaScript objects. Each object in the array contains the following fields:
Table 892: Array object fields

<table>
<thead>
<tr>
<th>Object</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The name of the cookbook</td>
</tr>
<tr>
<td>version</td>
<td>The version of the cookbook</td>
</tr>
</tbody>
</table>

For more information, see the Chef *cookbook documentation*.

Table 893: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef request was successful</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef request failed, the Chef server was unavailable, or the Chef server rejected the supplied credentials</td>
</tr>
</tbody>
</table>

The Get Cookbooks activity uses only *shared input variables*.

Legacy: Get cookbook data

The Get Cookbook Data activity retrieves the recipes and attributes from a given cookbook.

The activity stores the retrieved cookbook data in the cookbookData sensor script variable as an array of JavaScript objects. Each object contains the following fields, as well as all fields returned by the *Chef Request* activity:

Table 894: Array object fields

<table>
<thead>
<tr>
<th>Object</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The name of the cookbook</td>
</tr>
<tr>
<td>recipes</td>
<td>A list of recipes stored in the cookbook</td>
</tr>
<tr>
<td>attributes</td>
<td>A parameter that controls the behavior of a node, such as the port used by a web server</td>
</tr>
</tbody>
</table>

Table 895: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>the Chef server returned a response. The activity returns a successful result even if one or more Chef requests failed. To determine the success of a specific request, use the success value from an object stored in the cookbookData variable</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef server was not available or rejected the supplied credentials</td>
</tr>
</tbody>
</table>
Table 896: Input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookbook data</td>
<td>An array of JavaScript objects that defines which cookbooks to get data from. Each object contains the following fields:</td>
</tr>
<tr>
<td></td>
<td>• cookbook_name: the name of the cookbook to get data for.</td>
</tr>
<tr>
<td></td>
<td>• cookbook_version: the version of the cookbook to get data for.</td>
</tr>
</tbody>
</table>

Legacy: Chef activity: Get Environments
The activity stores retrieved environment names as an array of strings in the environments sensor script variable.

The Get Environments activity retrieves the names of all environments on a given Chef server.

Table 897: results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef request was successful</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef request failed, the Chef server was unavailable, or the Chef server rejected the supplied credentials</td>
</tr>
</tbody>
</table>

The Get Environments activity uses only shared input variables.

Legacy: Chef activity: Get Recipes
The Get Recipes activity retrieves all recipes stored in a version of a cookbook.

Unlike the Get Cookbook Data activity, the Get Recipes activity does not get attribute information. The activity stores retrieved recipes in the recipes sensor script variable as an array of JavaScript objects. Each object in this array contains the following fields, as well as all fields returned by the Chef Request activity:

Table 898: Array object fields

<table>
<thead>
<tr>
<th>Object</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cookbook_name</td>
<td>The name of the cookbook, passed in the Cookbook data activity input variable</td>
</tr>
<tr>
<td>cookbook_version</td>
<td>The version of the cookbook, passed in the Cookbook data activity input variable</td>
</tr>
<tr>
<td>recipes</td>
<td>An array of JavaScript objects that lists the recipes contained in the cookbook. Each object in this array contains the name of a single recipe and the description of that recipe</td>
</tr>
</tbody>
</table>
Table 899: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef request was successful</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef request failed, the Chef server was unavailable, or the Chef server rejected the supplied credentials</td>
</tr>
</tbody>
</table>

Table 900: Input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookbook data</td>
<td>An array of JavaScript objects that lists the cookbooks to get recipes from. Each object in the array contains the following fields:</td>
</tr>
<tr>
<td></td>
<td>• cookbook_name: the name of the cookbook to get recipes from.</td>
</tr>
<tr>
<td></td>
<td>• cookbook_version: the version of the cookbook to get recipes from.</td>
</tr>
</tbody>
</table>

Legacy: Chef activity: Get Roles

The Get Roles activity retrieves roles installed on a given Chef server.

The activity stores a list of retrieved role names in the roles sensor script variable.

Table 901: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef request was successful</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef request failed, the Chef server was unavailable, or the Chef server rejected the supplied credentials</td>
</tr>
</tbody>
</table>

The Get Roles activity uses only shared input variables.

Legacy: Get role data

The Get Role Data activity retrieves additional information about a given Chef role.

The activity stores retrieved role data in the roleData sensor script variable as a JavaScript object. The object contains the following fields, as well as all fields returned by the Chef Request activity:

Table 902: Object fields

<table>
<thead>
<tr>
<th>Object</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>role_name</td>
<td>The name of the role, passed in the Role data activity input variable</td>
</tr>
<tr>
<td>description</td>
<td>A description of the role, if available</td>
</tr>
<tr>
<td>Object</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>run_list</td>
<td>The list of recipes and other roles that the role contains</td>
</tr>
<tr>
<td>default_attributes</td>
<td>Attributes that apply to nodes with this role</td>
</tr>
<tr>
<td>override_attributes</td>
<td>Attributes that apply to nodes with this role. These attributes can override a default attribute inherited from a parent role</td>
</tr>
</tbody>
</table>

Table 903: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef server returned a response. The activity returns a successful result even if one or more Chef requests failed. To determine the success of a specific request, use the success value from an object stored in the roleData variable</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef server was not available or rejected the supplied credentials</td>
</tr>
</tbody>
</table>

Table 904: Input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role data</td>
<td>An array of JavaScript objects that defines which roles to get more information about. Each object contains the following field:</td>
</tr>
<tr>
<td></td>
<td>• role_name: the name of the role to get more information about.</td>
</tr>
</tbody>
</table>

Legacy: Chef activity: Update Node

The Update Node activity updates a given Chef node with a run list.

A run list defines which recipes, roles, and attributes to apply to a Chef node, and the order to apply them. For more information, see the Chef run list documentation. The activity stores returned data in the nodeData sensor script variable as an array of JavaScript objects. The object contains the following fields, as well as all fields returned by the Chef Request activity:

Table 905: Array objects table

<table>
<thead>
<tr>
<th>Object</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>fqdn</td>
<td>The given fully-qualified domain name for the node</td>
</tr>
</tbody>
</table>

Any other name-value pairs based on the value entered in the Node data activity input variable
### Table 906: Results table

<table>
<thead>
<tr>
<th>Result</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>The Chef server returned a response. The activity returns a successful result even if one or more Chef requests failed. To determine the success of a specific request, use the success value from an object stored in the nodeData variable.</td>
</tr>
<tr>
<td>Failure</td>
<td>The Chef server was not available or rejected the supplied credentials.</td>
</tr>
</tbody>
</table>

### Table 907: Input variables table

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run list</td>
<td>An array of JavaScript objects that defines the configuration settings to push to Chef. Objects in this array contain the following fields:</td>
</tr>
<tr>
<td></td>
<td>• type: the type of Chef resource. Valid types are recipe or role.</td>
</tr>
<tr>
<td></td>
<td>• name: the name of the recipe or role.</td>
</tr>
<tr>
<td>Environment</td>
<td>The Chef environment the specified node should belong to.</td>
</tr>
<tr>
<td>Node data</td>
<td>An array of JavaScript objects that defines additional configuration settings, including attributes, for the Chef node. Objects in this array contain the following fields:</td>
</tr>
<tr>
<td></td>
<td>• fqdn: the fully-qualified domain name of the node to update.</td>
</tr>
<tr>
<td></td>
<td>• attribute: an array of JavaScript objects that defines the attributes to apply. Objects in this array contain the following fields:</td>
</tr>
<tr>
<td></td>
<td>• name: the name of an attribute.</td>
</tr>
<tr>
<td></td>
<td>• value: the value to assign the specified attribute.</td>
</tr>
<tr>
<td></td>
<td>• type: [Optional] the type of attribute. Supported values are normal, default, and override. The attribute type is normal by default.</td>
</tr>
<tr>
<td></td>
<td>• namespace: [Optional] an array of strings that defines the attribute path. For example, to access an attribute called db_name with a path of mysql/db/db_name, enter a namespace value of ['mysql', 'db'].</td>
</tr>
</tbody>
</table>
Legacy: Configuration automation roles

Table 908: Configuration Automation roles

<table>
<thead>
<tr>
<th>Role Title [Name]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Automation user</td>
<td>Can assign node definitions to nodes assigned to the user through the Self Service Service Catalog page.</td>
</tr>
<tr>
<td>[config_auto_user]</td>
<td></td>
</tr>
<tr>
<td>Configuration Automation administrator</td>
<td>Can create and modify node definition records, assign node definitions to nodes, view all configuration automation records, request changes to existing node definition assignments, and define new configuration automation providers using extension points.</td>
</tr>
<tr>
<td>[config_auto_admin]</td>
<td></td>
</tr>
</tbody>
</table>

Note: A node definition is called a configuration template in the ServiceNow Provider.

Legacy: ConfigAutomationDiffBase script includes

The ConfigAutomationDiffBase script include allows you to define how to handle changes to a CI or node definition from the change management system. The script include as the basis for creating the Difference Extension by CI and Difference Extension by Node Definition scripts.

Script Use

To create both of the scripts, make a copy of the ConfigAutomationDiffBase script include and implement the process method for the new configuration provider. The method should return a single JavaScript object with the two properties described in the following table.

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>short description</td>
<td>String</td>
<td>Returns the information for the Change Request short_description field.</td>
</tr>
<tr>
<td>description</td>
<td>String</td>
<td>Returns the information for the Change Request description field.</td>
</tr>
</tbody>
</table>

Difference Extension by CI

This script checks for changes from the change management system that affect the ServiceNowConfiguration CI. Implement the process method to check for any changes. In this case, the input parameter is the CI sys_id.
Difference Extension by Node Definition

**Note:** A node definition is called a configuration template in the ServiceNowProvider.

This script checks for changes from the change management system that affect the ServiceNow node definition. Implement the process method to check for any changes. In this case, the input parameter is the node definition ID.

*Legacy: Example node definition diff script for Chef: ConfigAutomationDiffBase*

```javascript
ChefNodeDefinitionDiff.prototype = Object.extendObject(
  ConfigAutomationDiffBase , {
    initialize : function () { } ,
    process : function (draftNodeDefId ) { var gr  = new GlideRecord ('chef_node_definition' ) ;
      gr. get (draftNodeDefId ) ; var nodeDefId = '' + gr. peer. sys_id ; return
      this. getDiff (nodeDefId , draftNodeDefId ) ; } ,
    getDiff : function (nodeDefId , draftNodeDefId ) { var orgNodeData =
      this._getNodeData (nodeDefId , 'chef_node_definition' ) ; var draftNodeData =
      this._getNodeData (draftNodeDefId , 'chef_node_definition' ) ;

      //Get the differences between node definition and draft node definition
      for the specific sys id. var diff = this._getNodeComponentDiff (orgNodeData.
      nodeComponents , draftNodeData. nodeComponents ) ;

      // Get the differences in attributes.
      diff += this._getAttributeDiffs (orgNodeData. nodeAttributes ,
      draftNodeData. nodeAttributes ) ;

      //Create messages var Name = gs. getMessage ( 'Name' ) ;
      var ChefManagementServer = gs. getMessage ( 'Chef Management
      Server' ) ; var Environment = gs. getMessage ( 'Environment' ) ;
      var ChangeChefNodeDefinition = gs. getMessage ( 'Change Chef node
      definition' ) ; var ThisIs = gs. getMessage ( 'This is a change generated by
      modifying Chef node definition.' ) ;

      var nodeDiff = { } ; var nodeDef = orgNodeData. nodeObj ; var
draftNodeDef = draftNodeData. nodeObj ;

      nodeDiff. shortDescription = ChangeChefNodeDefinition ;
      nodeDiff. description = ThisIs + "\n " ;
      nodeDiff. description += this._getDiff ( Name , nodeDef. name ,
      draftNodeDef. name ) ;
      nodeDiff. description += this._getDiff (ChefManagementServer , nodeDef.
      chefManagementServer. name , draftNodeDef. chefManagementServer. name ) ;
      nodeDiff. description += this._getDiff (Environment , nodeDef.
      environment_name , draftNodeDef. environment_name ) + diff ;

      return nodeDiff ; } ,
  }
}

_getNodeData : function (nodeDefId , tableName ) { var nodeData = { } ; if
    (!gs. nil (nodeDefId )) { var nodeObj = this._getNodeInfo (nodeDefId ,
    tableName ) ; if (!gs. nil (nodeObj )) {
      nodeData. nodeObj = nodeObj ; }

    // Get associated node definition classes and parameters
    nodeData. nodeComponents = this._getNodeComponents (nodeDefId ) ;
    nodeData. nodeAttributes = this._getNodeAttributes (nodeDefId ) ; }

    return nodeData ; }
```
/**
 * Retrieves the node information for the specified node definition.
 */
_getNodeInfo : function (sysId , tableName ) { var gr  = new GlideRecord (tableName ) ;

    if (gr. get (sysId ) ) { var nodeObj = { } ; // Common fields for Node definition
      nodeObj. sysId = sysId ;
      nodeObj. name = '' + gr. name ;
      nodeObj. chefManagementServer = { } ;
      nodeObj. chefManagementServer. sys_id = '' + gr. management_server ;
      nodeObj. chefManagementServer. name = '' + gr. management_server. name ;

      // Unique fields... if (tableName. startsWith ( 'chef_node_definition' ) )
      {
        nodeObj. inherits = '' + gr. inherits ;
        nodeObj. inheritsName = '' + gr. inherits. name ;
        nodeObj. environment_name = '' + gr. environment. name ;
      } return
      nodeObj ; } return null ; },

    /*
     * Retrieves the node class for the indicated node definition
     */
    _getNodeComponents  : function (sysId ) { var gr  = new GlideRecord
    ( 'chef_map_node_to_object' ) ;
    gr. addQuery ( 'node_definition' , sysId ) ;
    gr. orderBy ( 'chef_object' ) ;
    gr. query ( ) ;

    var nodeComponents  = [ ] ;

    while (gr. next ( ) ) { var nodeComponentObj = { } ;
      nodeComponentObj. sysId = '' + gr. sys_id ;
      nodeComponentObj. chefComponent = '' + gr. chef_object ;
      nodeComponentObj. chefComponentName = '' + gr. chef_object. name ;
      nodeComponentObj. nodeDefinition = '' + gr. node_definition ;
      nodeComponentObj. nodeDefinitionName = '' + gr. node_definition. name ;
      nodeComponentObj. type = '' + gr. type ;
      nodeComponentObj. chefObjectType = '' + gr. chef_object. sys_class_name.
      getDisplayValue ( ) ;
      nodeComponents. push (nodeComponentObj ) ; } return
      nodeComponents ; } ,

    /*
     * Returns difference if any for the passed field.
     */
    _getDiff : function (field , orig , draft ) { if (orig  != draft ) { return
      this._formatDiff (gs. getMessage ( "Modified {0} from {1} to {2}" ,
      [field , orig , draft ] ) ) ; } return '' ; },

    /*
     * Retrieves the parameters for the indicated node definition
     */
    _getNodeAttributes  : function (sysId ) { var nodeAttrObj = { } ; var gr =
    new GlideRecord ( 'chef_node_def_attribute' ) ;
    gr. addQuery ( 'node_definition' , sysId ) ;
    gr. orderBy ( 'name' ) ;
    gr. query ( ) ; while (gr. next ( ) ) { var nodeAttrObj = { } ;
      nodeAttrObj. name = (gs. nil (gr. chef_attribute. path ) ? '' : gr.
      chef_attribute. path + '.' ) + gr. chef_attribute. name ;
      nodeAttrObj. value = '' + gr. value ;
      nodeAttrObj. node_definition = '' + sysId ;
nodeAttrs. push (nodeAttrObj ) ; } return nodeAttrs ; },

/**
 * Returns the changes of node components between node definition and draft node definition.
 * @param nodeComponents, draftNodeComponents
 * @returns {String}
 */
_getNodeComponentDiff : function (nodeComponents , draftNodeComponents )
{ var diff = '' ; // Traverse thru the draft node components and find the differences. for ( var i = 0 ; i < draftNodeComponents. length ; i ++ ) { var draftNodeComponent = draftNodeComponents [i ] ; // Getting the original node definition. var nodeComponent = this._findNodeComponent (nodeComponents , draftNodeComponent. chefComponent ) ;
   diff += this._getNodeComponentDiff (draftNodeComponent , nodeComponent ) ; }
   // Traverse thru the node components and find the differences. for ( var i = 0 ; i < nodeComponents. length ; i ++ ) { var nodeComponent = nodeComponents [i ] ; if (nodeComponent. chefComponent == draftNodeComponent. chefComponent ) {
   diff += this._getNodeComponentDiff (draftNodeComponent , nodeComponent ) ; }
   return diff ; },

/**
 * Find a specific class from the indicated collection of classes
 */
_findNodeComponent : function (nodeComponents , component ) { if ( ! gs. nil (nodeComponents ) && !gs. nil (component ) ) { for ( var i = 0 ; i < nodeComponents. length ; i ++ ) { var nodeComponent = nodeComponents [i ] ; if (nodeComponent. chefComponent == component ) {
   return nodeComponent ; } } } return null ; },

/**
 * Helper function for generating the chef node component differences.
 */
_getComponentDiff : function (draft , orig ) { if (gs. nil (orig ) ) {
   return this._formatDiff (gs. getMessage ( "Added (0) : {1}" , [draft. chefObjectType , draft. chefComponentName ] ) ) ; } else if (gs. nil (draft ) ) { return this._formatDiff (gs. getMessage ( "Deleted (0) : {1}" , [orig. chefObjectType , orig. chefComponentName ] ) ) ; } return '' ; },

/**
 * Format diff string.
 */
_formatDiff : function (s ) { return "\n      " +s ; },

/**
 * Returns the changes of attributes between node definition and draft node definition.
 * @param nodeDefRoot
 * @returns {String}
 */
_getAttributeDiffs : function (nodeAttributes , draftNodeAttributes ) { var diff = '' ;
   // See if any parameters were added or modified for ( var i = 0 ; i < draftNodeAttributes. length ; i ++ ) { var draftNodeAttr = draftNodeAttributes [i ] ; var nodeAttr = this._getNodeAttrByName (nodeAttributes , draftNodeAttr. name ) ;
   diff += this._getNodeAttrDiff (draftNodeAttr , nodeAttr ) ; }
// See if any parameters were added or modified for ( var i = 0 ; i <
nodeAttributes. length ; i ++ ) { var nodeAttr = nodeAttributes [i ] ; var
draftNodeAttr = this._getNodeAttrByName (draftNodeAttributes , nodeAttr.
name ) ;
    diff += this._getNodeAttrDiff (draftNodeAttr , nodeAttr ) ; } return
diff ; },

/**
* Find a specific attribute found by the passed name
*/
_getNodeAttrByName : function (attrs , name ) { if ( !gs. nil (attrs ) && !
gs. nil ( name ) ) { for ( var i = 0 ; i < attrs. length ; i ++ ) { var
attr = attrs [i ] ; if (attr. name == name ) { return attr ; } } } return
null ; },

/*
* Helper function for generating the puppet node parameter differences.
*/
_getNodeAttrDiff : function (draft , orig ) { if (gs. nil (orig ) ) { return
this._formatDiff (gs. getMessage ( "Added attribute : {0} with value
{1}" , [draft. name , this._getAttrDisplayValue (draft ) ] ) ) ; } else if
(gs. nil (draft ) ) { return this._formatDiff (gs. getMessage ( "Deleted
attribute : {0} with value {1}" , [orig. name , this._getAttrDisplayValue
(orig ) ] ) ) ; } else if (draft. value != orig. value ) { return
this._formatDiff (gs. getMessage ( "Modified attribute : {0} from
value {1} to {2}" , [draft. name , this._getAttrDisplayValue (orig ) ,
this._getAttrDisplayValue (draft ) ] ) ) ; } return '' ; },

_getAttrDisplayValue : function (attr ) { return attr. value ; },

 Legacy: Extending Configuration Automation
Configuration automation extensions allow you to customize an instance to support configuration
t automation providers in addition to those offered by ServiceNow.

Change manager extensions scripting is available to users with the Chef Administrator [chef_admin] or
Puppet Administrator [puppet_admin] role.

To support a new provider, you need to define:

• The change manager script
• A difference by CI extension script
• A difference by node definition script
• Workflows, if needed
• The change manager
• The provider

Legacy: Defining a Difference by CI Extension script
The Difference by CI Extension script generates the differences between the current CI definition and
upcoming changes.

These differences are inserted into the change request detail. Extend the ConfigAutomationDiffBase
script include to create this script and implement the process(String configuration_automation_changeId)
method, which is called to generate the diff message.

Legacy: Defining a Difference by Node Definition script
The Difference by Node Definition script generates the differences between the current node definition and
upcoming changes.
Note: A node definition is called a configuration template in the ServiceNowProvider.

These differences are inserted into the change request detail. Extend the ConfigAutomationDiffBase script include and implement the processString draft_node_definition_Id) method, which is called to generate the diff message.

Legacy: Defining a change manager script
Defining the change manager

1. Define the script.
2. Register the script.
3. Configure the change manager in the Change Manager module.

The change manager is a script that manages changes between the ServiceNow system node definitions or CIs and the definitions on the configuration automation provider server. Use the CfgAutoChangeManager script include as your starting point, and implement the required functions so that they provide the necessary information. Register your script in the Config Automation Provider [config_automation_provider] table.

2. Click New.
3. Fill in the fields and then click Submit.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider</td>
<td>Name of the configuration automation provider.</td>
</tr>
<tr>
<td>Change Manager</td>
<td>Script that defines how to manage the configuration information for this provider. This is the script defined in Defining the Change Manager script.</td>
</tr>
<tr>
<td>Table</td>
<td>Table that contains the configuration automation information.</td>
</tr>
</tbody>
</table>
Figure 422: Change Manager script include

```javascript
var ChefServerChangeManager = class.create();
ChefServerChangeManager.prototype = Object.extendObject(CfgAutoChangeManager, {
    UPDATE_NODE_WF: 'Deploy Chef Change Master',
    CK_PROP_NAME: 'glide.config.auto.chef.ci_assignment_use_change',
    CHEF_ADMIN: 'chef_admin',
    CHEF_USER: 'chef_user',
    CFG_AUTO_ADMIN: 'cfg_auto_admin',
    CFG_AUTO_USER: 'cfg_auto_user',
    CK_FIELD_NAME: 'cfg_auto_change',
    IN_PROGRESS: 'In Progress',

    prepare: function(ciGr) {
        var change = ciGr.cfg_auto_change;
        if (!util.notNull(change)) {
            var phaselist = new ChoiceList('cfg_auto_change', 'phase');
            var gr = new GlideRecord('cfg_auto_change');
            gr.get(change.sys_id);
            gr.setValue('phase', phaselist.getValue(this.IN_PROGRESS));
            gr.update();
        } return ciGr;
    },

    cleanupAfterCancelChange: function(ciGr) {
        if (ciGr.cfg_auto_change) {
        }
    },
});
```
**Legacy: Define a new Configuration Automation provider**

The Configuration Automation Provider form gathers all script and table information required by the configuration automation provider.

Role required: admin

1. Navigate to Configuration Automation > Extension > Providers.
2. Click New, provide a Name and Description, and then fill in the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference Extension by CI</td>
<td>Script that defines the difference extension by CI. This is the script defined in Defining a Difference by CI Extension Script.</td>
</tr>
<tr>
<td>CI Push Subflow</td>
<td>[Optional] If required by the configuration automation provider: Sub workflow that defines how changes are pushed for a CI.</td>
</tr>
<tr>
<td>Difference Extension by Node Definition</td>
<td>Script that defines the difference extension by node definition, created in Defining a Difference by Node Definition Script.</td>
</tr>
<tr>
<td>Node Definition Push Subflow</td>
<td>[Optional] If required by the configuration automation provider: Sub workflow that defines the changes pushed to a node definition.</td>
</tr>
</tbody>
</table>

**Legacy: Workflows for a custom Configuration Automation provider**

Workflows are optional depending on the requirements of the new configuration automation provider.

For example, Puppet does not use workflows; instead, the Puppet Master pulls the changes from the instance. Chef, however, uses the following workflows to pull changes.

<table>
<thead>
<tr>
<th>Workflow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push CI Change to Chef Server</td>
<td>Pushes the configuration automation change to the Chef server.</td>
</tr>
<tr>
<td>Push Chef Changes By Node Definition</td>
<td>Pushes configuration automation changes triggered by a node definition change.</td>
</tr>
</tbody>
</table>

If the new configuration automation provider requires workflows, register the workflows in Configuration Automation Provider form, and make sure to implement the getPushWorkflowName() and getWorkflowVariables(String workflowName, GlideRecord record) method in the change manager script.

**Legacy: Define the Change Manager script**

The change manager script is responsible for the logical change process and exposes customization hooks for provider implementations, which are scripts that determine how the assets are handled.

1. Create a new script that extends the CfgAutoChangeManager script include.
2. Implement the following mandatory functions:
   - isAuthorized(GlideRecord record)
   - isChangeRequired()
   - getChangeId(GlideRecord current)
   - setChangeId(GlideRecord record, String changeld)
• prepare(GlideRecord record)
• finalizeChange(GlideRecord record)
• getWorkflowVariables(String workflowName, GlideRecord record)
• getPushWorkflowName()
• cleanupAfterCancelChange(GlideRecord record)

3. Implement the optional getPushWorkflowName() override function if it applies to the provider.

Example Change Manager Script

```
var ChefNodeDefinitionChangeManager = Class.create();
ChefNodeDefinitionChangeManager.prototype = Object.extendObject(CfgAutoChangeManager, { // Code body omitted for brevity });
```

Legacy: Puppet Configuration Management

Puppet is a server management application that can use CMDB data to bring computers into a desired state by managing files, services, or packages installed on physical or virtual machines. The ServiceNow application can interact with Puppet systems that run on Linux.

ServiceNow identifies a Puppet Master, which controls Puppet nodes, and uses a standalone utility to discover the components in the Puppet environment. The ServiceNow system uses information about server CIs from the Puppet Master to classify the servers as Puppet nodes. Puppet then evaluates a node's current state and modifies the node to achieve the desired state. For more information, see What is Puppet?.

Legacy: Puppet Integration

A script, available in the ServiceNow instance, must run on a Puppet Master to designate the ServiceNow system as an ENC. The Puppet Master evaluates the current and desired state of each node, based on the node definition, and modifies any nodes that are not in the desired state.

Using the ServiceNow instance to control Puppet resources allows you to maintain a single source of record within the instance. You can:

• Classify Puppet nodes: You can use the instance as an external node classifier for Puppet nodes.
• Create Puppet workflows: Workflow activities allow you to create workflows that affect Puppet behavior.
• Control changes: The instance can manage and automate the request and approval process when making changes to Puppet resources.
Legacy: Set up Puppet
To use Puppet Configuration Automation, configure a ServiceNow instance to act as an external node classifier (ENC) for a Puppet Master installation.

Prerequisites
Before you can use an instance as a Puppet external node classifier, you must:

- Puppet Master: Install the Puppet Master software. The Puppet Master communicates with Puppet nodes and the ServiceNow instance. For more information, see the Puppet Labs Installing Puppet documentation.
- MID Server: Install a MID Server and configure it to access both the Puppet Master and ServiceNow.
- Puppet User: Create a user record in the instance that Puppet can use to access records related to Puppet. This user must have the SOAP role. Enter this user’s credentials in the external node classifier (ENC) script.

Legacy: Activate Puppet configuration management
Puppet Configuration Management is deprecated in the Istanbul release. It is still available on instances upgraded from a previous release but is not available for new instances. This integration requires the Puppet Configuration Management plugin, which requires a separate subscription. It uses Orchestration, which is also available as a separate subscription. The Puppet Configuration Management plugin also activates the Configuration Automation plugin and the Orchestration Activities - Puppet plugins, which provide Puppet-specific components.

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>Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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.

Legacy: Installed with Puppet

The Puppet Configuration Automation plugin adds or modifies tables, user roles, properties, and other components.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet Master [cmdb_ci_puppet_master]</td>
<td>The server part of a client-server Puppet deployment. A Puppet Master serves the configuration catalogs to the Puppet agents that run on each client node.</td>
</tr>
<tr>
<td>Module [puppet_module]</td>
<td>A collection of Puppet resources such as classes, files, and templates. Pre-built modules are available that can provide a wide array of functionality. A single module can describe, for instance, an entire web application. Modules are the highest-level resource available with Puppet. You cannot create module records in the instance, but must discover this content from a Puppet Master.</td>
</tr>
<tr>
<td>Manifest [puppet_manifest]</td>
<td>A file that contains resource declarations such as classes, variables, and defined types. These files are written in the Puppet language and have a .pp file extension. You cannot create manifest records in the instance, but must discover this content from a Puppet Master.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Class [puppet_class]</td>
<td>Defines a collection of resources that can then be treated as a single logical unit and applied to an agent by way of a node definition. You cannot create class records in the instance, but must discover this content from a Puppet Master.</td>
</tr>
<tr>
<td>Node Definition [puppet_node_definition]</td>
<td>A collection of classes which will be applied to an agent node.</td>
</tr>
<tr>
<td>Node Definition Draft [puppet_node_definition_draft]</td>
<td>An editable draft of a node definition record. The instance creates these records when modifying a node definition using change management.</td>
</tr>
<tr>
<td>Parameter [puppet_parameter]</td>
<td>A piece of information that a class accepts upon declaration.</td>
</tr>
<tr>
<td>Puppet Object [puppet_object]</td>
<td>A base class that most of the Puppet tables extend. It provides a name and a reference to the parent Puppet Master.</td>
</tr>
<tr>
<td>Class Declaration [puppet_class_declaration]</td>
<td>The declaration of a class from within a node definition.</td>
</tr>
<tr>
<td>Parameter Value [puppet_parameter_value]</td>
<td>The value of a parameter in the context of a class declaration.</td>
</tr>
</tbody>
</table>

**Legacy: Configure Puppet properties**

Properties installed with Puppet.

**Table 911: The following properties appear at Puppet Properties**

<table>
<thead>
<tr>
<th>Property Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.puppet.use_sudo</td>
<td>Perform commands on the Puppet Master using elevated (sudo) privileges.</td>
</tr>
<tr>
<td>puppet.cmdb_ci.fqdn_field</td>
<td>The name of the field that contains the fully-qualified domain name of the Puppet node.</td>
</tr>
</tbody>
</table>

**Legacy: Puppet scripted Web Services**

Scripted Web Services installed with Puppet.

**Table 912: Scripted Web Services**

<table>
<thead>
<tr>
<th>Web Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PuppetENC</td>
<td>Serves as an endpoint for a Puppet Master to use the instance as the external node classifier (ENC).</td>
</tr>
</tbody>
</table>

**Legacy: Puppet user groups**

User groups installed with Puppet.
Table 913: User Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet Users</td>
<td>Grants the Puppet User role.</td>
</tr>
<tr>
<td>Puppet Administrators</td>
<td>Grants the Puppet administrator role.</td>
</tr>
</tbody>
</table>

Legacy: Puppet user roles
User roles installed with Puppet.

Table 914: User Roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet User [puppet_user]</td>
<td>Can assign node definitions to Puppet nodes and request changes to existing node definition assignments.</td>
</tr>
<tr>
<td>Puppet Administrator [puppet_admin]</td>
<td>Can create and modify node definition records, and perform all Puppet User actions.</td>
</tr>
</tbody>
</table>

Legacy: Define Puppet credentials
The user account on the Puppet Master server must have rights to run Puppet and view all Puppet files.
Role required: puppet_admin
Before the instance can communicate with Puppet, an administrator must define a credential record for a user on a Puppet Master server. See the official Puppet role documentation for more information about setting up users on the Puppet server.

1. Navigate to Orchestration Credentials.
2. Click New.
3. Select the credential Type appropriate for the Puppet Master server.
4. Enter the User name and Password for a user on the Puppet Master server. This user must have rights on the Puppet Master server to run Puppet and view all Puppet files.
5. [Optional] Select Specific MID Servers from the Applies to field, and select the MID Server that has access to the Puppet Master.
6. Click Submit.

Legacy: Modify the external node classifier script
Puppet uses an external node classifier (ENC) Python script to determine which node definitions to use.
Role required: puppet_admin
The instance provides a version of the script that identifies the instance as an external node classifier. An administrator can enable a Puppet Master to use the script.

1. Navigate to Puppet ENC Scripts.
2. Select snc_enc.py. Alternatively, select snc_enc_with_proxy.py to send puppet requests through a proxy server.
3. [Optional] Modify the Script to use your existing node classifications. A history of modifications to the script appears in the Versions related list.
   To use an outside source for node definitions, modify the default enc.py script to use your existing configuration information.
4. Click Download.
5. Use a text editor to edit the downloaded `snc_enc.py` file to include your instance name as well as the Puppet user credentials.

Do not add the credentials to the script before downloading a copy. Adding credentials before downloading the script poses a security risk.

6. Configure the Puppet Master to use the new `snc_enc.py` file as the external node classifier script.

For more information, see the Puppet Labs external node documentation.

Figure 424: Puppet ENC Script

Legacy: Puppet key concepts

Puppet uses these concepts:

- Puppet node: A computer that runs the Puppet agent service. The ServiceNow product supports managing Puppet nodes on Linux computers.
- Puppet Master: A computer that runs the Puppet Master service. A Puppet Master can install and configure software on a Puppet node, serving the configuration catalogs to the Puppet agents that run on each client node.
- Resource: A building block that describes an aspect of a system, such as a file, a user, a service that must be running, or a package that must be installed.
- Class: A collection of Puppet resources. A class can be treated as a single logical unit and can be applied to an agent by way of a node definition. You cannot create class records in the instance, but must discover this content from a Puppet Master.
- Manifest: A file that contains resource declarations such as classes, variables, and defined types. Manifests are written in the Puppet language and have a .pp file extension. You cannot create manifest records in the instance, but must discover the content from a Puppet Master.
- Module: A self-contained bundle of Puppet code and data. Pre-built modules are available that can provide a wide array of functionality. A single module can describe, for instance, an entire web...
application. Modules are the highest-level resource available with Puppet. You cannot create module records in the instance, but must discover this content from a Puppet Master.

- **Node definition**: A collection of classes. A node definition specifies which classes should apply to a Puppet node.
- **External node classifier (ENC)**: A source of Puppet node configurations separate from the Puppet Master. The instance provides an External Node Classifier Script (ENC) that you can modify and run from a Puppet Master to use the instance as an external node classifier.

*Legacy: Node definitions*

Chef and Puppet management configurations use node definitions to group all configuration items to be applied to a group of nodes. A node definition is called a configuration template in ServiceNow Provider.

Node definitions allow you to automate the process of maintaining machines by applying a single definition to multiple machines.

The Node Definitions form lists and allows you to edit node definitions.

*Legacy: Use Puppet*

Puppet users can request changes to a Linux computer configuration item (CI) assigned to them. Puppet change management ensures that requested changes go through a controlled change process that includes approvals.

Role required: puppet_user or puppet_admin

After a change is approved and the requesting user proceeds with the change, the Puppet Master modifies the computer to bring it to the desired state.

The instance can store data about several Puppet resource types including modules, manifests, classes, and nodes.

Puppet module, manifest, and class records are maintained in Puppet and can be viewed in the instance. A Puppet administrator can retrieve these records from a Puppet Master. It is not necessary to activate Discovery to discover the Puppet environment.

1. Navigate to Puppet Puppet Masters.
2. Click New.
3. In the Puppet Master form, enter the Name of the Puppet Master and the IP Address of the host computer.
4. Right-click the form header and select Save.
5. Click Discover Puppet Details under Related Links.
   - The instance detects the Puppet Master and completes the remaining fields in the form.
   - The instance discovers the Puppet modules, manifests, and classes, and creates records for them in the respective tables.
You can configure an instance to discover Puppet modules, manifests, and classes based on a schedule.

Role required: puppet_admin

1. Navigate to Puppet Puppet Masters.
2. Select a Puppet Master record.
3. In the Scheduled discoveries related list, click New.
5. [Optional] Select Conditional and specify a scripted Condition that must evaluate to true before the scheduled discovery can run.
6. Click Submit.
Legacy: Managing Puppet nodes

A Puppet administrator can directly configure Puppet settings for a specific node from the CI form.

To view a list of CIs assigned to the logged-in user that use Puppet configuration automation, navigate to Configuration Automation Managed Nodes. By default, a Puppet user cannot directly modify the Puppet fields on the CI form, and must request changes through a controlled change process. These fields appear on the Configuration Automation related list of the CI form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully qualified domain name</td>
<td>FQDN that Puppet uses to access this CI.</td>
</tr>
<tr>
<td>Provider</td>
<td>Configuration Automation provider managing this CI.</td>
</tr>
<tr>
<td>Management Server</td>
<td>Server managing this CI.</td>
</tr>
<tr>
<td>Node definition</td>
<td>Node definition for this CI.</td>
</tr>
<tr>
<td>Node Attributes</td>
<td>CI-level attributes defined for this CI.</td>
</tr>
</tbody>
</table>

Legacy: Create a Puppet node definition

A node definition groups several classes together.

Role required: puppet_admin

A Puppet administrator must create a node definition before a Puppet user can assign it to Puppet nodes. When a Puppet user assigns a node definition to a Puppet node, the Puppet node uses the classes specified by the node definition.

To create a new node definition, create an editable node definition draft and then publish the draft.

1. Navigate to Puppet Node Definitions.
2. Click New Draft.
3. Fill in and then save the form.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider</td>
<td>[Read-only] The configuration automation provider for this definition.</td>
</tr>
<tr>
<td>Inherits</td>
<td>[Optional] The parent node definition that contains class declarations to be inherited.</td>
</tr>
<tr>
<td>Puppet master</td>
<td>The Puppet Master that manages the nodes that use this node definition.</td>
</tr>
<tr>
<td>State</td>
<td>[Read-only] The state of the node definition: Draft or Published.</td>
</tr>
<tr>
<td>Environment</td>
<td>[Optional] An additional parameter that allows you to group Puppet nodes. See Puppet Environments documentation for more information.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Replaces</td>
<td>[Read-only] For node definition draft records, the original node definition record that the draft replaces when published.</td>
</tr>
<tr>
<td>Change request</td>
<td>[Read-only] The change request generated when the draft is published.</td>
</tr>
</tbody>
</table>

4. Click Publish.

Legacy: Declaring classes with Puppet

A node definition may have Class Declaration related records.

Class declarations associate a Class record to a Node definition. You can add class declarations only to draft node definition.

The Type selection specifies how Puppet nodes that use this node definition should handle the class. Available Type choices are:

- Exclude: removes the specified class from the node definition if previously included by a parent node definition. If the parent node definition does not include the class, the Exclude choice has no effect.
- Include: adds the specified class to Puppet nodes that use this node definition.
- Override: uses the class Parameters from the declared class in place of the existing parameters for that class in the parent node definition. If the parent node definition does not include the class, the Override choice functions as Include.

For node definitions that extend a parent node definition, the Exclude and Override choices remove or update classes defined by the parent node definition. node definitions that do not extend another node definition can only Include classes.

![Figure 426: Puppet class declaration](Image)

Legacy: Edit CI-level attributes

Editing CI-level attributes overrides the attributes for a specific CI. For example, if you have applied a node definition to several CIs but want to modify an individual CI to use a different timezone, you can add the attribute for that CI.

Role required: admin

1. Navigate to Configuration Automation Managed Nodes or Configuration Servers Linux.
2. Select a server and then click the Configuration Automation related list.
3. Edit the attributes as necessary and then click Update.

Legacy: Using change management with Puppet
By default, the system allows changes to Puppet configurations only as part of a controlled change management process.

With change management, users cannot directly edit Puppet records such as node definitions or the relationships between CIs and node definitions. For all changes to Puppet resources, the requesting user’s manager must approve the request. If the user record does not have a value in the Manager field, the request is approved automatically.

When a user requests a change, each change management approver and the requesting user receive a notification. Additionally, the system populates the Assigned to field on the change request with the requesting user. This user receives a notification when the request is approved or rejected.

