



Automate Network Changes

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Change Automation Overview

The Change Automation application automates the process of deploying changes to the network. You can define automation tasks to achieve the intended network states in Change Automation using Playbooks that consist of Plays written using YAML. You can then push configuration changes to Cisco Network Service Orchestrator (NSO), which deploys these changes to the network devices.

Change Automation, in conjunction with health insights, allows operators to build automation in a *closed-loop framework*. Changes are deployed to the router or other device using programmable APIs, and the intent of the change is verified using telemetry that comes back from the router. Change Automation relies on telemetry to verify the intent of the change, avoiding the need to frequently poll the device for updates.

The following is a high-level Change Automation workflow:

1. Review the existing Plays and Playbooks to see if they fully or partially meet your needs.



Note Change Automation comes with a robust library of Playbooks, each with its own collection of configuration and check Plays.

2. Build Playbook as required:

- If the required Playbook is available, use it.
- If some combination of existing Plays accomplishes the task, build a new Playbook using those Plays.
- If some of the required Plays are not available, create new Plays and build a new Playbook using the new and existing Plays.

3. Dry run the Playbook to test if it performs as expected.
4. Deploy the Playbook.

Change Automation allows you to customize and generate Plays and Playbooks using its API interface. For more information, see [About Custom Plays, on page 5](#) and [About Customizing Playbooks, on page 11](#).

Configure Change Automation Settings

Configuring Change Automation settings is a post-installation activity and is the first task to be performed after installing Change Automation.

For more information, see [Configure Change Automation Settings](#).

View the Play list










The **Play List** window of the Change Automation application gives you a consolidated list of all the Plays in the system.

From the main menu, select **Network Automation > Play List** to view the **Play List** window.

Figure 1: Play List

Name	Description	type	Labels	Modified By	Last Modified
<input type="checkbox"/> Add VRF under BGP on...	Play to add a VRF under BGP on a router	Device Config	IOS XE cisco-ios-cli-6.33	Cisco	23-Oct-2020 05:28:00 AM IST
<input type="checkbox"/> Add or delete Ethernet ...	Play adds interfaces to or deletes interfaces from an existing Ethernet link bu...	Device Config	IOS XR cisco-iosxr-cli-7.29	Cisco	24-Aug-2022 02:35:00 AM IST
<input type="checkbox"/> Add or remove VRF un...	Play to add or remove VRF under BGP on router	Device Config	IOS XR cisco-iosxr-cli-7.18	Cisco	01-Oct-2020 04:55:00 AM IST
<input type="checkbox"/> Add or remove an addr...	This play adds or removes an IPv4 address family under either a global BGP o...	Device Config	IOS XR cisco-iosxr-cli-7.29	Cisco	08-Oct-2020 05:23:00 PM IST
<input type="checkbox"/> Add prefix list to the ro...	Play to configure a new prefix-list and also can be used to modify the existing...	Device Config	IOS XE cisco-ios-cli-6.33	Cisco	27-Oct-2020 07:11:00 PM IST
<input type="checkbox"/> Add/Delete prefix set o...	This play creates a new or modifies or deletes an existing prefix set on a spec...	Device Config	IOS XR cisco-iosxr-cli-7.18	Cisco	01-Oct-2020 04:41:00 PM IST
<input type="checkbox"/> Add/Remove Traffic col...	Play to add or remove traffic collector on a XR router	Device Config	IOS XR SR cisco-iosxr-cli-7.29	Cisco	22-Oct-2020 11:12:00 AM IST
<input type="checkbox"/> Capture and compare n...	Play to capture node states based on the given sensor path and reports the d...	Action	CLI Check	Cisco	22-Oct-2020 06:23:00 AM IST
<input type="checkbox"/> Change interface state ...	Shut or unshut one or more interface on an XR router	Device Config	IOS XR cisco-iosxr-cli-7.24	Cisco	04-Nov-2020 01:17:00 AM IST
<input type="checkbox"/> Change interface state ...	Play to change the GigE interface state on a IOS XE router	Device Config	IOS XE cisco-ios-cli-6.33	Cisco	22-Oct-2020 12:57:00 PM IST
<input type="checkbox"/> Check BGP neighbor st...	Play checks the state of the given BGP neighbor and passes if the state is ES...	Check	SNMP	Cisco	23-Oct-2020 02:15:00 AM IST
<input type="checkbox"/> Check CPU usage	Verify that CPU utilization on the target device is below the reference thresho...	Check	SNMP	Cisco	23-Oct-2020 01:58:00 AM IST
<input type="checkbox"/> Check VRF neighbors s...	This verb uses the collector golang library and generic CLI collection ("sh bg...	Action	CLI Check	Cisco	23-Oct-2020 05:44:00 AM IST
<input type="checkbox"/> Check if the traffic is pr...	Play to invoke the generic cli collection for "show traffic-collector ipv4 count...	Action	CLI Check SR	Cisco	29-Jan-2021 08:49:00 AM IST
<input type="checkbox"/> Check interface bandw...	Play uses MDT to see if the interface bandwidth is greater than or equal to a ...	Check	MDT	Cisco	23-Oct-2020 02:13:00 AM IST
<input type="checkbox"/> Check router interface ...	Play MDT to check the Line State of all the interfaces. It passes if the Line Sta...	Check	MDT	Cisco	23-Oct-2020 02:06:00 AM IST

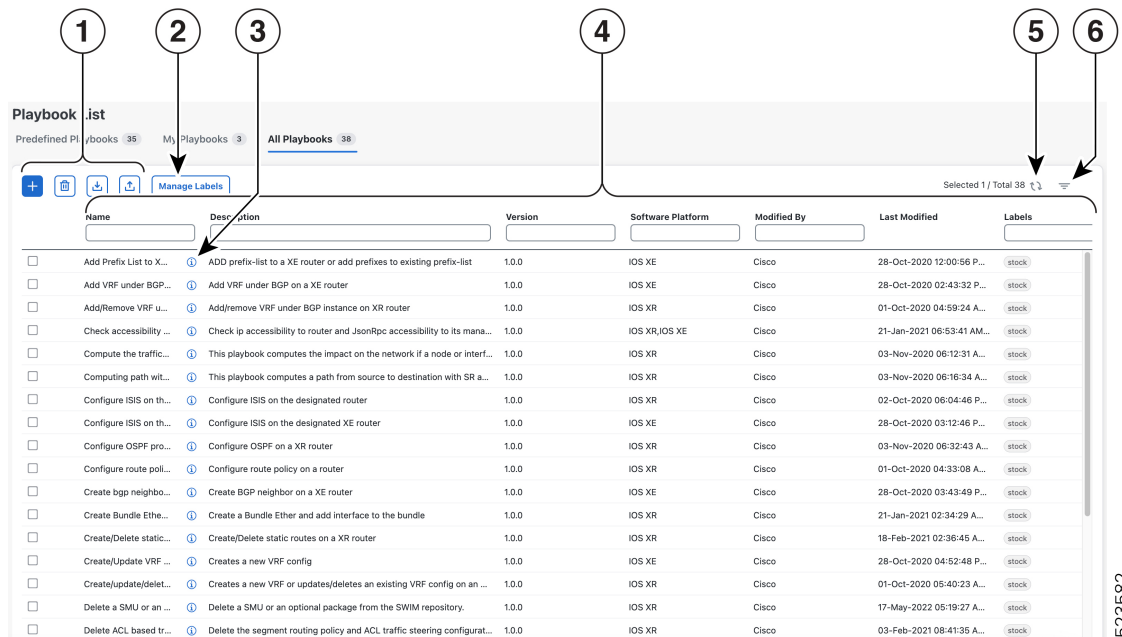
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Item	Description
1	Click  to create a custom Play. See Create a Custom Play Using Templates, on page 5 .
	Click  to delete a custom Play. See Delete Custom Plays, on page 10 .
	Click  to import a custom Play from a gzipped TAR archive file. See Import Custom Plays, on page 10 .
	Click  to export a custom Play as a gzipped TAR archive file. See Export Plays, on page 9 .
2	Click  to see a pop-up Play Details window showing the Play's description and schema. When you are finished viewing these details, click  or the Close button to close the pop-up window.
3	The Type column indicates the type of the Play. You can click the column headings (Name, Description, Type, Labels, and Modified by) to sort the table using that column's data.
4	Click  to refresh the Plays list.
5	Click  to set filter criteria on one or more columns in the table.
	Click  to clear any filter criteria you may have set.