Legacy: Modify a Puppet node
Change management prevents Puppet users from directly editing the Configuration automation or Node definition fields on the CI form.

Role required: puppet_admin

A Puppet administrator can directly configure Puppet settings for a specific node from the CI form. To view a list of CIs that use Puppet configuration automation and are assigned to the logged-in user, navigate to Configuration Automation Managed Nodes. By default, a Puppet user cannot directly modify the Puppet fields on the CI form, and must request changes through a controlled change process.

**Note:** Updates to a CI reset the Node group assignment state to Ready. The Ready state ensures that assignment rules are applied and that the CIs are re-assigned based on the new values. For example, updating fqdn or IP address might reassign a CI to a different node group.

1. Navigate to Configuration Automation Managed Nodes or Configuration Servers Linux.
2. Open the node to update.
3. Edit the fields under the Configuration Automation related list.

### Table 917: CI form

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully qualified domain name</td>
<td>The fully qualified domain name that Puppet uses to access this CI.</td>
</tr>
<tr>
<td>Provider</td>
<td>The configuration automation provider managing this CI.</td>
</tr>
<tr>
<td>Management Server</td>
<td>The server managing this CI.</td>
</tr>
<tr>
<td>Node group assignment state</td>
<td>The state of automatic assignment of this CI to a node group, as described in the following table.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready</td>
<td>Default state for newly discovered CIs. Assignment rules are applied only to CIs in the Ready state.</td>
</tr>
<tr>
<td>In Progress</td>
<td>CI is currently experiencing a configuration change.</td>
</tr>
<tr>
<td>Assigned</td>
<td>CI is part of one or more node groups.</td>
</tr>
<tr>
<td>Processed</td>
<td>Assignment rules have been applied to the CI. There may or may not be a match.</td>
</tr>
<tr>
<td>State</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Excluded</td>
<td>Configuration admin role can exclude a CI from being processed by the assignment rules.</td>
</tr>
</tbody>
</table>

4. Click Update.

Legacy: Modify a Puppet node definition

The Checkout Draft related link on the Puppet Node Definitions form creates an editable draft copy of the record.

Role required: puppet_admin

Before a Puppet user or Puppet administrator can commit changes to a node definition, the user’s manager must approve the change request.

When making a change to a node with one or more class declarations, the system duplicates these related records and associates the duplicates with the new node definition draft record.

To update a node definition:

1. Navigate to Puppet Node Definitions.
2. Select a published node definition.
3. Click Checkout Draft.
   This step creates an editable copy of the current record as a draft and opens the form for the record.
4. Update the draft record as needed and then click Publish.
   • This related link creates a change request record. A draft can have only one active change request at a time.
   • After the requesting user's Manager approves the request, the Proceed with Change related link appears on the Puppet Node Definition Draft form.

After the user's manager approves the request:

1. Navigate to the relevant node definition draft record.
2. Click Proceed with Change to push the changes to the original node definition record and delete the draft record.

Legacy: Request a change to Puppet using the service catalog

A user can request a change to a Puppet node through the service catalog. Changes to nodes through the service catalog require the same change request and approvals as changes made through the CI form.

Role required: puppet_user or puppet_admin

1. Navigate to Self-Service Service Catalog.
2. Click Software.
3. Click Modify computer configuration.
4. Select a Computer to modify.
   Only computers Assigned to the requesting user can be selected.
5. Select Puppet for the Configuration automation provider.
6. Select the Node definition to apply to the selected computer.
7. Click Order Now.

Legacy: Disable change management
Disabling change management with the Chef, Puppet, or ServiceNow provider allows users to make and save changes on the definition forms and templates and the Configuration Automation section of the CI form.

Role required: puppet_admin or chef_admin

1. Navigate to one of the following:
   - Chef Properties
   - Puppet Properties
   - Configuration Automation Properties

2. Separately disable change management for either or both of the properties that are associated with the provider:

   Table 918: Disabling change management

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable change management to control updates to node definitions (node definitions) [glide.config_auto.chef.node_definition.use_change]</td>
<td>Disable this property for Chef</td>
</tr>
<tr>
<td>Enable change management to control assignments of Chef definitions to CIs [glide.config_auto.chef.ci_assignment_use_change]</td>
<td>Disable this property for Chef</td>
</tr>
<tr>
<td>Enable change management to control updates to node definitions (node definitions) [glide.node_definition_use_change]</td>
<td>Disable this property for Puppet</td>
</tr>
<tr>
<td>Enable change management to control assignments of definitions to CIs [glide.ci_assignment_use_change]</td>
<td>Disable this property for Puppet</td>
</tr>
<tr>
<td>Enable change management to control updates to node definitions (node definitions)</td>
<td>Disable this property for ServiceNow provider</td>
</tr>
<tr>
<td>Enable change management to control updates to CI</td>
<td>Disable this property for ServiceNow provider</td>
</tr>
</tbody>
</table>

Legacy: Using Puppet with cloud management

By using both Puppet and Cloud Management, you can automate the entire provisioning process including installing software packages on provisioned virtual machines.

Using this automation, you can offer fully-configured virtual machines through the service catalog.

You must activate and configure both Puppet and VMware for Cloud Provisioning before performing the procedures on this page.

Legacy: Offer a virtual machine with the Puppet agent

All Puppet nodes require the Puppet agent service to communicate with the Puppet Master.

Role required: puppet_admin

To provision and configure virtual machines with Puppet, create a Linux virtual machine template that includes the Puppet agent software. After creating the template, create a catalog item for a Linux virtual
machine using that template. See the VMware template documentation for information on creating a virtual machine template.

1. Provision a virtual machine in vCenter with a name that identifies it as a Puppet node.
   You can use the instance to provision the virtual machine, or use vCenter to provision the virtual machine manually.
2. Install the Puppet agent software on the new virtual machine.
   Refer to the Puppet documentation for more information on installing the Puppet agent.
3. Create a user account on the virtual machine with permission to run Puppet. There must be a credential record for this user within the instance.
4. In vCenter, mark this virtual machine as an available template.
5. Discover the template to add it to the list of available virtual machine templates.
   The instance cannot detect whether the Puppet agent is included with a template. It is the responsibility of the vCenter administrator to ensure this template has the Puppet agent installed.

Create a Puppet virtual machine catalog item

Create a catalog item using a virtual machine template.

Role required: puppet_admin

1. On the VMware Catalog Item form, select Guest customization to display the Customization specification field.
2. [Required] Select a Customization specification.
3. Click Update.

Figure 427: Puppet Vmware Catalog Item

Legacy: Provision a virtual machine with Puppet

The procedure for ordering a virtual machine with Puppet is the same as for ordering a standard virtual machine through the service catalog.

Provisioning a virtual machine with Puppet does not add the virtual machine information as a virtual machine CI. Instead, the instance records the new CI as a Linux server.
Completing Provisioning Tasks

A cloud operator must complete the provisioning task generated by the catalog request to provision the virtual machine. To provision a virtual machine with Puppet, ensure that:

• Guest customization is set to Yes.
• Node definition is set to a node definition.

Authenticating New Puppet Virtual Machines

When provisioning a new virtual machine with Puppet, the Puppet Master can authenticate and configure the virtual machine. Provisioning a new virtual machine with Puppet bypasses the standard Puppet approval process, only cloud provisioning approvals are required.

After the virtual machine has been provisioned, the Puppet agent included on the virtual machine attempts to retrieve configuration information from the Puppet Master. If the Puppet agent and Puppet Master successfully communicate, the Puppet agent configures the virtual machine without further user interaction according to the node definition assigned to the virtual machine.

Legacy: Orchestration Puppet activities
Several Orchestration activities are available for managing Puppet configurations.

Legacy: Determine Puppet activity result values
Puppet activities communicate with a Puppet Master through a MID Server.

When a Puppet activity sends a request, the MID Server sends a response to the ECC queue. All Puppet activities set their activity.result value based on the response payload from the MID Server. If this payload contains an error, the activity result value is failure. If the payload contains no error, the activity result value is success.

Legacy: Puppet activity: Install Module
The Install Module activity installs a module to a Puppet Master or puppet node.

This activity implements the behavior detailed by the puppet-module Install action.

Table 919: Input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master or node you want to install the module to. A Puppet Master must have a module before it can push that module to individual puppet nodes.</td>
</tr>
<tr>
<td>Module name</td>
<td>The name of the module you want to install. Enter module names using the format provider/module name, such as puppetlabs/apache. You can find a list of module names by viewing your module repository.</td>
</tr>
<tr>
<td>Version</td>
<td>The version of the module you want to install, in the format #.#.#, such as 0.0.3. Leave this field blank to install the latest available version of the module.</td>
</tr>
<tr>
<td>Module path</td>
<td>The directory path you want to install the module to. This path can be any location on the puppet node.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
Module repository | The repository that contains the module you want to install. For example, you can access the Puppet Forge repository at forge.puppetlabs.com.
Ignore dependencies | Option to have this activity not attempt to install dependencies along with the specified module. For example, when installing the apache package, if you select Ignore Dependencies, ServiceNow does not install the stdlib or firewall package dependencies.
Force | Option for overwriting any existing module with the same Module name.

Legacy: Puppet activity: Uninstall Module Puppet
The Uninstall Module activity removes a specified module from a Puppet Master or Puppet node.
This activity implements the behavior detailed by the puppet-module Uninstall action.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master or node you want to uninstall the module from.</td>
</tr>
<tr>
<td>Module name</td>
<td>The name of the module you want to uninstall. Enter module names using the format provider/module name.</td>
</tr>
<tr>
<td>Version</td>
<td>The version of the module you want to uninstall. Leave this field blank to uninstall the latest version of the module.</td>
</tr>
<tr>
<td>Module path</td>
<td>The directory path of the module you want to uninstall.</td>
</tr>
<tr>
<td>Force</td>
<td>The option to uninstall the specified module even if doing so causes dependency issues on the Puppet Master or node.</td>
</tr>
</tbody>
</table>

Legacy: Puppet activity: Sign Puppet Node
The Sign Puppet Node activity signs the certificate request for a Puppet node.
Use this activity to allow a Puppet Master to recognize a certificate from a Puppet node.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master that should manage the Puppet node.</td>
</tr>
<tr>
<td>Node FQDN</td>
<td>The fully qualified domain name of the Puppet node whose certificate the Puppet Master needs.</td>
</tr>
</tbody>
</table>
Legacy: Puppet activity: Get Manifests

The Get Manifests activity retrieves a list of the manifests that are part of the installed modules on a Puppet Master or node.

When successful, the activity stores the manifests as a JavaScript array called puppetManifests. Access this JavaScript array in the sensor script by calling the puppetManifests variable. The activity does not add this variable to the workflow scratchpad.

Each object in the array contains:
- basename: the name of the manifest file.
- path: the path where the manifest is installed.
- content: full textual content of the manifest file.
- classes: JavaScript array of the classes in the manifest. Each class has these fields:
  - name: name of the class.
  - inherits: name of the class that this class inherits, or blank if the class does not inherit anything.
  - params: JavaScript array of the input parameters this class takes. Each parameter has these fields:
    - name: the parameter's name.
    - defaultValue: the parameter's default value, or blank if there is no default value.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of Puppet Master you want to retrieve manifests from.</td>
</tr>
<tr>
<td>Sensor script</td>
<td>JavaScript that runs after the command executed by the activity completes. Use this script to process any data returned by the command.</td>
</tr>
</tbody>
</table>

Legacy: Puppet activity: Get Modules

The Get Modules activity retrieves a list of the modules that are installed on a Puppet Master or Puppet node.

When successful, the activity stores the modules as a JavaScript array called puppetModules. Access this JavaScript array in the sensor script by calling the puppetModules variable. The activity does not add this variable to the workflow scratchpad.

Each object in the array contains these fields:
- name: the name of the installed module.
- path: the path where the module is installed.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master that contains the module you want to retrieve.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
Sensor script | JavaScript that runs after the command executed by the activity completes. You can use this script to process any data returned by the command.

Legacy: Puppet activity: Get Node Certificates

The Get Node Certificates activity retrieves a list of the node certificates that are signed, requested, or revoked for a Puppet Master.

When successful, the activity stores the certificates as a JavaScript array called puppetNodeCerts. Access this JavaScript array in the sensor script by calling the puppetNodeCerts variable. The activity does not add this variable to the workflow scratchpad. Each object contains the arrays signed, revoked, and requested.

Each array contains these fields:
- hostname: the hostname of the node making the request.
- cert_line: the full text returned by the Puppet Master for each node.

Table 924: Input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master that has pending certificate requests you want to retrieve.</td>
</tr>
<tr>
<td>Sensor script</td>
<td>JavaScript that runs after the command executed by the activity completes. You can use this script to process any data returned by the command.</td>
</tr>
</tbody>
</table>

Legacy: Puppet activity: Get Properties

The Get Properties activity retrieves configuration properties from a Puppet Master or Puppet node.

When successful, the activity stores the configuration properties as a JavaScript array of name-value pairs called puppetProperties. Access this JavaScript array in the sensor script by calling the puppetProperties variable. The activity does not add this variable to the workflow scratchpad.

Table 925: Input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puppet master</td>
<td>The IP address of the Puppet Master that has the properties you want to retrieve.</td>
</tr>
<tr>
<td>Sensor script</td>
<td>JavaScript that runs after the command executed by the activity completes. You can use this script to process any data returned by the command.</td>
</tr>
</tbody>
</table>

Legacy: Change Manager script include

The CfgAutoChangeManager script include provides methods for defining a configuration automation change manager.
Implement the methods described here to customize a configuration automation provider or define a new provider.

**Where To Use**

Use this script include to define a custom configuration automation change manager.

**Method Summary**

To use this script include, implement the following methods.

<table>
<thead>
<tr>
<th>Return Type</th>
<th>Method Summary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>boolean</td>
<td>isAuthorized(GlideRecord record)</td>
<td>Tests if the current user can create or update changes that are associated with the passed record.</td>
</tr>
<tr>
<td>boolean</td>
<td>isChangeRequired()</td>
<td>Tests if change management is required by checking the property for the configuration automation provider.</td>
</tr>
<tr>
<td>String</td>
<td>getChangeId(GlideRecord current)</td>
<td>Returns the change request ID associated with the passed current record. If change management is required, a change record must be associated with the resource to be changed.</td>
</tr>
<tr>
<td>void</td>
<td>setChangeId(GlideRecord record, String changeId)</td>
<td>Associates the passed change request ID with the passed record.</td>
</tr>
<tr>
<td>GlideRecord</td>
<td>prepare(GlideRecord record)</td>
<td>Prepares the upcoming changes. This method is called before the change execution.</td>
</tr>
<tr>
<td>void</td>
<td>finalizeChange(GlideRecord record)</td>
<td>Finishes the change process. This method is called before the change request is closed. Anything that needs to be done before the change request closes goes here.</td>
</tr>
<tr>
<td>void</td>
<td>getWorkflowVariables(String workflowName, GlideRecord record)</td>
<td>Returns the variables that the workflow consumes. Even if you do not need to use a workflow, implement this function and return an &quot;undefined&quot; value.</td>
</tr>
<tr>
<td>Return Type</td>
<td>Method Summary</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Object</td>
<td>getPushWorkflowName()</td>
<td>If a workflow is required by the provider, returns the master workflow name. Even if you do not need to use a workflow, implement this function and return an &quot;undefined&quot; value.</td>
</tr>
<tr>
<td>void</td>
<td>cleanupAfterCancelChange(GlideRecord)</td>
<td>Cleans up any resource or data when a change is canceled. This method is called after the change request is canceled.</td>
</tr>
</tbody>
</table>

**Legacy: Method Detail**

**isAuthorized(GlideRecord record)**

Determines if the user is authorized to make changes.

**Input Fields**

Parameters:

- record - (GlideRecord) The current record.

**Output Fields**

Returns: (boolean) true if the user is authorized to make changes.

**Example**

```javascript
isAuthorized : function (current ) { return gs. hasRole ( 'chef_admin' ) ; }```

**isChangeRequired()**

Determines if change management is required.

**Input Fields**

Parameters:

- None

**Output Fields**

Returns: (boolean) true if change management is required; otherwise, false.
**Example**

```javascript
isChangeRequired: function () { return gs.getProperty ('glide.config_auto.chef.node_definition.use_change') == 'true'; }
```

**getChangeId(GlideRecord current)**

Returns the change ID associated with the passed current record. If change management is required, a change record must be associated with the resource to be changed.

**Input Fields**

Parameters:

- `current` - (GlideRecord) The current record.

**Output Fields**

Returns: (String) the Change ID.

**Example**

```javascript
getChangeId : function (current ) {
    if (JSUtil.nil (current ) ) return null ;
    if ( !current. instanceOf ('node_definition' )) { return null ; }
    return current [ 'change' ];
}
```

**setChangeId(GlideRecord record, String changeld)**

Associates the passed change request ID with the passed record.

**Input Fields**

Parameters:

- `record` (GlideRecord) The current record.
- `changeld` (String) The Change Request ID.

**Output Fields**

Returns: void
Example

```javascript
setChangeId : function (current, changeId) {
    if (JSUtil.nil(current)) return;
    current['change'] = changeId;
    current.update();
}
```

**prepare(GlideRecord record)**

Prepares the changes. This method is called before the execution of the changes.

**Input Fields**

Parameters:
- record - (GlideRecord) The current node definition draft record.

**Output Fields**

Returns: (GlideRecord) the current node definition draft record.

Example

```javascript
prepare : function (current) {
    var change = current.cfg_auto_change;
    if (JSUtil.notNull(change)) {
        var phaseList = new ChoiceList('cfg_auto_change', 'phase');
        var gr = new GlideRecord('cfg_auto_change');
        gr.get(change.sys_id);
        gr.setValue('phase', phaseList.getValue(this.IN_PROGRESS));
        gr.update();
    }
    return current;
}
```

**finalizeChange(GlideRecord record)**

Finishes the change process. This method is called before the change request is closed. Anything that needs to be done before the change request closes goes here.

**Input Fields**

Parameters:
- record - (GlideRecord) The current node definition draft record.
Output Fields

Returns: void

Example

finalizeChange : function (current) {
    var changeId = current.cfg_auto_change.sys_id;
    //Update current node definition from requested
    var changeGr = new GlideRecord('cfg_auto_change');
    changeGr.get(changeId);
    current.fqdn = changeGr.fqdn;
    current.cfg_auto_provider = changeGr.provider;
    current.cfg_auto_management_server = changeGr.management_server;
    current.node_definition = changeGr.node_definition;
    current.update();
    ...
}

getWorkflowVariables(String workflowName, GlideRecord record)

If a workflow is required by the provider, returns the variables that the workflow consumes. Even if you do not need to use a workflow, implement this function and return an "undefined" value.

Input Fields

Parameters:
• workflowName - (String) The workflow name.
• record - (GlideRecord) The current record.

Output Fields

Returns: (Object) the workflow variables.

Example

getWorkflowVariables : function (wfName, nodeDefGr) {
    var wfVars = { 'u_node_def_id' : nodeDefGr.getValue('sys_id') };
    return wfName === 'Deploy Chef Change Master' ? wfVars : {};
}

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getPushWorkflowName()

If a workflow is required by the provider, returns the master workflow name. Even if you do not need to use a workflow, implement this function and return an "undefined" value.

Input Fields

Parameters:
• None

Output Fields

Returns: (String) The workflow name.

Example

getPushWorkflowName : function ( ) { return 'Deploy Chef Change Master' ; }

cleanupAfterCancelChange(GlideRecord record)

Cleans up any resource or data if a change is canceled. This method is called after the change request is canceled.

Input Fields

Parameters:
• record - (GlideRecord) The node definition draft record.

Output Fields

Returns: void

Example

cleanupAfterCancelChange : function (nodeDefDraftGr ) { 
    new Workflow ( ). cancel (nodeDefDraftGr ) ; // cancel the flows against our extended table
    nodeDefDraftGr. change = '' ;
    nodeDefDraftGr. update ( ) ; }

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.

What is installed

- Password Reset 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 1702.
- 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 1680.

Next steps

Plan and configure the Password Reset processes for your organization. See the Password Reset admin guide on page 1695.

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>
</tbody>
</table>

Note: Plugins are activated in two batches each business day in the Pacific timezone, 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

Any information that would be helpful for the ServiceNow personnel activating the plugin such as if you need the plugin activated at a specific time instead of during one of the default activation windows.

3. Click Submit.

Installed with Password Reset

Tables, roles, business rules, scripts, and workflows are installed with the Password Reset application.

<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 have selected while going through the enrollment process.</td>
</tr>
<tr>
<td>[pwd_active_answer]</td>
<td></td>
</tr>
<tr>
<td>Password Reset Active Question</td>
<td>Security questions that users have 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 have been 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>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</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 Identification Type</td>
<td>Password Reset identification types that are available.</td>
</tr>
<tr>
<td>[pwd_identification_type]</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 SMS Verification Code</td>
<td>SMS verification codes that have been 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 [password_reset_admin]</td>
<td>Configures and maintains Password Reset and Password Change.</td>
</tr>
<tr>
<td>service desk agent [password_reset_service_desk]</td>
<td>Resets passwords on behalf of users, tracks password reset requests, and views logs.</td>
</tr>
<tr>
<td>credentials manager [password_reset_credential_manager]</td>
<td>Determines which credential stores are valid for use with Password Reset.</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>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 min ver</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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Deactivate process with no verification</td>
<td>Password Reset Process Verification</td>
<td>Deactivates the process if the verifications associated with it are removed.</td>
</tr>
<tr>
<td></td>
<td>[pwd_map_proc_to_verification]</td>
<td></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>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>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>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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Credential Store Types</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td></td>
<td>[pwd_cred_store_type]</td>
<td></td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Verification Type</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_type]</td>
<td></td>
</tr>
<tr>
<td>Security Questions Param Validation</td>
<td>Password Reset Verification Param</td>
<td>Checks for valid parameters in security question verifications.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_param]</td>
<td></td>
</tr>
<tr>
<td>Send SMS code</td>
<td>Password Reset Device Enrollment Code</td>
<td>Sends an enrollment code to a device.</td>
</tr>
<tr>
<td></td>
<td>[pwd_dvc_enrollment_code]</td>
<td></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</td>
<td>Sends out SMS authentication code via Notify if the Notify plugin is active.</td>
</tr>
<tr>
<td></td>
<td>[pwd_sms_code]</td>
<td></td>
</tr>
<tr>
<td>Single credential store per process</td>
<td>Password Reset Process Credential Store</td>
<td>Prevents having more than one credential store per process.</td>
</tr>
<tr>
<td></td>
<td>[pwd_map_proc_to_credential_store]</td>
<td></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>Update action based on access</td>
<td>Password Reset Desktop Access Log [pwd_access_log]</td>
<td>Updates the &quot;action&quot; field of this log record based on the access control conditions.</td>
</tr>
<tr>
<td>conditions</td>
<td></td>
<td></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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Validate Pwd Extension Type Name</td>
<td>Password Reset Extension Type</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_extension_type]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Identification Type Name</td>
<td>Password Reset Identification Type</td>
<td>Enforces the name to be unique and not empty.</td>
</tr>
<tr>
<td></td>
<td>[pwd_identification_type]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Process Name</td>
<td>Password Reset Process</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_process]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Verification Name</td>
<td>Password Reset Verification</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Verification Type Name</td>
<td>Password Reset Verification Type</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_type]</td>
<td></td>
</tr>
<tr>
<td>Validate Security Question</td>
<td>Password Reset Question</td>
<td>Validates rules for security questions such as no duplicates or empty questions.</td>
</tr>
<tr>
<td></td>
<td>[pwd_question]</td>
<td></td>
</tr>
<tr>
<td>Verify Account Lookup Script</td>
<td>Password Reset Credential Store</td>
<td>Checks whether the account lookup script has the correctly named function.</td>
</tr>
<tr>
<td></td>
<td>[pwd_cred_store]</td>
<td></td>
</tr>
<tr>
<td>VerifyAutoEnroll</td>
<td>Password Reset Verification Type</td>
<td>Checks whether auto-enroll is selected and ensures that an enrollment check script is provided.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_type]</td>
<td></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>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>$pwd_enroll_questions_ui</td>
<td>UI for question and answer security validation enrollment.</td>
</tr>
<tr>
<td>$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>
</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:

```xml
<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_questions_ui</td>
<td>JavaScript code for the $pwd_enroll_questions_ui UI macro.</td>
</tr>
<tr>
<td>$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>$pwd_enrollment_submit_event</td>
<td>UI script for an enrollment submission event.</td>
</tr>
<tr>
<td>$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>
<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>Workflow</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</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 928: 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>Pwd Connection Test - Remote SN</td>
<td>Tests connection to a remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

Table 929: 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 930: 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 931: 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>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 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>
</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 932: 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/ init</td>
<td>v1</td>
<td>Initial request to establish session, write logs, and fetch UI messages.</td>
</tr>
<tr>
<td>pwd_identify</td>
<td>/api/now/v1/pwd_reset/ identify</td>
<td>v1</td>
<td>Get identification page components.</td>
</tr>
<tr>
<td>pwd_verify</td>
<td>/api/now/v1/pwd_reset/ verify</td>
<td>v1</td>
<td>Get verification page components.</td>
</tr>
<tr>
<td>pwd_new</td>
<td>/api/now/v1/pwd_reset/ reset</td>
<td>v1</td>
<td>Get resetting password page components.</td>
</tr>
<tr>
<td>pwd_success</td>
<td>/api/now/v1/pwd_reset/ success</td>
<td>v1</td>
<td>Get success page components.</td>
</tr>
<tr>
<td>pwd_failure</td>
<td>/api/now/v1/pwd_reset/ failure</td>
<td>v1</td>
<td>Get failure page components.</td>
</tr>
</tbody>
</table>

### Password Reset Windows Application

If a user forgets the password or is locked out of a Windows computer, the user can 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](https://knowledge.dialthru.com). 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 or Password Change process on page 1701.
- The Password strength indicator is not supported. See Configure and test the Password Reset connection to a credential store on page 1704.
- For some verification types, you can use only one verification. Custom verifications are not supported. See Password Reset verifications on page 1708 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 and test the Password Reset connection to a credential store on page 1704.

**Password Reset Windows Application installation requirements**

You must activate the Password Reset Orchestration Add-on plugin to use the Password Reset Windows Application.
### Requirement

**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.

**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)

**Required software**

<table>
<thead>
<tr>
<th>Version of Password Reset Windows Application</th>
<th>Microsoft .NET Framework</th>
<th>Microsoft Visual C++ Redistributable Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9, 3.2, and earlier</td>
<td>4.5.2 and newer</td>
<td>2013</td>
</tr>
<tr>
<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.
- The ServiceNow SHA certificate must not be blocked by the corporate network. Information on the ServerCertificateSHA256 file appears in the documentation for Password Reset Windows Application.
- 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 CAPTCHA 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. (The user had earlier 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 texted to a mobile device — the SMS 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 1691.

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.

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 1698

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.

- 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. Understand how groups and roles differ in their 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. Consider 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. Consider 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. Consider 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?

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.

Overview of the Password Reset application

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.
Elements of a password reset process

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.
- Process tables include a sys-overrides column on business rules, UI actions, and so on.
- The Password Reset application is built using Orchestration. Orchestration does not fully support domain separation.

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.
Configure your Password Reset or Password Change process

To implement the process, you configure credentials, verifications, and users.

Role required: password_reset_admin or admin

1. Be sure to Plan your Password Reset processes on page 1698.
2. Create the credential store record for user names 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.

   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 (extension script includes) that verify the identity of the requesting user and that enable the service desk agents to authorize reset of the password.

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 and/or the Password change check box.
5. Specify the Apply to all users setting.

<table>
<thead>
<tr>
<th><strong>Apply to all users setting</strong></th>
<th><strong>Result</strong></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. If you selected Password Reset, fill in the Password Reset Details tab and, optionally, the Advanced tab. See Settings on the Password Reset Details tab on page 1711 and Settings on the Password Reset ‘Advanced’ tab on page 1717.

7. Save the form. The form refreshes and additional related lists appear.

8. From the Password Reset Process Verifications related list, select one or more verifications. See Password Reset verifications on page 1708.

9. 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.

10. 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.

11. Click Update.

12. 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 [sys_user] table 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.

**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.

**Credential store types**

A credential store type is a set of workflows that specify how to connect to a credential store. The base system includes example credential store types that you can use as models to create custom 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 Orchestration add-on.</td>
</tr>
<tr>
<td>Remote (SOAP) ServiceNow instance</td>
<td>Represents a remote ServiceNow instance. Installed with the Orchestration add-on.</td>
</tr>
</tbody>
</table>

**Connection workflows for credential store types**

A credential store type 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 428: 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 1728.

Configure and test the Password Reset connection to a credential store

You specify a credential store to access during the Password Reset or Password Change process and configure other settings that control the process.

Role required: password_reset_admin or password_reset_credential_manager

| Note: | The Password Reset Windows Application supports only Active Directory (AD) credential stores. |

1. Navigate to Password Reset Credential Stores.
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.

<table>
<thead>
<tr>
<th>Type</th>
<th>You can use credential store types (templates that provide a desired set of capabilities). Credential stores inherit the functionality of the credential store type.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Note: The Password Reset Windows Application supports only AD Credential Store.</td>
</tr>
</tbody>
</table>

Installed credential store types:

- Local ServiceNow Instance installed with Password Reset.
- AD Credential Store installed with the Orchestration Add-on.
- Remote (SOAP) ServiceNow installed with the Orchestration Add-on.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-generate password</td>
<td>Script include that generates a temporary password for use during the reset process.</td>
</tr>
<tr>
<td>Note</td>
<td>If you select the Enforce history policy check box, then you must specify a value for Auto-generate password.</td>
</tr>
<tr>
<td>Enforce history policy</td>
<td>Note: This option appears only if you select a credential store Type of AD Credential Store. To enforce the history policy that is configured for the credential store:</td>
</tr>
<tr>
<td></td>
<td>1. Select the Enforce history policy check box.</td>
</tr>
<tr>
<td></td>
<td>2. Follow the procedure that appears after this table.</td>
</tr>
<tr>
<td>Note</td>
<td>Active Directory domains can be configured to include a history policy that ensures that users do not reuse passwords.</td>
</tr>
<tr>
<td></td>
<td>For example, the history policy might be configured to not allow the user to reuse any of the previous three passwords when resetting a password.</td>
</tr>
<tr>
<td>Hostname</td>
<td>URL or IP address of the credential store that contains the user credential (for example, user names and passwords).</td>
</tr>
<tr>
<td>User account lookup</td>
<td>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.</td>
</tr>
<tr>
<td>Password rule hint</td>
<td>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>Note</td>
<td>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>Client script that validates the 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>Note</td>
<td>The Password Reset Windows Application does not support Password Strength.</td>
</tr>
</tbody>
</table>
3. Click Submit.
   The connection is created. 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.

If you selected the Enforce history policy check box, then follow these steps:

1. Open the associated Password Reset process definition: Password Reset Processes.

2. On the Details tab of the Password Reset Process form, clear the Auto-generate password check box and then save the process definition.

3. On the domain controller, set Password Aging (MIN_PASSWORD_AGE) to zero.

4. On the domain controller, set the history policy to twice the desired number of passwords. For example, to enforce that the last three passwords are not repeated, set the history policy to six.

**Note:** To enforce the history policy that is configured for the credential store, the system auto-generates a new temporary password for each reset cycle. The system auto-generates the temporary password even though you have 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.

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.

Configure Password Reset for Active Directory
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.

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 and then complete the form with the following values for the credential.
   • Type: Select Windows.
   • User name: Enter your Active Directory domain user. For example, domain\admin.
   • Password: Enter your Active Directory domain user password.
   • Applies to: Select the MID Server that is used to access the Active Directory server.
5. Click Submit.
6. Create a credential store for Active Directory.

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).

<table>
<thead>
<tr>
<th>Table 934: Password Reset verifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA verification</td>
</tr>
</tbody>
</table>
| 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.  
  This verification is based on the Security Questions verification type.  
  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 1764. |
| SMS verification                       |
| Implements a self-service or service desk-assisted Password Reset model that relies on auto-generated code numbers. This verification is based on the SMS Code verification type.  
  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 1764. |
| Personal Data — Confirm Email Address  |
| 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. |
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].

**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>Label that the user sees during the password reset request.</td>
</tr>
<tr>
<td></td>
<td>Data Type: string</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Data Type: string</td>
</tr>
<tr>
<td></td>
<td>Default Value: n/a</td>
</tr>
</tbody>
</table>

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

**Note:** The Password Reset Windows Application does not support custom identification types.

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.

<table>
<thead>
<tr>
<th>Identification field label</th>
<th>Text to display as a label for the Identification field.</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.

SMS Code Verification type for Password Reset
Using the Simple Message Service (SMS) Code Verification type, a user can verify identity through 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 enters the code on the password reset 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.
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 ServiceNow NotifyNow (via Twilio SMS Messaging). 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/
2. Activate the Notify plugin.
3. Associate the Twilio account with Notify.

No other configuration is required. Users who request password change or reset receive SMS codes through NotifyNow.

Settings on the Password Reset Details tab

The settings define the user experience when resetting or changing a password.

The Password Reset Details tab appears when you are configuring a Password Reset process (Password Reset Processes).

### Table 935: SMS Code Verification type parameters

<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.</td>
</tr>
<tr>
<td></td>
<td>Data Type: integer (any positive integer)</td>
</tr>
<tr>
<td></td>
<td>Default Value: 5</td>
</tr>
<tr>
<td>complexity</td>
<td>Number of digits in the numerical verification code.</td>
</tr>
<tr>
<td></td>
<td>Data Type: integer (any positive integer)</td>
</tr>
<tr>
<td></td>
<td>Default Value: 4</td>
</tr>
<tr>
<td>pause_window</td>
<td>Number of minutes before the user can request another SMS code for verification.</td>
</tr>
<tr>
<td></td>
<td>Data Type: integer (any positive integer)</td>
</tr>
<tr>
<td></td>
<td>Default Value: 2</td>
</tr>
<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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Public access</td>
<td>The check box is available only when Password reset is selected.</td>
</tr>
<tr>
<td></td>
<td>• Clear the check box to define a service desk-assisted process in which only service desk agents and not users can reset a password.</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>Public URL</td>
<td>This 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=default.</td>
</tr>
<tr>
<td>URL suffix</td>
<td>This 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>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Display CAPTCHA</td>
<td>This 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 Configure Google reCAPTCHA on page 1716. Note: The Password Reset Windows Application uses the base-system CAPTCHA service even if the Password Reset application is configured to use Google reCAPTCHA. To use the CAPTCHA service that is provided with the base system, change the password_reset.captcha.google.enabled system property to false. Note: Because on-premises instances do not have access to the Internet, they cannot use the Google reCAPTCHA service. Set the password_reset.captcha.google.enabled property to false for on-premises instances.</td>
</tr>
<tr>
<td>Identification type</td>
<td>Method that the user employs to claim their 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 Personal data identification types and confirmation type verifications on page 1709.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Minimum verifications</td>
<td>Number of verifications that a user must successfully submit to reset the password. 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. By default during the password reset process, the system presents optional verifications to the user based on the Order values for the verifications. <strong>Note:</strong> Each user must submit all mandatory verifications regardless of the number specified.</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. <strong>Note:</strong> See Self-service Password Reset process: overview for an outline of the process that is enabled by default.</td>
</tr>
<tr>
<td>Enable account unlock</td>
<td>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. <strong>Note:</strong> Not supported by the default self-service Password Reset process.</td>
</tr>
<tr>
<td>Unlock user account</td>
<td>Select the check box to unlock user accounts on credential stores after a password reset.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Auto-generate password | This check box is available only when:  
  • The Password reset check box is selected.  
  • The Email Password Reset URL check box is not selected  
  
  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.  
  
  **Note:** Clear the check box to enable the Enforce history policy option for a credential store. See `Configure and test the Password Reset connection to a credential store` on page 1704. |
| User must reset password | 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.  
  
  **Note:** 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. |
| Display password    | 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. |
Field | Description
--- | ---
Email password | 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.

Related lists

Verifications | This related list is available only after the record has been saved.
One or more verifications that the process uses. See Password Reset verifications on page 1708.

Groups | The Groups related list is available only after the record has been saved and if the Apply to all users check box is cleared.
ServiceNow user groups to associate with the Password Reset process.

Configure Google reCAPTCHA

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. The process described in this topic is optional for instances that are running on the service-now.com domain.

Role required: admin

Note:

Because on-premises instances do not have access to the Internet, they cannot use the Google reCAPTCHA service. Do not follow the process 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>System 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>
</tbody>
</table>
Settings on the Password Reset 'Advanced' tab

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 937: 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 scripts on page 1748.</td>
</tr>
</tbody>
</table>

Configure the required strength for passwords

The password that a user defines must meet certain requirements — it must contain at least eight 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 password. The default requirements for a new password are:

- At least eight characters
- At least one uppercase and one lower case letter
- At least one numeral
Note: This topic describes the procedure for configuring password strength requirements only. You can configure several other settings for the credential store, as described in Configure and test the Password Reset connection to a credential store on page 1704.

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>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password rule hint</td>
<td>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>Note:</td>
<td>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 Client script</td>
<td>Client script that validates the 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>Note:</td>
<td>The Password Reset Windows Application does not support Password Strength.</td>
</tr>
</tbody>
</table>
Strength rule: This text box appears only if you select Enable Password Strength.

Note: The Password Reset Windows Application does not support Password Strength.

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.

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.

Configure the number of questions for a 'Security Questions' verification

When designing a Security Questions verification for Password Reset, you can specify the number of questions to display when users enroll and the number to display when a user requests password reset.

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 938: 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 security questions that are displayed while a user is enrolling for Password Reset. 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 while a user is attempting to reset the password. The questions are selected at random and are presented in random order. 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 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 three 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 five and seven.

Note: The following properties affect Password Reset, but do not appear on the Password Reset Properties page:

- 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.
- 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.

1. Navigate to Password Reset Properties.
2. Update settings as needed and then click Save.
### Table 939: Password Reset properties

<table>
<thead>
<tr>
<th>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset Global properties</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Workflow polling frequency | password_reset.wf.refresh_rate | Time period in milliseconds between checks on status of the workflow.  
- Type: integer  
- Default value: 500 |
| Workflow expiration | password_reset.wf.timeout | Maximum wait time in milliseconds for the workflow to complete. The workflow is triggered during the password reset request when the user clicks Submit.  
- Type: integer  
- Default value: 90000 |
| Disable CAPTCHA validation functionality | password_reset.captcha.ignore | Enables or disables CAPTCHA functionality.  
- Type: true|false  
- Default value: false  

The Password Reset application uses Google reCAPTCHA 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 | | |
| Number of unsuccessful attempts allowed to reset/change password | password_reset.request.max_attempts | Number of password reset attempts a user has before they are locked out for a period determined by the value in max_attempt_window.  
- Type: integer  
- Default value: 3 (attempts) |
<table>
<thead>
<tr>
<th>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of minutes a user must wait to reset/change password after exceeding the maximum allowed unsuccessful attempts | password_reset.request.max_attempt_window | Time period that users are blocked or prevented from changing their passwords after trying the maximum number of times.  
• Type: integer  
• Default value: 1440 (minutes) |
| Number of minutes a user must wait to reset/change password after the last successful reset/change | password_reset.request.success_window | Time period that a user must wait after successfully resetting the password to reset the password again.  
• Type: integer  
• Default value: 1440 (minutes) |
| 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 that a user is allowed to perform the Password Reset process.  
• Type: integer  
• Default value: 10 (minutes) |

<table>
<thead>
<tr>
<th>Password Reset Security Question properties</th>
<th>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>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of security questions required during the password reset request | `password_reset.qa.num_reset` | Number of questions that a user must answer to verify identity during the Password Reset process.  
- Type: integer  
- Default value: 3 (questions)  
- Possible values: Integers that are less than the number specified for the `num_enroll` property.  
  
  **Note:** You can override this security question property by adding the `num_reset` parameter in the security question verification. |
| Number of security questions required during enrollment | `password_reset.qa.num_enroll` | During the enrollment process, the number of questions that a user must answer to be enrolled in the Password Reset program.  
- Type: integer  
- Default value: 5 (questions)  
  
  **Note:** You can override this security question property by adding the `num_enroll` parameter in the security question verification. |

Password Reset SMS Code properties
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>password_reset.sms.max_per_day</code></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 10 (per day)</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can override this SMS code property by adding the <code>max_per_day</code> parameter in the SMS code verification.</td>
</tr>
<tr>
<td><code>password_reset.sms.pause_window</code></td>
<td>Time that must pass before another SMS code can be sent to a user.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 2 (minutes)</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> You can override this SMS code property by adding the <code>pause_window</code> parameter in the SMS code verification.</td>
</tr>
<tr>
<td><code>password_reset.sms.default_complexity</code></td>
<td>Number of characters required for a user to reset their password.</td>
</tr>
<tr>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td>• Default value: 4 (digits)</td>
</tr>
<tr>
<td></td>
<td>You can override this SMS code property by adding the complexity parameter in the SMS code verification.</td>
</tr>
</tbody>
</table>
### Text on the Password Reset properties page

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of minutes before the SMS code expires | 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Time interval, in minutes, for counting blocked users | Time window to count the number of blocked users.  
• Type: integer  
• Default value: 60 (minutes)  

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of blocked users, in the defined time interval, that triggers a system log event | Number of blocked (or locked) users, within the specified time window, that triggers a system log event.  
• Type: integer  
• Default value: 10 (blocked users) |

---

**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.

### 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).
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.

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.

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 1747.
   Extension scripts 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 or Password Change process on page 1701.
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 1728.
   • Verification types: Define new types for how users are verified. See Create a custom Password Reset verification type on page 1734.
   • Identification types: Define new types for how users can identify themselves. See Create a custom identification type for Password Reset on page 1710.

Add a custom question to the Security Questions verification

To enroll for the ‘Security Questions’ verification, the user selects several questions and supplies 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 default language is English, and you can create a custom question in a non-English language. If you create the appropriate non-English language questions, then the questions appear in the language that the user requested during login.

1. Navigate to Password Reset Security Questions and then click New.
2. Enter the English language question in the Security question field and then click Submit.
   The question appears in the Translations related list.
3. To add the same question in another language, complete the following steps.
   a) Click the English language question to translate.
      Note: Do not change the Language value for the default questions that come with the base system.
   b) On the Password Reset Question page, in the Translations related list, click New.
c) Select the language in the Language field.
d) Enter the non-English text in the Security question field.
e) Click Submit.

The question appears in the Translations related list on the Password Reset Question page. If a user selects the language while logging in, then the verification question appears in that language.

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 940: 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 2600. For installed workflows, see Installed with Password Reset on page 1681.</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 1681.</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 2600. For installed workflows, see Installed with Password Reset on page 1681.</td>
</tr>
</tbody>
</table>
Unlock user workflow

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 1681.

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<table>
<thead>
<tr>
<th>Verification Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Data Verification Type</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>
<td>Note: The Password Reset Windows Application allows you to define and use multiple verifications of the Personal Data type. See <em>Personal data identification types and confirmation type verifications</em> on page 1709.</td>
</tr>
<tr>
<td>Security Questions Verification Type</td>
<td>Verifies user identity by presenting personal security questions that the user must answer correctly.</td>
<td>Note: The Password Reset and Password Reset Windows Application support only a single verification of the Security Questions type. See <em>Add a custom question to the Security Questions verification</em> on page 1727.</td>
</tr>
<tr>
<td>SMS Code Verification Type</td>
<td>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.</td>
<td>Note: The Password Reset and Password Reset Windows Application support only a single verification of the SMS Code type. See <em>SMS Code Verification type for Password Reset</em> on page 1710.</td>
</tr>
<tr>
<td>Mock Verification Type</td>
<td>Not a functional identity verification. Demonstrates how to add a verification type in a Password Reset process.</td>
<td>Note: The Password Reset Windows Application does not support the Mock verification type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The enrollment UI macro for this verification gets the user input and returns the entered value in the enrollment processor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Password Reset UI macro for this verification gets input from the user and returns the entered value through the verification processor.</td>
</tr>
</tbody>
</table>

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>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create verifications based on one of the verification types in the base system.</td>
<td>Password Reset supports the following types. You can create multiple instances of any type.</td>
</tr>
<tr>
<td>• Personal Data Confirmation Verification</td>
<td></td>
</tr>
<tr>
<td>• Personal Data Verification</td>
<td></td>
</tr>
<tr>
<td>• Security Question Verification</td>
<td></td>
</tr>
<tr>
<td>• SMS Code Verification</td>
<td></td>
</tr>
<tr>
<td>The Password Reset Windows Application supports the following types:</td>
<td></td>
</tr>
<tr>
<td>• Personal Data Verification. You can create only a single instance.</td>
<td></td>
</tr>
<tr>
<td>• Security Question Verification. You can create multiple instances.</td>
<td></td>
</tr>
<tr>
<td>• SMS Code Verification. You can create only a single instance.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position of the verification as it appears on the Enrollment form and Password Reset form.</td>
</tr>
</tbody>
</table>

| Password Reset Verification Parameters | 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 default specified in the Password Reset properties. |
|                                        | 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.

Verification type components

You can configure the Password Reset app to enroll users in the Password Reset process automatically, or you can define an enrollment check.

To define an enrollment check, you must define:

- An enrollment processor script, which specifies how enrollment is processed
- A corresponding enrollment UI macro, which specifies how the enrollment information is displayed to the user

The following example uses PwdEnrollISMSProcessor as the enrollment processor script and pwd_enroll_sms_ui as the enrollment UI macro.
A verification type must also define a verification processor script and a corresponding verification UI macro. The example uses `PwdVerifySMSProcessor` as the verification processor script and `pwd_verify_sms_ui` as the verification UI macro. The following shows the verification processor script:
Figure 431: Verification type SMS processor

The following is the corresponding UI macro:
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.

Verification type components
You can configure the Password Reset app to enroll users in the Password Reset process automatically, or you can define an enrollment check.

To define an enrollment check, you must define:

- An enrollment processor script, which specifies how enrollment is processed
- A corresponding enrollment UI macro, which specifies how the enrollment information is displayed to the user

The following example uses PwdEnrollISMSProcessor as the enrollment processor script and pwd_enroll_sms_ui as the enrollment UI macro.
A verification type must also define a verification processor script and a corresponding verification UI macro. The example uses `PwdVerifySMSProcessor` as the verification processor script and `pwd_verify_sms_ui` as the verification UI macro. The following shows the verification processor script:
Figure 434: Verification type SMS processor

The following is the corresponding UI macro:
Password Reset script includes
The Password Reset plugin adds several Password Reset script includes. Use the base-system script includes as they are or call custom extension scripts at the provided extension points.

Figure 435: Verification type SMS UI macro
Extension scripts 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).

**'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>Provides a default check that always returns true.</td>
</tr>
<tr>
<td>PwdMockIsEnrolled</td>
<td>Provides an example check 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]).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdDefaultAutoGenPassword</td>
<td>Generates a password from a random word and 4 digits.</td>
</tr>
</tbody>
</table>
'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>')`.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdVerifyPersonalDataConfirmationProcess</td>
<td>Verifies that the user accepts the answer.</td>
</tr>
<tr>
<td>PwdVerifyPersonalDataProcessor</td>
<td>Verifies that the user's answers match the expected data in the system.</td>
</tr>
<tr>
<td>PwdVerifyQuestionsProcessor</td>
<td>Provides question and answer verification of user input on the second page of the verification form.</td>
</tr>
<tr>
<td>PwdVerifySimpleProcessor</td>
<td>Provides simple verification of user input on the second page of the verification form.</td>
</tr>
<tr>
<td>PwdVerifySMSProcessor</td>
<td>Provides SMS verification of user input on the second page of the verification form.</td>
</tr>
</tbody>
</table>

'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.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdPostProcessor</td>
<td>Executes actions after the process completes for success, failure, or both conditions.</td>
</tr>
</tbody>
</table>

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.
// 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);

// Simple helper to return the sys-id for a given extension script
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.' + category + '\\');
    gr.query();
    if (gr.next()) {
        result = gr.getValue('sys_id');
    }
    return result;
}

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 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>
        <...>
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 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!

  /*
   * Process the identification form request, and returns the user's sys_id. if user was not identified return null.
   *
   * @param 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 using: request.getParameter('<element-id>')
   * Supported request parameters:
   *   sysparm_user_id - the user identifier value entered in the form.
   * @return The sys-id of the user that corresponds to the requested input; if no user was found, null should be returned.
   */
  processForm: function(params, request) {
    return request.getParameter('sysparm_user_id') + '_' + params.processId;
  },

type: 'SampleIdentificationProcessorExtension'
}]]></script>
  </sys_script_include>
</sys_script_include>
</record_update>
Use the process and processForm extensions

This example shows a script that uses two sample extensions, one process extension and one processForm extension.

```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(identificationExtensionSysId);

// 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();
  request.setParameter('sysparm_user_id', 'joe.employee');
var userIdentity =
  identificationExtension.processForm(params, request);
gs.print('identity: ' + userIdentity);
```

---

```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>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!
}]]></script></sys_script_include></record_update>
```
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/**********
* 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'

processForm function:

```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.&#13;
Returns the sys-id of the user that corresponds to the requested input; if no user was found, null should be returned.&#13;</description><![CDATA[var SampleIdentificationProcessorExtension =Class.create();
SampleIdentificationProcessorExtension.prototype={
category:'password_reset.extension.identification_form_processor',// DO NOT REMOVE THIS LINE!

/**********
* Process the identification form request, and returns the user's sys_id.
* if user was not identified return null.
*
* @param 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 using: request.getParameter('element-id')
*
* entered in the form.
```
Password Reset extension script categories

You can use a custom extension script to extend Password Reset functionality for credential store, verification, or identification types.

### 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 1748.

<table>
<thead>
<tr>
<th>Extension script category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enrollment check</strong></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><strong>Enrollment form processor</strong></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>
</tbody>
</table>
## Extension script category

<table>
<thead>
<tr>
<th>Extension script category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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!

    process : function (params) { return (params.userId && params.verificationId) ? true : false; },

    type : 'SampleEnrollmentCheck'
};
```

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### '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>
</table>
| Enrollment Form Processor | 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. | `process(params)` | 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 to be processed (table: `pwd_verification`).  
  - `request` - The form request object. Fields in the form can be accessed with `request.getParameter('<element-id>')`. | Returns: (boolean) true, if the user is enrolled in the specified verification; otherwise, false. |

The following information should be added to the state of the enrollment process:

- `gs.getSession().setProperty("result.status", status)` - Whether the user was successfully enrolled.
- `gs.getSession().setProperty("result.message", message)` - An associated message to be returned to the UI, such as a detailed error message.
- `gs.getSession().setProperty("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;
    },

    type: 'SampleEnrollmentProcessor'
};
```

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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:

```java
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;
        var sysparm_user_id = request.getParameter('sysparm_user_id');

        gr = new GlideRecord('sys_user');
        gr.addQuery('user_name', sysparm_user_id);
        gr.runQuery()
        sysId = gr.sys_id;
        return sysId;
    }
};
```
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></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• params.processId</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>
</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() { },

    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>
<tbody>
<tr>
<td>User Account Lookup</td>
<td>Gets the credential store account ID for a given user.</td>
<td>process(params)</td>
<td>Parameters: - params.userId - The sys_id of the user being checked (table: sys_user).</td>
<td>Returns: (String) the credential store account ID for the given user.</td>
</tr>
</tbody>
</table>

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; // returns the credential store account ID for a given user.
    },

    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>Returns: (boolean)</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>true, if the user is verified; otherwise, false.</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>

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!

    // Process the verification form request, and return whether the user was successfully verified.
    // This is a sample verification processor returns true only if the user sent "ok" in the input field;
    // otherwise, it returns false.

    processForm : function(params, request)
    {
        return request.getParameter('element-id') == 'ok';
    }
};
```

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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 for a user

In a service desk-assisted Password Reset process, service desk agents with the password_reset_service_desk role reset user passwords. Users do not 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 Settings on the Password Reset Details tab on page 1711.

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.

_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>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>The user whose password is being reset or changed.</td>
</tr>
<tr>
<td>Process</td>
<td>The process that implements this password reset request.</td>
</tr>
<tr>
<td>Type</td>
<td>The 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 agent.</td>
</tr>
<tr>
<td></td>
<td>• Self Service: Requesting user opened the reset request.</td>
</tr>
<tr>
<td>Action Type</td>
<td>The 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 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>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>The 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>The total number of times the user has attempted to complete a password reset request.</td>
</tr>
</tbody>
</table>

**Service desk: Unblock a Password Reset user**

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). 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.

Password Reset and Password Change reports

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 943: Password Reset reports

<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>The 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>Title</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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 have and have not enrolled in the password reset program. A large number for users who have 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>
<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 monitoring requirements, you could configure 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 monitoring requirements, you could configure 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>

*View log of failed login attempts*

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.

Role required: admin

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.

**Users: Enroll in the Password Reset program**

Some organizations auto-enroll users in a Password Reset program. Your organization could offer you the option to enroll for one or more methods of verifying your identity when you reset your password.
You 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.

**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.

---

**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.

Role required: none

**Note:** You cannot enroll on a mobile device.

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 1764

---

**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.

Role required: none

**Note:** You cannot enroll on a mobile device.

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 have verified 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 1764

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 have configured 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.

---

**Orchestration MID Servers**

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 [Specify MID Server applications](#) on page 1110 for instructions.

You can have MID Servers focus on different capabilities and separate sections of your network. See:

- [Configure an IP address range for the MID Server](#) on page 1111
- [MID Server capabilities](#) on page 1179

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](#) on page 1769.
Configure an IP address range for the MID Server

Configure an IP address range on the MID Server to limit the MID Server to work with only a specific set of IP ranges.

Role required: agent_admin or admin

Applications, such as Discovery and Orchestration, can specify an IP range or a specific IP address of a target. When the application looks for a MID Server to use during auto-selection, it chooses a MID Server that has corresponding IP range that includes the application's IP range or specific IP address. Applications also use other criteria, such as the MID Server supported application and capabilities. See MID Server selection on page 1106 for more information.

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. The MID server would need to have access to the IP ranges that the applications need for it to be actually used. The ALL IP range is new, starting with the Istanbul release.

Orchestrator

Use the IP address of the target machine (together with the capability) to select the correct MID Server for Orchestration activities. See the steps below to configure the IP address.

Service Mapping

Elects 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 also use this IP address range, starting with the Istanbul release. Discovery can also use the quick IP range that you specify in the Discovery schedule.

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
  - 0x0A0B909B
  - 0A0B909B

- An IP address range in dotted decimal or hexadecimal format. Here are examples:
  - 10.11.144.150-10.11.144.160
  - 0x0A0B9096-0x0A0B90A0
  - 10.11.144.150-0x0A0B90A0

- 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
  - 10.11.144.0/0xFFFFFF00
  - 0x0A0B9000/24
• 0xA0B9000/0xFFFF00

1. Navigate to MID Server IP Ranges.
2. Click New.
3. Fill out the form fields (see table).

<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>Type</td>
<td>Select the type of range:</td>
</tr>
<tr>
<td></td>
<td>• Include:</td>
</tr>
<tr>
<td></td>
<td>• Exclude: Exclude the IP address range.</td>
</tr>
<tr>
<td>Range</td>
<td>Enter the range in an valid format.</td>
</tr>
<tr>
<td>Related list</td>
<td>The MID Servers that can use this IP address range.</td>
</tr>
</tbody>
</table>

4. Click Save.

Open the ALL IP range and configure the MID Servers that you want to use with any set of IP addresses.

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 Sever 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.

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 Set a default MID Server for an application on page 1110 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.

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 437: How Orchestration uses probes

**Probe List**

The base system includes the following Orchestration probes (Orchestration Definition Probes).

<table>
<thead>
<tr>
<th><strong>Probe Name</strong></th>
<th><strong>ECC Queue Topic</strong></th>
<th><strong>ECC Queue Name</strong></th>
<th><strong>Description</strong></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>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>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>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>
</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. |

**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
What is installed

- Password Reset 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 1702.

- 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 1680.

Next steps

Plan and configure the Password Reset processes for your organization. See the Password Reset admin guide on page 1695.

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>
</tbody>
</table>

Note: Plugins are activated in two batches each business day in the Pacific timezone, 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

<table>
<thead>
<tr>
<th>Reason/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any information that would be helpful for the ServiceNow personnel activating the plugin such as 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.

#### Table 946: Password Reset tables

<table>
<thead>
<tr>
<th>Table name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset Active Answer [pwd_active_answer]</td>
<td>Security questions and associated answers, in an encrypted state, that users have selected while going through the enrollment process.</td>
</tr>
<tr>
<td>Password Reset Active Question [pwd_active_question]</td>
<td>Security questions that users have selected while going through the enrollment process.</td>
</tr>
<tr>
<td>Password Reset Activity Monitor [pwd_activity_monitor]</td>
<td>Password Reset lockout activity.</td>
</tr>
<tr>
<td>Password Reset Credential Store [pwd_cred_store]</td>
<td>Password Reset credential stores that are available.</td>
</tr>
<tr>
<td>Password Reset Credential Store Parameters [pwd_cred_store_param]</td>
<td>User-created credential store parameters.</td>
</tr>
<tr>
<td>Password Reset Credential Store Types [pwd_cred_store_type]</td>
<td>Password Reset credential store types that are available.</td>
</tr>
<tr>
<td>Password Reset Desktop Access Control [pwd_access_control]</td>
<td>Password Reset Windows Application access control.</td>
</tr>
<tr>
<td>Password Reset Desktop Access Log [pwd_access_log]</td>
<td>Password Reset Windows Application access logs.</td>
</tr>
<tr>
<td>Password Reset Device Enrollment Code [pwd_dvc_enrollment_code]</td>
<td>Device enrollment codes that have been sent to users during SMS code enrollment.</td>
</tr>
<tr>
<td>Password Reset Devices [pwd_device]</td>
<td>User SMS devices that are in a state of verified.</td>
</tr>
<tr>
<td>Table name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Password Reset Enrollment for Verification [pwd_enrollment]</td>
<td>Information about user enrollment by verification.</td>
</tr>
<tr>
<td>Password Reset Enrollment Snapshot [pwd_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>Password Reset Extension Type [pwd_extension_type]</td>
<td>Extension types that are available.</td>
</tr>
<tr>
<td>Password Reset Identification Type [pwd_identification_type]</td>
<td>Password Reset identification types that are available.</td>
</tr>
<tr>
<td>Password Reset Process [pwd_process]</td>
<td>Password Reset processes that are available.</td>
</tr>
<tr>
<td>Password Reset Process Credential Store [pwd_map_proc_to_cred_store]</td>
<td>Credential stores and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>Password Reset Process User Group [pwd_map_proc_to_group]</td>
<td>Groups and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>Password Reset Process Verification [pwd_map_proc_to_verification]</td>
<td>Verifications and the associated Password Reset processes that the application is using.</td>
</tr>
<tr>
<td>Password Reset Question [pwd_question]</td>
<td>Questions that the application uses for security question verifications.</td>
</tr>
<tr>
<td>Password Reset Request [pwd_reset_request]</td>
<td>Information about Password Reset requests.</td>
</tr>
<tr>
<td>Password Reset SMS Verification Code [pwd_sms_code]</td>
<td>SMS verification codes that have been sent to users for a password reset.</td>
</tr>
<tr>
<td>Password Reset User Lockout [pwd_user_lockout]</td>
<td>Users that are locked out of Password Reset.</td>
</tr>
<tr>
<td>Password Reset Verification [pwd_verification]</td>
<td>Verifications that are available.</td>
</tr>
<tr>
<td>Password Reset Verification Param [pwd_verification_param]</td>
<td>User-created verification parameters.</td>
</tr>
<tr>
<td>Password Reset Verification Type [pwd_verification_type]</td>
<td>Password Reset verification types that are available.</td>
</tr>
</tbody>
</table>
### Password Reset roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>password reset administrator [password_reset_admin]</td>
<td>Configures and maintains Password Reset and Password Change.</td>
</tr>
<tr>
<td>service desk agent [password_reset_service_desk]</td>
<td>Resets passwords on behalf of users, tracks password reset requests, and views logs.</td>
</tr>
<tr>
<td>credentials manager [password_reset_credential_manager]</td>
<td>Determines which credential stores are valid for use with Password Reset.</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>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 min ver</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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Deactivate process with no verification</td>
<td>Password Reset Process Verification</td>
<td>Deactivates the process if the verifications associated with it are removed.</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>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>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>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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Credential Store Types</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td></td>
<td>[pwd_cred_store_type]</td>
<td></td>
</tr>
<tr>
<td>Prevent against deletion when in use</td>
<td>Password Reset Verification Type</td>
<td>Prevents deletion when the type is in use.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_type]</td>
<td></td>
</tr>
<tr>
<td>Security Questions Param Validation</td>
<td>Password Reset Verification Param</td>
<td>Checks for valid parameters in security question verifications.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_param]</td>
<td></td>
</tr>
<tr>
<td>Send SMS code</td>
<td>Password Reset Device Enrollment Code</td>
<td>Sends an enrollment code to a device.</td>
</tr>
<tr>
<td></td>
<td>[pwd_dvc_enrollment_code]</td>
<td></td>
</tr>
<tr>
<td>Set new record flag</td>
<td>Password Reset Process</td>
<td>Sets a new record flag for the client to take appropriate action.</td>
</tr>
<tr>
<td></td>
<td>[pwd_process]</td>
<td></td>
</tr>
<tr>
<td>Send SMS Verification Code Via Notify</td>
<td>Password Reset SMS Verification Code</td>
<td>Sends out SMS authentication code via Notify if the Notify plugin is active.</td>
</tr>
<tr>
<td></td>
<td>[pwd_sms_code]</td>
<td></td>
</tr>
<tr>
<td>Single credential store per process</td>
<td>Password Reset Process</td>
<td>Prevents having more than one credential store per process.</td>
</tr>
<tr>
<td></td>
<td>Credential Store</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[pwd_map_proc_to_cred_store]</td>
<td></td>
</tr>
<tr>
<td>SMS Code Param Validation</td>
<td>Password Reset Verification Param</td>
<td>Checks for valid parameters in SMS code verifications.</td>
</tr>
<tr>
<td></td>
<td>[pwd_verification_param]</td>
<td></td>
</tr>
<tr>
<td>Update action based on access conditions</td>
<td>Password Reset Desktop Access Log</td>
<td>Updates the &quot;action&quot; field of this log record based on the access control</td>
</tr>
<tr>
<td></td>
<td>[pwd_access_log]</td>
<td>conditions.</td>
</tr>
<tr>
<td>Update proc_to_cred_store</td>
<td>Password Reset Process</td>
<td>Enforces a one-to-one relation between a Password Reset process and a</td>
</tr>
<tr>
<td></td>
<td>[pwd_process]</td>
<td>credential store.</td>
</tr>
<tr>
<td>Validate Process</td>
<td>Password Reset Process</td>
<td>Verifies that a Password Reset process is configured correctly.</td>
</tr>
<tr>
<td></td>
<td>[pwd_process]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Cred Store Name</td>
<td>Password Reset Credential Store</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_cred_store]</td>
<td></td>
</tr>
<tr>
<td>Validate Pwd Cred Store Type Name</td>
<td>Password Reset Credential Store Types</td>
<td>Enforces the name to be unique.</td>
</tr>
<tr>
<td></td>
<td>[pwd_cred_store_type]</td>
<td></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 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>VerifyAutoEnroll</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>
</tbody>
</table>
### Istanbul ServiceNow Now Platform Capabilities

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>$pwd_enroll_questions_ui</td>
<td>UI for question and answer security validation enrollment.</td>
</tr>
<tr>
<td>$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>
</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:

```xml
<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_questions_ui</td>
<td>JavaScript code for the $pwd_enroll_questions_ui UI macro.</td>
</tr>
<tr>
<td>$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>$pwd_enrollment_submit_event</td>
<td>UI script for an enrollment submission event.</td>
</tr>
<tr>
<td>$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 947: 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>Workflow</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------</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 948: 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>Pwd Connection Test - Remote SN</td>
<td>Tests connection to a remote(SOAP) ServiceNow instance.</td>
</tr>
</tbody>
</table>

**Table 949: 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 950: 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 951: 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>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 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>
</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 952: 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/init</td>
<td>v1</td>
<td>Initial request to establish session, write logs, and fetch UI messages.</td>
</tr>
<tr>
<td>pwd_identify</td>
<td>/api/now/v1/pwd_reset/identify</td>
<td>v1</td>
<td>Get identification page components.</td>
</tr>
<tr>
<td>pwd_verify</td>
<td>/api/now/v1/pwd_reset/verify</td>
<td>v1</td>
<td>Get verification page components.</td>
</tr>
<tr>
<td>pwd_new</td>
<td>/api/now/v1/pwd_reset/reset</td>
<td>v1</td>
<td>Get resetting password page components.</td>
</tr>
<tr>
<td>pwd_success</td>
<td>/api/now/v1/pwd_reset/success</td>
<td>v1</td>
<td>Get success page components.</td>
</tr>
<tr>
<td>pwd_failure</td>
<td>/api/now/v1/pwd_reset/failure</td>
<td>v1</td>
<td>Get failure page components.</td>
</tr>
</tbody>
</table>

Password Reset Windows Application

If a user forgets the password or is locked out of a Windows computer, the user can 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 or Password Change process on page 1701.
- The Password strength indicator is not supported. See Configure and test the Password Reset connection to a credential store on page 1704.
- For some verification types, you can use only one verification. Custom verifications are not supported. See Password Reset verifications on page 1708 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 and test the Password Reset connection to a credential store on page 1704.

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>
<tbody>
<tr>
<td>Required ServiceNow release</td>
<td>• Password Reset Windows Application version 2.X is supported on Helsinki and newer releases.</td>
</tr>
<tr>
<td></td>
<td>• Password Reset Windows Application version 3.X is supported on Kingston and newer releases.</td>
</tr>
<tr>
<td>Required hardware</td>
<td>• 1 GHz or faster processor</td>
</tr>
<tr>
<td></td>
<td>• 512 MB of RAM</td>
</tr>
<tr>
<td></td>
<td>• 10 MB of available hard disk space (x86)</td>
</tr>
<tr>
<td></td>
<td>• 10 MB of available hard disk space (x64)</td>
</tr>
<tr>
<td>Required software</td>
<td><strong>Version of Password Reset Windows Application</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Microsoft .NET Framework</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Microsoft Visual C++ Redistributable Package</strong></td>
</tr>
<tr>
<td>2.9, 3.2 and earlier</td>
<td>4.5.2 and newer</td>
</tr>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>2.10, 3.3</td>
<td>4.7.1 and newer</td>
</tr>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Supported operating systems</td>
<td>• Windows 7</td>
</tr>
<tr>
<td></td>
<td>• Windows 8.1</td>
</tr>
<tr>
<td></td>
<td>• Windows 10 Enterprise</td>
</tr>
<tr>
<td></td>
<td>• Windows 10 Pro</td>
</tr>
<tr>
<td>Supported processor architecture</td>
<td>• X86</td>
</tr>
<tr>
<td></td>
<td>• X64</td>
</tr>
<tr>
<td>Supported network architecture</td>
<td>• 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</td>
</tr>
<tr>
<td></td>
<td>• The ServiceNow SHA certificate must not be blocked by the corporate network. Information on the ServerCertificateSHA256 file appears in the documentation for Password Reset Windows Application.</td>
</tr>
<tr>
<td></td>
<td>• To reset an AD password, the client must be on the corporate network.</td>
</tr>
</tbody>
</table>
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 CAPTCHA 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. (The user had earlier 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 texted to a mobile device — the SMS 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 1691.

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.

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 1698

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.

• 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. Understand how groups and roles differ in their 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. Consider 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. Consider 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. Consider 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?

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.

Overview of the Password Reset application

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.
Elements of a password reset process

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.
- Process tables include a sys-overrides column on business rules, UI actions, and so on.
- The Password Reset application is built using Orchestration. Orchestration does not fully support domain separation.

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.
Configure your Password Reset or Password Change process

To implement the process, you configure credentials, verifications, and users.

Role required: password_reset_admin or admin

1. Be sure to Plan your Password Reset processes on page 1698.
2. Create the credential store record for user names 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.

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 (extension script includes) that verify the identity of the requesting user and that enable the service desk agents to authorize reset of the password.

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 and/or the Password change check box.
5. Specify the Apply to all users setting.

<table>
<thead>
<tr>
<th>Apply to all users setting</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. If you selected Password Reset, fill in the Password Reset Details tab and, optionally, the Advanced tab. See Settings on the Password Reset Details tab on page 1711 and Settings on the Password Reset 'Advanced' tab on page 1717.
7. Save the form. The form refreshes and additional related lists appear.
8. From the Password Reset Process Verifications related list, select one or more verifications. See Password Reset verifications on page 1708.
9. 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.

10. 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.

11. Click Update.

12. 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 [sys_user] table 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.

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.

Credential store types

A credential store type is a set of workflows that specify how to connect to a credential store. The base system includes example credential store types that you can use as models to create custom types.

Table 953: Credential store types installed with the base system

<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 Orchestration add-on.</td>
</tr>
<tr>
<td>Remote (SOAP) ServiceNow instance</td>
<td>Represents a remote ServiceNow instance. Installed with the Orchestration add-on.</td>
</tr>
</tbody>
</table>

Connection workflows for credential store types

A credential store type 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 438: 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 1728.

Configure and test the Password Reset connection to a credential store

You specify a credential store to access during the Password Reset or Password Change process and configure other settings that control the process.

Role required: password_reset_admin or password_reset_credential_manager

**Note:** The Password Reset Windows Application supports only Active Directory (AD) credential stores.

1. Navigate to Password Reset Credential Stores.
2. Click New, enter a unique and meaningful Name and Description, and then fill in the form.
### Type

You can use credential store types (templates that provide a desired set of capabilities). Credential stores inherit the functionality of the credential store type.

**Note:** The Password Reset Windows Application supports only AD Credential Store.

### Installed credential store types:

- Local ServiceNow Instance installed with Password Reset.
- AD Credential Store installed with the Orchestration Add-on.
- Remote (SOAP) ServiceNow installed with the Orchestration Add-on.

### Auto-generate password

Script include that generates a temporary password for use during the reset process.

**Note:** If you select the Enforce history policy check box, then you must specify a value for Auto-generate password.

### Enforce history policy

**Note:** This option appears only if you select a credential store Type of AD Credential Store.

To enforce the history policy that is configured for the credential store:

1. Select the Enforce history policy check box.
2. Follow the procedure that appears after this table.

**Note:** 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 three passwords when resetting a password.

### Hostname

URL or IP address of the credential store that contains the user credential (for example, user names and passwords).

### 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

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

Client script that validates the 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. |
|---|---

**Note:** The Password Reset Windows Application does not support Password Strength.

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.

3. Click Submit.
   The connection is created. 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.

If you selected the Enforce history policy check box, then follow these steps:

1. Open the associated Password Reset process definition: **Password Reset Processes**.
2. On the Details tab of the Password Reset Process form, clear the Auto-generate password check box and then save the process definition.
3. On the domain controller, set Password Aging (MIN_PASSWORD_AGE) to zero.
4. On the domain controller, set the history policy to twice the desired number of passwords. For example, to enforce that the last three passwords are not repeated, set the history policy to six.

Note: To enforce the history policy that is configured for the credential store, the system auto-generates a new temporary password for each reset cycle. The system auto-generates the temporary password even though you have 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.

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.

Configure Password Reset for Active Directory

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.

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 and then complete the form with the following values for the credential.
   - Type: Select Windows.
   - User name: Enter your Active Directory domain user. For example, domain\admin.
   - Password: Enter your Active Directory domain user password.
   - Applies to: Select the MID Server that is used to access the Active Directory server.
5. Click Submit.
6. Create a credential store for Active Directory.

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.

**Table 954: Password Reset verifications**

<table>
<thead>
<tr>
<th>Verification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA verification</td>
<td>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. This verification is based on the Security Questions verification type. 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 1764.</td>
</tr>
</tbody>
</table>
SMS verification

Implements a self-service or service desk-assisted Password Reset model that relies on auto-generated code numbers. This verification is based on the SMS Code verification type.

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 1764.

<table>
<thead>
<tr>
<th>Personal Data — Confirm Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<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>

<table>
<thead>
<tr>
<th>Personal Data — Enter UserName</th>
</tr>
</thead>
<tbody>
<tr>
<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 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].

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>Label that the user sees 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>

*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

*Note:* The Password Reset Windows Application does not support custom identification types.

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.

<table>
<thead>
<tr>
<th>Identification field label</th>
<th>Text to display as a label for the Identification field.</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.
SMS Code Verification type for Password Reset

Using the Simple Message Service (SMS) Code Verification type, a user can verify identity through 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 enters the code on the password reset 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 955: SMS Code Verification type parameters

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Description</th>
</tr>
</thead>
</table>
| expiry         | Number of minutes the verification code is valid.  
Data Type: integer (any positive integer)  
Default Value: 5 |
| complexity     | Number of digits in the numerical verification code.  
Data Type: integer (any positive integer)  
Default Value: 4 |
| pause_window   | Number of minutes before the user can request another SMS code for verification.  
Data Type: integer (any positive integer)  
Default Value: 2 |
| max_per_day    | Maximum number of codes sent for verification in one day.  
Data Type: integer (any positive integer)  
Default Value: 10 |

---

*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 ServiceNow NotifyNow (via Twilio SMS Messaging). 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 reset receive SMS codes through NotifyNow.
Settings on the Password Reset Details tab

The settings define the user experience when resetting or changing a password.

The Password Reset Details tab appears when you are configuring a Password Reset process (Password Reset Processes).

Table 956: Password Reset Details tab

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Public access | The check box is available only when Password reset is selected.  
• Clear the check box to define a service desk-assisted process in which only service desk agents and not users can reset a password.  
• 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. |
| Public URL  | This field is available only when Public access is selected.  
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=default. |
| URL suffix  | This field is available only when Public access is selected.  
Suffix used to create a unique URL for the Password Reset or Password Change form. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display CAPTCHA</td>
<td>This 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 Configure Google reCAPTCHA on page 1716. Note: The Password Reset Windows Application uses the base-system CAPTCHA service even if the Password Reset application is configured to use Google reCAPTCHA. To use the CAPTCHA service that is provided with the base system, change the password_reset.captcha.google.enabled system property to false. Note: Because on-premises instances do not have access to the Internet, they cannot use the Google reCAPTCHA service. Set the password_reset.captcha.google.enabled property to false for on-premises instances.</td>
</tr>
<tr>
<td>Identification type</td>
<td>Method that the user employs to claim their 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 Personal data identification types and confirmation type verifications on page 1709.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Minimum verifications</td>
<td>Number of verifications that a user must successfully submit to reset the password. 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. By default during the password reset process, the system presents optional verifications to the user based on the Order values for the verifications.</td>
</tr>
<tr>
<td>Note:</td>
<td>Each user must submit all mandatory verifications regardless of the number specified.</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>
<tr>
<td>Note:</td>
<td>See Self-service Password Reset process: overview for an outline of the process that is enabled by default.</td>
</tr>
<tr>
<td>Enable account unlock</td>
<td>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.</td>
</tr>
<tr>
<td>Note:</td>
<td>Not supported by the default self-service Password Reset process.</td>
</tr>
<tr>
<td>Unlock user account</td>
<td>Select the check box to unlock user accounts on credential stores after a password reset.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Auto-generate password</td>
<td>This check box is available only when:</td>
</tr>
<tr>
<td></td>
<td>• The Password reset check box is selected.</td>
</tr>
<tr>
<td></td>
<td>• The Email Password Reset URL check box is not selected</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Clear the check box to enable the Enforce history policy option for a credential store. See <em>Configure and test the Password Reset connection to a credential store</em> on page 1704.</td>
</tr>
<tr>
<td>User must reset password</td>
<td>This check box is available only when Auto-generate password is selected.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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>
</tbody>
</table>
### Configure Google reCAPTCHA

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. The process described in this topic is optional for instances that are running on the service-now.com domain.

**Role required:** admin

**Note:**

Because on-premises instances do not have access to the Internet, they cannot use the Google reCAPTCHA service. Do not follow the process 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>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| password_reset.captcha.google.enabled | Set to true.  
Type: string  
Default: true |
Istanbul   ServiceNow   Now Platform Capabilities

google.captcha.site_key
Set to the site key that Google provided.
Type: string
Default: A site key that Google provided to ServiceNow

google.captcha.secret
Set to the secret that Google provided.
Type: password2
Default: An encrypted secret that Google provided to ServiceNow

Settings on the Password Reset 'Advanced' tab
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 957: 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 scripts on page 1748.</td>
</tr>
</tbody>
</table>

Configure the required strength for passwords
The password that a user defines must meet certain requirements — it must contain at least eight 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 password. The default requirements for a new password are:
• At least eight characters
• At least one uppercase and one lower case letter
• At least one numeral
Note: This topic describes the procedure for configuring password strength requirements only. You can configure several other settings for the credential store, as described in Configure and test the Password Reset connection to a credential store on page 1704.

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>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password rule hint</td>
<td>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. <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 client</td>
<td>Client script that validates the 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>
</tbody>
</table>
| 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. |
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.

### Configure the number of questions for a 'Security Questions' verification

When designing a Security Questions verification for Password Reset, you can specify the number of questions to display when users enroll and the number to display when a user requests password reset.

**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 958: 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 security questions that are displayed while a user is enrolling for Password Reset. 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 while a user is attempting to reset the password. The questions are selected at random and are presented in random order. 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 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 three 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 five and seven.

**Note:** The following properties affect Password Reset, but do not appear on the Password Reset Properties page:

- 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.
- 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.

1. Navigate to Password Reset Properties.
2. Update settings as needed and then click Save.

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<table>
<thead>
<tr>
<th>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password Reset Global properties</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Workflow polling frequency | password_reset.wf.refresh_rate | Time period in milliseconds between checks on status of the workflow.  
  - Type: integer  
  - Default value: 500 |
| Workflow expiration | password_reset.wf.timeout | Maximum wait time in milliseconds for the workflow to complete. The workflow is triggered during the password reset request when the user clicks Submit.  
  - Type: integer  
  - Default value: 90000 |
| Disable CAPTCHA validation functionality | password_reset.captcha.ignore | Enables or disables CAPTCHA functionality.  
  - Type: true|false  
  - Default value: false  
  The Password Reset application uses Google reCAPTCHA 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 | | |
| Number of unsuccessful attempts allowed to reset/change password | password_reset.request.max_attempts | Number of password reset attempts a user has before they are locked out for a period determined by the value in max_attempt_window.  
  - Type: integer  
  - Default value: 3 (attempts) |
<table>
<thead>
<tr>
<th>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of minutes a user must wait to reset/change password after exceeding the maximum allowed unsuccessful attempts | `password_reset.request.max_attempt_window` | Time period that users are blocked or prevented from changing their passwords after trying the maximum number of times.  
  - Type: integer  
  - Default value: 1440 (minutes) |
| Number of minutes a user must wait to reset/change password after the last successful reset/change | `password_reset.request.success_window` | Time period that a user must wait after successfully resetting the password to reset the password again.  
  - Type: integer  
  - Default value: 1440 (minutes) |
| 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 that a user is allowed to perform the Password Reset process.  
  - Type: integer  
  - Default value: 10 (minutes) |

**Password Reset Security Question properties**

| 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>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number of security questions required during the password reset request                                   | password_reset.qa.num_reset                        | Number of questions that a user must answer to verify identity during the Password Reset process.  
• Type: integer  
• Default value: 3 (questions)  
• Possible values: Integers that are less than the number specified for the num_enroll property.  