View the Playbook List



The Change Automation application's **Playbook List** window (in the following figure) gives you a consolidated list of all the Playbooks in the system. To view the **Playbook List** window, select **Network Automation > Playbook List**.

Figure 2: Playbook List



Item	Description
1	<p>Click to create a custom Playbook. See Create a Custom Playbook Through the UI, on page 11.</p> <p>Click to delete the currently selected custom Playbook. See Delete Custom Playbooks, on page 18.</p> <p>Click to import Playbooks from a gzipped TAR archive file. See Import Playbooks, on page 18.</p> <p>Click to export the currently selected Playbook(s) as a gzipped TAR archive file. See Export Playbooks, on page 17.</p>
2	Click Manage Labels to assign a label(s) to the Playbook. Assigning label(s) to the Playbooks allows the system administrator to control which Playbooks each user role is allowed to run.
3	Click to see a pop-up Playbook Details window showing the Playbook's description, software compatibility, version number, and its plays. When you are finished viewing these details, click or the Close button to close the pop-up window.
4	Click the Name , Description , Version , Software Platform , and Last Modified column headings in the table to sort the table by that column's data. You can also choose which columns are shown and set quick or advanced filters for any column.
5	Click to refresh the Playbooks list.

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Item	Description
6	Click  to set filter criteria on one or more columns in the table.
	Click  to clear any filter criteria you may have set.

About Custom Plays

Change Automation allows you to create your own custom Plays, either based on Cisco models or from scratch. You can also import, export, and delete your custom Plays.

You can create custom Plays in any of the following types:

- **Check Play:** Verifies the data from your devices using a logical expression.
- **Data Collection Play:** Collects data from your devices.
- **Device Config Play:** Performs configuration changes on your device
- **Service Play:** Provisions and manages a service that is deployed.



Note You cannot edit, export, or delete Cisco-supplied Plays.



Note Check Play and Data Collection Play supports MDT and SNMP collection.

Create a Custom Play Using Templates

This section explains the procedure to create a custom Play. The stages of Play creation vary depending on the Play type you choose:

- **Check Play:** *Select Play Type > Select Sensor Path > Build Check Expression > Review Play*
- **Data Collection Play:** *Select Play Type > Select Sensor Path > Build Filter Expression > Review Play*
- **Device Config Play or Service Play:** *Select Play Type > Configure Play (using sample payload in JSON format) > Review Play*

Step 1 From the main menu, choose **Network Automation > Play List**. The **Play List** window is displayed.


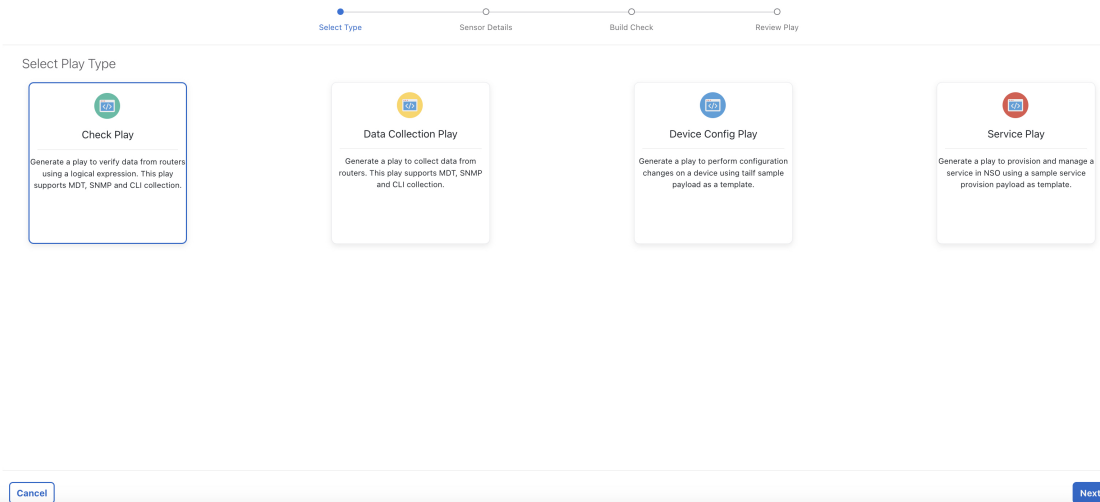
Step 2 Click  to create a custom Play. The **Select Play Type** window opens displaying the types of Plays supported and a description for each. The stages of creation are also displayed, and it varies depending on the Play type you select.

Figure 3: Select Play Type



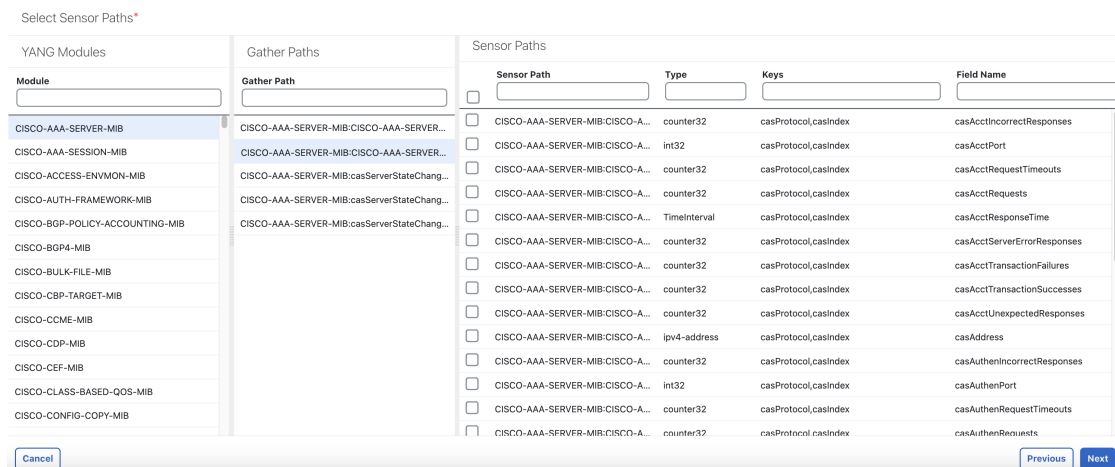
Select the Play type that you want to create and click **Next**.

Step 3 Creating a Check Play or Data Collection Play

When creating Check or Data collection plays, Cisco provides YANG modules for Cisco products. The process that is described in this section assumes that the sensor that you want to use or the field that you want to modify is included in the modules that are provided by Cisco. If the sensor or field is not listed in the default YANG modules, Cisco allows you to expand the device coverage. For information on loading a new or modified module, see the topic [Manage Device Packages](#) in the [Cisco Crosswork Network Controller Administration Guide](#).

- In the **Select Sensor Paths** window, select the required YANG module, Gather Path, and Sensor Paths. Click **Next** to continue.

Figure 4: Select Sensor Paths



- Depending on the Play type you have selected, you must **Build Check** (for Check Play) or **Build Filter** (for Data Collection Play) to apply in your Play. Click **Add Rule** to add a logic expression using the keys and fields of the selected sensor path(s). Click **Add Group** to add a new logic group. Select the sensor field, operator, and value from the drop-down lists. Select the desired logic operation (AND/OR) between each rule or group.

Click the **Runtime** check box if you prefer to enter the value of the sensor field dynamically during run time. If you select this check box, the *value* field is disabled, and you will be prompted to enter the input parameter when this Play is executed (as part of a Playbook) during run time.

Figure 5: Check Expression

Check Expression
Build check expression using the selected fields.

The screenshot shows a configuration window titled "Check Expression" with the subtitle "Build check expression using the selected fields." The window contains a list of rules. Each rule is represented by a horizontal bar with a dropdown menu for "Select sensor field", a dropdown menu for "Select operator", a text input field for "value", and a checkbox for "Runtime". The first rule has "And" selected between "And" and "Or". The second rule has "Or" selected. There are buttons for "Add Rule", "Add Group", "Cancel", "Previous", and "Next" at the bottom of the window.

Click **Next** to continue.

Step 4 Creating a Device Config Play or Service Play

Ensure that the configuration you are trying to create is available in NSO; otherwise, it will show an error.

When creating a Service Play, you are not creating a new service for NSO but creating a Play to manage and provision an existing service in one or more NSO instances. For more information, see <https://developer.cisco.com/docs/nso/>.


- In the **Configure Play** window, click  or the **Import** link to import your device config (.JSON) file. You can download and use the sample configuration template. Browse and select your .JSON file, and click **Import**.
- In the acknowledgment prompt, click **Continue** to select the NSO instance for the config you have imported.
- Select the NSO provider instance from the dialog box and click **Process Payload**.

Figure 6: Select NSO Provider

Select NSO Provider

Select the managing NSO instance from the list below and ensure that HTTPS connectivity is enabled to the NSO instance. Then, Click "Process Payload" button to view "Config" schema.

Providers

Reacha...	State	Provide...	UUID	Con...	Family	Type	Model P...	Model V...
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="text" value="nso101"/>	<input type="text" value="c59b32f0..."/>	<input type="text" value="NETC..."/>	<input type="text" value="NSO"/>		<input type="text" value="Cisco-IO..."/>	<input type="text" value="6.6.1;5.9.2"/>

Note The creation workflow of a Service Play is similar to the Device Config Play, except in the template of the payload file used.

- d) The **Configure Play** window opens, displaying information from the payload file. You can edit the *value* or *description* columns with the values that you want to see during a Playbook execution.

Figure 7: Configure Play

Select Type Configure Play Review Play

Title	Value	Path	Type	Description	Actions
tailf-ncs:devices		/tailf-ncs:devices			
device		/tailf-ncs:devices/device			
0					
name	xrv9k-1	/tailf-ncs:devices/device/0/name			
config		/tailf-ncs:devices/device/0/config	container	NCS copy of the device configuration	
tailf-ned-cisco-ios-xr:interface		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface	container	Select an interface to configure	
GigabitEthernet-subinterface		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface	container		
GigabitEthernet		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet	list		
0					
id	0/0/0/0.401	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet/0/id	string		✓
mode	l2transport	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet/0/mode	string		✓
description	T-SDN interface	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet/0/description	string	Set description for this interface	✓
mtu	64	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet/0/mtu	uint16	Set the MTU on an interface	✓
encapsulation		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet-subinterface/GigabitEthernet/0/encapsulation	container	Set the encapsulation on an (sub)interface	

Click **Next** to continue.

Step 5 In the **Review Play** window, review the parameters of your Play. Click **Dry Run** to validate your parameters.

Label your Play with a unique **Name** and **Description**.

Note Cisco also formats the play names with indicators such as `cfg` for configuration, `chk` for check, and so on, in the name to help you organize the plays properly. You can also use similar tagging for the plays you create.

You can also add labels to your Play to group it in the future (optional).

Note The labels determine the type of devices with which you can use the Play. For example, an IOS XR Play cannot run on IOS XE devices. Be sure to review the labels (IOS XR, IOS XE, and so on) when you add them.

Figure 8: Review Play

Step 6 If you are satisfied with your changes, click **Create**.

The **Play List** window opens, displaying your new custom Play in the Play list.


Export Plays

A user must have Change Automation read permission to export any custom Play authored or imported by you or another user into Change Automation.

The exported archive contains only the user-customizable files listed in [Playbook Components and Files, on page 11](#). Once you extract them from the archive, you can identify the Play components by their file names and filename extensions.

Step 1 From the main menu, choose **Network Automation > Play List**.

Step 2 Check the check boxes for the custom Plays you want to export.

Step 3 Click . Your browser will prompt you to select a path and the file name when saving the gzipped tar archive. Follow the prompts to save the file.

Import Custom Plays

You can import any custom Play that meets the following requirements:

- The Play files must be packaged as a gzipped tar archive.
- The archive must contain a `.play` file (a data spec file for the Play), at minimum.
- The archive file must have a unique name.



Note For more details about editing and importing, see [Cisco Crosswork Change Automation Developer Guide](#).

You *can* overwrite a custom Play. The system will warn you when you are about to overwrite a custom Play but will not prevent you from doing so.




Warning Take precautions to ensure you do not accidentally overwrite the custom Plays you created.

Before you begin

To import Plays, a user must have write access. For more information about granting a user read-write role access, see [Configure Change Automation Settings](#).

Step 1 From the main menu, choose **Network Automation > Play List**.

Step 2 Click . Your browser will prompt you to browse to and select the gzipped archive file containing the Plays you want to import.

Make sure that there are no Cisco-supplied Plays with the same name as the Play you intend to import. If you import a Play with the same name, it will fail.

Step 3 Follow the prompts to import the archive file.


Delete Custom Plays

You can delete custom Plays only. You cannot delete a Cisco-supplied Play.

Your user ID must have Change Automation delete permission to delete Plays.

Step 1 From the main menu, choose **Network Automation > Play List**.

Step 2 In the **Play List** window, select the custom Plays you want to delete.

- Step 3** Click the  icon.
- Step 4** When prompted, click **Delete** again to confirm.
-

About Customizing Playbooks

You can create your own Playbooks from scratch, based on details from Cisco-supplied Playbooks. You can also create custom Playbooks using the available Plays.