**Note:** You can override this security question property by adding the num_reset parameter in the security question verification.                                                                                                                                                        |
| Number of security questions required during enrollment                                                 | password_reset.qa.num_enroll                       | During the enrollment process, the number of questions that a user must answer to be enrolled in the Password Reset program.  
• Type: integer  
• Default value: 5 (questions)  

**Note:** You can override this security question property by adding the num_enroll parameter in the security question verification.                                                                                                                                                        |
<p>| Password Reset SMS Code properties                                                                        |                                                    |                                                                                                                                                                                                                                                                                                                                             |</p>
<table>
<thead>
<tr>
<th>Text on the Password Reset properties page</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of SMS codes sent for verification per day</td>
<td>password_reset.sms.max_per_day</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 10 (per day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can override this SMS code property by adding the max_per_day parameter in the SMS code verification.</td>
</tr>
<tr>
<td>Number of minutes before the user can attempt to send another SMS code for verification</td>
<td>password_reset.sms.pause_window</td>
<td>Time that must pass before another SMS code can be sent to a user.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 2 (minutes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> You can override this SMS code property by adding the pause_window parameter in the SMS code verification.</td>
</tr>
<tr>
<td>Number of digits in the SMS code sent to the user</td>
<td>password_reset.sms.default_complexity</td>
<td>Number of characters required for a user to reset their password.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Type: integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default value: 4 (digits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can override this SMS code property by adding the complexity parameter in the SMS code verification.</td>
</tr>
<tr>
<td>Text on the Password Reset properties page</td>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</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. |

<table>
<thead>
<tr>
<th>Password Reset Monitoring and Reporting properties</th>
</tr>
</thead>
</table>
| 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) |

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.

<table>
<thead>
<tr>
<th>SNC User Lockout Check with Auto Unlock</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Uses the value of the glide.user.max_unlock_attempts property to set the limit for failed login attempts.</td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>SNC User Lockout Check</td>
<td>Tracks the number of failed login attempts and locks the user account after a specified number of failed login attempts (default: 5).</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SNC User Clear</td>
<td>Updates the user record after a successful login: Resets the number of failed login attempts and updates the date of the last login.</td>
</tr>
</tbody>
</table>

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.

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.

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 1747.

   Extension scripts 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 or Password Change process on page 1701.

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 1728.
   - Verification types: Define new types for how users are verified. See Create a custom Password Reset verification type on page 1734.
   - Identification types: Define new types for how users can identify themselves. See Create a custom identification type for Password Reset on page 1710.

Add a custom question to the Security Questions verification

To enroll for the 'Security Questions' verification, the user selects several questions and supplies 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 default language is English, and you can create a custom question in a non-English language. If you create the appropriate non-English language questions, then the questions appear in the language that the user requested during login.

1. Navigate to Password Reset Security Questions and then click New.
2. Enter the English language question in the Security question field and then click Submit. The question appears in the Translations related list.
3. To add the same question in another language, complete the following steps.
   a) Click the English language question to translate.
      
      **Note:** Do not change the Language value for the default questions that come with the base system.

   b) On the Password Reset Question page, in the Translations related list, click New.
   c) Select the language in the Language field.
   d) Enter the non-English text in the Security question field.
   e) Click Submit.

The question appears in the Translations related list on the Password Reset Question page. If a user selects the language while logging in, then the verification question appears in that language.

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.
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. Custom verifications might work, but you must test and verify.

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.
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

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 961: Verification types in the base system

<table>
<thead>
<tr>
<th>Verification Type</th>
<th>Description</th>
<th>Note</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Data Confirmation Verification Type</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>
<td>The Password Reset Windows Application does not support the Personal Data Confirmation Verification type.</td>
<td>Personal data identification types and confirmation type verifications on page 1709.</td>
</tr>
<tr>
<td>Personal Data Verification Type</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>
<td>The Password Reset Windows Application allows you to define and use multiple verifications of the Personal Data type.</td>
<td>Personal data identification types and confirmation type verifications on page 1709.</td>
</tr>
<tr>
<td>Security Questions Verification Type</td>
<td>Verifies user identity by presenting personal security questions that the user must answer correctly.</td>
<td>The Password Reset and Password Reset Windows Application support only a single verification of the Security Questions type.</td>
<td>Add a custom question to the Security Questions verification on page 1727.</td>
</tr>
<tr>
<td>SMS Code Verification Type</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note:</td>
<td>The Password Reset and Password Reset Windows Application support only a single verification of the SMS Code type.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See</td>
<td>SMS Code Verification type for Password Reset on page 1710.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mock Verification Type</th>
<th>Not a functional identity verification. Demonstrates how to add a verification type in a Password Reset process.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note:</td>
<td>The Password Reset Windows Application does not support the Mock verification type.</td>
</tr>
<tr>
<td></td>
<td>• The enrollment UI macro for this verification gets the user input and returns the entered value in the enrollment processor.</td>
</tr>
<tr>
<td></td>
<td>• The Password Reset UI macro for this verification gets input from the user and returns the entered value through the verification processor.</td>
</tr>
</tbody>
</table>

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>Type</th>
<th>Create verifications based on one of the verification types in the base system.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Password Reset supports the following types. You can create multiple instances of any type.</td>
</tr>
<tr>
<td></td>
<td>• Personal Data Confirmation Verification</td>
</tr>
<tr>
<td></td>
<td>• Personal Data Verification</td>
</tr>
<tr>
<td></td>
<td>• Security Question Verification</td>
</tr>
<tr>
<td></td>
<td>• SMS Code Verification</td>
</tr>
<tr>
<td></td>
<td>The Password Reset Windows Application supports the following types:</td>
</tr>
<tr>
<td></td>
<td>• Personal Data Verification. You can create only a single instance.</td>
</tr>
<tr>
<td></td>
<td>• Security Question Verification. You can create multiple instances.</td>
</tr>
<tr>
<td></td>
<td>• SMS Code Verification. You can create only a single instance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order</th>
<th>Position of the verification as it appears on the Enrollment form and Password Reset form.</th>
</tr>
</thead>
</table>

| Password Reset Verification Parameters | 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 default specified in the Password Reset properties. 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.

Verification type components

You can configure the Password Reset app to enroll users in the Password Reset process automatically, or you can define an enrollment check.

To define an enrollment check, you must define:

• An enrollment processor script, which specifies how enrollment is processed
• A corresponding enrollment UI macro, which specifies how the enrollment information is displayed to the user

The following example uses PwdEnrollSMSProcessor as the enrollment processor script and pwd_enroll_sms_ui as the enrollment UI macro.
A verification type must also define a verification processor script and a corresponding verification UI macro. The example uses PwdVerifySMSProcessor as the verification processor script and pwd_verify_sms_ui as the verification UI macro. The following shows the verification processor script:
**Figure 441: Verification type SMS processor**

The following is the corresponding UI macro:
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.

Figure 442: Verification type SMS UI macro
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.

Verification type components

You can configure the Password Reset app to enroll users in the Password Reset process automatically, or you can define an enrollment check.

To define an enrollment check, you must define:

- An enrollment processor script, which specifies how enrollment is processed
- A corresponding enrollment UI macro, which specifies how the enrollment information is displayed to the user

The following example uses PwdEnrollSMSProcessor as the enrollment processor script and pwd_enroll_sms_ui as the enrollment UI macro.
Figure 443: Verification type example

A verification type must also define a verification processor script and a corresponding verification UI macro. The example uses PwdVerifySMSProcessor as the verification processor script and pwd_verify_sms_ui as the verification UI macro. The following shows the verification processor script:
Figure 444: Verification type SMS processor

The following is the corresponding UI macro:
Password Reset script includes

The Password Reset plugin adds several Password Reset script includes. Use the base-system script includes as they are or call custom extension scripts at the provided extension points.
Extension scripts 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).

### '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>Provides a default check that always returns true.</td>
</tr>
<tr>
<td>PwdMockIsEnrolled</td>
<td>Provides an example check 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]).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdDefaultAutoGenPassword</td>
<td>Generates a password from a random word and 4 digits.</td>
</tr>
</tbody>
</table>
'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>")`.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdVerifyPersonalDataConfirmationProcess</td>
<td>Verifies that the user accepts the answer.</td>
</tr>
<tr>
<td>PwdVerifyPersonalDataProcessor</td>
<td>Verifies that the user's answers match the expected data in the system.</td>
</tr>
<tr>
<td>PwdVerifyQuestionsProcessor</td>
<td>Provides question and answer verification of user input on the second page of the verification form.</td>
</tr>
<tr>
<td>PwdVerifySimpleProcessor</td>
<td>Provides simple verification of user input on the second page of the verification form.</td>
</tr>
<tr>
<td>PwdVerifySMSProcessor</td>
<td>Provides SMS verification of user input on the second page of the verification form.</td>
</tr>
</tbody>
</table>

'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.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwdPostProcessor</td>
<td>Executes actions after the process completes for success, failure, or both conditions.</td>
</tr>
</tbody>
</table>

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.
// 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);

// Simple helper to return the sys-id for a given extension script
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.' +
    category + '\');
  gr.query();
  if (gr.next()) {
    result = gr.getValue('sys_id');
  }
  return result;
}

**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
<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!

    /**
     * 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'
};]]></script>

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 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. It 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, request) {
          return request.getParameter('sysparm_user_id') + '_' + params.processId;
        }
      },
      type: 'SampleIdentificationProcessorExtension'
    ]]>></script>
  </sys_script_include>
</record_update>
Use the process and processForm extensions

This example shows a script that uses two sample extensions, one process extension and one processForm extension.

```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();
request.setParameter('sysparm_user_id', 'joe.employee');
var userIdentity = identificationExtension.processForm(params, request);
gs.print('identity: ' + userIdentity);
```

```
// Simple helper to return the sys-id for a given extension script
function getExtensionScriptSysId(scriptName, category){
  var result;
  var gr = new GlideRecord('sys_script_include');
  gr.addQuery('name', scriptName);
  gr.addQuery('script', 'CONTAINS', 'category: ' + category + 'password_reset.extension.');
  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" 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!
}]]></script><sys_script_include_action>1</sys_script_include_action><sys_script_include_owner>admin</sys_script_include_owner><sys_script_include_name>SampleUserAccountLookupExtension</sys_script_include_name><sys_script_include_file>SampleUserAccountLookupExtension.js</sys_script_include_file><sys_script_include_version>1.0.0</sys_script_include_version><sys_script_include_license>Simplified BSD License</sys_script_include_license><sys_script_include_rls>1.10.0</sys_script_include_rls><sys_script_include_class>SampleUserAccountLookupExtension</sys_script_include_class><sys_script_include_class_file>SampleUserAccountLookupExtension.js</sys_script_include_class_file><sys_script_include_class_version>1.0.0</sys_script_include_class_version><sys_script_include_class_license>Simplified BSD License</sys_script_include_class_license><sys_script_include_class_rls>1.10.0</sys_script_include_class_rls></record_update>
```
/**
 * 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'
}

processForm function:
<?xml version="1.0" encoding="UTF-8"?><record_update table="sys_script_include" action="INSERT_OR_UPDATE"><active>true</active><client_callable>false</client_callable><description>Script that processes an identification form.&lt;#13;
Returns the sys-id of the user that corresponds to the requested input; if no user was found, null should be returned.&lt;#13;</description><name>SampleIdentificationProcessorExtension</name><!--!
[CDATA[var SampleIdentificationProcessorExtension =Class.create();
SampleIdentificationProcessorExtension.prototype={
    category:'password_reset.extension.identification_form_processor',// DO NOT REMOVE THIS LINE!
    process:function(params){return params.userId;},
type:'SampleUserAccountLookupExtension'
};]

*/

/* Process the identification form request, and returns the user's sys_id. if user was not identified return null.
 * @param 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 using: request.getParameter('element-id')
 * Supported request parameters: 
 * sysparm_user_id - the user identifier value

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Password Reset extension script categories

You can use a custom extension script to extend Password Reset functionality for credential store, verification, or identification types.

<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>
</tbody>
</table>
### Extension script category

<table>
<thead>
<tr>
<th>Extension script category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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) true, if the user is enrolled in the specified verification; otherwise, false.</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></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!

  process: function (params) {
    return (params.userId && params.verificationId) ? true : false;
  },

  type: 'SampleEnrollmentCheck'
};
```

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### '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!

    /* Process the enrollment form request, and return whether the user was successfully enrolled.
     * @param params.userId         The sys_id of the user trying to enroll (table: sys_user)
     * @param params.verificationId The sys_id of the verification to be enrolled into (table: pwd_verification)
     * @param params.enrollmentId   The sys_id of this enrollment process
     * @param request               The form request object. Fields in the form can be accessed with
     * return boolean telling whether the user was successfully enrolled
     * 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
     */
    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;
    }
}
```
### '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>Parameters:</td>
<td>Returns: the sys_id of the user that corresponds to the requested input. Returns null, if no user was found.</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>
<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;'). Use request.getParameter('sysparm_user_id') to get the user ID that was entered into the form.</td>
<td></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 ( ) { } ,

  /**
   * Process the identification form request, and returns the user's sys_id. If user was not identified return null.
   * @param 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>').
   * Supported request parameters: sysparm_user_id - the user identifier value entered in the form
   * @return The sys_id of the user that corresponds to the requested input; if no user was found, null should be returned
   **/**

  processForm : function (params , request ) { var processId = params. processId ; var sysparm_user_id = request. getParameter ( 'sysparm_user_id' ) ;
    gr = new GlideRecord ( 'sys_user' ) ;
    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>
</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:

```javascript
var SamplePasswordGenerator = Class.create ( ) ;
SamplePasswordGenerator.prototype = {
    category : 'password_reset.extension.password_generator', // DO NOT REMOVE THIS LINE!

    process : function (params ) { var basePassword ;
        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>
</tbody>
</table>

- params.resetRequestId - The sys_id of the calling Password Reset process (table: pwd_process).
- params.wfSuccess      - A flag indicating whether the workflow completed successfully. True if, and only if, successful.

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>
<tbody>
<tr>
<td>User Account Lookup</td>
<td>Gets the credential store account ID for a given user.</td>
<td>process(params)</td>
<td>Parameters:</td>
<td>Returns:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- params.userId - The sys_id of the user being checked (table: sys_user).</td>
<td></td>
</tr>
</tbody>
</table>

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>
</table>
| Verification Form Processor | Processes a verification form request and indicates whether the user was verified or not. | processForm(params, request) | 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 to be processed (table: pwd_verification).  
  - request - The form request object. Fields in the form can be accessed with request.getParameter('<element-id>'). | Returns: (boolean) true, if the user is verified; otherwise, false. |

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){
    // Implementation...
  }
};
```

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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 for a user

In a service desk-assisted Password Reset process, service desk agents with the password_reset_service_desk role reset user passwords. Users do not 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 Settings on the Password Reset Details tab on page 1711.

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.

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 962: Password Reset request fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>The user whose password is being reset or changed.</td>
</tr>
<tr>
<td>Process</td>
<td>The process that implements this password reset request.</td>
</tr>
<tr>
<td>Type</td>
<td>The 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 agent.</td>
</tr>
<tr>
<td></td>
<td>• Self Service: Requesting user opened the reset request.</td>
</tr>
<tr>
<td>Action Type</td>
<td>The 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 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>The 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>The total number of times the user has attempted to complete a password reset request.</td>
</tr>
</tbody>
</table>

Service desk: Unblock a Password Reset user

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). 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.

Password Reset and Password Change reports

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>The 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>
</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.

---

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Password Reset Top Users (last 30 days)</strong></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><strong>Password Reset Failed Verifications (last 7 days)</strong></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><strong>Password Reset Enrollment By Verification</strong></td>
<td>Number of users by verification type who have and have not enrolled in the password reset program. A large number for users who have not enrolled could indicate a compliance or communication issue within the organization.</td>
</tr>
<tr>
<td><strong>Password Change Top Users (last 30 days)</strong></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 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 964: Purge intervals for Password Reset tables

<table>
<thead>
<tr>
<th>Table name</th>
<th>Purge interval</th>
</tr>
</thead>
</table>
| [pwd_reset_request]         | 90 days (7,776,000 seconds). Depending on your organizational data monitoring requirements, you could configure the rule to:
|                             | • Purge successful requests after 90 days
|                             | • Keep failed requests for 120 days                 |
| [pwd_user_lockout]          | 90 days (7,776,000 seconds). Depending on your organizational data monitoring requirements, you could configure the rule to:
|                             | • Purge successful requests after 90 days
|                             | • Keep failed requests for 120 days                 |
| [pwd_reset_activity]        | 90 days (7,776,000 seconds).                       |
| [pwd_activity_monitor]      | 90 days (7,776,000 seconds).                       |
| [pwd_dvc_enrollment_code]  | 1 day (86,400 seconds).                             |
| [pwd_sms_code]              | 1 day (86,400 seconds).                             |

View log of failed login attempts

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.

Role required: admin

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.
Users: Enroll in the Password Reset program

Some organizations auto-enroll users in a Password Reset program. Your organization could offer you the option to enroll for one or more methods of verifying your identity when you reset your password.

You might enroll for any combination of the following methods:

<table>
<thead>
<tr>
<th>Method Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify your identity using security questions (QA verification)</td>
<td>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.</td>
</tr>
<tr>
<td>Verify your identity using an SMS code (SMS verification)</td>
<td>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.</td>
</tr>
</tbody>
</table>

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.

Role required: none

**Note:** You cannot enroll on a mobile device.

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 1764

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.

Role required: none

**Note:** You cannot enroll on a mobile device.

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 have verified 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 1764

---

### 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 have configured 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.
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.
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.
Upon successful creation of the instance, you receive an email containing the instance ID, IP address, and the public DNS for the instances created.

**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.

![Screen shot of Service Catalog]

Figure 449: 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.
Figure 450: Delivery time

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.

**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.
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.

**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.
Figure 453: 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 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 email notifications sent to you, except those marked Meeting Invitation.
   - 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:

Figure 454: 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.
For information about update sets, see *Create an update set*.

**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. <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>
Assessments: important terms

Assessment admins use several terms when working with assessments.

Assessment terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric type</td>
<td>A <em>metric type</em> defines a set of records to evaluate, such as vendors, projects, or employees.</td>
</tr>
<tr>
<td>Assessable record</td>
<td>An <em>assessable record</em> 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 <em>metric category</em> 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>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>
<tr>
<td>Assessment instance</td>
<td>An <em>assessment instance</em> represents one assessment questionnaire assigned to one user. The system generates a new assessment instance for each assigned user when:</td>
</tr>
<tr>
<td></td>
<td>• The assessment generation scheduled job runs.</td>
</tr>
<tr>
<td></td>
<td>• An assessment administrator creates an on-demand assessment.</td>
</tr>
<tr>
<td>Scorecard</td>
<td>A <em>scorecard</em> 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.</td>
</tr>
<tr>
<td>Decision matrix</td>
<td>A <em>decision matrix</em> 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.</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:
Figure 455: 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.
Figure 456: Scripted metric example

Data types for assessments

Metric data types have functions that depend on the method that you select.

Table 965: 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.&lt;br&gt;Scales 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.  

![Questionnaire](image)

**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.
<table>
<thead>
<tr>
<th>Data type</th>
<th>Compatible methods</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>String</td>
<td>Assessment</td>
<td>On questionnaires, users enter text. The size of the string field depends on the String option you select:</td>
</tr>
</tbody>
</table>

![Figure 457: 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>

**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.

Installed with assessments

Several types of components are installed with Assessments.

Demo data is available for assessments and surveys. **Vendor Performance** offers an additional set of vendor assessment demo data.

Tables installed with assessments

**Tables**

Assessments adds the following tables.

### Table 966: Tables for assessments

<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>Table</td>
<td>Description: Assessments</td>
<td>Description: Surveys</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Assessment Metric [asmt_metric]</td>
<td>Stores all <em>metrics</em>.</td>
<td>Stores all survey questions.</td>
</tr>
<tr>
<td>Assessment Metric Definition [asmt_metric_definition]</td>
<td>Stores all <em>metric definitions</em>.</td>
<td>Stores all <em>answer options</em> for survey questions.</td>
</tr>
<tr>
<td>Assessment Metric Template [asmt_template]</td>
<td>Stores all <em>metric templates</em>.</td>
<td>Stores all question templates.</td>
</tr>
<tr>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Stores all <em>metric types</em>.</td>
<td>Stores all <em>survey definitions</em>.</td>
</tr>
<tr>
<td>Assessment Stakeholders [asmt_m2m_stakeholder]</td>
<td>Stores associations between assessable records and category users. A category user that is associated to an assessable record is a <em>stakeholder</em>.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>Assessment Template Definition [asmt_template_definition]</td>
<td>Stores all <em>metric template definitions</em>.</td>
<td>Stores all question template definitions.</td>
</tr>
<tr>
<td>Assessment X Category Matrix [asmt_m2m_xcategory_matrix]</td>
<td>Allows users to specify metric categories as the X axis of a <em>decision matrix</em>.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>Assessment Y Category Matrix [asmt_m2m_ycategory_matrix]</td>
<td>Allows users to specify metric categories as the Y axis of a <em>decision matrix</em>.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>Bubble Chart [asmt_bubble_chart]</td>
<td>Stores all <em>bubble chart definitions</em>.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>Category Assessable Records [asmt_m2m_category_assessment]</td>
<td>Stores associations between assessable records and metric categories.</td>
<td>For system use only.</td>
</tr>
<tr>
<td>Decision Matrix [asmt_decision_matrix]</td>
<td>Stores all <em>decision matrixes</em>.</td>
<td>Not used for surveys.</td>
</tr>
<tr>
<td>Metric Category [asmt_metric_category]</td>
<td>Stores all <em>metric categories</em>.</td>
<td>Stores all survey categories.</td>
</tr>
<tr>
<td>Metric Result [asmt_metric_result]</td>
<td>Stores all <em>metric results</em>.</td>
<td>Stores all <em>survey responses</em>.</td>
</tr>
<tr>
<td>Signature [asmt_signature]</td>
<td>Stores all <em>signature records</em> for assessments and [[Attestations</td>
<td>GRC attestations]].</td>
</tr>
</tbody>
</table>
Properties installed with assessments

**Properties**

Assessments adds the following properties.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn_portal_surveys.sp_survey.email_redirection</td>
<td>Allows 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 2094</td>
</tr>
<tr>
<td>com.snc.assessment.signature_authentication</td>
<td>Requires 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></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: Signatures</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 2094</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| css.assessment.caption.background.color | Sets the background color of the caption on assessment and survey questionnaires.  
  - Type: color  
  - Default value: #eee  
  - Location:  
    - Assessments Admin Assessment Properties  
    - Survey Management Administration Properties  
  - Learn more: Customize the appearance of a survey on page 2094 |
| com.snc.assessment.decision_matrix_filter_max_entries | Maximum number of items to show for a decision matrix field filter.  
  - Type: integer  
  - Default value: 1000  
  - Location:  
    - Assessments Admin Assessment Properties  
    - Survey Management Administration Properties  
  - Learn more: Customize the appearance of a survey on page 2094 |
| css.assessment.caption.font.color | Sets the font color of the caption text on assessment and survey questionnaires.  
  - Type: color  
  - Default value: #ffffff  
  - Location:  
    - Assessments Admin Assessment Properties  
    - Survey Management Administration Properties  
  - Learn more: Customize the appearance of a survey on page 2094 |

User roles installed with assessments

**Roles**

Assessments adds the following roles.
### Table 968: Roles for assessments

<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 the Assessments application.</td>
<td>• None</td>
</tr>
<tr>
<td>[assessment_admin]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: The assessment_admin role is contained by the itil_admin role. It is also contained by the survey_admin role.</td>
<td></td>
</tr>
</tbody>
</table>

### Script includes installed with assessments

**Script includes**

Assessments adds the following script includes.

#### Table 969: Script includes for assessments

<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>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 installed with assessments

**Client scripts**

Assessments adds the following client scripts.

#### Table 970: Client scripts for assessments

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate Assessable Record Field choice list</td>
<td>Trigger Condition [asmt_condition]</td>
<td>Limits the Assessable Record Field choices to those that are compatible with the selected assessment.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Check survey schedule period</td>
<td>Trigger Condition [asmt_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>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>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</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>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 [asmt_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>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>Set table field</td>
<td>Metric Category [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_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 [asmt_metric_definition]</td>
<td>Verifies that the Value is greater than or equal to zero.</td>
</tr>
</tbody>
</table>
### Business rules installed with assessments

#### Business rules

Assessments adds the following business rules.

Table 971: 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>
</tbody>
</table>
| Auto stakeholder creation                 | Category Assessable Records [asmt_m2m_category_assessment] | Creates stakeholders from all of a category’s category users automatically for new assessable records if:  
  • The Create stakeholders check box is selected for the metric category.  
  • The same metric category is associated to the new assessable record. |
<p>| Auto stakeholder creation                 | Metric Category [asmt_metric_category]        | 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. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculate category max weight</td>
<td>Assessment Metric</td>
<td>Calculates the sum of all metric weights in a category.</td>
</tr>
<tr>
<td>Calculate category max weight</td>
<td>[asmt_metric]</td>
<td></td>
</tr>
<tr>
<td>Cancel notification workflow</td>
<td>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>Cancel notification workflow</td>
<td>[asmt_assessment_instance]</td>
<td></td>
</tr>
<tr>
<td>Category domain matches type</td>
<td>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>Category domain matches type</td>
<td>[asmt_metric_category]</td>
<td></td>
</tr>
<tr>
<td>Check Live Feed Groups</td>
<td>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 Live Feed Groups</td>
<td>[asmt_assessable_record]</td>
<td></td>
</tr>
<tr>
<td>Check only one default</td>
<td>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>[asmt_bubble_chart]</td>
<td></td>
</tr>
<tr>
<td>Check only one default</td>
<td>Decision Matrix</td>
<td>Ensures there is only one default decision matrix for a metric type.</td>
</tr>
<tr>
<td>Check only one default</td>
<td>[asmt_decision_matrix]</td>
<td></td>
</tr>
<tr>
<td>Create actual results</td>
<td>Assessment Instance</td>
<td>Generates assessment and category results from the user responses if a user completes an assessment.</td>
</tr>
<tr>
<td>Create actual results</td>
<td>[asmt_assessment_instance]</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Create Business Rule on Remote table      | Assessment Metric Type [asmt_metric_type] | Generates the following business rules if an assessment administrator creates or updates a metric type:  
- 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.  
- 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.  
  
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                          | Assessable 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>
</table>
| Link assessable record and category | Metric Category [asmt_metric_category] | Sets these hidden fields as follows for a newly created survey category:  
  • Table: Assessment Metric Type [asmt_metric_type]  
  • Filter: <sys_id of the survey definition the new survey category is associated with> |
<p>| Live Feed Group | Assessable Record [asmt_assessable_record] | 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. |
| Metric domain matches category | Assessment Metric [asmt_metric] | 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. |
| Notify assessment user | Assessment Instance [asmt_assessment_instance] | 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. |
| Prevent recursive dependencies | Assessment Metric [asmt_metric] | Prevents the Depends on field from being set in a way that creates a recursive conditional question dependency. |
| Publish Survey | Assessment Metric Type [asmt_metric_type] | Generates survey instances and assigns them to the associated survey users when the survey definition state changes from Draft to Published. |
| Remove auto create Business Rules | Assessment Metric Type [asmt_metric_type] | Deletes the automatically created business rule for a metric type when an assessment administrator deletes that metric type. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>Remove Scheduled Job</td>
<td>Assessment Metric Type [asmt_metric_type]</td>
<td>Assessments: Deletes the scheduled job for a metric type if either of these conditions is met:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Someone deletes the metric type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Someone changes the schedule type from Scheduled to On demand.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surveys: Deletes the scheduled job for a survey definition if the schedule period is set to Only Once or No Limit.</td>
</tr>
<tr>
<td>Reset Min/Max for metric</td>
<td>Assessment Metric Definition [asmt_metric_definition]</td>
<td>Updates the Min and Max fields for metrics and survey questions based on the metric definition Value.</td>
</tr>
<tr>
<td>Set Domain for M2M Cat Assessable Recs</td>
<td>Category Assessable Records [asmt_m2m_category_assessment]</td>
<td>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.</td>
</tr>
<tr>
<td>Set Domain for M2M Category Users</td>
<td>Assessment Category User [asmt_m2m_category_user]</td>
<td>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.</td>
</tr>
<tr>
<td>Set Domain for M2M Stakeholders</td>
<td>Assessment Stakeholders [asmt_m2m_stakeholder]</td>
<td>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.</td>
</tr>
<tr>
<td>Name</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<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.

### Create an assessment category

Assessment categories are used with assessment metric types and assessment metrics to generate bubble charts.

**Role required: assessment_admin or 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 Demand Settings Assessments .
2. Click Create New to create a new record.

#### Table 972: 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.
3. Complete the Metric Category form.

### Table 973: 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.</td>
</tr>
<tr>
<td></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>• Percent: Attestation score as a weighted percentage of correct answers for scored questions.</td>
</tr>
<tr>
<td></td>
<td>• 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>Filter</td>
<td>Filter conditions that assessable records must meet to be evaluated using metrics in this category.</td>
</tr>
<tr>
<td></td>
<td>The filter operates on fields on the selected table.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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>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></td>
</tr>
</tbody>
</table>
### Field | Description
--- | ---
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.
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.
Users | 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.

**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.

**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.

**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><strong>Assessments Metric Definition Categories</strong></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 974: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td></td>
<td><strong>Note:</strong> You cannot change the category if the Depends on field is set or if another metric depends on this metric</td>
</tr>
<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></td>
<td><strong>Note:</strong> 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. 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>
<tr>
<td>Active</td>
<td>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.</td>
</tr>
<tr>
<td>Mandatory</td>
<td>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.</td>
</tr>
<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
## Field Description

### 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.

* What type of men's trousers are expressly forbidden by company policy?

Female employees may mark this question "Not Applicable".

---

### General Section

#### Question

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?**

---

#### Description

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.

---
### Field | Description
---|---
Depends on | 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.

Displayed when | 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.

### Field Type Section

| Data type | [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.

Note: If another metric depends on this metric, you cannot change the data type.

| Randomize answers | 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.

This field is visible only if a data type that requires metric definitions is selected.

Note: 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:
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Template</strong></td>
<td>Metric template to use for the metric question. A metric template is a set of predefined answer options. 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><strong>Dependent plugin</strong></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.</td>
</tr>
<tr>
<td></td>
<td>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><strong>Scale definition</strong></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><strong>Min</strong></td>
<td>Lowest numerical value to be used as an answer option on assessments or as a scaled value in a scripted metric.</td>
</tr>
<tr>
<td></td>
<td>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>
<tr>
<td><strong>Max</strong></td>
<td>Highest numerical value to be used as an answer option or scaled value.</td>
</tr>
<tr>
<td></td>
<td>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><strong>Script</strong></td>
<td>Script that obtains the desired system information.</td>
</tr>
<tr>
<td></td>
<td>This field is visible and required only if the Method is Script.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related List</td>
<td>Lists all metric definitions, which appear as answer options for questions on assessment questionnaires. Click New to create a new metric definition.</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>

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 1899.

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 1921.
## Table 975: 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>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>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 matrices.</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 matrices 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 1918.</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. If someone changes the metric type's table or conditions, 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>Schedule type</td>
<td>Setting that determines which assessment process to use. Select On demand or Scheduled.</td>
</tr>
<tr>
<td>Scheduled job</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 &lt;type name&gt; Assessment Creation. 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>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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 .  
  • Survey: For details, see *Survey definitions* on page 2095.                                                                                           |
| 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:** 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. |
| Allow retake         | 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. |
| Active               | 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. |
| Description          | Helpful information about this type. Enter a clear description of the type and its purpose.                                                                                                                                         |
| Introduction         | 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. |
| End note             | 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. |
| Send notifications   | Select the check box to send notifications for this assessment, survey, or attestation. You may need to configure the form to see this field.                                                                                           |
| Condition section    |                                                                                                                                                                                                                                    |
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
</table>
| Table                  | [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.  
  
  **Note:** 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.                                                                                                                                 |
<p>| Enforce condition      | Check box that determines what happens to assessable records when you change the selected table or conditions.                                                                                                                                                                                                                                                                                                                                                             |
| Condition              | 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.                                                                                                                                                                                                                                 |
| Decision Matrix section|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter field</td>
<td>[Required] Field on the selected table that can be used to filter results on decision matrices 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 matrices 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>
<tr>
<td>Default matrix filter</td>
<td>Record to use as the default filter choice on decision matrices and scorecards. The selected Filter field and Filter condition control the available record choices. To see the records, if any, click the refresh icon next to the field. Consider the case that the filter field is Vendor type and you select Applications as the default matrix filter. The filter choice on decision matrices for this type is set to Applications by default. If you change the value of the Table or Filter condition field, you must click the refresh icon to view the updated Default matrix filter choices. If you do not, the system selects the first available choice from the updated field choices when you save the record.</td>
</tr>
</tbody>
</table>
### Field Description

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric Categories</td>
<td>All metric categories associated with the type.</td>
</tr>
<tr>
<td>Assessable Records</td>
<td>All assessable records associated with the type. This related list is hidden in the Attestation view of this form.</td>
</tr>
</tbody>
</table>

**Note**: The Generate Assessments button is visible to administrators in certain cases for scheduled assessments. Do not click the button until after completing the prerequisite tasks.

---

**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
   - Metrics
   - Metric definitions
   - Decision matrixes

---

**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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see *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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see [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]
- 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]

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 977: 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>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.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</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.

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.
In the Category Users related list, select the check box for each stakeholder you want to delete.
3. Select Delete in the Actions choice list.
4. 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.

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 DefinitionTypes.
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 Leclaire 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: none

1. Navigate to Assessments Assessments Assessment Instances.
2. Click an assessment instance number to open the record.
3. View the record, which displays the following information.
Table 980: Assessment Instance form

<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.</td>
</tr>
<tr>
<td>State</td>
<td>State of the assessment. The possible states are Ready to take, In progress, Complete, and Canceled.</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>
<tr>
<td>Signature result</td>
<td>Verification provided by the recipient when a signature is required. This value is either the recipient's full name from the User [sys_user] table or checked, indicating that the recipient acknowledged reading the assertion by selecting a check box.</td>
</tr>
</tbody>
</table>

4. 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 981: 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>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>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. 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>Note</td>
<td>This field is not available if the selected Assessment is a metric type used for surveys. See Survey trigger conditions on page 2116.</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>
<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>

**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>
<thead>
<tr>
<th>Table 982: Trigger condition configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
</tr>
<tr>
<td>Table</td>
</tr>
<tr>
<td>User field</td>
</tr>
<tr>
<td>Repeat Interval</td>
</tr>
<tr>
<td>Active</td>
</tr>
<tr>
<td>Trigger randomly</td>
</tr>
<tr>
<td>Assessable Record Field</td>
</tr>
<tr>
<td>Related Field 1</td>
</tr>
<tr>
<td>Related Field 2</td>
</tr>
<tr>
<td>Condition</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 message notifies you of an assigned 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.
3. Select Notify assessment user from the Workflow Versions list.

The workflow appears.

Figure 458: Workflow Window
Figure 459: Notify Assessment User Workflow

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. Click the reference icon (🔗) to open the metric result record.
3. View the Metric Result form. All fields on the form except Updated and String value are read-only.

**Table 983: Metric Result form fields**

<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 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>Method 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>Assessment instance completed by the Assigned to user. This field is blank when the method is Script.</td>
</tr>
<tr>
<td>Actual value</td>
<td>Unscaled value from a user response or script, depending on the method:</td>
</tr>
<tr>
<td></td>
<td>• Assessment: Value obtained from the user response to the assessment instance question. The actual value is determined by the metric 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></td>
<td>• Script: Value the script placed in the actual_result variable.</td>
</tr>
<tr>
<td></td>
<td>This field is hidden and left blank when the data type is Duration.</td>
</tr>
<tr>
<td>Duration value</td>
<td>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.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</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:  
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. |
| Normalized value | Adjusted value that accounts for weights, scale definition, minimum and maximum values, and other factors that impact the metric.                                                                                      |
| 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
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 984: Assessments overview module reports descriptions**

<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 Suite 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 the following values are valid: LightGray, lightgray, #D3D3D3, d3d3d3.
Figure 461: Bubble Chart form

Table 985: Bubble Chart form fields

<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>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, 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: • Top left label: Resource • Top right label: Essential Partner • Bottom left label: Poor Performer • Bottom right label: Reevaluate</td>
</tr>
<tr>
<td>• Top right label</td>
<td></td>
</tr>
<tr>
<td>• Bottom left label</td>
<td></td>
</tr>
<tr>
<td>• Bottom right label</td>
<td></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><strong>Type</strong></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><strong>Metric X category</strong></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><strong>Metric Y category</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Metric Z category</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Quadrant label color</strong></td>
<td>Color of the label text for the quadrant borders.</td>
</tr>
<tr>
<td><strong>Default</strong></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 associated with the assessable records for each of the listed source records.
Vendor Quality Bubble Chart

<table>
<thead>
<tr>
<th>Companies</th>
<th>Source record list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer</td>
<td></td>
</tr>
<tr>
<td>Adobe Systems</td>
<td></td>
</tr>
<tr>
<td>Adtran</td>
<td></td>
</tr>
<tr>
<td>Alps</td>
<td></td>
</tr>
<tr>
<td>Amazon</td>
<td></td>
</tr>
<tr>
<td>America Online</td>
<td></td>
</tr>
<tr>
<td>Apache Software Foundation</td>
<td></td>
</tr>
<tr>
<td>APC</td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td></td>
</tr>
<tr>
<td>Asus</td>
<td></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 463: Bubble chart score summary

View an assessment scorecard

You can open and print assessment scorecards, and export a scorecard as an image. 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. For more information about vendor performance, see Project Portfolio Suite.

1. Navigate to Assessments Assessable Records.
2. Open a record.
4. Complete the following steps to export the scorecard as an image.
   a) Click the menu icon and select Save as PNG or Save as JPEG as the download format.
   b) When the export is complete, select Download to save the scorecard image to a storage location.
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].
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.

**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 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.

![Group scorecard with ratings filter](image)

**Figure 464: Group scorecard with ratings filter**

**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 465: Scorecard categories

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 466: Scorecard category metrics

Head to head compare
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:

\[
\frac{\text{sum of normalized values in category result}}{\text{number of assessment groups}}
\]

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 468: Normalized values
Figure 469: Overall Rating on the Group 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 470: 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 471: Scorecard history - 4 quarters

*Live feed*

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 472: Scorecard Live Feed group
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 473: Vendor scorecard trend chart

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.

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.

Data types for quizzes

<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 Create quiz questions on page 1970.</td>
</tr>
</tbody>
</table>
### Data type Description

<table>
<thead>
<tr>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.</td>
</tr>
<tr>
<td>Numeric scale</td>
<td>Selectable number scale. The default is 1-5. Answer options appear as radio buttons.</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.</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>

**Quiz roles**

The Quizzes application uses these roles. No role is required to take quizzes that are assigned to you.

#### Table 987: 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>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>

**Note:** The itil_admin role and the survey_admin role contain the assessment_admin role.

**Quiz application: Important terms**

The quiz application involves several terms.

#### Table 988: Terms used in quiz application

| Quizzes  | 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. |

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### Categories
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.

### Questions
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.

### 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.

---

**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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 989: 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 1970.</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.</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.</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.</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 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.