Creating and modifying Cisco-supplied Playbooks are engineering tasks that take place outside of the user interface for Change Automation. As such, they are outside the scope of this User Guide.

Cisco supplies developer-level documentation for Cisco-supplied Playbooks. For more information on how to create custom plays and Playbooks, see the:

- "Playbooks" and "Plays" references in the [Change Automation Developer Guide on Cisco Devnet](#)
- "Custom Playbooks" tutorial in the [Change Automation Developer Guide on Cisco DevNet](#)

Playbook Components and Files

Change Automation Playbooks contain various components, referred to using specialized names. The components are implemented in the Playbook as files. Some of these components' names are borrowed from the Ansible specification, but all have their definitions, and not all the corresponding files can be customized by users. Some components are Cisco proprietary intellectual property; while you can use them in custom Plays and Playbooks, you cannot customize them directly. For more information, see Section: [Writing Custom Playbooks at Cisco Crosswork Change Automation Developer Guide](#).

Create a Custom Playbook Through the UI

Change Automation allows users with admin and read/write roles to create custom Playbooks using the available Plays. For more information about granting read/write role access to a user, see the section "Assign Change Automation User Access Levels" in the topic [Configure Change Automation Settings](#).



Note You cannot edit a custom Playbook once it is created. We recommend that you perform a dry run of the Playbook *before completing the creation* to ensure that the Playbook's purpose is met. Once created, if you must make changes to the custom Playbook, you have to recreate your Playbook with the relevant changes.


- Step 1** From the main menu, choose **Network Automation > Playbook List**. The **Playbook List** window is displayed.
- Step 2** Click  to create a custom Playbook. The **Select plays** window opens displaying the available Plays.
-

Figure 9: Select plays

Available Plays

Selected 0 / Total 62

Name	Type	Play id	Labels	Description	Modified By	Last Modified
<input type="checkbox"/> Add VRF under BG...	Device Config	router_cfg_bgp_vrf_xe	IOS XE, cisco-ios-cl-6-33	Play to add a VRF under BGP on a router	Cisco	23-Oct-2020 05:28:00 A.
<input type="checkbox"/> Add or delete Ethe...	Device Config	router_cfg_modify_b...	IOS XR, cisco-iosxr-cl-7-29	Play adds interfaces to or deletes interfaces from an existing Ether...	Cisco	24-Aug-2022 02:35:00 A.
<input type="checkbox"/> Add or remove VRF...	Device Config	router_cfg_bgp_vrf	IOS XR, cisco-iosxr-cl-7-18	Play to add or remove VRF under BGP on router	Cisco	01-Oct-2020 04:55:00 A.
<input type="checkbox"/> Add or remove an ...	Device Config	router_cfg_bgp_addr...	IOS XR, cisco-iosxr-cl-7-29	This play adds or removes an IPv4 address family under either a gl...	Cisco	08-Oct-2020 05:23:00 P.
<input type="checkbox"/> Add prefix list to th...	Device Config	router_cfg_prefix_list...	IOS XE, cisco-ios-cl-6-33	Play to configure a new prefix-list and also can be used to modify L...	Cisco	27-Oct-2020 07:11:00 P...
<input type="checkbox"/> Add/Delete prefix s...	Device Config	router_cfg_prefix_set	IOS XR, cisco-iosxr-cl-7-18	This play creates a new or modifies or deletes an existing prefix se...	Cisco	01-Oct-2020 04:41:00 P...
<input type="checkbox"/> Add/Remove Traff...	Device Config	router_cfg_traffic_co...	IOS XR, SR, cisco-iosxr-c	Play to add or remove traffic collector on a XR router	Cisco	22-Oct-2020 11:12:00 A...
<input type="checkbox"/> Capture and comp...	Action	router_op_state_sna...	CLI, Check	Play to capture node states based on the given sensor path and re...	Cisco	22-Oct-2020 06:23:00 A...
<input type="checkbox"/> Change interface s...	Device Config	router_cfg_interface...	IOS XR, cisco-iosxr-cl-7-24	Shut or unshut one or more interface on an XR router	Cisco	04-Nov-2020 01:17:00 A...
<input type="checkbox"/> Change interface s...	Device Config	router_cfg_interface...	IOS XE, cisco-ios-cl-6-33	Play to change the GigE interface state on a IOS XE router	Cisco	22-Oct-2020 12:57:00 P...
<input type="checkbox"/> Check BGP neighb...	Check	router_chk_bgp_neig...	SNMP	Play checks the state of the given BGP neighbor and passes if the ...	Cisco	23-Oct-2020 02:15:00 A...
<input type="checkbox"/> Check CPU usage	Check	router_chk_cpu_proc...	SNMP	Verify that CPU utilization on the target device is below the referen...	Cisco	23-Oct-2020 01:58:00 A...
<input type="checkbox"/> Check VRF neighb...	Action	router_op_verify_vrf...	CLI, Check	This verb uses the collector golang library and generic CLI collecti...	Cisco	23-Oct-2020 05:44:00 A...
<input type="checkbox"/> Check if the traffic ...	Action	router_op_verify_traf...	CLI, Check, SR	Play to invoke the generic cli collection for "show traffic-collector l...	Cisco	29-Jan-2021 08:49:00 A...

Cancel Next

Select all the Plays you want in your Playbook, and click **Next**.

Note The recommendation is to include the **Perform Check Sync on the device** and **Sync NSO from device** Plays as a pre-step to running other operations in the Playbook or as part of pre-maintenance.

The **Perform Check Sync on the device** Play checks the device sync status with NSO and performs sync only when needed, based on the Playbook's sync parameter value. It reduces the playbook execution time and ensures the NSO configuration matches the device configuration.

- If the Playbook's sync parameter is set to True and the device is not in sync, the **Perform Check Sync on the device** Play will sync the device with the NSO configuration.
- If the sync parameter is set to False and the device is not in sync, the Play will fail to execute with a commit message.
- If the device is already in sync, the Play will succeed.

Step 3

In the **Order Playbook** window, arrange the order of the Plays in the Playbook as per the execution phase (Continuous, Pre-Maintenance, Maintenance, Post-Maintenance). By default, all the selected Plays are displayed within the Maintenance phase. You can click and drag the Plays to rearrange them to the appropriate phase.

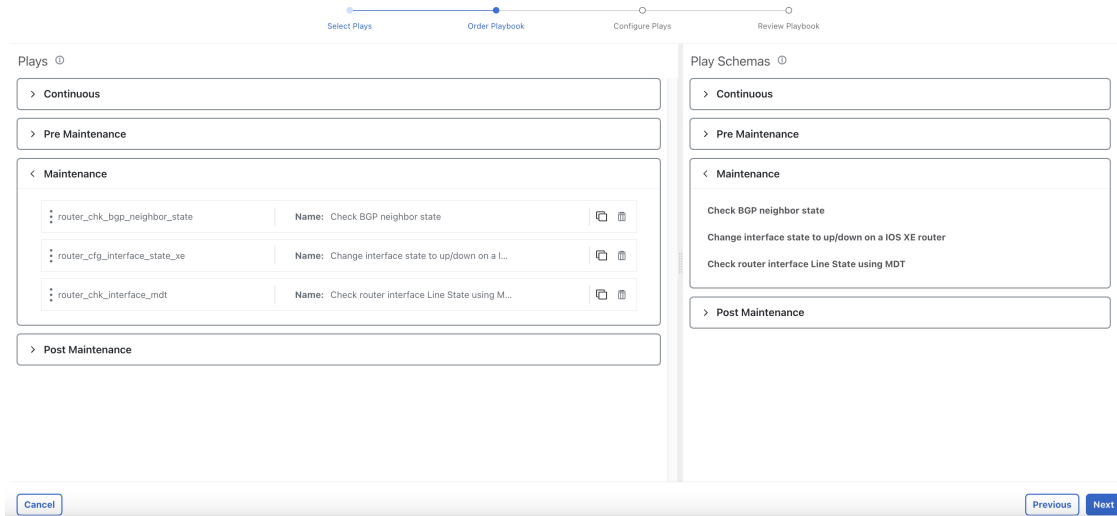
Depending on the type of Play you have selected, it may be restricted from being used in certain phases. For example, a configuration Play cannot be used outside of the Maintenance phase.

For more information on each execution phase, see [Playbook Execution Order, on page 20](#).

Change Automation also formats the Play names with indicators such as "cfg" for configuration, "chk" for check, and so on, in the name to help you organize the plays properly. You can use similar tagging for the Plays you create.

You can also duplicate or delete a Play by clicking on the icons provided.

Figure 10: Order playbook

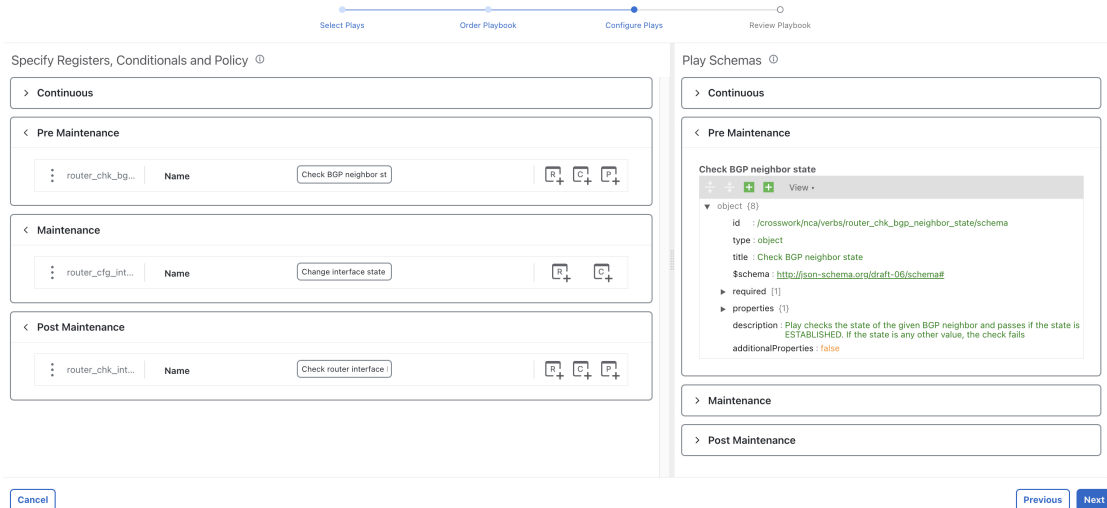


Click **Next**.

Step 4

The **Configure Plays** window opens, displaying the Plays in each execution phase and the Play schemas.

Figure 11: Configure plays



You can perform the following:

- Click **P+** to specify a policy for a Play. In the **Specify Policy** dialog box, specify relevant values for the fields provided. Click **i** for more information about each field. Click **Save** to save your policy values.

Note Policies are applicable to Check Plays.

Figure 12: Specify Policy

Specify Policy

Minimum passes ⓘ

Maximum fails ⓘ

Security Consecutive ⓘ

Cancel **Save**


- Click  to apply a condition to a Play. Execution of the play proceeds only if the condition is met. In the **Specify Conditionals** dialog box, click **Add Condition** to add a condition. Click **Save** to save your conditional values.

Figure 13: Specify Conditionals

Specify Conditionals

Build conditionals using the selected fields.

Add condition 

Cancel **Save**


- Click  to specify a register for a Play. Specifying registers allows you to use the output of a previous Play as the input for another Play. Click **Save** to save your registers.

Figure 14: Specify Registers

Specify Registers

Specify registers using the selected fields:

config 

Cancel **Save**

- (Optional) Rename the Plays if you want them to be displayed with different names during the Playbook execution. Click **Next** to continue.


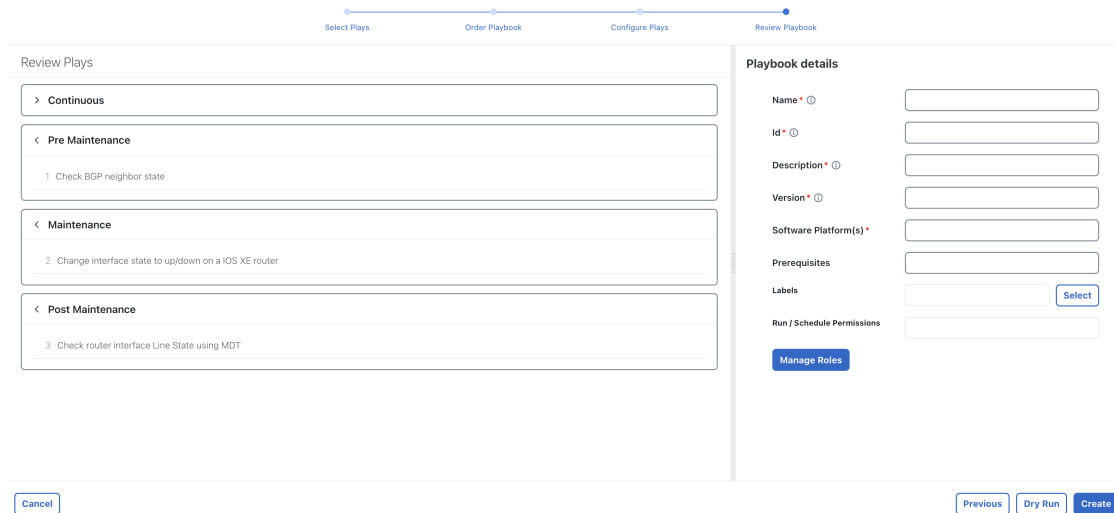
Step 5 In the **Review Playbook** window, review the Plays in your Playbook. Enter relevant values for the **Playbook details** fields. You can click  for more information about each field.

Figure 15: Review Playbook



The screenshot shows the 'Review Playbook' window with a progress bar at the top indicating the current step. The main area is divided into two sections: 'Review Plays' and 'Playbook details'.

Review Plays:

- Continuous:** (Expanded)
- Pre Maintenance:** (Collapsed)
 1. Check BGP neighbor state
- Maintenance:** (Collapsed)
 2. Change interface state to up/down on a IOS XE router
- Post Maintenance:** (Collapsed)
 3. Check router interface Line State using MDT

Playbook details:

- Name *
- Id *
- Description *
- Version *
- Software Platform(s) *
- Prerequisites
- Labels
- Run / Schedule Permissions
-

At the bottom, there are buttons for 'Cancel', 'Previous', 'Dry Run', and 'Create'.