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 990: 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 Introduction_to_Fields#Field_Status_Indicator&quot; --&gt; 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>
<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: • 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.</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>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 Date 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</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.</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 991: Quiz designer configuration

<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>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 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>
<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 email notifications to a recipient's manager when that user fails to submit an assigned quiz before the due date.</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 992: 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>
<tbody>
<tr>
<td>Method</td>
<td>Setting that determines how to use the question.</td>
</tr>
<tr>
<td></td>
<td>• Assessment: Makes the question available on a quiz distributed to users. The Assessment method is compatible with all data types except Duration.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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 question relative to other questions in the same category. By default, the weight is 10. For weighting suggestions, see <a href="#">Weight categories and metrics</a> on page 1902. 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.</td>
</tr>
<tr>
<td>Order</td>
<td>[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. <strong>Note:</strong> It does not matter which order value you use for metrics with the Script method, because they do not appear on questionnaires.</td>
</tr>
<tr>
<td>Active</td>
<td>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.</td>
</tr>
<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.</td>
</tr>
<tr>
<td></td>
<td>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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></td>
</tr>
<tr>
<td>Data type</td>
<td>[Required] Format of the expected response data. See the table of data types for details.</td>
</tr>
<tr>
<td>Note:</td>
<td>You cannot change the data type if another question depends on this question</td>
</tr>
<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.</td>
</tr>
<tr>
<td>Note:</td>
<td>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.</td>
</tr>
<tr>
<td>Note:</td>
<td>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 1876.</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>
</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 multiline text field that allows word wrap and returns. |
| Scored              | 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:  
  • Choice  
  • Likert Scale  
  • Template  
  • Checkbox  
  • Yes/No  

Selecting this check box hides the Scale definition field and sets the value in that field to High. |
| Correct answer      | [Required] Desired answer to a scored question. This field is available when the Scored check box is selected.                                                                                             |
| Template            | Answer template to use with this question. This field is available when the Data type is Template.                                                                                                         |
| Related List        |                                                                                                                                                                                                          |
| Assessment Metric Definitions | List of options for this question. This related list is available only if the Data type is Choice or Likert Scale.                                                                                                                                 |

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.
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
You can add questions, make changes to existing questions, and delete questions in a published 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

- 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 993: Quiz reports

<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>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</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>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>

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.
Figure 475: 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.

![Pie chart example]

Figure 476: 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 477: 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 478: 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 481: 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.
Figure 482: Scorecard history - 4 quarters

View a 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 (ęb) 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 994: 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>
</tbody>
</table>
| Rating | Rating is used on scorecards and decision matrixes. Rating is updated dynamically as users complete assessments. Rating is calculated as:  

\[(\text{Sum of all normalized values that share a particular assessment group, category, and assessable record}) / (\text{Number of assessment instances for the assessment group})\]  

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.  

On the associated Metric Results table, you can see that there are 4 instances of this group: AINST0000801, AINST0000802, AINST0000803, and AINST0000804.  

The system calculated the rating using  

\[(5.14+5.14+1.43+5.71+5.14+4.29+4.29+4.29) / 4 = 8.86\] |
### 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>
<tr>
<td>Normalized value</td>
<td>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: Normalized value = Rating x (Associated category weight / Sum of weights of all categories the source record has category results for in this assessment group) 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 x [9 / (10+9+9+9)] = 1.9</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight of the associated category. You may need to configure the form to see this field.</td>
</tr>
<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>

### 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></td>
</tr>
<tr>
<td>Component</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Filter</strong></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><strong>Scale</strong></td>
<td>Select the scale for the decision matrix. The greater the scale, the larger the decision matrix appears.</td>
</tr>
<tr>
<td><strong>Decision matrix</strong></td>
<td></td>
</tr>
<tr>
<td><strong>X- and Y-axes</strong></td>
<td>Each axis represents one or more metric categories. If multiple categories are used for an axis, their respective <em>weights</em> 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

![Rating summary](image)

**Figure 483: Decision matrix rating summary**

*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.

   ![Decision matrix axes](image)

   **Figure 484: Decision matrix axes**

5. Fill in the remaining fields on the Decision Matrix form (see table) and save the record.
### Decision Matrix

<table>
<thead>
<tr>
<th>Quadrant Design</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrant label color:</td>
<td>#333333</td>
</tr>
<tr>
<td>X-Axis label:</td>
<td>Importance</td>
</tr>
<tr>
<td>Plotted item color:</td>
<td>#B6AA01</td>
</tr>
<tr>
<td>Top left label:</td>
<td>Low importance, high satisfaction</td>
</tr>
<tr>
<td>Top left color:</td>
<td>#CFCFCF</td>
</tr>
<tr>
<td>Bottom left label:</td>
<td>Low importance, low satisfaction</td>
</tr>
<tr>
<td>Bottom left color:</td>
<td>#B5B5B5</td>
</tr>
<tr>
<td>Y-Axis label:</td>
<td>User Satisfaction</td>
</tr>
<tr>
<td>Highlight item color:</td>
<td>Purple</td>
</tr>
<tr>
<td>Top right label:</td>
<td>High importance, high satisfaction</td>
</tr>
<tr>
<td>Top right color:</td>
<td>#C8C8C8</td>
</tr>
<tr>
<td>Bottom right label:</td>
<td>High importance, low satisfaction</td>
</tr>
<tr>
<td>Bottom right color:</td>
<td>#CFCFCF</td>
</tr>
</tbody>
</table>

### Related Links

- **View Matrix**

#### X Axis

- Decision matrix = Importance vs User Satisfaction

#### Y Axis

- Decision matrix = Importance vs User Satisfaction
**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.

<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.</td>
</tr>
<tr>
<td></td>
<td>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 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>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>Y-Axis label</td>
<td>Label text for the Y-axis of the decision matrix.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
Highlight item color | 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.

Top right label | Label text for the top right quadrant.
Top right color | Fill color for the top right quadrant.
Bottom right label | Label text for the bottom right quadrant.
Bottom right color | Fill color for the bottom right quadrant.
Related Lists
X Axis | Lists categories that define the X-axis of the decision matrix.
Y Axis | Lists categories that define the Y-axis of the decision matrix.

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 (−) or expand icon (+) 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 1899.

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.

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 <em>display value</em> 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 matrices of the same metric type. Decision matrices 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 matrices 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.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</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>

## Approvals

Approvals can be defined for all tasks and allow users or groups to be associated with a task, for either approving or rejecting that task. Approvals are defined by navigating to System Policy Approvals.

The following information defines an approval:

**Table 997: Approval definition information**

<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. Choices are:</td>
</tr>
<tr>
<td></td>
<td>• Not Yet Requested (This state indicates that you are not yet asking your approvers to approve this request. Until you set the status to Requested, they do not receive email notifications about the request.)</td>
</tr>
<tr>
<td></td>
<td>• Requested</td>
</tr>
<tr>
<td></td>
<td>• Approved</td>
</tr>
<tr>
<td></td>
<td>• Rejected</td>
</tr>
<tr>
<td>Approving</td>
<td>A document_id reference field to the record being approved, on any table.</td>
</tr>
<tr>
<td>Comments</td>
<td>A journal field for storing comments regarding the approval.</td>
</tr>
<tr>
<td>Approval Summarizer</td>
<td>A formatter that displays key fields relevant to the approval from the referenced document. This summarizer does not display if there is no record referenced.</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.
# Approval engine options

<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>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. <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 grayed 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>`. 

---

<table>
<thead>
<tr>
<th>Table</th>
<th>Name</th>
<th>Approval Engine</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Phase</td>
<td>change_phase</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Change Request</td>
<td>change_request</td>
<td>Turn engines off</td>
<td>Workflows are managing approvals on this table.</td>
</tr>
<tr>
<td>IMAC</td>
<td>change_request_imac</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Change Task</td>
<td>change_task</td>
<td>Process Guides</td>
<td></td>
</tr>
<tr>
<td>HR Case</td>
<td>hr_case</td>
<td>Turn engines off</td>
<td>Workflows are managing approvals on this table.</td>
</tr>
<tr>
<td>HR Task</td>
<td>hr_task</td>
<td>Approval Rules</td>
<td></td>
</tr>
<tr>
<td>Incident Task</td>
<td>incident_task</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Request new Knowledge Base</td>
<td>kb_knowledge_base_request</td>
<td>Turn engines off</td>
<td>Workflows are managing approvals on this table.</td>
</tr>
<tr>
<td>KB Submission</td>
<td>kb_submission</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Problem Task</td>
<td>problem_task</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Reconcile Duplicate Task</td>
<td>reconcile_duplicate_task</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Release Phase</td>
<td>release_phase</td>
<td>Turn engines off</td>
<td></td>
</tr>
<tr>
<td>Feature Task</td>
<td>release_task</td>
<td>Turn engines off</td>
<td></td>
</tr>
</tbody>
</table>
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 approval state of the task record 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 thus 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 1000: 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.
3. Set these to auto start the approval process.
Table 1001: Approval rules

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of this rule.</td>
</tr>
<tr>
<td>Table</td>
<td>Task table to which this rule applies. For most service catalog approvals, select Request.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> The list shows only tables and database views that are in the same scope as the approval rule.</td>
</tr>
<tr>
<td>Active</td>
<td>Indicator of whether the rule is active (defaults to true).</td>
</tr>
<tr>
<td>Run Rule Before</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>User</td>
<td>User who must approve this request (can be empty).</td>
</tr>
<tr>
<td>Group</td>
<td>Group that must approve this request (can be empty).</td>
</tr>
<tr>
<td>Set State</td>
<td>Value of the approval field on the task in after this rule runs. Usually, select Requested.</td>
</tr>
<tr>
<td>Condition</td>
<td>Condition under which the rule applies.</td>
</tr>
<tr>
<td>Script</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>

Notes and limitations:

1. You can have as many rules as you want on a given table. If more than one rule applies, you get more than one approver.

2. You cannot get duplicate approvers, for example, if two rules both want Fred Luddy to approve a particular request, the system only creates one approval entry for him.

3. By default all requests start out in a Not yet requested approval state. Approval notifications do not go out until the approval state of the request 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. You can, for example, specify that David Loo is required to approve all Blackberrys.

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

![Approved By Group](image)

- Approval group
  - Hardware
  - Actions on selected rows...

![Approved By](image)

- Approver
  - David Loo
  - Actions on selected rows...

**Figure 486: Approve list**

In the example above, all members of the Hardware group and David Loo must approve this request.

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 only gets 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.

![Delivery Plan](image)

- Name: Blackberry Delivery Plan
- Short description: Delivery plan for outfitting an employee with a Blackberry and

**To add an Approval**

![Delivery Plan Tasks](image)

- Name
- Short description

**Figure 487: Add approval**
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

In the example above, Fred Luddy must approve this security approval task.

**Figure 488: Approval task**

In the example above, Fred Luddy must approve this security approval task.
Note: When an in-process approval is rejected, that particular line item is canceled as well, but the request itself is not 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.

Example #2: Apply to all "Capacity Review" tasks where the requester is in Atlanta.

Process guide tips and tricks:

1. All catalog tasks are generated when a request is first submitted, but tasks which are not active yet have a state of "pending." So if you do not want to send out approval requests until a task has 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 the same way the old, pre-process guide code did regarding 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.

Figure 489: Approval process

Approval summarizer formatter

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.
Istanbul ServiceNow Now Platform Capabilities

Figure 490: Summary of a change request

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Summary of Item being approved

Change Request

<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>
<tr>
<td>Short description</td>
<td>Rollback Oracle Version</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 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 reentering 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
To activate approval with e-signatures, refer to the following topic.
Activate a plugin.

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 the State of a request record 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.

E-signature SAML properties
Configurable properties for e-signature with SAML 2.0 update 1.
### Table 1002: E-Signature SAML Properties form

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AuthnRequest URL for eSignature Authentication</strong></td>
<td>Enter the URL that points to the SAML 2.0 Identity Provider AuthnRequest Consumer for eSignature Authentication. Usually, this URL is the same as the AuthnRequest URL used in general authentication. However, if you intend to use the same AuthnRequest Consumer URL that is used for general SAML 2.0 authentication in your instance.</td>
</tr>
<tr>
<td>[com.snc.integration.saml_esig.idp_authnrequest_url]</td>
<td></td>
</tr>
<tr>
<td><strong>The SAML 2.0 Assertion Consumer URL for eSignature Authentication</strong></td>
<td>Usually, this URL is: <a href="https://YOURINSTANCE.service-now.com/consumer.do">https://YOURINSTANCE.service-now.com/consumer.do</a>. However, if you employ a customized method of handling the SAML authentication for eSignature, you can set up your own consumer URL. For example, if you are using Multi-Provider SSO, you do not need to use this property. Configure the Identity Provider form, add the Assertion Consumer URL for eSignature authentication, field, and set the URL in that field.</td>
</tr>
<tr>
<td>[com.snc.integration.saml_esig.approval_consumer_url]</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>The SAML 2.0 Assertion Consumer Index for eSignature authentication</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>[com.snc.integration.saml_esig.assertion_consumer_service_index]</td>
<td></td>
</tr>
<tr>
<td>Authentication Pop-up Dialog Width</td>
<td>When a user approves a request using eSignature, a dialog allows the user to enter their credentials. This setting controls the width of that dialog box.</td>
</tr>
<tr>
<td>[com.snc.integration.saml_esig.popup_dlg_width]</td>
<td></td>
</tr>
<tr>
<td>Authentication Pop-up Dialog Height</td>
<td>When a user approves a request using eSignature, a dialog allows the user to enter their credentials. This setting controls the height of that dialog box.</td>
</tr>
<tr>
<td>[com.snc.integration.saml_esig.popup_dlg_height]</td>
<td></td>
</tr>
</tbody>
</table>

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 reauthentication 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 system 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 choice list to select a specific table.

Table 1003: Table Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Input Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>A table choice list to select the table that requires e-signatures.</td>
</tr>
</tbody>
</table>
Set up an approval from a local database

To set up Approvals with e-signature using credentials from a local database:

1. **Activate the Approval with E-Signature plugin.**
2. Create user records for approval users.

Set up an approval from a SAML 2.0 authentication

Setting up e-signature with SAML 2.0 requires configuration on the identity provider and the instance.

The SAML Identity Provider (IdP) must support and honor the forceAuthn attribute in SAML Assertion Requests. E-signature does not function without this IdP setting.

To set up Approval with e-signature using credentials from a SAML 2.0 authentication:

1. Activate or upgrade to a SAML 2.0 Update 1 integration.
2. Activate the Approval with E-Signature plugin.
3. Enter the e-signature SAML properties.
4. Regenerate the service provider metadata and update it on the IdP.
5. Create user records for approval users.

**Note:** Customers on SAML 2.0 Update 1 no longer have to create custom UI pages for logging out the user or deleting session cookies.

**Note:** If you are a Life Science Customer using E-Signature, you must deactivate the User self-lockout prevention business rule. See [KB0547061](https://kb.service-now.com) for more information.

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
- Setting up approvals from a SAML 2.0 authentication

**Note:** ADFS 2.0 does not support reauthentication requests that E-Signature requires.

Approval status

The approval status of a change request is determined by looking at the status of all the approvers.

If any approver has rejected the change, the approval status is Rejected. If all approvers have approved the change, the approval status is Approved. If all approvers are in the Not Requested status or if there are no approvers, the change status is Not Requested, otherwise the status is 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 is required 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:

![Approval Rules](image)

**Figure 493: 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 Requested." When the status of the approver is changed 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.

Several 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 both the workflow engine and the approval engine manage the approval process for a table. 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 changes to "Approved." Should any approver reject the request, the status is immediately set to "Rejected."
Receive notifications

Individuals who are designated approvers automatically receive approval notifications, including approval status updates.

Approval notifications are 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 are sent an email. By default, the email an approver receives contains a "mailto" link that allows 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 receives 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: To see the "mailto" links mentioned above to approve or reject a request (that is '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 are not 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 are looking at a Change Management approval request, you will see details from the relevant change request. For a Service Catalog approval request, you will get details of the request.
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 494: Change request approval example

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
<th>Quantity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available for executives and sales people</td>
<td>$600.00</td>
<td>1</td>
<td>$600.00</td>
</tr>
<tr>
<td>Dell OptiPlex SX280</td>
<td>$4,000.00</td>
<td>1</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>Dell OptiPlex GX280</td>
<td>$1,200.00</td>
<td>1</td>
<td>$1,200.00</td>
</tr>
</tbody>
</table>

Figure 495: Service Catalog 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)
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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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

The following components 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
### Table 1004: Business Rules

<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

#### Table 1005: Client Scripts

<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 1006: Properties

<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>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
</tbody>
</table>
| glide.geolocation.proximity               | 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.  
  - Type: Integer  
  - Default value: 500                                                                                           |
| glide.geolocation.proximity.location      | 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.  
  - Type: Integer  
  - Default value: 200                                                                                           |
| glide.geolocation.rush.travel.buffer      | 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.  
  - Type: Integer  
  - Default value: 0                                                                                              |
| glide.geolocation.tracking.frequency      | 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. 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.  
  - Type: Integer  
  - Default value: 300                                                                                              |
### Glide Geolocation Travel Buffer

- **glide.geolocation.travel.buffer**
  - **Description**: 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

- **glide.geolocation.work.spacing**
  - **Description**: 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

### 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 Work Management, have functionality that requires this license.

If you are using auto-routing or auto-dispatch in Work 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

State flows adds the following tables.
Table 1008: Tables for 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>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

State flows adds the following business rules.

Table 1009: Business rules for 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>Business rule</td>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Remove script for Field controls</td>
<td>State Flow</td>
<td>If all field controls are disabled, see if any of the client scripts should be removed.</td>
</tr>
<tr>
<td></td>
<td>[sf_state_flow]</td>
<td></td>
</tr>
<tr>
<td>State Change</td>
<td>State Flow</td>
<td>Get the correct state choice value when the state is changed.</td>
</tr>
<tr>
<td></td>
<td>[sf_state_flow]</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>
<tr>
<td></td>
<td>[sf_state_flow]</td>
<td></td>
</tr>
</tbody>
</table>

### Script includes installed with state flows

#### Script includes

State flows adds the following script includes.

Table 1010: 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.

**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 1011: 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>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 Triggering Events on State Changes 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>
</tbody>
</table>
| Class          | Defines the state flow class for this record. The system selects the appropriate class from these options:  
  - State Flow: Records created for state flows in all task-based tables except those in work management.  
  - Work Order Flow: Records created for state flows in the Work Order [wm_order] table. This class is available when work management is activated.  
  - 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. |
<p>| Dictionary override | Sets the starting value for the State field on all new records for the table named in the state flow record. See Dictionary overrides for state flows on page 2046 for configuration procedures. |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work notes</td>
<td>Noteworthy comments about this state flow transition. For details about how these notes are used, see Work Notes.</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></td>
</tr>
<tr>
<td>Manual condition string</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>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 (Runs a business rule automatically when a task record is changed and updated.)</td>
<td></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>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>
</tbody>
</table>
### Not mandatory
Makes the selected fields optional when this transition occurs, or when the end state is the current state.

### Not read only
Makes the selected fields editable when this transition occurs, or when the end state is the current state.

### Not visible
Hides the selected fields when this transition occurs, or when the end state is the current state.

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.

### 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.

### 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.
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.

Configure state flow records with an ending state only and create the correct behavior for every ending state you want to control. This 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>Table 1012: Field Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Business rule</td>
</tr>
<tr>
<td>Client script (onLoad)</td>
</tr>
<tr>
<td>Client script (onChange)</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

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 1013: State Flow Cleanup

<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>All state flows for the table specified that have events configured are</td>
</tr>
<tr>
<td>Dictionary override</td>
<td>deleted.</td>
</tr>
<tr>
<td>Business rule that processes events triggered by a</td>
<td>All state flows for the table are deleted.</td>
</tr>
<tr>
<td>state flow</td>
<td></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.

**Survey Management**

The ServiceNow® Survey Management application allows you to create, send, and collect responses for basic surveys. You can also use the Survey widget to set up a survey within Service Portal, if installed.

Survey Management does not support domain separation.

**Comparing Survey Management and Legacy Surveys**

Two versions 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.

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 1014: 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>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>Capability</td>
<td>Surveys</td>
<td>Legacy Surveys</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</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>

### Configuring surveys in Survey Management

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.

### Survey Management roles

The Survey Management application uses the following roles.

No role is required to take assigned survey questionnaires.
Table 1015: Survey Management roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey administrator</td>
<td>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.</td>
<td>• survey_reader</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• assessment_admin</td>
</tr>
<tr>
<td>Survey reader</td>
<td>View surveys and related information, such as survey responses, survey groups, scorecards, and reports.</td>
<td>none</td>
</tr>
</tbody>
</table>

Key survey terms

These survey terms are used throughout the documentation to describe survey management functions and capabilities.

Table 1016: 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>Term</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</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 responses and results

There is a metric result record for each user's response to each question on every survey instance. Survey results for each question and category are calculated automatically based on these 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 the 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 497: 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 2057.

**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
### Field | Description
---|---
**Assessment group** | 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.

**Metric** | Question that the user answered.

**Data type** | Data type of the question the user answered.

**Method** | Assessment method. Always Assessment for surveys.

**Updated** | Date and time the metric result was last updated.

**Source** | Survey definition from which the associated survey instance was generated.

**Assigned to** | User who completed the survey questionnaire.

**Instance** | Survey instance completed by the Assigned to user.

**Actual value** | Value obtained from the user response to the question. The actual value is determined by the question 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.

**Normalized value** | Adjusted value that accounts for the question's 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 2056.

**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 question data type is Percentage. The string value is N/A for unanswered questions of certain data types.

---

*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 = \frac{(Input Value - Min value defined in metric)}{(Max value defined in metric - Min value defined in metric)} \times \frac{current metric weight}{(sum of valid metric weight)} \times 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 1018: 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>
<tr>
<td>Scale factor</td>
</tr>
</tbody>
</table>

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 SurveyView Surveys.
2. Open a survey definition.
   The scorecard link is hidden if there are no survey results to report.

The interactive scorecard displays the name of the survey and results or comparisons of the ratings. You can display results in the following views:

- Category Results
- Question Results
- Average Ratings
- History

*Survey scorecard category results*

The Category Results view is a stacked bar chart showing survey results for all questions in a category 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

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the Survey Designer
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 499: Survey scorecard category results detail

**Survey scorecard question results**
The Question Results view shows the results for each question in a category using different chart types, based on a 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 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 (64.29%)
- 5 = 1 (7.14%)

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Bar chart

A bar chart appears when question results use the Percentage data type.

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.

Survey scorecard average ratings
The Average Ratings view displays the weighted average rating for each survey question in a category.

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 are...
- 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.

Figure 502: 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>Overall Rating</th>
<th>Current</th>
<th>Diff</th>
<th>2013</th>
<th>2012</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<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 504: 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.
Service Desk Satisfaction Survey

Survey Scorecard

<table>
<thead>
<tr>
<th>Overall Rating</th>
<th>Current</th>
<th>Diff</th>
<th>1st</th>
<th>4th</th>
<th>3rd</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Desk Satisfaction Survey</td>
<td>0.00</td>
<td>-5.40</td>
<td>5.40</td>
<td>0.00</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>-5.40</td>
<td>5.40</td>
<td>0.00</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>-1.02</td>
<td>1.02</td>
<td>0.00</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>-1.21</td>
<td>1.21</td>
<td>0.00</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>-1.02</td>
<td>1.02</td>
<td>0.00</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>
<td>0.00</td>
</tr>
</tbody>
</table>

Figure 505: Survey scorecard history - 4 quarters
Export a 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 Survey widget is provided on the base instance.

Surveys in Service Portal

If you have Service Portal installed, you can use the Survey widget to set up surveys 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 2197. 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>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max records</td>
<td>Specify how many surveys to show on the Service Portal homepage (default is 5).</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 survey designer property *Pagination setting for Service Portal view* is automatically set to one question per page.

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 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 506: Controls
The assessment engine provides a built-in result calculation feature that converts responses to scored question data types to a score between 0 and 10.

### Table 1020: 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 <em>Create a question in the survey designer</em> on page 2079.</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 <em>Quiz scorecards</em> on page 1991.</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>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.

<table>
<thead>
<tr>
<th>Survey Designer</th>
<th>Design</th>
<th>Configuration</th>
<th>Availability</th>
</tr>
</thead>
</table>

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.
- **Preview**: Display a preview of the survey as it will appear to recipients.
- **Publish**: Distribute the survey to the selected recipients.
- **Save and Publish**: Save 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.

### 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
The configuration values you use in this procedure are applied to the entire survey.

Role required: admin or survey_admin

1. Select Configuration in the survey designer.
2. Complete the Survey Designer Configuration form.

Table 1021: Survey Designer Configuration form

<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 survey to recipients.</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>
</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>Description</th>
<th>Description of this configuration or the survey to which it is attached.</th>
</tr>
</thead>
<tbody>
<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>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>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 (automatic for mobile)</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>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><strong>Note:</strong> By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey and assessment 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 that opens.
   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>Type</td>
<td>Data type selected for this question. See the table in Controls for the available 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 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>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>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.</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>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>
</tbody>
</table>

**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.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>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>
<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. Note: 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 very 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 509: 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 datatype

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.
### Equipment Usage Survey

#### Multiple Selection

<table>
<thead>
<tr>
<th>What equipments do you use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop</td>
</tr>
<tr>
<td>Tablet</td>
</tr>
<tr>
<td>Smart Phone</td>
</tr>
</tbody>
</table>

---

**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.**

|  |  
|---|---|
| ✔️ | Laptop |
| 1 | Tablet |
| 2 | Smart Phone |
| 3 | MAC |

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 users’ queues.

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. For more information, see Show or hide fields on a form.

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

Navigate to Survey Survey Instances and open a survey instance.

Each survey instance is stored as a record on the Assessment Instance [asmt_assessment_instance] table with a modified view for survey use.

<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Due date</td>
<td>Description</td>
</tr>
<tr>
<td>State</td>
<td>Description</td>
</tr>
<tr>
<td>Assigned to</td>
<td>Description</td>
</tr>
<tr>
<td>Expiration date</td>
<td>Description</td>
</tr>
<tr>
<td>Related Link</td>
<td>Description</td>
</tr>
<tr>
<td>Assessment Instance Questions</td>
<td>Description</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></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 *Show or hide fields on a form*.

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.

**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 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

Table 1024: 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>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>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>css.assessment.caption.background.color</td>
<td>Assessment caption background color</td>
<td>Sets the background color of the caption on assessment and survey questionnaires.</td>
</tr>
<tr>
<td>com.snc.assessment.decision_matrix_filter_max_entries</td>
<td>Maximum number of items to show for a decision matrix field filter</td>
<td>• Default value: 1000</td>
</tr>
<tr>
<td>css.assessment.caption.font.color</td>
<td>Assessment caption font color</td>
<td>Sets the font color of the caption text on assessment and survey questionnaires.</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.
3. Modify the fields on the Survey Definition form, as appropriate.

<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>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>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:</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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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. 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.</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>
</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. |
| 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             | Content to display on the screen that appears when someone submits a survey questionnaire. Consider adding a thank you message, follow-up instructions, or other applicable information. |
| Pagination setting   | 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. |
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment duration</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> By default, the system runs the Cancel Expired Assessments script every 30 days to cancel expired survey and assessment instances that are in the Work in progress or Ready to take states.</td>
</tr>
<tr>
<td>Send notifications</td>
<td>Select the check box to send notifications for the survey when it is published. Configure the form to see the field.</td>
</tr>
<tr>
<td>Related Links</td>
<td><strong>Enable Public Access</strong> 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></td>
<td><strong>Note:</strong> You can use the View Survey URL related link to share the URL with users.</td>
</tr>
<tr>
<td></td>
<td><strong>Remove Public Access</strong></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>Related Lists</td>
<td><strong>Metric Categories</strong> All survey categories for this survey.</td>
</tr>
<tr>
<td></td>
<td><strong>Survey Users</strong> 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></td>
<td><strong>Assessment Instances</strong> All survey instances for this survey. Configure the form to add this related list to see it.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
</tbody>
</table>

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 1026: 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> You cannot change the data type if another question depends on this question.</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> You cannot change the template if another question depends on this question.</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. 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. 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>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>
</tbody>
</table>
6. Save the record.
   Be sure to create answer options if you select the Choice or Likert Scale data type.

*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 very 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 512: 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 datatype

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.

<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 515: 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.

Table 1027: 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.
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.
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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 system does not, however, update the fields for existing questions 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 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 1028: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 1029: 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. You may want to change the order of questions if you add a new question manually after you create other 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. When 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 1030: 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>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>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.</td>
</tr>
<tr>
<td></td>
<td>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></td>
<td><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.</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.
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**Trigger condition example**

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>AINST0010011</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: INC0010008</td>
<td>INC0010008</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 URL**s
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>
<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>

An error message appears if someone opens a URL for an unpublished or deactivated survey.

**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:

<table>
<thead>
<tr>
<th>UI16</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UI15 or UI11</td>
<td>Right-click the application menu you want to add the module to and select Edit Application Menu.</td>
</tr>
</tbody>
</table>

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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see *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 *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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see 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]

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: 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 Survey Legacy Surveys Masters.
   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.

3. Under Related Links, click Migrate to Assessment.
   A dialog box appears, which describes what happens when you migrate the survey. Note that certain types of survey questions cannot be migrating.

4. 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.

5. Click the reference icon beside the Assessment field to view the new survey definition.

6. 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.

7. 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.

8. 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 1032: 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>Legacy survey type</td>
<td>Assessment data type</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------------</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>

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 1033: Migrated components**

<table>
<thead>
<tr>
<th>Survey component</th>
<th>Assessment survey components</th>
</tr>
</thead>
</table>
| Survey master [survey_master] | • Survey definition [asmt_metric_type]  
|                         | • Assessable record [asmt_assessable_record], for system use only  
|                         | • Survey category [asmt_metric_category]                                                   |
| Survey question [survey_question_new] | • Survey question [asmt_metric]                                                             |
| 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 component | Assessment survey components
---|---
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 1034: 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 1035: 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>Question choice text</td>
<td>Question choice value</td>
<td>Question choice order</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------</td>
<td>-----------------------</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 1036: 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 1037: 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.

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></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>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>

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.

Quiz application: Important terms

The quiz application involves several terms.

Table 1038: Terms used in quiz application

<table>
<thead>
<tr>
<th>Quizzes</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>
A category user is the recipient of questions for a specific category. You can select different users to answer the questions for each category.

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.

## 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.

## Quiz roles

The Quizzes application uses these roles. No role is required to take quizzes that are assigned to you.

<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>
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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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.
Figure 516: Question controls

Table 1040: 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 1970.</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.</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.</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>.</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 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.

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 1041: 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 Introduction_to_Fields#Field_Status_Indicator 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>
<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: • 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.</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>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 Date 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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.</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**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.
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>
<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 email notifications to a recipient's manager when that user fails to submit an assigned quiz before the due date.</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 1043: 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.

**Edit a quiz**

You can update a quiz after the quiz has been distributed.

**Role required:** assessment_admin or admin

- 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>

**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.

![Metric Results](image)

*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.

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 517: 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 518: 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 519: 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 520: 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 1044: Quiz reports

<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>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>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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.

![Describe your incident](image)

Figure 522: Record generator wizard

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 an example wizard variable

Define an example wizard variable.

**Note:** To learn more, see *Define a wizard variable* on page 2167.

Define wizard variables:

![Wizard Variable](image)

Figure 523: Basic variables

1. In the Wizard Variable related list, click New.
2. Enter the variable details.
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>
<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.
   • What are you having difficulties with?: Email Issue
   • 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

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**

You can add variables to wizard panels to prompt users to answer questions and to collect data.

To collect user input, 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 email 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

Define a wizard variable to specify its type, name, question description, order number, and any other details.

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.*

![Figure 524: Basic publish](image)

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 or UI11 | 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>
</tbody>
</table>
### Desired Action | URL schema
--- | ---
Require the user to restart a wizard from the beginning regardless of previous progress | https://<base URL>/nav_to.do?uri=expert_shell.do?sysparm_sys_id=<wizard sys_id>&sysparm_initial=true

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**

You can make all relevant roles public to make a wizard available to users who are not logged in.

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*

You can use scripts to implement advanced customizations in a 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):

   ```javascript
   if ( typeof gs.getRoles() == "undefined" || gs.getRoles() == '' ) {
     current.insert();
     current.setAbortAction(true);
   } else {
     var gr = new GlideRecord("expert_instance");
     if (gr.get(wizard_instance_id))
       gr.deleteRecord();
     wizard.redirect = "test_page.do?sysparm_id=" + current.sys_id;
   }
   ```

*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**

Administrators can provide users with access to wizards:

- 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

Create a wizard launcher to make the 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 module

Create Module

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.

Note: To learn more, see Wizard Panels.

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 1047: New fields

<table>
<thead>
<tr>
<th>Display Name (Table Name)</th>
<th>Modification</th>
</tr>
</thead>
</table>
| Survey Conditions (survey_conditions) | Add fields to determine which survey is sent when conditions are met:  
  - Type - either a survey or survey wizard  
  - Survey_wizard - reference to applicable survey wizard |
| Task Survey (task_survey) | Add fields to track which surveys were sent to users:  
  - Type - either a survey or survey wizard  
  - Survey_wizard - reference to applicable survey wizard |
| Survey Instance (survey_instance) | Add fields to track survey wizard instances along with surveys |
| Wizard (expert) | Add field to support new survey wizard table |

The following tables are added:

#### Table 1048: New tables

<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 (active 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>
</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.              |
| Reason/Comments | Any information that would be helpful for the ServiceNow personnel activating the plugin such as if you need the plugin activated at a specific time instead of during one of the default activation windows. |

Note: Plugins are activated in two batches each business day in the Pacific timezone, 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.

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.

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.
4. Configure the form to add the Read roles field, if necessary.
5. Click Submit.
6. Repeat steps 1 – 4 for all variables in the table.

Table 1049: 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>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>Type</td>
<td>Name</td>
<td>Question</td>
<td>Additional configuration</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------</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>
<tr>
<td>Yes/No</td>
<td>acrobat</td>
<td>Acrobat</td>
<td>Default value: No</td>
</tr>
<tr>
<td>Yes/No</td>
<td>dreamweaver</td>
<td>Dreamweaver</td>
<td>Default value: No</td>
</tr>
<tr>
<td>Multi Line Text</td>
<td>project_description</td>
<td>Describe projects for which you use these tools:</td>
<td>Mandatory: true</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 1050: Panel variables table

<table>
<thead>
<tr>
<th>Name and Title</th>
<th>Description</th>
<th>Add variables</th>
</tr>
</thead>
</table>
| Describe Needs       | Please complete this survey to help us evaluate our ongoing software needs.| Business software you use (select all that apply):
                                                                        Microsoft Office Suite
                                                                        Adobe Creative Suite
                                                                        Other
                                                                        Please specify:
### Name and Title | Description | Add variables
--- | --- | ---
Microsoft Office | Please rate the importance of each program to your job, using a scale from 1 to 5 (1 = not important, 5 = very important): | Word  
PowerPoint  
Excel  
Publisher  
Access
Adobe Creative Suite | Have you used these programs? | Acrobat  
Illustrator  
Photoshop  
Dreamweaver  
Describe projects for which you use these tools: 
End Note | Thanks for completing our survey. To order new or upgraded software, visit the service catalog.

*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.

![Survey wizard UI](image)

**Figure 525: Survey wizard UI**

1. Navigate to Survey Wizards Wizard Policy Wizard UI Policy.
2. Click New.
3. Enter the UI policy details.
Table 1051: 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 1052: 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 1053: Condition details

<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 1054: Email notification details

<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.

---

**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>
<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>
</tbody>
</table>
6. Enter type-specific information and save the record.
   - *Prompts user to answer questions (wizard panel)*
   - *Catalog Checkout*
   - *Catalog Order*
   - *KB Viewer*
   - *Redirect*
   - *Record Generator*
   - *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**.
Field setters
A field setter defines a field value for a record created by a record generator. Define field setters using:

Table 1056: 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>

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 1057: 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. To learn more, see Field Setters.</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 \textit{Wizard Scripts}.

### Use wizard banners

The wizard banner is a graphical flow of wizard steps displayed at the top of a wizard.

![Wizard banner highlighted](image)

\textbf{Figure 526: Wizard banner highlighted}

### 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.

![Wizard variables](image)

### Define an example wizard variable

Define an example wizard variable.

\textbf{Note:} To learn more, see \textit{Define a wizard variable} on page 2167.

Define wizard 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 1058: 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 1059: Wizards concepts

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panels</strong></td>
<td>Screen that appear in a defined order. Each step in a wizard is represented by a panel. The available panel types are:</td>
</tr>
</tbody>
</table>

Table 1060: Panel types

<table>
<thead>
<tr>
<th>Panel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 <em>Survey Wizard plugin</em></td>
</tr>
</tbody>
</table>

| Variables           | Questions that collect and store user input. Variables are defined in a wizard and can included on more than one panel. |

| Transitions         | Define logic used to move between panels. Transition logic may be based on user input. |

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.