Note For the **Software Platform(s)** field, make sure to use the exact software type name as it is mentioned in **Device Management > Network Devices > Software Type** column.

Step 6 (Optional) Click **Select** and perform one of the following, as applicable, to set the **Labels**:

- Select the applicable label and click **Done**.
- Click **+ New label**, enter relevant values for **Label** and **Roles**, and click **Save**. Select the new label and click **Done**.

Note The labels determine which user or roles can run which Playbooks.

For more information on assigning Playbooks to specific roles, see [Assign Playbooks to Specific Roles](#), on page 19.

Step 7 (Optional, but recommended for testing the Playbook) After you enter the relevant details, click **Dry run** to validate the parameters. A dialog box opens, displaying the Playbook Details.

Figure 16: Playbook Details

Playbook Details: trial

The following playbook will be created

trial

Last Modified: 2023-Nov-16, 18:30:10 by admin

Software Platform: IOS XR  Version: 1.0

Description: test

> Continuous (0)

< Pre Maintenance (1)

1 Check BGP neighbor state

< Maintenance (1)

2 Change interface state to up/down on a IOS XE router

< Post Maintenance (1)

Cancel

Create Playbook

Note Dry run does not commit the changes but provides a platform to validate whether the Playbook would work with the parameters you entered.

Step 8 Click **Previous** to navigate back to a step to make changes as necessary to get the Playbook to function properly.

Step 9 Click **Create** to create the Playbook.

The **Playbook List** window opens, displaying your new custom Playbook on the list.

Create a Custom Playbook Using APIs

This section explains the steps to create a custom Playbook using APIs. For more information, see the ["Custom Playbooks" tutorial in the Change Automation Developer Guide on Cisco DevNet](#).



Note A Playbook containing a custom Play can be created through the UI (see [Create a Custom Playbook Through the UI, on page 11](#)) or using APIs.

A Playbook consisting of one or more custom Plays is expected to have a *dataspec* value for the custom Play in the Playbook file. The *dataspec* value is generated when the custom Playbook is created using the API in this procedure. You cannot create the same custom Playbook using the import option (API: `/v1/mops/import`), as it does not add the *dataspec* value for the custom Play.

Step 1 Ensure that the Plays (stock or custom) you need for the Playbook are created beforehand.

You can create a custom Play either through the UI (see [Create a Custom Play Using Templates, on page 5](#)) or using API (use the API call `//crosswork_ip:30603/crosswork/nca/v1/Plays/device/config`).

Note If you are importing Plays that share the same name with existing Plays, then the error "Play validation failed, custom Play already present" will be displayed, to prevent the existing Plays being overwritten.

Step 2 Create the Playbook using the following API:

API call: `//crosswork_ip:30603/crosswork/nca/v1/mops`

Export Playbooks

You can export any Playbook as a gzipped tar archive. This includes any Cisco-supplied Playbook and custom Playbooks you or another party have authored and imported into Change Automation.

The exported archive contains only the user-customizable files listed in [Playbook Components and Files, on page 11](#). It also contains one or more `.pb` files (for example, `router_config_bgp_rd.pb` for the Playbook code), which are parsed and processed at the back end.


You can edit the exported files as needed, following the guidelines in the ["Custom Playbooks" tutorial in the Change Automation Developer Guide on Cisco DevNet](#). Then, you can import them as explained in [Import Playbooks, on page 18](#).

Your user ID must have Change Automation read permission to export Playbooks and write permissions to import new or modified playbooks.

Step 1 From the main menu, choose **Network Automation > Playbook List**.

Step 2 (Optional): In the **Playbook List** window, filter the table as needed.

Step 3 Check the check boxes for the Playbooks you want to export. Check the check box at the top of the column to select all Playbooks for export.

Step 4 Click . Your browser will prompt you to select a path and the file name when saving the gzipped tar archive. Follow the prompts to save the file.

Import Playbooks

You can import any custom Playbook, provided it meets the following requirements:

- The Playbook files must be packaged as a gzipped tar archive.
- The archive must contain a .pb file, at minimum.
- The archive file must have a unique name.

The individual files included in the archive must meet the additional validation requirements described in the ["Custom Playbooks" tutorial in the Change Automation Developer Guide on Cisco DevNet](#).




Note While you cannot overwrite a Cisco-supplied Playbook, you *can* overwrite a custom Playbook. The system will warn you when you are about to overwrite a custom Playbook but will not prevent you from doing so. Take precautions to ensure that you do not overwrite your custom Playbooks accidentally.

You cannot re-import an exported Cisco-supplied Playbook with the same name as the original.

Before you begin


To import Playbooks, a user must have write access. For more information about granting a user read-writer role access, see [Configure Change Automation Settings](#).

-
- Step 1** From the main menu, choose **Network Automation > Playbook List**.
- Step 2** Click . Your browser will prompt you to browse to and select the gzipped archive file containing the Playbooks you want to import.
- Make sure there is no existing Playbook with the same name as the Playbook you intend to import unless you want to overwrite the existing Playbook.
- If you are creating an improved version of a Playbook, it is recommended that you use a version number or other indicator to ensure that the name is unique and does not overwrite the original Playbook until the replacement is completely tested.
- Step 3** Follow the prompts to import the archive file.
-

Delete Custom Playbooks

You can delete user-defined Playbooks only. You cannot delete a Cisco-supplied Playbook.

Your user ID must have Change Automation delete permission to delete Playbooks.

-
- Step 1** From the main menu, choose **Network Automation > Playbooks List**.
- Step 2** In the **Playbooks List** window, select the custom Playbook you want to delete.
- Step 3** Click the  icon.

Step 4 When prompted, click **Delete** again to confirm.

Assign Playbooks to Specific Roles

This section explains how to assign Playbook labels to specific roles so that they can run and import the Playbooks with that particular label. Admin users can enable other users to run Playbooks with a specific label.

Before you begin

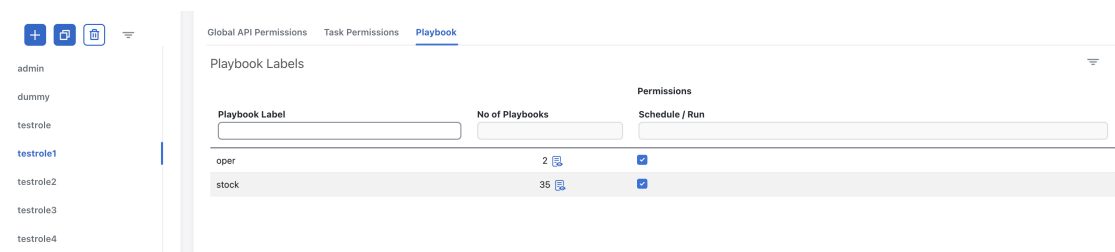
If required, create a new user to whom you would want to assign the Playbook. For more information, see the topic [Create User Roles](#) in the [Cisco Crosswork Network Controller Administration Guide](#).

Step 1 Go to **Administration > Users and Roles > Roles > Playbook**.

Step 2 Under the **Roles** pane, select the role to whom you want to assign the Playbook labels.

Step 3 Enable the **Permissions** check boxes for the **Playbook Label(s)** you want to assign.

Figure 17: Playbook Labels



Playbook Label	No of Playbooks	Permissions
oper	2	<input checked="" type="checkbox"/> Schedule / Run
stock	35	<input checked="" type="checkbox"/> Schedule / Run

About Running Playbooks

You must have permission to run the Playbooks with a particular Playbook label. For more information on assigning Playbooks to specific roles, see [Assign Playbooks to Specific Roles, on page 19](#).

Running any Playbook consists of five steps:

1. Select the **Playbook** you want to run (see [View the Playbook List, on page 3](#)).
2. Select the **device or devices** that you want to run it on.
3. Enter the appropriate run-time **parameters** that you want the Playbook to apply.
4. Select the **execution mode** that you want to use:
 - a. [Perform a Dry Run of a Playbook, on page 21](#), where you can see what the Playbook does before make changes to the network.
 - b. [Run Playbooks In Single Stepping Mode, on page 27](#), so you can pause after each Playbook check or action, and roll back changes you did not intend.

- c. [Run Playbooks In Continuous Mode, on page 33](#) and apply the changes immediately.

While selecting the execution mode, you can also choose to:

- [Schedule Playbook Runs, on page 39](#) for another calendar date or time.
- **Collect syslogs** during and after the run. Syslog collection is available only when running the Playbook in single-stepping or continuous execution mode and only if you have already configured a syslog storage provider.
- Specify a **Failure Policy**, where you decide what the system should do if a failure occurs during the Playbook run.

5. **Confirm** your settings and run the Playbook in the execution mode you selected.

Depending on their complexity and network factors, some Playbooks may take much time to run. You can view the run details and status at any time during and after the completion of a run. If the Playbook is still running, you can also choose to cancel it. For details, see [View or Abort Playbook Jobs, on page 41](#).

Playbook Execution Order

When it is running, every Playbook conducts checks and configuration changes in four phases, which correspond to sections of the Playbook code (identified using the tags discussed in [Playbook Components and Files, on page 11](#)):

1. **Pre-Maintenance**—This phase of the Playbook includes non-disruptive checks and any other operations on the device that prepare it for potentially traffic-impacting changes. For example:
 - Take snapshots of various routing protocol states.
 - Take snapshots of memory, CPU, and system health parameters.
 - Validate the capacity (storage, memory) on active and standby routers for the new software patch upgrade.
2. **Maintenance**—This phase of the Playbook includes any task that may disrupt traffic flowing through the router or impact neighboring routers. For example:
 - Cost out the router and wait until traffic drains out completely.
 - Verify that the redundant router is healthy and carrying traffic.
 - Perform the upgrade procedure on the device.
 - Reconfigure the device(s) to support a new configuration or feature.
3. **Post-Maintenance**—This phase of the Playbook includes verification tasks to perform on the router after any disruptive operation. For example:
 - Verify that the current state matches the desired state.
 - Cost in the router and wait for traffic to return to normal levels.
4. **Continuous**—In addition to the three serial phases already described, Change Automation can also run check tasks that span the entire duration of Playbook execution. These tasks check the state of the router while the Playbook is being deployed and cancel the Playbook execution if any catastrophic or undesirable

state change occurs. The checks in the Playbook may also monitor a neighboring router to guarantee no second-order failures in the network while the changes are being deployed.

Perform a Dry Run of a Playbook

A dry run lets you view configuration changes that the Playbook will send to the device without performing the actual commit of the changes, as you would with a run in the single-stepping or continuous execution modes.

It is a best practice to perform a dry run and verify the configuration changes before you deploy those changes to the router. If the dry run fails, you may want to debug its parameter values using another dry run. You can also debug by performing a single-stepping run, which will allow you to abort and rollback changes after one or more of the plays, instead of only at the end, as part of a continuous run's Failure Policy.

Note that dry run mode is intended for use only with Playbooks that perform device configuration changes via Cisco NSO. See the "Playbooks" and "Plays" references in the [Change Automation Developer Guide on Cisco Devnet](#) for details on Playbooks that do not support dry run mode. These will include, for example, Node state snapshot, Install optional package or SMU, and Uninstall optional package or SMU.

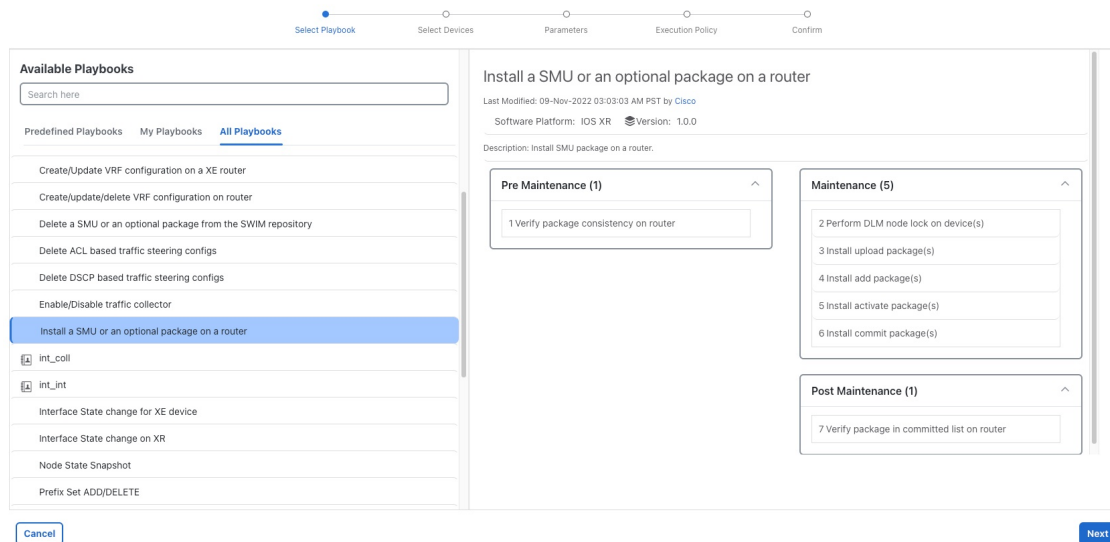
Step 1

From the main menu, choose **Network Automation > Run Playbook**.

Step 2

In the **Available Playbooks** list on the left, click on the Playbook you want to dry run. On the right, the window displays the Playbook name, hardware and software compatibility information, and descriptions for all the plays in the selected Playbook.

Figure 18: Select Playbook



Step 3

Click **Next**. The **Select Devices** window appears.