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 1061: 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>
</tbody>
</table>
| Select Box      | contract_type | Which type of contract?                     | Mandatory: true  
Choice table: Contract  
[ast_contract]  
Choice field: Contract type |
| Date            | starts      | Start Date                                   |                                                               |
| Date            | ends        | End date                                     |                                                               |
| Single Line Text | short_description | Enter short description for contract |                                                               |
| List Collector  | asset_select | Asset Listing                                | List Table: Configuration Item[cmdb_ci]                      |
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>Name</th>
<th>Add variables</th>
</tr>
</thead>
</table>
| 1 Contract Screen | Associate assets?  
|                  | Which type of contract?                           |
|                  | Start Date                                         |
|                  | End Date                                           |
|                  | Enter short description for contract               |
| 2 Asset Screen   | Asset Listing                                      |

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.
   a. Name: 3 Contract No Assets
   b. 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>
<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>
<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>
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();}}
```
3. Enter the transition details and save the record.
4. Repeat steps 1 – 3 for all panel transitions in the 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 ServiceNow.

Explore
- Service Portal release notes
- Upgrade to Istanbul
- Understanding Service Portal on page 2198
- Service Portal core concepts on page 2199

Set up
- Set up Service Portal on page 2223
- Create a portal on page 2230
- Configure a portal header menu on page 2234

Administer
- Service Portal Single sign-on, logins, and URL redirects on page 2422
- Content Management and Service Portal on page 2201
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 should be done by 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.

Figure 528: Service Portal overview diagram
For more information on the different pieces that make up a portal, see *Service Portal components* on page 2424.

**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 [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 Connect plugin.

**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:

<table>
<thead>
<tr>
<th><strong>Underlying technology</strong></th>
<th>CMS uses Jelly, which is not a widely used technology. Service Portal instead uses <em>AngularJS</em>, 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual layer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Mobile first</strong></td>
<td>Unlike CMS, Service Portal is optimized for a mobile environment. For this reason, the following apply to the Service Portal environment:</td>
</tr>
<tr>
<td></td>
<td>• 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 <em>Service Portal and client scripts</em> on page 2225.</td>
</tr>
</tbody>
</table>
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 1065: 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: Widgets on page 2270.</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: Widgets on page 2270.</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 2207.</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 2225.
- 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 2220.
- 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 2220. |
| 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 2225. **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.  
To understand the impact of updating your CMS to work in a mobile environment, review Mobile client GlideForm (g form) scripting and migration. | - Update your scripts to remove any unsupported client APIs.  
- Check that the script UI Type is set to Mobile / Service Portal or All. |
<p>| 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 2225. | Update your scripts to remove any unsupported client APIs. |</p>
<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.  
    - 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](https://servicenow.com) on page 2220.  
- 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.  
  The following are not supported in Service Portal:  
  - Three-step checkout  
  - Uploading attachments | Upgrade to the Kingston release for a base system order guide widget that enables three-step checkout and uploading attachments. However, keep in mind that 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](https://servicenow.com) on page 2207. |
| Record producers    | Record producers are used in Service Portal with the following differences:  
  - 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. |
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.

In Service Portal, define login behavior by modifying the SPEntryPage script include and setting system properties. For more information, see Service Portal Single sign-on, logins, and URL redirects on page 2422.

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.

- 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.

For more information, see Service Catalog forms in Service Portal on page 2207.

The Service Portal includes a base system Shopping Cart widget.

Use the Shopping Cart widget.

---

### 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.

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.
Figure 529: Service Catalog form

In Service Portal, the single-column layout renders as expected.
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.
In Service Portal, the two-column layout setting of the subcontainer is ignored. The subcontainer renders as a single column.

**Figure 531: Service Catalog form**
Two-column layout with variable sets and subcontainers

Figure 532: 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.

Figure 533: Service Catalog form
Figure 534: 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 535: Service Catalog form
In Service Portal, the container split and two-column container settings are ignored when inside a single-column variable set.
Nested containers

A Service Catalog form with:
- Containers that contain variable sets.
- Variable sets that contain nested containers.

Figure 537: 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>Container2</td>
<td>NestedContainer1</td>
<td></td>
</tr>
<tr>
<td>Variable1</td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td>Variable2</td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td>Variable3</td>
<td>NestedVariable6</td>
<td></td>
</tr>
<tr>
<td>Variable4</td>
<td>NestedContainer2</td>
<td>NestedVariable6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NestedVariable6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NestedVariable6</td>
</tr>
</tbody>
</table>

**Figure 538: 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**

```
<div>
  Data from catalog variable:
  <h1>{{ c.data.message }}</h1>
</div>
```

**Widget client script**

```
function($scope) {
  var c = this;

  //Watch for changes in the color variable
  $scope.$watch(function () {
    return $scope.page.g_form.getValue('color');
  }, function (value) {
```
// Update local data object with data from variable
c.data.message = value ?
'Content of color variable: ' + value : '';
});
}

You can use the following to access variable or catalog item fields:

- `$scope.page.g_form()`: The g_form instance on the form. You can use all supported g_form methods described in Service Portal and client scripts on page 2225. For example, `g_form.setValue('variable_name', 'new value');`.
- `$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.

What color would you like?

Blue

Data from catalog variable:

Content of color variable: Blue

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

- **Get Help**
  Browse guides, tutorials and videos to learn how to set up, configure and customize your portals

*Figure 539: Service Portal configuration page*
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.

# Set up Service Portal

Set up a site for your users using Service Portal.

## Requirements

Configuration for Service Portal takes place in the Service Portal Configuration page. You can access this page by navigating to Service Portal Service Portal Configuration.

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 of 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 2230

### 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 2250

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. That widget instance has its own record so you can configure it specifically for each use. For example, you can add several Icon Link widget to a page, configure them to link to different areas and with different icons, and none of them will be affected by the others.

You can start by cloning an existing widget and making changes to your cloned version. Developers or people with an advanced understanding of AngularJS can create a new widget.

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 2258

Configure the header menu

The header menu in a portal is actually 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. You need to configure both before a header menu can appear and act like a header menu in your portal.

- Create a portal header menu on page 2234
- Add a header or footer to a portal on page 2234

Configure the branding for the portal

The Branding Editor allows you to configure the styles and theme of your portal in a view with real time updates. You can see how your portal will appear to users with the click of a button. More advanced users still have the option of creating CSS stylesheets for the portal theme, however they will not be able to take advantage of the real
time update that the Branding Editor provides. Any 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 2241
- Create a portal theme on page 2244

Next steps

- Configure search in the portal
- Set up URL redirects

Unsupported 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. ServiceNow will continue to enhance Service Portal over time.

Not currently supported

- Domain separation
- Approvals with e-signature

No plans to support

- @ Mentions
- Click-through/pop-ups
- UI macros
- Formatters
- UI actions marked as Client
- Nested container Catalog variables
- Survey wizards

Some client scripting globals are also unavailable in Service Portal. For more information, see Service Portal and client scripts on page 2225.

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 still do something different depending 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()`

**Supported client side APIs**

These are the supported client scripting APIs you can 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>• clearMessages()</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>• getDefaultOperator()</td>
</tr>
<tr>
<td>g_service_catalog</td>
<td>isOrderGuide()</td>
</tr>
<tr>
<td>GlideAjax</td>
<td>new GlideAjax(scriptIncludeName)</td>
</tr>
<tr>
<td></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 will not work in the Service Portal. Instead, use one of the following:

- getXML(Function callback)
- getXMLAnswer(Function callback)
### Usage examples

**g_list**

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**

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() {
```
Unsupported form scripts for Service Portal

Because Service Portal doesn’t use Jelly, not all form customizations are available.

Table 1066: Supported and unsupported form scripts

<table>
<thead>
<tr>
<th>Form script</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client scripts</td>
<td>Service Portal uses UI type set to All or Mobile/Service Portal. Client Scripts marked as Desktop rely on legacy APIs that aren’t supported by Service Portal. Before flagging a script as Mobile or All, make sure you are only using mobile 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. Any UI Actions marked as Client are ignored by the form widget.</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>

Create a portal

Create a portal using the Service Portal configuration page.

Users from any coding level can create a portal as long as they have the admin or sp_admin role.

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 1067: 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 sp, 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 IT, only the article categories defined for the IT knowledge base appear in the <code>&lt;KB categories widget&gt;</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 <code>&lt;Branding Editor&gt;</code>.</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>Quick start config</td>
<td>Configuration settings generated by the <code>&lt;Branding Editor&gt;</code></td>
</tr>
<tr>
<td>CSS variables</td>
<td>Portal-specific Sass variables. You can overwrite existing theme variables in here.</td>
</tr>
<tr>
<td>Application</td>
<td>Application scope. This field is uneditable and Global by default</td>
</tr>
<tr>
<td>Property</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>404 page</td>
<td>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.</td>
</tr>
<tr>
<td>Catalog</td>
<td>Catalog listed in the sc_catalog table to use in the portal.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Only one Service Catalog can be used with a portal.</td>
</tr>
<tr>
<td>Catalog home page</td>
<td>Catalog page that you created in the portal to represent the catalog</td>
</tr>
<tr>
<td>Main menu</td>
<td>Reference to the menu in the sp_instance_menu table that appears in the header</td>
</tr>
<tr>
<td>Theme</td>
<td>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.</td>
</tr>
</tbody>
</table>
Navigate by URL

You can navigate to a portal or a page using the URL.

https://<instance name>/<sp url suffix>?id=<page id>&<page parameters>

**Elements:**
- Base Instance URL: Unique, secure web address for each instance. The default format is: https://<instance name>.service-now.com
- sp url suffix: Suffix established for the Service Portal
- id: The id of the Page to navigate to within the portal frame
- page parameters: Some pages require additional parameters to look up a record (table, sys_id)
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.

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 out of box 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, then click New.
2. Complete the fields in the menu form.
**Figure 541: Menu form**
Table 1068: 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>
<tr>
<td>Additional options, JSON format</td>
<td>Advanced configuration options. For example, use this field to enable the shopping cart in the header menu with the following code:</td>
</tr>
</tbody>
</table>
|                                    | `{  
|                                    |   "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 an out-of-box widget. |

3. Save the form then click Menu Items from the related lists.
4. Click New and complete the menu item form.

Table 1069: 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 <a href="#">Create a UI action</a>.</td>
</tr>
<tr>
<td>Glyph</td>
<td>Icon that appears beside the menu item</td>
</tr>
</tbody>
</table>

Associate the menu you created with a portal, then create a header with a theme for your menu.

*Add a menu to a portal*

After you create a menu and menu items, add the menu to a portal.

Create a menu or use an existing one.

1. Navigate to Service Portal Portals, then open the portal you want to add a menu to.
2. From the main menu field, click the reference lookup icon, then select the appropriate menu by name. Click Save.
Service Portal

* Title
  Documentation portal

* URL suffix
  doc_portal

Homepage

Knowledge base

Social QA Knowledge Base

KB home page

Login page

Application

Global

404 page

Catalog

Catalog home page

Main menu

- Benchmarks Menu
- CAB Workbench - Menu
- Documentation menu
- SP Config Menu
- SP Header Menu
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 543: 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 544: Branding Editor

Table 1070: 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>
|                            | ```json
[{
   "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 (r,g,b), 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 (r,g,b) 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 1071: 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 1072: 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.
Complete the style sheet form fields, then click Save.

**Table 1073: 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>
</tbody>
</table>
### Field Description

| **Source** | Select one of the following options:  
|            |   • 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.  
|            |   • URL: Link to an external style sheet. Use external style sheets to use the same CSS as a corporate website or other online resource.  

| **Style sheet** | Associate a style sheet or CSS file URL, depending on which option you select in the Source field.  

5. To add a JavaScript include to the theme, in the JS Include related list, click New.

![Figure 546: CSS include record](image)

6. Complete the style sheet form fields.
### Table 1074: 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 <a href="#">UI scripts</a>.</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>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>

**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. Each page has a page_id that you can use to reference the specific page, therefore any created page can be referenced in more than one portal.

You can use any of the pages provided with Service Portal as a template or a starting point.
How can we help?

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
09/01/16 - a day
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.

To access the Service Portal Designer, navigate to Service Portal Service Portal Configuration, and then click Designer.

1. Switch to the portal you want to design pages for by selecting the portal name in the header.

2. From the Service Portal Designer, select a page to customize or click Add a new page.

3. Under Layouts, select Container and drag it onto the page.

4. 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.

5. Use the filter to search for a widget, then drag the widget to the layout.
6. Edit page properties.
   a) Click Edit Page Properties. The page record from the Pages table [sp_page] opens.
   b) Edit the form.

<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>
</tbody>
</table>

7. Edit container properties.
   a) Click within the container you would like to edit, or select Container in the breadcrumbs.
   b) Click the edit icon []. The container record from the Containers table [sp_container] opens.
   c) Edit the form.

<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>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</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 pagespecific 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>

8. To switch to a different page, click the Pages tab in the left pane, then select the next page you want to configure.

9. 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 549: 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 ( ).
5. Select Move to header.
Figure 550: Container record

As a subheader, the container sticks to the header and does not scroll.

Configure a page in Page Editor

Page Editor provides an easy-to-read tree view of every element as it resides on the page.

1. In the Service Portal configuration page (Service Portal Service Portal Configuration), click Page Editor.
2. Click the nodes within the tree menu to load corresponding records on the page directly below the menu. Use this view to visualize and edit every page element as well as the containers within the layout.
3. Use the page node to complete page details at a more granular level. Use the information in the following table to complete the page node fields.
Table 1077: Page view

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Name of the page. The page title isn't public facing however you can use it to search for a page in the Service Portal Designer. The page title also helps determine the page ID.</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>Short description</td>
<td>Describes the portal page. This field is also not public facing.</td>
</tr>
<tr>
<td>Page Specific CSS</td>
<td>Unless as 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>Public</td>
<td>Allows 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>Clone Page</td>
<td>If you want to make a similar but modified page, you can use the Clone Page option. If you clone a Service Portal provided page, the page creates new widget instances for each widget on the page.</td>
</tr>
</tbody>
</table>

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 552: Edit Portal Properties

2. From the Homepage list, select the page you want for your portal homepage and click Save.
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.

Containers, rows, and columns

Containers, rows, and columns are what give structure and form to the content on a portal page.

**Containers**

Containers are markup artifacts that are put on a page to ‘contain’ the layouts that will ultimately 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 ( ).
You can also edit a container by navigating to the Page Editor and selecting the container node in the tree view.

Figure 554: Service Portal Designer breadcrumbs
Figure 555: Container record

- Change the layout of widgets on a page
- Determine the number of columns available to layout widgets
- 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 it

Container CSS

Define container CSS by specifying a parent class or CSS class.
Only users with an advanced understanding of CSS should make CSS configuration changes.
Configure container CSS by selecting the container in the Page Editor tree hierarchy.

Figure 556: Container CSS

You can also edit the container CSS from the Service Portal Designer. Select the container using the
breadcrumbs at the top of the page, then click the edit icon ( ).
Row and column CSS

Use the CSS class to define row and column CSS.

Select a row or column in the tree hierarchy in the Page Editor to add CSS class names to the CSS class field.
You can also edit the CSS class for both rows and columns using the Service Portal Designer. In the Designer, select the row or column using the breadcrumbs, then click the Edit Option icon ( ) to open the modal window.
Define page-specific CSS

Themes control the overall look and feel of a portal, but you can modify a page using the page-specific CSS option to be more specific. CSS applied to a page affects the page and all the elements falling within or below the page, such as containers, rows, or widgets.

1. From the Service Portal Configuration page (Service Portal Service Portal Configuration), click Page Editor.
2. Find the page you want to style in the page list.
3. Select the top-level node in the page hierarchy to open the Editor for that page.

![Page hierarchy diagram](image)

**Figure 560: Page hierarchy**

4. In the page-specific CSS field, enter CSS for the styles you want to change on the page.

```css
body {
    background-color: #fff;
}
```

**Figure 561: Page specific CSS**

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.
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.

Example widgets

- Approvals widget on page 2272

Service Catalog widgets

- SP Variable Editor widget on page 2356

Knowledge Management widgets

- KB also in Category widget on page 2312

© 2018 ServiceNow. All rights reserved.
• Approval Info widget on page 2273
• Approval Record widget on page 2274
• Breadcrumbs widget on page 2275
• Breakout Game widget on page 2276
• Calculator widget on page 2276
• Carousel widget on page 2277
• Cool Clock widget on page 2280
• Header menu widget on page 2286
• Hello World widgets on page 2287
• HTML widget on page 2290
• Icon Link widget on page 2291
• Icon menu list widget on page 2293
• Language Switch widget on page 2294
• Link button widget on page 2295
• Login widget on page 2295
• My Requests widget on page 2296
• Organization Chart widget on page 2297
• Sample Footer widget on page 2301
• Stock widget on page 2301
• Ticket Attachments widget on page 2302
• Ticket Conversations widget on page 2303
• Ticket Location widget on page 2305
• User Profile widget on page 2305
• Weather widget on page 2306

Service Status widgets
• Business Service Status widget on page 2363
• Current Status widget on page 2364
• Planned Maintenance widget on page 2365

Catalog Content widget on page 2333
• Request Fields widget on page 2335
• Requested Items widget on page 2335
• SC Catalog Item widget on page 2338
• SC Categories widget on page 2341
• SC Category Page widget on page 2344
• SC Order Guide widget on page 2346
• SC Popular Items widget on page 2348
• SC Save Bundles widget on page 2349
• SC Saved Carts widget on page 2350
• SC Shopping Cart widget on page 2351
• KB Article Comments widget on page 2313
• KB Article Page widget on page 2313
• KB Categories widget on page 2315
• KB Category Page widget on page 2316
• KB Most Viewed widget on page 2317
• KB News widget on page 2318
• KB Search widget on page 2319
• KB Top Rated widget on page 2320
• KB View widget on page 2321
• KB View 2 widget on page 2323
• My Favorite Tags widget on page 2323
• Popular Questions widget on page 2324
• SQANDA Create Question widget on page 2325
• SQANDA Question widget on page 2327
• SQANDA Related Question widget on page 2329
• Subscribed Questions widget on page 2331
• Tagged Question List widget on page 2331

Service Portal configuration widgets
• Service Portal Config Overview widget on page 2357
• Portal config widget on page 2359

List and form widgets
• Simple List widget on page 2298
• Data table from instance definition widget on page 2282
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.

Approvals widget

Users can approve or reject items directly within Service Portal.

**Note:** Service Portal does not currently support Approvals with e-signature.

---

**My Approvals**

**REQ0010001 - Dell Precision 690**

Requestor ITIL User

Price $1,875.00

**Options**

- [X] Reject

- Approve

---

Figure 562: Approvals widget
**Instance options**

Use the instance options to change the appearance of the approvals widget.

![Instance options](image)

**Figure 563: Approvals widget instance options**

**Table 1078: 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.
Figure 564: Approval Info widget

*Approval Record widget*
The Approval Record widget shows the full record for an approval including the activity stream.
Figure 565: Approval Record widget

_Breadcrumbs widget_

The breadcrumbs widget allows users to easily navigate around a portal.
The breadcrumbs widget does not have instance options. It displays information based on where a page is located in a portal.

**Breakout Game widget**
The Breakout Game widget is a fun 404 interaction for pages that don't exist.

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.

The calculator widget does not have instance options. You can use it as an example of how to pass data between the client and server.
Figure 568: Calculator widget

Carousel widget
The carousel widget displays a scrolling list of images.

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.
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>
</tbody>
</table>
Repeat this step for as many slides as you want to appear in the carousel widget.

**Cool Clock widget**

The Cool Clock widget uses instance options to show different times around the world.

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 570: 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. 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. Use the local full name, for example, America/New York, instead of the abbreviated time zone. Using the full name allows time zones to stay consistent with daylight savings time. 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*

Data table from instance definition displays a table that you define using the widget instance options.

After you add the data table from instance definition widget to a page, use the instance options to configure the appearance of the table.
Figure 572: Data table from instance definition widget

### Instance options

Table 1079: Data table 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>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>
Enable Filter

Select this check box to allow users to create their own filter for the table. This option is currently only supported for the Data Table widgets.

**Data Table from URL definition widget**

The Data Table from URL definition widget displays the table you select from the list.

![Data Table from URL definition widget](image)

**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>
<tr>
<td>Link to this page</td>
<td>Direct users to a specific page when the 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>
</tbody>
</table>
### Use Instance Title
Select to use the title in the Title field instead of the table title

---

**Form widget**
The form widget is a platform form within the Service Portal UI with a few differences.

![Form widget image](image)

*Figure 574: Form widget*
URL Parameters

The form widget accepts the following parameters within the URL:

<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>

Table 1080: Form widget URL parameters

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

Table 1081: Supported and unsupported form scripts

<table>
<thead>
<tr>
<th>Form script</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client scripts</td>
<td>Service Portal uses UI type set to All or Mobile/Service Portal. Client Scripts marked as Desktop rely on legacy APIs that aren't supported by Service Portal. Before flagging a script as Mobile or All, make sure you are only using mobile 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. Any UI Actions marked as Client are ignored by the form widget.</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>

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 isn't 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 2234.
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.
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 client script](#).

Use the widget list to switch to Hello World 2 or 3.

**Figure 576: Hello World 1**
Hello World 2 includes an example of how the server script can be used as well.

Figure 577: Hello World 2
Figure 578: Hello World 3

For more information on Service Portal APIs, see the GlideSPScriptable.

**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 579: HTML widget

Instance options

Table 1082: 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 <em>Formatting in the TinyMCE editor</em>.</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 580: Icon Link widget
Instance options

**Figure 581: Icon Link widget instance options**

**Table 1083: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Type             | Defines what the widget links to. The fields that appear on the form vary depending on which option you select. Choose from:  
  - Page: Another page in the Service Portal  
  - URL: Link to an external website.  
  - Catalog category: Link to a specific catalog category within the service catalog.  
  - Catalog item: Link to a specific catalog item.  
  - KB topic: Link to a KB topic page.  
  - KB article: Link to a KB article by number.  
  - KB category: Link to a specific KB category within the knowledge base. |
| Page             | Page within the portal that you want to link to. This field varies depending on the Type you choose. |
| Bootstrap color  | 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. |
| Template         | The appearance of the link icon widget. Choose from:  
  - Top icon  
  - Circle icon  
  - Color box |

*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.

![Icon information](image)

**Figure 582: Icon Menu list widget**

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 1084: Icon menu list widget instance options

<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.
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.

### Instance options

The login widget controls user access to your site.
Figure 585: Login widget

### Instance options

**Table 1086: Instance options fields**

<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.
My Requests

Sales Laptop
REQ0010002 • about an hour

Apple iPad 3
REQ0010001 • about an hour

Apple iPad 3
REQ0010001 • 6d

Figure 586: My Requests widget

Instance options

Table 1087: 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>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 587: 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>Incident Description</th>
<th>Incident Number</th>
<th>Status</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>InsideSales NeuralView Instance relocation from US datacenter to Hongkong dat...</td>
<td>INC0006789</td>
<td>a day</td>
<td></td>
</tr>
<tr>
<td>Results not as per expectation after performing the documented steps in Oracle...</td>
<td>INC0006911</td>
<td>a day</td>
<td></td>
</tr>
<tr>
<td>Performance degrade observed in Oracle Planning and Budgeting</td>
<td>INC0006890</td>
<td>a day</td>
<td></td>
</tr>
<tr>
<td>Network response time is poor</td>
<td>INC0006800</td>
<td>a day</td>
<td></td>
</tr>
<tr>
<td>Performance degrade observed in Eloqua Marketing Measurement</td>
<td>INC0006790</td>
<td>a day</td>
<td></td>
</tr>
<tr>
<td>Fidelity Stock Plan Services upgrade to the latest version</td>
<td>INC0006797</td>
<td>a day</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 588: Simple List widget*
### Instance options

#### Table 1088: 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 Create a filter in List v3.</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 scrollbar 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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>View</td>
<td>The view option for when a list item links to a form. The Link to this page field must be set to a form page for this option to work.</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 2234.

**Figure 589: Sample Footer widget**

**Instance options**

The Sample footer widget does not include instance options.

**Stock widget**

The Stock widget displays an example of how widgets communicate with data outside of the system.

The Stock widget pulls information from an online data source for stock information.

**Note:** As of November 2017, the Yahoo Finance API has been discontinued. As the stock widget relies on this functionality, the widget is no longer supported, and has been removed as of the London release.
Figure 590: Stock widget

**Instance options**

The Stock 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.
**Attachments**

*Drop files here*

**Figure 591: Ticket Attachments widget**

**Instance options**

**Table 1089: 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 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 592: Ticket Conversations widget

Instance options

Table 1090: 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 your location in a ticket.

Figure 593: Ticket Location widget

Instance options

The Ticket Location widget does not include any instance options.

User Profile widget
Store user profile information.
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.
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.

*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 "Configure search in Service Portal" on page 2420.
Figure 596: Home Page Search widget

Instance options

Table 1091: 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 <code>{title: 'Search', color: 'blue', size: 'lg'}</code>. For more information on which style options you can add, see the instance options for the Typeahead Search widget on page 2310.</td>
</tr>
</tbody>
</table>

**Search Page widget**

The Search Page widget displays search results.

---

No Results

Your search -- did not match any documents

Suggestions:

- Make sure all words are spelled correctly
- Try different, more general, or fewer keywords

---

**Figure 597: Search Page widget**
Table 1092: 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 of the 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>
</tbody>
</table>

For more information on configuring search, see *Configure search in Service Portal* on page 2420.

*Typeahead Search widget*
Predictive search feature that shows words as users type.
Figure 599: Typeahead Search widget

Figure 600: Typeahead search instance options

Table 1093: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>
</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 969.

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 1001.

Figure 601: KB also in Category widget
Instance options

Table 1094: 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.

![KB Article Comments widget](image)

**Figure 602: KB Article Comments widget**

**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.
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.

Figure 604: 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 1001.

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.
**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.
### Instance options

#### Table 1095: 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>
<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.
Figure 607: KB Most Viewed widget

Instance options

Table 1096: 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.
**News**

**Email Interruption Tonight at 11:00 PM Eastern**

3d

**Sales Force Automation is DOWN**

5d

Figure 608: KB News widget

**Instance options**

Table 1097: 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>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 as a search source.

The *typeahead search widget* is embedded in the KB search widget.
Figure 609: KB Search widget

Instance options

Table 1098: 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 610: KB Top Rated widget

*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.

![Figure 612: KB View 2](image)

**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 filter questions based on tags. By saving favorite tags, you only see questions that conform to that filter.
Figure 613: My Favorite Tags widget

**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>Author</th>
<th>Date</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>

First 5 of 15 shown

**Figure 614: 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 615: 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?

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?

4mo ago • Asked by Abel Tutor

1 Answer

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.

4mo ago • Answered by System Administrator

Figure 616: SQANDA Question widget
Instance options

The SQANDA Question widget does not have any included instance options.

SQANDA Related Question widget
Lists stats 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](image)

**Figure 618: Subscribed Questions 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>
</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.
<table>
<thead>
<tr>
<th>#</th>
<th>Votes</th>
<th>Question</th>
<th>Answer</th>
<th>Author</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>Does anyone know a good template for work email signature?</td>
<td>marketing, email</td>
<td>Mara Rineheart</td>
<td>4mo ago</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>What's the best way to find meeting rooms in the office?</td>
<td>office, meeting, facilities</td>
<td>Joe Employee</td>
<td>4mo ago</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>What are the pros and cons between OSX and Windows machines?</td>
<td>windows, Laptop, OSX</td>
<td>Joe Employee</td>
<td>4mo ago</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Any suggestions on using the company credit card?</td>
<td>expenses, company card</td>
<td>Joe Employee</td>
<td>4mo ago</td>
</tr>
</tbody>
</table>
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.

The service catalog widgets are part of the Service Portal Service Catalog [com.glide.service-portal.service-catalog] plugin, which is activated automatically with the Service Portal for Enterprise Service Management [com.glide.service-portal.esm] plugin.

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.

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.
### Can We Help You?

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask a Question</td>
<td>Get an answer</td>
</tr>
<tr>
<td>Change Password</td>
<td></td>
</tr>
<tr>
<td>Create Incident</td>
<td>Create an incident record to report and request assistance with an issue you are having</td>
</tr>
<tr>
<td>Emergency Change</td>
<td>Open an Emergency Change</td>
</tr>
<tr>
<td>International Plan Request</td>
<td>International Plan Request</td>
</tr>
<tr>
<td>New Hire</td>
<td>New Hire Order Guide</td>
</tr>
<tr>
<td>Password Reset</td>
<td>Request a reset of a password for a service or an application.</td>
</tr>
<tr>
<td>Password Reset Enrollment</td>
<td></td>
</tr>
<tr>
<td>Report an Issue</td>
<td>Simple form with Subject and Description</td>
</tr>
<tr>
<td>Report Outage</td>
<td>Report an outage of a service or an application.</td>
</tr>
<tr>
<td>Report Performance Problem</td>
<td>Request assistance with a performance issue you are having with a service or an application</td>
</tr>
<tr>
<td>Request Knowledge Base</td>
<td>Request for a Knowledge Base</td>
</tr>
</tbody>
</table>

**Figure 620: 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 621: Request Fields widget](image)

### Table 1100: 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 ${Requests are picked up within &lt;br/&gt; 4 hours (M-F 9-5)}.</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 622: Requested Items widget
Instance options

Requested Items

Title
Requested Items

Bootstrap color
Primary

Display field
Short description

Filter

Table
Requested Item [sc_req_item]

Link to this page
ticket

Maximum entries
20

Save (⌘ + S)
### Table 1101: Requested Items instance options fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Name of the widget. The title appears in the header of the widget.</td>
</tr>
<tr>
<td><strong>Bootstrap color</strong></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>Display field</strong></td>
<td>Determine what information displays as the title for each requested item. Short description is the default.</td>
</tr>
<tr>
<td><strong>Filter</strong></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><strong>Table</strong></td>
<td>Table that displays the item when the user clicks an entry</td>
</tr>
<tr>
<td><strong>Link to this page</strong></td>
<td>Page that opens when the user clicks an item</td>
</tr>
<tr>
<td><strong>Maximum entries</strong></td>
<td>Max number of entries that appear in the list of requested items</td>
</tr>
</tbody>
</table>

---

**SC Catalog Item widget**

Describe catalog items and add options for users to select from.

**Configure catalog items** using the Service Catalog in the platform UI by navigating to Service Catalog Catalog Definitions Maintain items. Catalog items must have Availability set to Desktop or Desktop and Mobile.

Any specialized font or formatting added in the description field for the catalog item within the platform, appears the same way in the portal.

Catalog variables determine what information your users are allowed to pick from, for example, color, size, or price. For more information on defining the variables in the catalog item, see Create a service catalog variable.

Determine whether users can add this item to the shopping cart by selecting the Show Add Cart button check box in the widget instance options.
### iPhone 6

**iPhone 6**

iPhone 6s offers a multitude of features packaged within cutting edge design. This phone will be part of the corporate mobile contract, and you will not be billed for its use. The device has the following technical specifications:

- iOS 9
- Retina display
- A9 chip
- Touch ID

#### What color would you like?

- [ ] Black

#### How many gb's of storage?

- [ ] 16

**Price:** $450

*Recurring Price: $50 Monthly*

[Submit]  [Add attachments]
Instance options

Table 1102: Instance options

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrap color</td>
<td>Color of the widget based on the selections made in the Branding Editor.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show Add Cart button</td>
<td>Includes the option to add the item to the shopping cart. If this check box is cleared the Add to Card button does not appear on the form.</td>
</tr>
<tr>
<td>Custom URL format</td>
<td>Enter a web page for the page to redirect to upon successful completion of an order.</td>
</tr>
<tr>
<td></td>
<td>• Enter a custom portal URL, that is relative to the root. For example, if you enter sp?id=sc_home, the page redirects to &lt;instance_name&gt;.servicenow.com/sp?id=sc_home.</td>
</tr>
<tr>
<td></td>
<td>• Append a custom portal URL such as sp?id=sc_home</td>
</tr>
<tr>
<td></td>
<td>• You can also include a full web address such as <a href="https://google.com">https://google.com</a></td>
</tr>
<tr>
<td></td>
<td>• If the Auto Redirect on Successful Order is selected, the page redirects to the URL listed. If the option is cleared, clicking the click here to view in the confirmation banner redirects to that URL.</td>
</tr>
<tr>
<td></td>
<td>• Custom URL takes precedence over Page and Table selection</td>
</tr>
<tr>
<td>Successful Order Page</td>
<td>Select a page in the portal to redirect to after a successful order completion. If Auto Redirect on Successful Order is selected, the page redirects to the URL listed. If the option is cleared, clicking the click here to view in the confirmation banner redirects to that page.</td>
</tr>
<tr>
<td>Successful Order Table</td>
<td>Select a specific table on a page to direct a user to after the order is completed. The page ID and the table name are coupled to form a URL. If you set the page ID to Requests and the table name to Requested Item, the page opens with a URL similar to &lt;instance_name&gt;.servicenow.com/sp/?id=requests&amp;table=sc_req_item.</td>
</tr>
<tr>
<td>Auto Redirect on Successful Order</td>
<td>Select this option to redirect users to a new page automatically. If this option is not selected, the user stays on the catalog item page after submitting.</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].
Figure 626: SC Categories widget
Instance options

Figure 627: Categories widget instance options

Table 1103: Categories widget 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</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>Hide at XS</td>
<td>Hides the categories option on small screens, for example, on smart</td>
</tr>
<tr>
<td></td>
<td>phones. 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</td>
</tr>
<tr>
<td></td>
<td>catalog item.</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 to folder icon ( 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>Page</td>
<td>Defines what page opens when a user clicks a category. By default, this option redirects to the page for the selected category.</td>
</tr>
</tbody>
</table>

*SC Category Page widget*
Lists the catalog items available within a certain category. Categories are determined within the Service Catalog module.

**Note:** Order Guides do not display when viewed in a browser on a mobile device.
<table>
<thead>
<tr>
<th>Laptop Type</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Laptop</td>
<td>Acer Aspire NX</td>
<td>$1,100.00</td>
</tr>
<tr>
<td>Apple MacBook Pro 15&quot;</td>
<td>Apple MacBook Pro</td>
<td>$1,099.99</td>
</tr>
<tr>
<td>Asus G Series</td>
<td>ASUS G Series</td>
<td>$839.99</td>
</tr>
<tr>
<td>Development Laptop (PC)</td>
<td>Dell XPS 13</td>
<td>$1,100.00</td>
</tr>
<tr>
<td>Notebook Computer Loaner</td>
<td>Loaner Laptop</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 628: SC Category Page widget*
Instance options

<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>

Figure 629: Category page instance options

Table 1104: Category page widget instance options fields

**SC Order Guide widget**

Standardized order guide for the catalog items. This widget compiles several commonly ordered items into an order guide for a specific purpose, for example, new hires.
New Hire

* Hiring Manager
  - Eric Schroeder

* What group is this person joining

* Will this be a remote employee?
  - No

What office will they report to

* Will your employee need anything non-standard
  - No

Included Items...

Standard Laptop

Items

- Standard Laptop
- External Monitor
- New Email Account
- Corp VPN
- Desk Set Up

Total price: $1,100
Submit

Required information
- What group is this person joining
- Preferred Email address
### Instance Options

![Order Guide instance options](image)

**Bootstrap color**
- Default

**Title**
- Service Catalog

---

**Figure 631: Order Guide instance options**

**Table 1105: Order Guide 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>
<tr>
<td>Title</td>
<td>The name of the order guide.</td>
</tr>
</tbody>
</table>

*SC Popular Items widget*
List of service catalog items that users purchase often.
## Popular Items

### Figure 632: SC Popular Items widget

### Instance Options

<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>

### Table 1106: Popular Item widget instance option fields

*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>Bundle Name</th>
<th>Price</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple iPhone 5</td>
<td>$599.99</td>
<td>1</td>
<td>$599.99</td>
</tr>
<tr>
<td>+ $31.00 Monthly</td>
<td></td>
<td></td>
<td>+ $31.00 Monthly</td>
</tr>
<tr>
<td>Logitech USB Headset for PC &amp; Mac</td>
<td>$29.99</td>
<td>1</td>
<td>$29.99</td>
</tr>
<tr>
<td>PC/Mac Compatible Headset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales Laptop</td>
<td>$1,100.00</td>
<td>1</td>
<td>$1,100.00</td>
</tr>
<tr>
<td>+ $100.00 Annually</td>
<td></td>
<td></td>
<td>+ $100.00 Annually</td>
</tr>
</tbody>
</table>

Figure 634: 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.
Figure 635: SC Saved Cart widget

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.

Instance Options

The Saved Carts widget does not have any included instance options.

SC Shopping Cart widget
The shopping cart widget, used in combination with Service Catalog, stores all of your orders in one place.
Figure 636: Shopping cart widget

With the shopping cart widget, you can:

- Control the quantity of items going into the cart.
- Add items to a cart. This information gets 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 at a later time.
- Use the Clear Cart option to remove all the items from your cart.

If you want to add a bundle to your cart from the saved cart, you have the option of replacing all of the existing cart items with the bundle items, or including the bundle items with the cart items.

The shopping cart respects most Service Catalog properties.
Instance options

![Image of instance options](image)

**Table 1107: Shopping cart 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>
<tr>
<td>Cart template</td>
<td>Enter the name of an 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.html and large_shopping_cart.html.</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.
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 639: Shopping cart in the header menu

```
{
  "enable_cart": true,
  "displayValue": "true",
  "value": true
}
```
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.

*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 variables*. 
Variables

Allocated carrier

Sprint Nextel

Monthly data allowance

500MB [$1 Monthly]

Contract duration

12 Months

Color

Black

Storage

64GB

Save

Figure 640: Variable Editor widget

Instance Options

The Variable Editor widget is embedded as part of the shopping cart widget, therefore no instance options are included.

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.
Figure 642: Portal Config widget
**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 643: 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 644: 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 646: 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.
Figure 647: Business Service Status widget

Current Status widget
The Current Status widget displays any issues reported in the system.
Current Status

No system is reporting an issue

More information...

Figure 648: Current Status widget

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.

<table>
<thead>
<tr>
<th>Planned Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>We publish information on planned service availability below. This includes events occurring over the next 5 days.</td>
</tr>
<tr>
<td>No service maintenance is planned over the next 5 days</td>
</tr>
</tbody>
</table>

Figure 649: Planned Maintenance widget

Instance options

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.
**Service History - Bond Trading**

From most recent to oldest, this list shows all outages, degradations and planned maintenance for this service.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Service Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outage</td>
<td>Bond Trading</td>
<td>Started 2016-06-14 17:13:15, Duration 1 Hour 15 Minutes</td>
</tr>
<tr>
<td>Planned Outage</td>
<td>Bond Trading</td>
<td>Started 2016-06-10 14:50:26, Duration 3 Hours 31 Minutes</td>
</tr>
<tr>
<td>Planned Outage</td>
<td>Bond Trading</td>
<td>Started 2016-06-09 04:37:15, Duration 3 Hours 32 Minutes</td>
</tr>
<tr>
<td>Planned Outage</td>
<td>Bond Trading</td>
<td>Started 2016-06-08 16:08:12, Duration 3 Hours 24 Minutes</td>
</tr>
</tbody>
</table>

**Figure 650: Service History widget**

**Instance options**

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.
Figure 651: Service Status widget

**Instance options**

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.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>No issues</td>
</tr>
<tr>
<td>🔄</td>
<td>Planned maintenance</td>
</tr>
<tr>
<td>🔄⚠️</td>
<td>Service degradation</td>
</tr>
<tr>
<td>⚠️</td>
<td>Outage</td>
</tr>
<tr>
<td>🔄⚠️🔄️</td>
<td>Multiple issues</td>
</tr>
</tbody>
</table>

Figure 652: Service Status Legend widget

**Instance options**

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.
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 ( يكنא) 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.
Advanced users can configure the available options for a widget. For more information, see [Widget option schema](#) on page 2382.

**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 656: Widget context menu
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 1108: 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 2382.</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.

Parts of a widget

Like Angular directives, widgets execute a specified behavior within a Service Portal page. A widget includes:

**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.

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

When initially added to a page, a widget does not have instance options defined. If a default state is not provided, a widget can appear empty and can cause confusion. Instead of creating a widget that defaults to an empty state, give your widget default data to display when no other options are defined to:
<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
<th>Learn more</th>
</tr>
</thead>
</table>
| **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 to embed a subsection of a widget, embedding the entire widget creates unnecessary overhead. Instead, use directives to share lightweight code between 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. | Reuse components with Angular Providers on page 2388. |
| **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 server calls enabling you to:  
  - Keep widgets in sync when changing records or filters.  
  - Share context between widgets.  
  - Develop more performant widgets. | Reuse components with Angular Providers on page 2388. |
| **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 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 |                                                |
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 mouseover and other events that do not translate to a mobile device.
- Use SCSS variables to reuse items.
- Use variable names when using colors.
- Wrap strings for translation in localization APIs. See Internationalize a widget on page 2402.

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".
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.
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.

Figure 658: Hello World 2 clone
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.

4. Click 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.
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.
})();
```

**Define 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, and type. 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.
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.

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) {
               
   ```
return '$' + myVal.toFixed(2);
}
}

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.

   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.

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
<div>
    <widget id="widget-cool-clock"></widget>
</div>
```

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>
</tbody>
</table>
### Property name | Type | Description
--- | --- | ---
**css** | string | Compiled CSS output from the SASS field for the widget.
**data** | object | Data object containing keys and values from the widget server script.
**dependencies** | array | Any third-party libraries to load before the widget executes.
**options** | object | Options used to initialize the widget.
**template** | string | HTML template field for the widget.

**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 660: 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
   <div class="clock">
     <span class="square">
       <svg viewBox="0 0 100 100">
         <![CDATA[
           <line ng-repeat="minor in c.minors track by $index"
                 class="minor" y1="42" y2="45" ng-attr-transform="translate(0, 0) transform("y1 y2")]>
             <circle class="clock-face" r="48"/>
           <line ng-repeat="major in c.majors track by $index"
                 class="major" y1="42" y2="45" ng-attr-transform="translate(0, 0) transform("y1 y2")">
             <circle class="clock-face" r="48"/>
           </line>
         <![CDATA[
           <line class="hour" y1="2" y2="-28" ng-attr-transform="rotateH(60 * c.date.hours) + c.date.minu" />
           <line class="minute" y1="4" y2="-30" ng-attr-transform="rotateH(6 * c.date.minutes) + c.date.minu" />
           <line class="second" y1="18" ng-attr-transform="rotateH(c.date.seconds)"/>
         ]]>]]>
       </svg>
     </span>
   </div>
   ```

   Client Script

   ```javascript
   function (timeout) {
     var c = this;
     c.darkness = "";
     if (c.options.c_color || c.options.c_color.length) {
       c.options.c_color = 'red';
     }
     var x = c.options.zone || "America/Los_Angeles";
     c.date = moment().tz(x);
     c.majors = new Array(12);
     c.minors = new Array(60);
     function tick() {
       c.date = new moment().tz(x);
       var t = c.date.hour();
       c.darkness = "";
       if (t < 13) {
         c.darkness = "morning";
       } else if (t < 19) {
         c.darkness = "afternoon";
       } else if (t < 25) {
         c.darkness = "night";
       }
       setTimeout(tick, 1000);
     }
     tick();
   }
   ```
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>
Field | Description
--- | ---
Angular module name | 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.

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>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:

   `<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.

**Server script**

```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.

**Tutorial: 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**
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.

---

**Tutorial: 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');
```
```javascript
    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 1109: 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 <code>c.data.keywords</code>.</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 <code>c.server.update()</code> 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 <code>c.data.items</code>, an instance of the template is created and the expressions <code>{item.name}</code> and <code>{item.price}</code> 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.
Tutorial: 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:

```
(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');
        return items;
    }
```

© 2018 ServiceNow. All rights reserved. 2407
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}}</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.
Tutorial: 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:

```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)">{{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>
    <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 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:

```css
.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.
Tutorial: 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 */
    "15706fc0a0aa7007fc21e1ab70c2f": "question", /* Can we help you? */
    "d68eb4d637b1300054b6a3549dbe5db2": "mobile-phone", /* Mobiles */
    "109c9d8c6112276003b17991a09ad65": "print", /* Office and Print */
    "5d643c6a3771300054b6a3549dbe5db0": "print", /* Printers */
    "2c0b59874f7b420008e6eda18110c71f": "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.
```javascript
function() {
  return {
    template: '<span class="fa fa-stack fa-lg"></span><i class="fa fa-circle fa-stack-2x"></i><i class="fa-{{::icon}} fa-stack-1x fa-inverse"></i>'
  }
},
  link: function(scope, element) {
    var _iconMap = {
      '065a9f237313b0025d43d3a6eb55b4': 'tablet', // Tablets /
      '3d78e1c0fbc66b7071f11a387e2f': 'question', // Can we help you? /
      '60be43b83073b0025d43d3a6eb55b4': 'mobile-phone', // Mobiles /
      '3d78e1c0fbc66b7071f11a387e2f': 'print', // Office and Print /
      '5d843c037313b0025d43d3a6eb55b4': 'print', // Printers /
      '2ebb59074762d656e6ec3b112c71': 'plug', // Peripherals /
      'b00695e1c0fbc66b7071f11a387e2f': 'desktop' // Software /
    };
    scope.icon = _iconMap[scope.category] || 'shopping-cart';
  }
}
```
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

   ![New Angular Providers](image)

   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">
           <!-- Content of the list item -->
         </li>
       </ul>
     </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>
</table>
| spUtil   | • addTrivialMessage(String message)  
          | • get(String widgetId)  
          | • format(String, Object)  
          | • refresh(Object $scope)  
          | • recordWatch(Object $scope, String table, String filter, Function callback)  
          | • Update(Object) |
| spModal  | • alert(String message).then(fn)  
          | • confirm(String message).then(fn)  
          | • open(Object options).then(fn)  
          | • prompt(String message, String default).then(fn) |

**Note:** g_form as a global object cannot be used in a widget client controller or in a UI script.

**Supported server side APIs**

These are the supported Service Portal APIs that can be used in a widget server script.
Class | Available methods
---|---
GlideSPScriptable | • canReadRecord(GlideRecord gr)  
• canReadRecord(String table, String sysId)  
• getCatalogItem(String sysId)  
• getCatalogItem(String sysId, Boolean isOrdering)  
• getDisplayValue(String fieldName)  
• getField(GlideRecord gr, String fieldName)  
• getFields(GlideRecord gr, String fieldNames)  
• getFieldsObject(GlideRecord gr, String fieldNames)  
• getForm(String tableName, String sysId)  
• getListColumns(String tableName, String view)  
• getMenuHREF(GlideRecord page)  
• getMenuItems(String sysId)  
• getParameter(String name)  
• getPortalRecord()  
• getRecord()  
• getRecordDisplayValues(Object data, GlideRecord from, String names)  
• getRecordElements(Object data, GlideRecord from, String names)  
• getRecordValues(Object data, GlideRecord from, String names)  
• getStream(String table, String sysId)  
• getUserInitials()  
• getValue(String name)  
• getValues(Object data, String names)  
• getWidget(String sysID, Object options)

**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://angularjs.org/).

Configure search in Service Portal

Add search sources to your portal page to configure search. A search source is a record that describes the behavior and source of some type of data.

The search group defines where search data is retrieved from, how a search entry is templated in the search result page, and whether or not type-ahead functionality is enabled for that search type. Search sources are stored in the sp_search_source table.

Configure search sources in the platform.

1. Navigate to Service Portal Portals and select the portal you want to create a search source for.
2. From the Search Sources related list, click New or Edit to change an existing search source.
3. Create a name and ID for the search source.
4. Complete the following fields on the Search Source form:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is scripted source</td>
<td>Select this option to add 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>A script defining the endpoint and API calls to fetch external data. This field is only visible when Is scripted source is selected.</td>
</tr>
<tr>
<td>Table</td>
<td>Select a table from the list that you want to draw your results from. For example, User [sys_user]. Table queries use the Zing text indexing and search engine.</td>
</tr>
<tr>
<td>Conditions</td>
<td>Apply a filter to the table if you don't want all the search results to display. For example, Active is True.</td>
</tr>
<tr>
<td>Primary display field</td>
<td>Select which field you want to display in the search results. For example, Name.</td>
</tr>
<tr>
<td>Display fields</td>
<td>Select fields that also display in the search results. For example, Email, Department.</td>
</tr>
</tbody>
</table>

5. To create a typeahead search, select the Typeahead tab.
6. Make sure Enable typeahead is selected. Add a glyph to appear in the search bar, or a Page. For example, the user glyph, and the Form page.

Note: The Page field only configures the target page when an element is selected in the typeahead result. To change the link location for the full search results in the results page, edit the anchor HTML href attribute in the template to point to the page you want to navigate to. Only developers with an understanding of HTML scripting should do this advanced configuration.

Scripted sources, and Search Page Templates are advanced search features. Only developers with a scripting knowledge should configure these options. In most cases, this simple configuration should be enough.

Default portal search sources

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 ID's in the property.

To remove the default search source behavior, delete the property value or delete the value altogether.

Search page template

Advanced users with an understanding of HTML and Angular bindings can use the Search Page Template option in the Search Source form to define the appearance of the search results.

In most cases you won't need to change the default search page template. But you can use this field to configure how your data is rendered on the search results page.

Search page templates use simple HTML where you can define Angular bindings to actually render the data on the screen. Each search source comes with a default template that can be used, or modified to display additional data that you can provide through a Data-fetch script.

Configuring search page templates requires a knowledge of HTML and Angular bindings.

Typeahead search in Service Portal

Search Sources in Service Portal have an option for typeahead search. Typeahead has a simple configuration option for administrators or an advanced option for more technical users.

Typeahead is a mechanism that returns search results as a user is typing in a search box in real-time.

Some search scripts may not be fast enough to make typeahead feasible, so you can enable typeahead for some search sources and disable it for others.

Additionally, similar to generating data for search sources, there are two ways to configure typeahead:

- Simple: Administrators can simply define an icon for typeahead results, which displays next to the primary field defined by the search results. This is the easiest configuration to get immediate typeahead results with little configuration.
• Advanced: If you need more fine-grain control over the appearance of typeahead results, you can enable advanced configuration of typeahead. Configure the template of the typeahead result in the search page template.

Service Portal 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.

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 2250. 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:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide.entry.page.script</td>
<td>new</td>
<td>Login page determination</td>
</tr>
<tr>
<td></td>
<td>SPEntryPage().getLoginURL()</td>
<td></td>
</tr>
</tbody>
</table>

2. It's 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.
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 a system 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

Pro code or low code users can 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.
Videos

Use these videos to learn more about Service Portal configuration.

Service Portal components

View this video to learn more about the different pieces that make up a portal.

Anatomy of a widget

Check out this video to learn more about widgets in Service Portal.

Service Portal debugging tips

View this video for debugging tips in Service Portal.

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>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($color)</td>
<td>Returns the complement of a color.</td>
<td>No</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Availability</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>invert($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, $amount)</td>
<td>Makes a color more opaque.</td>
<td>No</td>
</tr>
<tr>
<td>transparentize($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>

### Other color functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjust-color()</td>
<td>Increases or decreases one or more components of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>scale-color()</td>
<td>Fluidly scales one or more properties of a color.</td>
<td>Yes</td>
</tr>
<tr>
<td>change-color()</td>
<td>Changes one or more properties of a color.</td>
<td>No</td>
</tr>
<tr>
<td>ie-hex-str()</td>
<td>Converts a color into the format understood by IE filters.</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>
</tbody>
</table>
### Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<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 together two lists into one.</td>
</tr>
</tbody>
</table>

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### Adding custom functions

```scss
ss @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:

```scss
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:

```
.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:

```
.container {  
  width: 100%;  
}

article[role="main"] {  
  float: left;  
  width: 62.5%;
}

aside[role="complementary"] {  
  float: right;  
  width: 31.25%;
}
```

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.

```
@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:

```
.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 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 the following sections.

View the list of your subscription applications

See View your subscription applications and allocation levels on page 2431.

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 and manage the number of subscribed users.

See Allocating users to a Per-User subscription on page 2436.

What to do next

Day-to-day administration: Monitor and manage subscriptions

See Monitoring subscriptions on page 2444

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 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 form 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

• You might not see all of the subscription services that you have purchased because the Subscription Management application does not yet allow management of some subscription services.
• 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.

On your production ServiceNow instance, navigate to Subscription Management Subscriptions. The page lists all subscriptions that your organization has purchased. A color code indicates the allocation level. You can click a subscription Name to open the Subscription form, where you can:
• View or update how users are allocated to a subscription. See Subscription form on page 2432
• View the applications and plugins that are included with a subscription on page 2434
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.

Table 1110: Fields on the Subscription form

<table>
<thead>
<tr>
<th>Name</th>
<th>[Read-only] One of the following values:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• For Per-User, Max User, PA Indicator,</td>
</tr>
<tr>
<td></td>
<td>and Unlimited subscriptions: Name of</td>
</tr>
<tr>
<td></td>
<td>the subscription that your organization</td>
</tr>
<tr>
<td></td>
<td>purchased.</td>
</tr>
<tr>
<td></td>
<td>• For Capacity subscriptions: Name of</td>
</tr>
<tr>
<td></td>
<td>the product, standard offering, option,</td>
</tr>
<tr>
<td></td>
<td>or add-on that your organization</td>
</tr>
<tr>
<td></td>
<td>purchased.</td>
</tr>
</tbody>
</table>

| Type                      | [Read-only] Type of subscription: Per-User, Max User, PA Indicator, Capacity, or Unlimited. |

| Category                  | [Read-only] The source of the purchased subscription: ServiceNow or ServiceNow Store. |

<p>| Start date / End date     | [Read-only] 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. |</p>
<table>
<thead>
<tr>
<th>Purchased</th>
<th>[Read-only] Number of users or other resources that can be subscribed.</th>
</tr>
</thead>
</table>
| Allocated      | Number of currently subscribed users or allocated resources for the subscription.  
                 The color codes indicate the percentage of the subscription that has been used. |
| Limit to purchased | Select the check box to ensure that you do not exceed the purchased subscription limit while attempting to allocate users.  
                   If allocating a user would exceed the subscription limit and the Limit to purchased option is selected for the subscription, the user is not subscribed and is instead set to Pending status. |
| Auto-sync with user sets | Select the check box to check all associated user sets for updates regularly (added or removed users) based on the user set membership settings and then update subscription allocation accordingly. |
| Display only   | [read-only] A value of true indicates that user allocation or monitoring is not currently supported for the subscription. |

### Table 1111: Related lists on the Subscription form

<table>
<thead>
<tr>
<th>Subscription Applications</th>
<th>Applications or suites that are associated with the subscription. The 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.</th>
</tr>
</thead>
</table>
| Subscribed Users          | This list of users that are subscribed to the applications is populated only for Per-User subscriptions.  
                           The users were allocated o the subscription individually and/or are members of user sets that were added to the subscription. |
User Sets | User sets that were added to the subscription.
---|---
Excluded Users | Excluded users cannot be allocated to the subscription.

### 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 subscriptions that your organization has purchased.

   **Note:** If the subscription does not appear in the list, contact your ServiceNow account representative to purchase the subscription.

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 subscription histories

You can view concise data on subscription downloads and updates for your organization.

**Role required:** usage_admin or admin

1. Navigate to Subscription Management Subscriptions and then click a subscription Name.
2. On the Subscription form, click the View Subscription History related link.
3. The Subscription History popup lists the operations on subscriptions for this ServiceNow instance. Click an Operation to view details.

### View the histories of subscription users

For each Per-User subscription, you can view concise historical data on changes in subscription status for users: when users were subscribed and when they were unsubscribed, excluded, or unexcluded.

**Role required:** usage_admin or admin

1. Navigate to Subscription Management Subscriptions and then click the Name of a Per-User subscription.
2. On the Subscription form, click the View User Subscription History related link.
3. The User Subscription History popup lists the operations on user subscription status for the specified subscription. Click a User State to view details of a change in subscription status for a user.

   - **User State:** Lists the change in the user status: subscribed/unsubscribed and excluded/unexcluded
   - **Allocation Source:** Lists the name of the user set that acted as the source of the user
   - **Allocation Type:** Lists the method for allocating the user to the subscription: user set or individual
   - **Operation time and Created by:** Lists the timestamp of change and the admin who made the change

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View the histories of subscription user sets

You can view concise historical data on subscription user sets: when they were created, updated, or deleted.

Role required: usage_admin or admin

1. Navigate to Subscription Management Subscription User Sets and then click the Name of a user set.
2. On the Subscription User Set page, click the View User Set History related link.
3. The User Set History popup lists the operations on user sets for the specified subscription. Click an Operation to view details.

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>
<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 suite 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 in the suite.</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. As the usage administrator, you allocate eligible fulfillers to each Per-User subscription. After fulfiller users are subscribed, you can enable subscription enforcement.</td>
</tr>
</tbody>
</table>
Unlimited | 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.

Why a subscription does 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 of the subscription services that you have purchased because the Subscription Management application does not yet allow management of some subscription services.
• Self-hosted instances do not receive subscription information and therefore do not display information on the Subscriptions form.

Why is the Subscriptions list empty?

• The subscription information might not yet have arrived. The data is downloaded daily.

Allocating users to a Per-User subscription

You, the usage admin, use the Subscriptions module to allocate users to the Per-User type subscriptions that your organization has purchased.

Example: Allocating users to a Per-User subscription

In this example, your organization purchased a subscription for 200 fulfiller users. You can therefore specify the 200 users—the subscribed users—who have the right to use the subscription application and features 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 subscribed to an application. 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.
The subscription admin allocates a mix of user sets and individual users to the 200-user subscription.

User Set 1

Allocate

User Set 2

Allocate

5 Individual Users

Allocate

The 200 users that the admin allocated to the subscription are now subscribed to the application.
Guidelines for allocating users

- You allocate users only to Per-User subscriptions. The instance automatically 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 Pending status and are listed on the Pending Users related list.
- 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 re-subscribed in the next synchronization cycle. To remove such a user, exclude the user.

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.

User sets

You define the criteria for a user to become a member of a user set (for example, all fulfiller users in the IT department). When you add a user set to a subscription, the system attempts to subscribe all users in the user set.

Auto-sync

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 2440.
**How users are subscribed and unsubscribed**

- 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 Pending status 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.

**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 allocated directly
- 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 Pending status. 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 allocated directly
- The user is added from another user set

**Build a user set**

You can create a user set using either of two methods: Configure a filter 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. Open the Subscription User Sets page: Navigate to Subscription Management Subscription User Sets.
2. Click New and then enter a unique Name (for example, Fulfiller users in the IT department) and Description for the user set.
3. Use one of the following methods to specify the Source of the users that you will add to the user set:
### User [sys_user]

- **Description:** The Conditions setting is a standard ServiceNow condition builder.
  
  1. 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]`.

  2. Click to view the number of users that the filter generates.

### Group [sys_user_group]

- **Description:** Unlock the Groups box and add appropriate groups.

  4. When the 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

To add an existing user set to a subscription:

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 Pending status and are listed in the Pending Users related list. Currently subscribed users who were individually subscribed or in other users sets are not affected. See Manage users with 'Pending' status on page 2443.

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 then 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 Pending status 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

Users are removed for

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 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 should be 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: 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. If allocating a user would exceed the subscription limit, the user is not subscribed. Instead, the user is set to Pending status and is listed in the Pending Users related list.
   - The number of allocated users is updated to include the users that you added.
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 should be 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 user is allocated to the subscription. If allocating a user would exceed the subscription limit, the user is not allocated. Instead, the user is set to Pending status and is listed in the Pending Users related list on the Subscription form.

   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 with 'Pending' status

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 Pending status. You can then deallocate some users and allocate other users to the subscription.

Role required: usage_admin or admin

Note: To allocate pending users to the subscription, the number of subscribed users must be lower than the subscription limit (the Purchased value).

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. Each action also removes the user from the Pending Users list.

<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.</td>
</tr>
<tr>
<td>Exclude from subscription</td>
<td>Excluded users cannot be allocated to the selected subscription.</td>
</tr>
<tr>
<td>Delete</td>
<td>Removes the selected users from Pending status 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 re-subscribed in the next synchronization cycle. To remove such a user, exclude the user.
Exclude a user

You can *exclude* users. Excluded users cannot be allocated to a specified subscription.

Role required: usage_admin or admin

---

**Note:** If an excluded user is a member of a user set that is auto-synced, the user is not added by synchronization.

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 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 subscriptions

You, the usage admin, use the Subscriptions module to allocate users to the Per-User subscriptions that your organization has purchased.
Subscription life cycle

1. Receive and view subscriptions
   - Your instance downloads subscription information and notifies you by email. Now you can review the subscriptions to decide which actions to take.

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 2431</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 2436</td>
</tr>
<tr>
<td>Monitor and adjust</td>
<td>You monitor usage of subscription applications: how many subscribed users, can you allocate more users, users who are not subscribed, and so on. As needed, reallocate users.</td>
<td>Subscription Overview module: <em>Monitor how resources are allocated to subscriptions</em> on page 2446</td>
</tr>
<tr>
<td>Plan for renewing subscriptions</td>
<td>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.</td>
<td>Subscriptions module: • <em>View your subscription applications and allocation levels</em> on page 2431</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <em>View subscription histories</em> on page 2434</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <em>View the histories of subscription user sets</em> on page 2435</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <em>View the histories of subscription users</em> on page 2434</td>
</tr>
<tr>
<td>Review the subscriptions that</td>
<td>View the list of all types of subscriptions and check allocation levels at a glance.</td>
<td>Subscriptions module: <em>View your subscription applications and allocation levels</em> on page 2431</td>
</tr>
<tr>
<td>your organization has purchased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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. Use the reports to perform the following actions:

- 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 to view the following data:
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 (one month of data is required before the report appears):

- 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 this 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, 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 fullfiller 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.

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 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

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 count.
   • Subscription allocation levels below the specified threshold are marked with a green color code.
   • Allocation levels between the threshold and 100% are marked yellow.
   • Allocation levels above 100% are marked red.
Survey Management

The ServiceNow® Survey Management application allows you to create, send, and collect responses for basic surveys. You can also use the Survey widget to set up a survey within Service Portal, if installed.

Survey Management does not support domain separation.

Comparing Survey Management and Legacy Surveys

Two versions 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.

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 1113: 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>Capability</td>
<td>Surveys</td>
<td>Legacy Surveys</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</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>

**Configuring surveys in Survey Management**

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.

Survey Management roles

The Survey Management application uses the following roles.

No role is required to take assigned survey questionnaires.

Table 1114: Survey Management roles

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
<th>Contains roles</th>
</tr>
</thead>
</table>
| Survey administrator [survey_admin] | 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 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 1115: 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>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</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.</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>occurs on a table, such as when an incident closes.</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>data summaries for one survey definition.</td>
</tr>
</tbody>
</table>

Survey responses and results

There is a metric result record for each user's response to each question on every survey instance. Survey results for each question and category are calculated automatically based on these 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 the 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.

![Survey filter](image)  

**Figure 664: 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 2057.

**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
## Table 1116: 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 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>Normalized value</td>
<td>Adjusted value that accounts for the question's Scale definition setting, minimum and maximum values, and other factors.</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 1117: 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>
<tr>
<td>Scale factor</td>
</tr>
</tbody>
</table>

Normalized value = (3 - 1) / (6 - 1) * 10 / (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 SurveyView Surveys.
2. Open a survey definition.

   The scorecard link is hidden if there are no survey results to report.

The interactive scorecard displays the name of the survey and results or comparisons of the ratings. You can display results in the following views:

- Category Results
- Question Results
- Average Ratings
- History

**Survey scorecard category results**

The Category Results view is a stacked bar chart showing survey results for all questions in a category 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

**Note:** The Checkbox and Yes/No data types are combined into the Boolean data type in the Survey Designer
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 666: Survey scorecard category results detail](image)

**Survey scorecard question results**

The Question Results view shows the results for each question in a category using different chart types, based on a 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 Survey Designer.
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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**Bar chart**

A bar chart appears when question results use the Percentage data type.

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.

**Survey scorecard average ratings**

The Average Ratings view displays the weighted average rating for each survey question in a category.

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.

![Figure 669: Average ratings detail](image)

**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.
Figure 670: Survey scorecard trend chart

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.
### Survey Scorecard

#### Overall Rating

<table>
<thead>
<tr>
<th>Service Desk Satisfaction Survey</th>
<th>Current</th>
<th>Diff</th>
<th>2013</th>
<th>2012</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you been satisfied with the response time to your incident? (1=not at all, 6=completely)</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 courteous and respectful was the technician who responded? (1=poor, 6=excellent)</td>
<td>0.00</td>
<td>-1.02</td>
<td>1.00</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>-1.21</td>
<td>1.21</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>-1.02</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 671: 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.
### Service Desk Satisfaction Survey

#### Survey Scorecard

<table>
<thead>
<tr>
<th>Overall Rating</th>
<th>Current</th>
<th>Diff</th>
<th>1st</th>
<th>4th</th>
<th>3rd</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Desk Satisfaction Survey</td>
<td>0.00</td>
<td>-5.40</td>
<td>5.40</td>
<td>0.00</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>
<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>
<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>
<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>
<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>
<td>0.00</td>
</tr>
</tbody>
</table>

Figure 672: Survey scorecard history - 4 quarters
Export a 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 Survey widget is provided on the base instance.

Surveys in Service Portal

If you have Service Portal installed, you can use the Survey widget to set up surveys 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 2197. 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 1118: 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>Specify how many surveys to show on the Service Portal homepage (default is 5).</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 survey designer property *Pagination setting for Service Portal view* is automatically set to one question per page.

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 673: Controls
The assessment engine provides a built-in result calculation feature that converts responses to scored question data types to a score between 0 and 10.

**Table 1119: 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 <em>Create a question in the survey designer</em> on page 2079.</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 <em>Quiz scorecards</em> on page 1991.</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>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.

![Survey Designer header bar and menu](image)

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.
- **Preview**: Display a preview of the survey as it will appear to recipients.
- **Publish**: Distribute the survey to the selected recipients.
- **Save and Publish**: Save 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.

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.
Figure 675: Initial appearance of the Survey Designer canvas

Configure a survey in the survey designer

The configuration values you use in this procedure are applied to the entire survey.

Role required: admin or survey_admin

1. Select Configuration in the survey designer.
2. Complete the Survey Designer Configuration form.

Table 1120: Survey Designer Configuration form

<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 survey to recipients.</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>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>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>
</tbody>
</table>
### Field Descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</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.  

| 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 and assessment 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 that opens.
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 Controls 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>
<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>
</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 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 |
| 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.                                    |
| Allow not applicable| 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. |
| Randomize answers   | 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. |

**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.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>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>
<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.</td>
</tr>
</tbody>
</table>

**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 very 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 676: 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 datatype

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 users’ queues.

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. For more information, see Show or hide fields on a form.

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

Navigate to Survey Survey Instances and open a survey instance.

Each survey instance is stored as a record on the Assessment Instance [asmt_assessment_instance] table with a modified view for survey use.

<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</td>
</tr>
<tr>
<td></td>
<td>are stored on the Assessment Instance table, and the field label on that</td>
</tr>
<tr>
<td></td>
<td>table is Metric type.</td>
</tr>
</tbody>
</table>
### Due date
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 and assessment instances that are in the Work in progress or Ready to take states.

### State
State of the survey instance. The possible states are Ready to take, In progress, Complete, and Canceled.

### Assigned to
User this survey instance is assigned to. This field becomes read-only when the state is In progress, Complete, or Canceled.

### Expiration date
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.

### Related Link
**View User's Response**
Shows a read-only version of the survey responses completed by the user.

### 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 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 *Show or hide fields on a form*.

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.

**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

<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. Note: This property applies only to surveys. 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. Default value: Yes</td>
</tr>
<tr>
<td>css.assessment.question.header.background.color</td>
<td>Question header background color</td>
<td>Sets the background color of question headers on assessment and survey questionnaires. 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.

3. Modify the fields on the Survey Definition form, as appropriate.

<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>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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>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:</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>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.</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>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.                                                                                                                                                                                                                                                                                                                                |
| 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                                  | Content to display on the screen that appears when someone submits a survey questionnaire. Consider adding a thank you message, follow-up instructions, or other applicable information.                                                                                                                                                                                                                                                                                                                 |
| 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.                                                                                                                                                                                                                                                                                                                                                      |
| 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 and assessment 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.                                                                                                                                                                                                                                                                                                                                                                           |
| Related Links                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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. Note: You can use the View Survey URL related link to share the URL with users.</td>
</tr>
<tr>
<td>Remove Public Access</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>Related Lists</td>
<td></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>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

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>
<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> You cannot change the data type if another question depends on this question.</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> You cannot change the template if another question depends on this question.</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. This field is visible only if the data type is Choice or Likert Scale.</td>
</tr>
<tr>
<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>
<td></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>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>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.
   Be sure to create answer options if you select the Choice or Likert Scale data type.

**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 very 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 679: 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 datatype

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?

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.

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](image)

**Figure 682: 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.

<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 system does not, however, update the fields for existing questions 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 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 1127: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</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 1128: 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. You may want to change the order of questions if you add a new question manually after you create other 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. When 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>Table 1129: Trigger condition fields</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Assessment</td>
</tr>
<tr>
<td>Table</td>
</tr>
<tr>
<td>User 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>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></td>
<td><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.</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>Assessment</th>
<th>Service Desk Satisfaction Survey</th>
<th>Application</th>
<th>Global</th>
<th>Active</th>
<th>Business rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Incident (Incident)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User field</td>
<td>Click to select...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Repeat Interval**
- Days: 30
- Hours: 00
- Minutes: 00

**Trigger randomly**
- True

**Related Field**
- Related Field 1: None
- Related Field 2: None
- Related Field 3: None
- Related Field 4: None

**Description**
- Send incident caller service desk satisfaction surveys when incidents are closed

**Condition**
- Add Filter Condition
- Add "OR" Clause
- Choose field:
  - --
  - Value:

Submit
Trigger condition example

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>AINST0010011</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: INC00004305</td>
<td>INC00004305</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

Option: Assign a survey to any user
Description: 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>
<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>
| Complete: User has submitted all required responses. | 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. |

An error message appears if someone opens a URL for an unpublished or deactivated survey.

 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:

<table>
<thead>
<tr>
<th>UI16</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UI15 or UI11</td>
<td>Right-click the application menu you want to add the module to and select Edit Application Menu.</td>
</tr>
</tbody>
</table>

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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see 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 *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 Istanbul release and should be used to move data from one instance to another. For information about update sets, see *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]

*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.
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 Survey Legacy Surveys Masters.
   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.

3. Under Related Links, click Migrate to Assessment.
   A dialog box appears, which describes what happens when you migrate the survey. Note that certain types of survey questions cannot be migrated.

4. 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.

5. Click the reference icon beside the Assessment field to view the new survey definition.

6. 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.

7. 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.

8. 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 1131: 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 1132: 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 1133: 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 1134: Legacy question: Please rate the overall quality of your service.

<table>
<thead>
<tr>
<th>Question choice text</th>
<th>Question choice vlue</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 1135: 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 1136: 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.

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><strong>Save your responses without submitting them</strong></td>
<td>Click Save. You can close the questionnaire and access it later from your queue.</td>
</tr>
<tr>
<td><strong>Submit the survey after answering all questions</strong></td>
<td>Click Submit. You cannot return to the questionnaire after submitting.</td>
</tr>
</tbody>
</table>

**Note:** 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.

**Note:** If there is an unanswered mandatory question or an invalid response, an error message appears and the problematic questions are temporarily highlighted.

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.

Activating timeline visualizations adds the predefined CIO Roadmap timeline visualization, which 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.

**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 to access the functionality.

The Project Management plugin is activated 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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 a Timeline Visualization

Timeline administrators 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.

Additionally, they create timeline visualization views to define what data appears in the summary window when a user clicks a panel on the timeline.

- To create a timeline visualization, navigate to Timeline Visualization Create New and create a new record.
Figure 683: Timeline visualization configuration form
Table 1137: Timeline visualization configuration form field descriptions

<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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> 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. The default value is 500.</td>
</tr>
<tr>
<td></td>
<td><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 1138: 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 1139: 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. 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>
</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.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label 1</strong></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><strong>Label 2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Label 3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Label 4</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Default color</strong></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><strong>Color 1</strong></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><strong>Color 2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Color 3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Color 4</strong></td>
<td></td>
</tr>
</tbody>
</table>
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.

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 also installs the CIO Roadmap, 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 setting 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.

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).
Figure 684: Visualization personalization

Table 1140: Timeline visualization personalization form

<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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, Label 2, Label 3, Label 4</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>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, Color 2, Color 3, Color 4</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>
</tbody>
</table>

**Note:**

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 1141: 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>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.

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.

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>
<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>
<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.
Table 1144: 3D view

<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 along the slider track 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>Up and down arrow keys</td>
<td>Press the arrow keys to move the timeline forward or backward.</td>
</tr>
</tbody>
</table>

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>

Plugins

Timeline visualization activates the following plugin, if it is not already active.

<table>
<thead>
<tr>
<th>Plugin Name</th>
<th>Plugin ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Management</td>
<td>com.snc.project_management_v3</td>
<td>Tools that aid in planning, organizing, and managing projects by applying basic task management processes.</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</td>
</tr>
</tbody>
</table>
Istanbul   
ServiceNow    
Now Platform Capabilities

<table>
<thead>
<tr>
<th>Name</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sets a new visualization as the default.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Timeline visualizations roles

Timeline visualizations provides two roles.

**Table 1145: 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>

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.

**Note:** UI16 or UI15 is required to use Visual Task Boards.

The following podcast offers additional information on the use of Visual Task Boards.

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

For evaluation, you can activate the plugin for an application that requires a purchased subscription on a sub-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 are not functional because other plugins are inactive, those plugins are listed. A warning states that some files are not installed. If you want the optional features to be installed, cancel this activation, activate the necessary plugins, and then return to activating the 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 policy 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 Visual Task Boards

Several types of components are installed with Visual Task Boards.

### Tables installed with Visual Task Boards

Visual Task Boards add the following tables.

<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>
<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

Visual Task Boards add the following properties.

<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>

**Note:** To open the System Property [sys_properties] table, enter sys_properties.list in the navigation filter.

Script includes installed with Visual Task Boards

Visual Task Boards add the following script includes.

<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

Visual Task Boards add the following client scripts.

<table>
<thead>
<tr>
<th>Client script</th>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Kanban Choice</td>
<td>VTBBoard [vtb_board]</td>
<td>Adds the -- Kanban Board -- option to the Lane field. This option indicates that the task board is a flexible board.</td>
</tr>
</tbody>
</table>

Business rules installed with Visual Task Boards

Visual Task Boards add the following business rules.
<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>VTB Previous Additional Assignees</td>
<td>Private Task [vtb_task]</td>
<td>Triggers the system to send an email notification to users when they are designated as additional assignees for cards.</td>
</tr>
</tbody>
</table>
Notifications installed with Visual Task Boards

Visual Task Boards add the following notifications.

<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 are designated as additional assignees for tasks.</td>
</tr>
<tr>
<td>VTB assignee notification</td>
<td>Sends an email notification to users when they are designated as the primary assignees for personal tasks.</td>
</tr>
<tr>
<td>VTB lane change notification</td>
<td>Sends an email notification to a task's assignees 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 6.1 and later
- Internet Explorer version 10 and later
  - 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 app 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.

**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 1146: 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 (%28); flexible boards appear with a vertical line beside two squares (%28); guided boards appear with two vertical lines (%28).
Figure 685: 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 686: Board layout
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.

1. Navigate to **Self-Service Visual Task Boards**.
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 lanes**

Any board member can edit board lanes.

Role required: none

When you create a freeform or flexible task board, it includes the default lanes To Do, Doing, and Done. Any board member can change the names and add new lanes to accommodate the task workflow you want to track.

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>
</table>
| Create a new lane | 1. Scroll past the last lane and click Add Lane.  
|              | 2. Enter a title for the lane, then press the Enter key.                     |

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.
### Option

<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.</td>
</tr>
<tr>
<td></td>
<td>You can also change the lane order from the board configuration menu.</td>
</tr>
<tr>
<td>Hide a lane</td>
<td>1. Click the lane menu (…) in a lane header.</td>
</tr>
<tr>
<td></td>
<td>2. Select Hide Lane.</td>
</tr>
<tr>
<td></td>
<td>You can restore hidden lanes from the board configuration menu.</td>
</tr>
<tr>
<td>Delete a lane</td>
<td>1. Click the lane menu in a lane header.</td>
</tr>
<tr>
<td></td>
<td>2. Select Delete Lane.</td>
</tr>
<tr>
<td></td>
<td>3. In the confirmation dialog box, click Delete.</td>
</tr>
<tr>
<td></td>
<td>When you delete a lane on a freeform or flexible board, all the cards in the deleted lane are archived.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

### Task cards

A Visual Task Board task card 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.

Add a task to a flexible or guided board

You can add cards directly to a flexible or guided board lane. These cards represent records on whichever table the board is associated with.

Role required: none

1. In a lane header, click the lane menu (atches) 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.
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.

Figure 687: Card details
• 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).

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.

![My desk phone does not work](image)

**Figure 688: Task card labels**

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 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 689: 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><strong>Add an assignee from the quick panel</strong></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>
</tbody>
</table>

| **Add an assignee from the card details**   | 1. Open the card details for a task.                                         |
|                                             | 2. Click the assignees tab (👤).                                             |
|                                             | 3. Click Add Primary Assignee or Add Additional Assignee. The Add Primary     |
|                                             | Assignee option is not available if there is already a primary assignee.    |
|                                             | 4. Select a user.                                                           |
|                                             | 5. Close the card detail pop-up window.                                     |

The system sends an email notification to inform the new assignee of the change.

**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 690: Add attachment

1. Click a card.
2. Click the attachment tab

( )

3. Click Add Attachment and select a file to add as an attachment.

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.
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 Checklists.

Create a new checklist for a card
You can create a unique checklist for each Visual Task Board card.

Role required: none

1. Open the card details for a task.
2. Click the checklist tab (✓).
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 (_drag) and drag a checklist item to a different position in the list.
9. Save the checklist as a template for easy reuse.
   a) Click the more icon (More) beside the Checklist formatter.
b) Select Save as Template.
   A dialog box appears.

c) 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.

d) Click Save.

10. To create a task from a checklist item:
   a) Point to a checklist item and click the create task icon (▲).
   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 a checklist from a checklist template
In a Visual Task Board card, you can quickly create a checklist from a checklist template you previously created.

Create at least one checklist template.
Role required: none
A template saves time by creating checklist items automatically. You can add, edit, or remove checklist items without impacting the template.

1. Open a task card that does not already contain a checklist.
2. Click the checklist tab (✓).
3. 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.
4. Under Copy items from, select a template.
   The checklist items appear automatically.

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.

Role required: none

You can archive cards you are no longer working on to reduce visual clutter. Note that it is only possible to archive cards on a freeform board.

1. Perform one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Archive one card from the lane view</strong></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>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Archive one card from the card details</td>
<td>1. Click a card and view the Details tab.</td>
</tr>
<tr>
<td></td>
<td>2. Under Tools, click Archive.</td>
</tr>
<tr>
<td></td>
<td>3. In the confirmation dialog, click Confirm.</td>
</tr>
<tr>
<td>Archive all the cards in a lane</td>
<td>1. In the lane header, click the more options icon.</td>
</tr>
<tr>
<td></td>
<td>2. Select Archive All Tasks.</td>
</tr>
<tr>
<td></td>
<td>3. In the confirmation dialog, click Archive.</td>
</tr>
</tbody>
</table>

2. To see all archived cards for the current board, from the board navigation panel, open the board information menu and click View Archived Tasks. The Archived Tasks window appears.

3. To restore an archived card, point to it and click Restore.

Access a task record

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

Do one of the following actions.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access the record from the task card</td>
<td>Click the record number on the task card.</td>
</tr>
<tr>
<td>Access the record from the card details</td>
<td>1. Open the card details for a task.</td>
</tr>
<tr>
<td></td>
<td>2. Click the record number in the header.</td>
</tr>
</tbody>
</table>

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 (i), 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 1148: Conversation tool tabs

<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Info](image) | Info | 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 |
| ![Members](image) | Members | 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. |
## View board information

You can display key information about any task board.

Role required: none

<table>
<thead>
<tr>
<th>Tab icon</th>
<th>Tab name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Labels icon" /></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 enable labels before being able to use this tab.</td>
</tr>
<tr>
<td><img src="image" alt="Activity icon" /></td>
<td>Activity</td>
<td>Displays all of the activity for cards on the board.</td>
</tr>
<tr>
<td><img src="image" alt="Configuration icon" /></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 <a href="">Configure the task board</a> on page 2582</td>
</tr>
</tbody>
</table>
Figure 693: Board owner's view of board information
2. Open the task board tools and 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.

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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add a member</td>
<td>1. In the Users section, click Add Members. 2. Enter a user's name or select a user from the drop-down menu.</td>
</tr>
<tr>
<td>Remove a member</td>
<td>1. In the Members section, point to a user. 2. Click the dash icon (-).</td>
</tr>
<tr>
<td>Promote an assignee to a member</td>
<td>1. In the Assignees section, point to a user. 2. Click the upward arrow icon.</td>
</tr>
<tr>
<td>Promote all assignees to members</td>
<td>In the Assignees section, click Promote All.</td>
</tr>
</tbody>
</table>

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 694: Visual Task Board with SLA indicators enabled

- **SSL certification issue**
  - SLA: 52%
  - Unassigned
  - INC0010001
  - 19h ago

- **Trouble getting to Oregon mail server**
  - Unassigned
  - INC0000039
  - 4d ago

- **Can't access SFA software**
  - Unassigned
  - INC0000046
  - 26d ago

- **Please remove the latest hotfix from my PC**
  - SLA: 21%
  - INC0000027
  - 2h ago

- **Phishing scam?**
  - "TrustedBank"
  - 1 Attachment
  - INC0000002
  - 4d ago

- **Unable to get to network file shares**
  - User can't get to any of his files on the file server.
  - 1 Attachment
  - INC0000002
  - 4d ago

- **JavaScript error on hiring page of corporate website**
  - 1 Attachment
  - INC0000002
  - about an hour ago

- **Network storage unavailable**
  - INC0000009

**Alert!** One or more tasks on this board require immediate attention.

- **Add Task**
- **Add Task**
- **Add Task**
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

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.

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.

Configure the task board

The board configuration menu provides several options that affect the look and feel of the board.

Role required: none

1. From the task board tools, click the menu icon.
2. In the Background 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 1149: Quick panel options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show Panel</td>
<td>When enabled, the quick panel is visible.</td>
</tr>
<tr>
<td></td>
<td>This setting applies to the current user only.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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:

4. In the Configure Cards section, toggle card options as necessary.
- Changes to the cards apply to the current user only.

Table 1150: View options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Cards</td>
<td>When enabled, the lane width is decreased and card information and thumbnails do not appear on the card.</td>
</tr>
<tr>
<td>Show Card Info</td>
<td>When enabled, card information 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 Thumbnail</td>
<td>When enabled, 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>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Show SLAs</td>
<td>When enabled, 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. In the Configure Lanes 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.

### Configure 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 five labels per board. Any board member can edit the labels on a board.

1. From the task board tools, open the activity stream.
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>
<tbody>
<tr>
<td><strong>Edit the board query</strong></td>
<td>1. Under Board Filter, click Edit Filter to open the condition builder.</td>
</tr>
<tr>
<td></td>
<td>2. Add and remove conditions as needed to edit the query.</td>
</tr>
<tr>
<td></td>
<td>3. Click Save.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change the lane field</strong></td>
<td>1. Click the Lane Field picker and select a field or the None option.</td>
</tr>
<tr>
<td></td>
<td>Guided boards have the Lane Field set to a field, such as State. Flexible</td>
</tr>
<tr>
<td></td>
<td>boards have the Lane Field set to None. You can change the Lane Field value</td>
</tr>
<tr>
<td></td>
<td>accordingly to change the board type.</td>
</tr>
<tr>
<td></td>
<td>2. In the confirmation dialog, click OK.</td>
</tr>
</tbody>
</table>

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.

**Note:** Performance degradation may occur if you set the Value to a number greater than 1,000, especially on tablet devices.

**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.
Field | Value
-----|-----
Name | glide.vtb.board_max
Type | integer

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**

- Workflow release notes
- Upgrade to Istanbul
- Workflow movement with update sets on page 2710
- Workflow activity pinning on page 2830

**Set up**

- Getting started with workflows on page 2587

**Administer**

- Workflow roles on page 2702
- Administering workflow contexts on page 2703

**Use**

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- Create a workflow on page 2600
- Workflow activities on page 2734

**Develop**

- Developer training
- Developer documentation
- Using variables in a workflow on page 2627

**Troubleshoot and get help**

- Ask or answer questions in the Developer Community
- Troubleshoot workflows on page 2729
- Search the HI knowledge base for known error articles
- Contact ServiceNow Support

---

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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:

![Notification](image)

Figure 695: Sample activity

For more information on available activities and their behaviors, see Workflow activities on page 2734.

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:

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 698: 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 2600
Workflow editing

The Workflow Editor is a user interface for defining workflows. 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:

![Workflow diagram](image)

**Figure 699: Standard change**

Workflow palette

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.

![Workflows tab in the palette](image)

**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 2815.
Workflow canvas

The tabs on the workflow canvas allow a workflow designer to move between open workflows and access other resources.

The editor opens with the Welcome tab, which displays related help links and videos for basic workflows and Orchestration (when Orchestration is activated). From this tab, you can open articles in the ServiceNow Knowledge Base, user community conversations, live feed postings, and user documentation.

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 2600.

**Note:** If your organization blocks users from viewing YouTube videos, you can remove the video channel from either the workflow or Orchestration welcome pages using the procedure in Remove a blocked video channel on page 2594.
**Workflow welcome tab**

**Istanbul**

**ServiceNow**

**Now Platform Capabilities**

---

**Resources**

- Overview
- Dashboard
- Knowledge Articles
- Video Tutorials

**Channel**

**Trouble viewing Channel?**

**1/3 TechNow Episode 9 | Extending Approvals**

---

**Community**

**Start a Dialog**

**How to check column changes made in Requested Items Table List?**

by Gunelinder Singh - 15 hours ago

In Requested Items table for a view there were columns added or removed. How do I find the changes and what update set or view ...

**ITCM: Orchestration**

Nov 06, 2015

**Using Rollback to with multiple branches**

by Ryan McArthur - Jan 26, 2015

Greetings! First off, our organization is currently on Eureka. We have a change process that requires two ...

**Passing catalog variables into a subflow**

by Carin Yagar - Aug 27, 2015

I just read that in ...

**Order: Guide Workflow vs Catalog Item Workflow**

by Jared Shafson - Aug 25, 2015

We have a on boarding process that currently uses an order guide, every catalog item in the order guide has the same workflow ...

---

**Live Feed**

**Workflows**

A feed to discuss workflow authoring.

---

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Remove a blocked video channel

If your organization blocks users from downloading the videos on the Workflow and Orchestration welcome pages, you can remove the videos.

The instructional videos on the workflow and Orchestration welcome pages are hosted on YouTube. Some organizations block viewing videos from this site. You can follow this procedure to remove the videos from either welcome page.

1. Navigate to System UI UI Pages.
2. Open the workflow_editor_welcome record.
3. From the HTML field, remove the lines shown here for one or both of the welcome pages and update the record.

- Basic workflow

```html
<div id="workflowchannel" class="widget-cotent">
  <h3 class="widget-header"> ${gs.getMessage('Channel')}$</h3>
  <div class="widget-link">
  </div>
  <iframe src="https://www.youtube.com/embed?list=PLCOmiTb5WX3o_ksSvChk1Af4yZ021Yz" width="525" height="380"
    frameborder="0" allowfullscreen="true"></iframe>
</div>

• Orchestration

```html
<div id="orcheschannel" class="widget-cotent">
  <h3 class="widget-header"> ${gs.getMessage('Channel')}$</h3>
  <div class="widget-link">
  </div>
  <iframe src="https://www.youtube.com/embed?list=PLCOmiTb5WX3o6xHIphZC0FRue4Wlz0Xm" width="525" height="380"
    frameborder="0" allowfullscreen="true"></iframe>
</div>
```
<table>
<thead>
<tr>
<th>Name</th>
<th>workflow_editor_welcome</th>
<th>Application</th>
<th>Category</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Welcome page for workflow editor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```html
<div class="content-body">
  <div id="workflowwelcome" class="widget-content">
    <h3 class="widget-header">$gi.getMessage('Channel')</h3>
  </div>
</div>
```

Workflow interface

You interact with the workflow editor through several different elements of the window: the canvas, the canvas tabs, the title bar, the palette, and the palette tabs.

- 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.
Figure 703: Workflow user interface

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.
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.
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 2614.</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 2620.</td>
</tr>
<tr>
<td>Edit Stages</td>
<td>Opens the Workflow Stages list. For more information, see Workflow stages on page 2648. For tables with a column of Type = Workflow.</td>
</tr>
</tbody>
</table>

Managing workflows

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 2710 before creating the workflow.

1. Navigate to Workflow Workflow Editor.
   The Welcome tab of the Workflow Editor opens. It links to workflow documentation and other related resources. If ServiceNow Orchestration is activated, the welcome screen contains resources for that feature as well.

2. On the Workflows tab in the palette, click the + icon in the upper right corner.

   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 2614.

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>

Note: The list shows only tables and database views that are in the same scope as the workflow. Also, all users who edit the workflow must have access to the necessary tables and domains.

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**: 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>
</table>
| Activity pinning | 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 2830. The possible options are:  
  • Set by activity: Allows all activities in the workflow to use their own pinning settings. This is the default pinning option.  
  • Pin all activities: Pins all activities in the workflow to their current version.  
  • Unpin all activities: Allows all activities in the workflow to be updated.                                                                 |
| Max activity count | 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. |

**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>
</tbody>
</table>
| Accessible from   | Scope restrictions for this workflow. Possible settings are:  
  • All application scopes: Workflow is accessible to all application scopes.  
  • This application scope only: Workflow access is limited to the scope named in the Application field.  
  For more information see Workflow scope on page 2693.                                                                                         |

**Schedule**

Use the Schedule section to create a schedule for this workflow using the schedule builder.
### Field | Description
--- | ---
Delivery based on | The schedule type for this workflow. Possible types are:
- User-specified duration: Duration based on a user-specified value. This is the default schedule type.
- Relative duration: Duration calculated from a preconfigured schedule, such as 8-5 weekdays.
Expected time | User-defined interval. This field is visible when the schedule type is User-specified duration.
Schedule | Preconfigured schedule that determines when this workflow runs.
Timezone | Time zone for this instance.

### Stages

The Stages section appears if you select a table with Type = Workflow.

### Field | Description
--- | ---
Stage | 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.
Stage rendering | 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 2663.
Stage order | 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 2648.
Name | The name of the stage as it appears in workflow fields..
Duration | Time allocated for the specific stage.
Order | 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 2648.
### 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 2727.

<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 <em>Outlying workflow run times</em> on page 2728.</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 2710 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 2614.

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 2710 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 "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 2614.
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 2710 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 2614.

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.

![Workflow with uncompleted branch](image)

**Figure 706: 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.

When they are created, all workflows contain Start and End activities.

For more information, see Workflow activities on page 2734.

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

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 2668.

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.

**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.
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 708: Workflows available to use as subflows](image)

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.
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.
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.

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**

This example describes the process of preparing a subflow for use in a parent workflow.

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.
   
   ```javascript
   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.
New Activity: Notification

<table>
<thead>
<tr>
<th>Name</th>
<th>Blue Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To</th>
<th>Beth Anglin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>This is for $description'12345ABC</td>
</tr>
<tr>
<td>Message</td>
<td>test notification</td>
</tr>
</tbody>
</table>

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.

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.

   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.

${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.

   ```plaintext
   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 2630.

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.

### 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

The scratchpad in workflow is a space in the workflow context to store and share string based variables (as name:value pairs) between instances of activities within an executing instance of a workflow. 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

There is no way to view the contents of the scratchpad.

Access and Assignment

As stated in the Declaration section:

```
workflow.scratchpad.variableName = variableValue;
```

or:

```
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
```javascript
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.
2. Enter or select a catalog item in the Cat Item reference field.
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 a 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 itemValue  = itemVariable. getGlideObject ( ). getValue ( ) ;
var itemQuestion  = itemVariable. getGlideObject ( ). getQuestion ( ).
getLabel ( ) ;
```

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 [sysevent_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 1152: 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, onNotifyTermination</td>
<td>Current thread, current mutex</td>
<td>Join activity</td>
</tr>
<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>Event</td>
<td>Description</td>
<td>Purpose</td>
<td>To use</td>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
</tr>
<tr>
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</tr>
<tr>
<td>timer</td>
<td>String value used by workflow activities to respond to a Timer activity that has expired.</td>
<td>Allows <code>wf_executing</code> 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 <code>fireEvent (wf_executing, timer)</code>.</td>
<td>Timer activity via a scheduled job</td>
<td>Worker thread, private mutex</td>
<td>Timer activity, onTimer event handler</td>
</tr>
<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 <code>wf_executing</code> 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 <code>run()</code> function is called. When the state of a record is Executing, this function always calls onExecute.</td>
<td>Workflow engine, via the WFActivity 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>
<td>Thread</td>
<td>Listeners</td>
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</tr>
<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>
<td>Informs a wf_executing record 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 wf_executing records for approval activities about an approval that completed and triggered the timer event.</td>
<td>Approval Coordinator both registers for the event and triggers the event. The child approvals have listeners that determine their approval state.</td>
<td>Approval Coordinator triggers the event during its onExecute</td>
<td>Current thread, current mutex</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>
</tr>
</tbody>
</table>

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<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>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</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>
</tr>
<tr>
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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 workflow 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 context.</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>
<td>Source</td>
<td>Thread</td>
<td>Listeners</td>
</tr>
<tr>
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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 its 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 onProbe_complete event handler is in the WebServiceActivityHandler 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>
### Table 1153: 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>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>

*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>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(eventName)</td>
<td>Function in the workflow environment that writes events represented as strings to the <code>wf_executing.registered_events</code> 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 <code>wf_executing</code> table looks for all executing records that contain the string that represents the event in the <code>wf_executing.registered_events</code> field.</td>
<td>The global variable <code>workflow</code> 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: <code>workflow.registerForEvent('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>
<td>Thread</td>
<td>Source</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 <code>unRegisters</code> for an event, it removes the event from the comma-delimited set of events stored with the Workflow Executing Activity <code>[wf_executing]</code> record. 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>
<td>Thread</td>
<td>Source</td>
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</tr>
<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>
<td>Thread</td>
<td>Source</td>
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</tr>
<tr>
<td>fireEvent</td>
<td>Function in the workflow environment that sends an event to a specific Workflow Executing Activity 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 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 (eventRecordSysId, eventName, optionalJSONObject)</td>
<td>Function in the workflow environment that sends an event to a specific Workflow Executing Activity 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 (contextId, eventName)</td>
<td>Function in the workflow environment that sends an event to all currently running Workflow Executing Activity 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 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>
<td>Thread</td>
<td>Source</td>
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</tr>
<tr>
<td>broadcastEvent(eventName)</td>
<td>Function in the workflow environment that sends an event to all currently running Workflow Executing Activity [wf_executing] records in the current context, regardless of their state.</td>
<td>This should not be confused with broadcastEvent above. This event is only available to current Workflow Executing Activity [wf_executing] records.</td>
<td>This is available only through the global workflow variable of the current context. The following is an example of its use from within an activity definition's script: workflow.broadcastEvent(eventName)</td>
<td>Current thread, current mutex</td>
<td>Global variable workflow</td>
</tr>
</tbody>
</table>

**Event-specific workflow activities**

The following workflow activities trigger events.
<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>
</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 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.

**How stage values are derived**

Stage values are derived from various sources in the interface.

- **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.

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.

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.

*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 2659.

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 2655.

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.

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 2648.

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 a new field to 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 2657.
- 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 2660. 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 2659.

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.

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 1158: 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 1159: Stage renderers and tooltip behavior

<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>
</tbody>
</table>
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.

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.

Show the current pending approver’s name in the stage widget mouseover
✓ Yes ❌ No

Figure 714: 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 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.

**Linear**

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 2764. 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

### 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 1160: 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 Restore a deleted record and reference.

Figure 718: 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]

**Figure 719: 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.
Figure 722: 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 1161: 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 2614
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 2668 for information on using workflow validators and the workflow validation report to see the type of information that is returned.

Table 1162: 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 2673</td>
<td>ValidateUpdateSetDependencies on page 2684</td>
</tr>
<tr>
<td>ValidateTransitionIn on page 2675</td>
<td>ValidateUpdateSetParentDependencies on page 2686</td>
</tr>
<tr>
<td>ValidateDanglingTransition on page 2676</td>
<td>ValidateInputVarUpdateSetDependencies on page 2688</td>
</tr>
<tr>
<td>ValidateSubflows on page 2677</td>
<td></td>
</tr>
<tr>
<td>ValidateScriptForCurrentDotUpdate on page 2678</td>
<td></td>
</tr>
</tbody>
</table>

Table 1163: 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 2681</td>
<td>ValidateParentFlow on page 2681</td>
</tr>
</tbody>
</table>

Table 1164: Workflow conflicts

<table>
<thead>
<tr>
<th>Workflow Properties Conflicts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify workflow design decisions that conflict with workflow properties</td>
</tr>
<tr>
<td>ValidateLowestCommonTable on page 2679</td>
</tr>
<tr>
<td>ValidateTableChange on page 2680</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.
• Invalid Result: Invalid
• Invalid Message: This workflow contains <condition count> activity conditions without an output transition.
• Suggested Action: If this is a conscious design decision, there is no corrective action. Otherwise, find the condition cited in the validator and add an appropriate transition to the next activity.
• Publishable: Yes
• Runnable: Yes
• Related Information: None

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.

Figure 723: 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 724: 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.
Figure 725: TransitionIn invalid

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
- **Valid Message:** This workflow contains <count> valid subflows.
- **Invalid Result:** Invalid
- **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.
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 2734

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 2734

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 2617

**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 726: 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 727: 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 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 2710

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 2710

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 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 2710

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 2713 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 2734
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 2734, 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.

ValidateWorkflowStateExceptionValues
The ValidateWorkflowStateExceptionValues 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 2734

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

Figure 728: Validate Workflow State Values

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 conditions.
- Create custom activities and reuse the data for other workflows.

See Orchestration activity designer on page 1359.
• 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 2602.

Workflows and domain separation

When domain separation is enabled, workflows and workflow activities inherit the domain of the user who publishes or creates them.

While workflows are managed by multiple tables, only the following tables are used for domain separation features:

- Workflow [wf_workflow]: used for delegated administration or process separation.
- 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 [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.
Figure 729: 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>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workflows</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 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>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>Table</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------</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 1166: 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 1359. 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 733: Show workflow

In the top right hand corner are two controls:
| ![Refresh Icon]  | Refreshes the workflow context. |
| ![Question Mark Icon]  | Displays a key of the colors used in the workflow to denote the state of activities and transitions: |

### 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");
```
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>Application</td>
<td>Specifies the type of application, such as Global.</td>
</tr>
<tr>
<td>Active</td>
<td>If selected, the scheduled workflow will be triggered at the appropriate time.</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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Starting</td>
<td>For periodical workflows, the first date and time to run the workflow. For scheduled workflows run once, the date and time to run the workflow.</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 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 2684.

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 2684 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

Follow the steps in this page to 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 *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 2684 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.

![Range Selectors](image)

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 1167: Available error information

<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>Yes</td>
<td>Yes</td>
<td>Error</td>
<td>Error</td>
<td>Yes</td>
<td>Yes</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>Yes</td>
<td>No</td>
<td>Finished</td>
<td>none</td>
<td>No</td>
<td>No</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.

![Switch]

Check assignment group

Always

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 2721 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.
**Figure 736: Activity execution order**

**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.
In this example, an SSH activity named File Read specifies an invalid MID Server.

Figure 737: 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:
   ```javascript
   && 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 1168: Formulas for computing workflow outlier ranges

<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) = 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.

**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.
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 1169: 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 2735.

### Core activities provided in the base system

- Approval and rollback workflow activities on page 2739
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. For information about the templates Orchestration provides for creating custom activities that you can upload to the ServiceNow Store, see Activity designer components.

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.

Table 1170: Approval and rollback activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval Action workflow activity</td>
<td>The Approval Action activity performs an approval action on the current task.</td>
</tr>
<tr>
<td>Approval Coordinator workflow activity</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>Approval - Group workflow activity</td>
<td>The Approval - Group activity creates approval records for each member of a specified group.</td>
</tr>
</tbody>
</table>
### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approval - User workflow activity</strong> on page 2750</td>
<td>The Approval - User activity creates one or more individual user approvals.</td>
</tr>
<tr>
<td><strong>Generate workflow activity</strong> on page 2755</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.</td>
</tr>
<tr>
<td><strong>Manual Approvals workflow activity</strong> on page 2758</td>
<td>The Manual Approvals activity watches and manages any approvals that users add manually outside of the workflow process.</td>
</tr>
<tr>
<td><strong>Rollback To workflow activity</strong> on page 2760</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 1171: Condition activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If workflow activity</strong> on page 2764</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><strong>Switch workflow activity</strong> on page 2765</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><strong>Wait for condition workflow activity</strong> on page 2769</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><strong>Wait for WF Event workflow activity</strong> on page 2770</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 activities manage calls and SMS messages in Notify.

#### Table 1172: Notify activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forward call workflow activity</strong> on page 414</td>
<td>The Forward Call activity forwards a Notify call to an E.164-compliant phone number.</td>
</tr>
<tr>
<td><strong>Input workflow activity</strong> on page 415</td>
<td>The Input activity creates a phone menu by presenting a list of options on a Notify call.</td>
</tr>
<tr>
<td><strong>Hangup workflow activity</strong> on page 417</td>
<td>The Hangup activity disconnects an active Notify phone call.</td>
</tr>
</tbody>
</table>
### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Play workflow activity</strong> on page 417</td>
<td>The Play activity plays a sound file on a Notify call.</td>
</tr>
<tr>
<td><strong>Record workflow activity</strong> on page 418</td>
<td>The Record workflow activity records audio from a user on a Notify call.</td>
</tr>
<tr>
<td><strong>Reject workflow</strong> on page 419</td>
<td>The Reject workflow activity rejects an incoming Notify call.</td>
</tr>
<tr>
<td><strong>Say workflow activity</strong> on page 419</td>
<td>The say workflow activity allows you to play a message, using text to speech, on a Notify call.</td>
</tr>
<tr>
<td><strong>Forward to notify client workflow activity</strong> on page 419</td>
<td>The forward to notify client workflow activity connects a phone call to a Notify WebRTC client.</td>
</tr>
<tr>
<td><strong>Call workflow activity</strong> on page 413</td>
<td>The Call activity makes outbound phone calls using a Notify workflow.</td>
</tr>
<tr>
<td><strong>Join conference call workflow activity</strong> on page 411</td>
<td>The Join Conference Call connects an incoming or outgoing call to a Notify conference call.</td>
</tr>
<tr>
<td><strong>Send SMS workflow activity</strong> on page 413</td>
<td>The send SMS workflow activity to send short text messages using Notify to users' phones.</td>
</tr>
<tr>
<td><strong>Queue workflow activity</strong> on page 420</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 1173: Notification activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Create Event workflow activity</strong> on page 2780</td>
<td>The Create Event activity adds an event to the event queue, but does not immediately fire the event.</td>
</tr>
<tr>
<td><strong>Notification workflow activity</strong> on page 2781</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 1174: Timer activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SLA Percentage Timer workflow activity</strong> on page 2782</td>
<td>The SLA Percentage Timer activity pauses the workflow for a duration equal to a percentage of an SLA.</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Timer workflow activity on page 2783</strong></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 1175: Task activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add Worknote workflow activity on page 2788</strong></td>
<td>The Add Worknote activity adds text to the Worknotes field of the current incident record.</td>
</tr>
<tr>
<td><strong>Attachment Note workflow activity on page 2788</strong></td>
<td>The Attachment Note activity adds an attachment to the current record.</td>
</tr>
<tr>
<td><strong>Catalog Task workflow activity on page 2789</strong></td>
<td>The Catalog Task activity creates a service catalog task record.</td>
</tr>
<tr>
<td><strong>Create Task workflow activity on page 2793</strong></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 1176: Utility activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Branch workflow activity on page 2797</strong></td>
<td>The Branch activity splits the workflow into multiple transition paths from a single activity.</td>
</tr>
<tr>
<td><strong>Join workflow activity on page 2797</strong></td>
<td>The Join activity unites multiple execution paths into one transition.</td>
</tr>
<tr>
<td><strong>Lock workflow activity on page 2798</strong></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><strong>Log Message workflow activity on page 2801</strong></td>
<td>The Log Message activity writes a message to the workflow log.</td>
</tr>
<tr>
<td><strong>Log Trace workflow Message on page 2801</strong></td>
<td>The Log Trace Message activity writes a trace message to the workflow log.</td>
</tr>
<tr>
<td><strong>REST Message workflow activity on page 2801</strong></td>
<td>The 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><strong>Return Value workflow activity on page 2803</strong></td>
<td>The Return Value activity returns a value to a parent workflow, when run from a subflow.</td>
</tr>
</tbody>
</table>
### Activity Description

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Script workflow activity on page 2803</td>
<td>The Run Script activity runs the specified script in the scope of the workflow version.</td>
</tr>
<tr>
<td>Set Values workflow activity on page 2803</td>
<td>The Set Values activity sets values on the current record.</td>
</tr>
<tr>
<td>Turnstile workflow activity on page 2804</td>
<td>The Turnstile activity limits how many times a workflow can pass through the same point.</td>
</tr>
<tr>
<td>Unlock workflow activity on page 2805</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 1177: Subflow activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel Flow Launcher workflow activity on page 2806</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.

### 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 2823.

**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 1178: Approval Action activity input variables**

<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 1179: 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 1180: 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 1181: Approval Coordinator 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 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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• Condition based on script: Call a script to determine how to manage an approval or rejection.</td>
</tr>
<tr>
<td>When a rejection occurs</td>
<td>Only appears if Wait for is set to All child activities to be approved or Any child activity to be approved. Specify what the coordinator should do when it sees a rejection from any one of the child activities. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Reject the approval: Immediately complete the Approval Coordinator activity with a result of rejected.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>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>
</tbody>
</table>
### Conditions

The conditions determine which transition runs after this activity.

**Table 1182: Approval Coordinator 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 1183: 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>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 - 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 1184: 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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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>
</tbody>
</table>

**Approval - Group Condition**

Specify how the activity decides to approve or reject the group approval, based on the responses from individual members of the group.

<table>
<thead>
<tr>
<th>Wait for</th>
<th>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:</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

Indicate what happens when any user rejects their approval request. Options are:

• Reject the approval: Immediately complete the activity with a result of rejected.
• 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.
• Condition based on script: Each time a user approves or rejects, the Approval script is called to determine if the activity should complete.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>When called, the following variables are available to the script for all the groups that are part of this approval activity:</td>
</tr>
</tbody>
</table>
|                       | counts.total = total number of groups that are part of this approval  
|                       | counts.approved = # of groups that approved so far  
|                       | counts.rejected = # of groups that rejected so far  
|                       | counts.requested = # of groups that are pending approval  
|                       | counts.not_requested = # of groups that are not pending approval  
|                       | counts.not_required = # of groups that approval is not required  
|                       | And for each group:                                                                                                                                  |
|                       | groups[group_id].total = total number of users that are part of this group's approval  
|                       | groups[group_id].approved = # of users that approved so far  
|                       | groups[group_id].rejected = # of users that rejected so far  
|                       | groups[group_id].requested = # of users that are pending approval  
|                       | groups[group_id].not_requested = # of users that are not pending approval  
|                       | groups[group_id].not_required = # of users that approval is not required  
|                       | groups[group_id].approvalIDs[state] = array of user ids that are at the specified approval state  
<p>|                       | Note: Iterate the groups using:                                                                                                                   |
|                       | for (var id in groups) { var group = groups[id]; }                                                                                              |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>When anyone rejects</td>
<td>A choice between different approval logics to determine which individual rejections result in rejection of the activity's approval. 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>
<tr>
<td></td>
<td><strong>Note:</strong> If Wait for is set to Anyone to approve, then a single approval causes the activity to complete with a result of approved, even if one or more users reject.</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Due date based on</th>
<th>Select how workflow determines the task's duration, due date, and schedule.</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

**Due date based on**

Select how workflow determines the task's duration, due date, and schedule.

<table>
<thead>
<tr>
<th>Duration</th>
<th>The specific number of days and hours.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative duration</td>
<td>The general number and length of business days.</td>
</tr>
<tr>
<td>Only appears when Due date based on is set to A relative duration</td>
<td></td>
</tr>
</tbody>
</table>

| 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 |                                                                                                                                                |

<p>| 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>
<tbody>
<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>The predefined Schedule from a list.</td>
</tr>
<tr>
<td>Schedule field</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.</td>
</tr>
<tr>
<td>Time zone based on</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.</td>
</tr>
<tr>
<td>Time zone</td>
<td>Select the time zone you want from the choice list.</td>
</tr>
<tr>
<td>Time zone field</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.</td>
</tr>
</tbody>
</table>

Approval - Advanced
If desired, write a script for determining additional users to request approvals from.
### Conditions

The following conditions determine which transition runs after this activity.

**Table 1185: 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 1186: 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>
</tbody>
</table>

---

Field | Description
--- | ---
Advanced | 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.

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');
```
<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 taken 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 1187: 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>
<tr>
<td>Approval - User Condition</td>
<td>Specify how the activity decides to approve or reject the approval, based on the responses from individual approvers.</td>
</tr>
<tr>
<td>WAIT FOR</td>
<td>A choice between different approval logics to determine which individual approvals result in approval of the activity's approval. Options are:</td>
</tr>
<tr>
<td></td>
<td>• Anyone to approve: Any user can approve and the first approval causes the activity to complete with a result of approved.</td>
</tr>
<tr>
<td></td>
<td>• Everyone to approve: All users must approve (see below for how a rejection is handled).</td>
</tr>
<tr>
<td></td>
<td>• First response from anyone: The first approval or rejection from any user causes the activity to complete.</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>When anyone rejects</td>
<td>A choice between different approval logics to determine which individual rejections result in rejection of the activity's approval. 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>

**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>Note:</td>
<td>Use the field's name, not its label.</td>
</tr>
<tr>
<td>Note:</td>
<td>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>
</tbody>
</table>
| 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. |
| 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 |                                                                                                                                                                                                             |
| 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. |
<p>| Schedule                      | The predefined Schedule from a list.                                                                                                                                                                         |
| Only appears when Schedule based on is set to A specific schedule |                                                                                                                                                                                                             |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule field</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.</td>
</tr>
</tbody>
</table>
| 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.                                                        |
| Advanced                      | Select this check box to write a script for determining additional users to request approvals from.                                          |
| Additional approvers script   | 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: |

```javascript
answer = [];
answer.push('id1');
answer.push('id2');
```

**Conditions**

The following conditions determine which transition runs after this activity.
### Table 1188: 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 1189: 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.

---

**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 1190: 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 1191: 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**

![Generate workflow diagram](image)

**Figure 740: 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 741: 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.

**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. 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 1192: 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>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

Conditions

The conditions determine which transition runs after this activity.
Table 1193: 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 1194: 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 1195: 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 1196: 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
Figure 742: 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 743: 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>
</tbody>
</table>
**Condition**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Taken when either the condition does not match or the Advanced script, if specified, returns no.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1199: 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 1200: 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 or Field

<table>
<thead>
<tr>
<th>Field 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. • Variable: select any service catalog variable. • Field: select any field from the Table defined in the workflow properties.</td>
</tr>
</tbody>
</table>

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1201: 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 744: Switch activity example

The Field selected is the incident Assigned to 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 2820.
Figure 746: 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 2782.

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 1202: Wait for condition activity input variables

<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 1203: Wait for condition 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>

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 1204: Wait For WF Event activity input variables

<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 1205: Wait For WF Event 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>

Notify workflow activities

Notify 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 1206: 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 1207: 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>
</tbody>
</table>
### Variable

<table>
<thead>
<tr>
<th>Advanced</th>
<th>Select this check box to use a script to build the phone menu, instead of using the activity conditions.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Script</strong></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 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>`.

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 1208: 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 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 1209: 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>
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 1212: 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 1213: 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, 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 {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 1214: 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 to, instead of using the User variable.</td>
</tr>
</tbody>
</table>
### Variable Description

**Script**
Define a script that controls which client to connect to. This script should return a GlideRecord for a single User [sys_user] record.

**Timeout (in seconds)**
Enter the amount of time to wait for the call to be connected before hanging up.

**Record**
Select this check box to record the call.

### 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 1215: Input variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Notify Number</strong></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><strong>Phone number to call</strong></td>
<td>The E.164-compliant phone number to call.</td>
</tr>
<tr>
<td><strong>Advanced</strong></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><strong>Script</strong></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>

### Conditions

The conditions determine which transition comes after this activity. The 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 call could not be set up due to invalid data returned by the advanced script.

*Join conference call workflow activity*

The Join Conference Call 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>
<thead>
<tr>
<th>Table 1216: Input variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>Advanced</td>
</tr>
<tr>
<td>Script</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 1217: 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>

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 1218: 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>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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 <code>{notify_number: </code>...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 1219: Create Event activity 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></td>
<td><strong>Note:</strong> If this parameter is a string value, it must be within quotes (&quot; &quot;).</td>
</tr>
<tr>
<td>Parameter 2</td>
<td>The second event parameter.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If this parameter is a string value, it must be within quotes (&quot; &quot;).</td>
</tr>
</tbody>
</table>

Notification workflow activity

The Notification activity sends an email or SMS message to specified users or groups.

Input variables

Table 1220: 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>
<tr>
<td>Message</td>
<td></td>
</tr>
</tbody>
</table>
Field | Description
---|---
Subject | The subject line of the email.
Message | The email body that is sent. 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 1221: 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 1222: SLA Percentage Timer 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 1223: SLA Percentage Timer activity input variables

<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 1224: SLA Percentage Timer states

<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 1225: Timer 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 1226: Timer activity input variables

<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>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>Wait</td>
<td>An additional timer adjustment when Timer based on is A relative duration or A date/time or duration field. The options are:</td>
</tr>
<tr>
<td></td>
<td>• The full duration: No modification of the calculated duration.</td>
</tr>
<tr>
<td></td>
<td>• A % of the duration: The duration is adjusted by multiplying the number of seconds by the (Percentage / 100).</td>
</tr>
<tr>
<td></td>
<td>• Some time before: The duration is shortened by the Time before days and hours.</td>
</tr>
<tr>
<td></td>
<td>• Some time after: The duration is lengthened by the Time after days and hours.</td>
</tr>
<tr>
<td>Percentage</td>
<td>The Wait percentage value when Timer based on is A relative duration or A date/time or duration field.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Time before</td>
<td>The modifier time value when Wait is Some time before.</td>
</tr>
<tr>
<td>Appears only when Timer based on is A relative duration or A date/time or duration field and Wait is Some time before.</td>
<td></td>
</tr>
<tr>
<td>Time after</td>
<td>The modifier time value when Wait is Some time after.</td>
</tr>
<tr>
<td>Appears only when Timer based on is A relative duration or A date/time or duration field and Wait is Some time after.</td>
<td></td>
</tr>
<tr>
<td>Field</td>
<td>The date/time or duration field that contains the elapsed wait-time before moving to the next workflow activity.</td>
</tr>
<tr>
<td>Appears only when Timer based on is A date/time or duration field.</td>
<td></td>
</tr>
<tr>
<td>Script</td>
<td>The script that sets 'answer' to the number of seconds for the duration.</td>
</tr>
<tr>
<td>Appears only when Timer based on is Script</td>
<td></td>
</tr>
<tr>
<td>Timer Schedule</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>Schedule based on</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>Appears only when Schedule based on is A specific schedule.</td>
<td>• A specific schedule: The schedule uses a pre-defined Schedule and an optional Time zone based on value.</td>
</tr>
<tr>
<td>Schedule field</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>Appears only when Schedule based on is A schedule field.</td>
<td></td>
</tr>
<tr>
<td>Timer Time Zone</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.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
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.
Appears only when Time zone based on is A specific 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.
Appears only when Time zone based on is A time zone field.

**States**

The activity state tells the workflow engine what to do with the activity.

**Table 1227: 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.
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.

```javascript
// 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');
```

Figure 747: Timer example
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>
<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>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>Field</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></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
### 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 1230: Catalog task activity information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Task Activity Settings</td>
<td>The following fields specify the behavior of the Catalog Task Activity.</td>
</tr>
<tr>
<td>Task Table</td>
<td>The table on which this activity runs. In most cases, leave set to the default value: [sc_req_item].</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>
<tr>
<td>Catalog Task Record Settings</td>
<td>The following fields specify the field values that this activity sets for the catalog task it creates.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Task value from       | Specify how you want to populate fields on the new task.  
|                       | • Fields: a predefined set of fields including Fulfillment group, Assigned to, Short description and Instructions.  
|                       | • Template: an existing template for the selected task table.  
|                       | • Values: values that you specify using a Set Values widget.  
<p>|                       | After you select a value for Task value from, additional fields specific to that value appear on the form.                                                                                                   |
| Fulfillment group     | The group that is responsible for completing the task. Populates the Assignment group field on the new task.                                                                                              |
| Only appears when Task value from is set to Fields |                                                                                                                                           |
| Assigned to           | The user who is responsible for completing the task. Populates the Assignment to field on the new task.                                                                                                  |
| Only appears when Task value from is set to Fields |                                                                                                                                           |
| Short description     | A short description for the task. Populates the Short description field on the new task.                                                                                                               |
| Only appears when Task value from is set to Fields |                                                                                                                                           |
| Instructions          | The task instructions for the user to complete prior to closing the task. Populates the Description field on the new task.                                                                              |
| Only appears when Task value from is set to Fields |                                                                                                                                           |
| Template              | The values in the task will be populated from the values in the template you select.                                                                                                                       |
| Only appears when Task value from is set to Template |                                                                                                                                           |
| SetValues             | Select any field on the task record to a value you specify here.                                                                                                                                        |
| Only appears when Task value from is set to Values |                                                                                                                                           |
| Advanced              | 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.                                                  |</p>
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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: <code>task.short_description = current.short_description;</code></td>
</tr>
<tr>
<td>Catalog Task Variables</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>
<tr>
<td>Due date based on</td>
<td>Select how workflow determines the task's duration, due date, and schedule.</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 1231: 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 1232: 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</td>
<td></td>
</tr>
<tr>
<td>Task value from is set</td>
<td>Fields</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</td>
<td>Fields</td>
</tr>
<tr>
<td>Task value from is set</td>
<td>Fields</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</td>
<td>Fields</td>
</tr>
<tr>
<td>Task value from is set</td>
<td>Fields</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</td>
<td>Fields</td>
</tr>
<tr>
<td>Task value from is set</td>
<td>Fields</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</td>
<td>Task values from is set to Template.</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</td>
<td>Task values 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>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<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: ( \text{task.short_description} = \text{current.short_description}; )</td>
</tr>
<tr>
<td>Task Schedule</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>
</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 1233: 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 is fired.</td>
</tr>
<tr>
<td>Finished</td>
<td>The activity finished running. See the result value for the outcome.</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 2825 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 1234: 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>
</tbody>
</table>
### Incomplete

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.

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.
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 1235: 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 1236: 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>Max. 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>
<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>
<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 workflow Message*

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 2801 activity.

*REST Message workflow activity*

The REST Message activity enables an administrator to override the REST endpoint or supply the variables configured in the REST Message module.

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 1239: REST Message activity input variables

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest Message Name</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 subnetwork 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></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 2617.

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 1240: 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 1241: 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.
Input Fields

The values you enter in the following fields determine the behavior of the activity.

Table 1242: 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 drop down box on the left, select the field on the current record whose value you want to set. 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:** 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.

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 2760 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 1243: 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 1244: 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 1245: 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 1246: 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 1247: 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 1248: 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 1249: 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>A unique name for the activity.</td>
</tr>
<tr>
<td>Name</td>
<td>The stage to display when the workflow reaches the activity.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</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 Parallel Flow Launcher Example.</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 WorkflowCoordinator object on page 2809 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>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>
<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>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</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>
<tr>
<td></td>
<td>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 <a href="#">Completed subflow values in scripts</a> on page 2810.</td>
</tr>
<tr>
<td></td>
<td>The variable “flow” is available to this script. It is an object that contains the following information about the flow that is finishing:</td>
</tr>
<tr>
<td></td>
<td>flow.output (String): The value that the subflow returns to the parent if it executed a Return Value activity before ending.</td>
</tr>
<tr>
<td></td>
<td>flow.index (Number): The zero-relative index of the subflow that finished.</td>
</tr>
<tr>
<td></td>
<td>flow.contextId (String): The sys_id of the workflow context for the completed subflow.</td>
</tr>
<tr>
<td></td>
<td>flow.inputs (Object): The inputs that were passed to the subflow when its context was created and started.</td>
</tr>
<tr>
<td></td>
<td>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.)</td>
</tr>
<tr>
<td>Parallel Flow Launcher Split</td>
<td></td>
</tr>
<tr>
<td>Process finished</td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>for (var i = 0; i &lt; coordinator.getNumFlows(); i++)</td>
</tr>
<tr>
<td></td>
<td>writeFlowResultsToTable( i, coordinator.getFlow(i) );</td>
</tr>
</tbody>
</table>
### Field Description

**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:

```javascript
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>
<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.

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 2810 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 1251: 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>
</tbody>
</table>
| flow | 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 var flow = coord.getFlow(I); where I is the numeric index of the subflow based on the order it was launched. These values are available from the completed subflow:  
  • index: the numerical index of this subflow based on the order it was launched  
  • workflow: the sys_id or name, depending on which you passed to the WorkflowCoordinator constructor, of the workflow used for this subflow  
  • inputs: any input values provided to the launched subflow  
  • status: status of the subflow context  
  • output: the value returned by the subflow  
  • contextId: the sys_id of the workflow context for the subflow |

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.

![Parallel flow launcher business case](image)

Figure 749: 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");
```

Update
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 751: Specifying which subflows to run

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.
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 2734 for links to the activities provided by default. Each activity description includes a detailed explanation of the specific elements offered by that activity.
Table 1252: 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 Using variables in a workflow on page 2627 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 2820 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 754: Example of activity conditions
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>
<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.
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 2016.

![Figure 756: Unavailable approval activities](image)

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 757: 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 2721.

**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 758: 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 1254:

<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>
<tr>
<td>Activity</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Input</td>
<td>Supports variable substitution in the Text field only.</td>
</tr>
<tr>
<td>Play</td>
<td>Supports variable substitution in the URL field only.</td>
</tr>
<tr>
<td>Forward call</td>
<td>Supports variable substitution in the Phone number 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.
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