Figure 19: Select Devices

Device(s) Selected: xrv9k-15-216 X




* You must have at least 1 and at most 1 devices

Select From Available Devices (5)

Reachability S...	Operational State	Host Name	Software Platform	Provider Name	Lock Status	Unique Identifier
<input type="checkbox"/> Reachable	OK	xrv9k-15-212	IOS XR	nso101	Unlock	8e449498-2abc-431b-b9d6-220cc80de49b
<input checked="" type="checkbox"/> Reachable	OK	xrv9k-15-216	IOS XR	nso101	Unlock	9a94dc6b-fb0a-4c2d-87b5-059bcd1384fc
<input checked="" type="checkbox"/> Reachable	OK(1)	xrv9k-15-214	IOS XR	nso101	Unlock	cbd5a8bf-05bb-4110-aea0-a548bd846e1a
<input checked="" type="checkbox"/> Reachable	OK	xrv9k-15-211	IOS XR	nso101	Unlock	4ab1d9f2-c533-4548-895e-0d67e3572116
<input checked="" type="checkbox"/> Reachable	OK	xrv9k-15-213	IOS XR	nso101	Unlock	4b40b03d-1d5d-4e52-bdc5-78a4318a1d05


Cancel Previous Next

Using this window:

- You can toggle between the table view and topology map view by clicking and selecting the relevant option on the drop-down button on the upper left corner of the window. Choose **Select Devices From List** or **Select Devices From Map** to select the table view or topology map view respectively. By default, the table view is displayed.
- With the topology map view displayed, you can toggle between the map's geographical and logical views by clicking on the  or the . You can also zoom, display bandwidth utilization, and change logical view layouts as you do with the topology map you see when you select **Topology** from the main menu.
- You can select the devices manually or using tags. The **Select Device Tag** option targets you to select the relevant tag instead of devices from the table and all devices associated with the relevant tag are selected. The **Select Device Manually** option allows you to select the devices from the list using quick and advanced filters and filter by tags on the left. Hover the mouse pointer over the  icon next to the options for more information. You can also view the selection criteria, such as the number of devices required for the selected playbook.

Note If you are a non-admin user and selecting the devices manually, make a note of the following:

- The devices on which you want to run the Playbook must belong to a Device Access Group, and you must have access to this Device Access Group. For more information on Device Access Groups and associating a user with a Device Access Group, see the [Manage Device Access Groups](#) section in the [Cisco Crosswork Network Controller Administration Guide](#).
 - If your role is associated with an empty Device Access Group, then you will receive an error message.
 - If your role is associated with multiple Device Access Groups and the device belongs to any of these Device Access Groups, then you can run the Playbook on this device. If the device does not belong to any of your Device Access Groups, then the operation fails.
 - If you are selecting multiple devices (using **Allow Bulk Jobs** option or using tags) and if any of the devices does not have access, then an error message appears stating that this list of devices does not have access to run the Playbook.
- In the **Select Device Manually** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook on them simultaneously. Based on your selection, the system creates a static

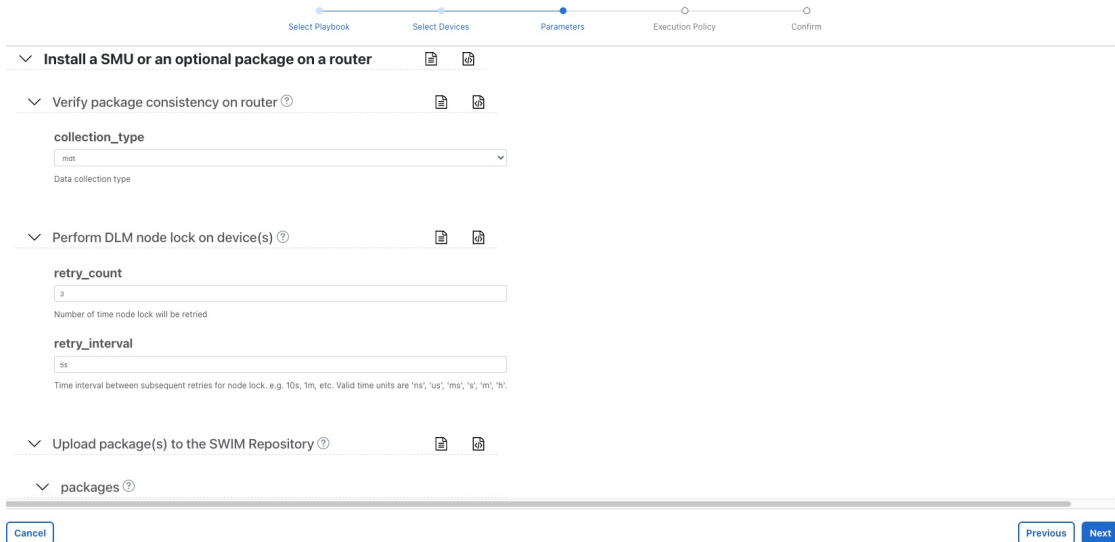
group of multiple jobs. Hover the mouse pointer over the  icon next to the check box for more information. There is no limit to the number of devices you can select for a bulk job.

Note **Allow Bulk Jobs** option is enabled for playbooks that can be executed on a single device.

Step 4 Click **Next**. The **Parameters** window appears.

Step 5 In the fields provided in the **Parameters** window, enter the Playbook parameter values for this dry run.

Figure 20: Parameters



The screenshot shows the 'Parameters' window for a playbook. At the top, a progress bar indicates the current step is 'Parameters'. The window contains several sections:

- Install a SMU or an optional package on a router:** Includes a dropdown menu for 'collection_type' with the value 'not' selected.
- Perform DLM node lock on device(s):** Includes input fields for 'retry_count' (value: 3) and 'retry_interval' (value: 5s).
- Upload package(s) to the SWIM Repository:** Includes a checkbox and a file upload icon.
- packages:** Includes a dropdown menu.

At the bottom of the window, there are three buttons: 'Cancel', 'Previous', and 'Next'.

With the **Parameters** window displayed, you can also:



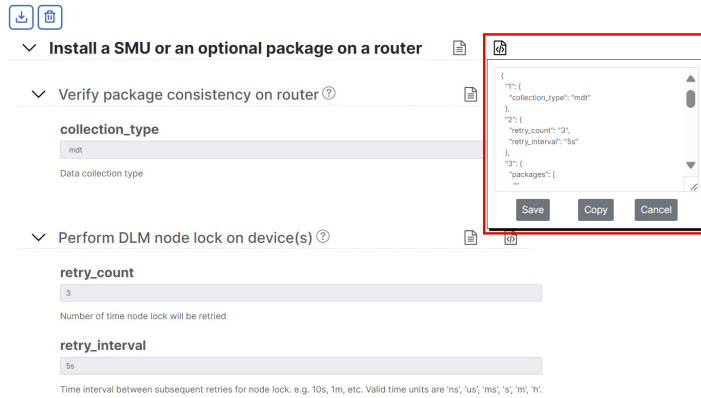
- Click  to upload a JSON file with the parameter values you want. You will be prompted to navigate to the JSON parameters file you have previously prepared (or downloaded from a previous Playbook run) and then upload it as appropriate for your browser and operating system.
- Click  to enter the parameter values in JSON format. A popup text window displays the full list of JSON parameters with empty values in quotes. Edit the values, and when you are finished, click **Save**.

Figure 21: Edit JSON




- Click  to select the items you want to configure. A pop-up text window will appear, displaying the complete list of plays or parameters that can be configured. For the Playbook, it will show a list of Plays and, for each selected Play, it will display a list of parameters that can be configured for that Play. If you unselect any item, it will not appear for configuration. Uneditable options indicate mandatory items that cannot be deselected.

Figure 22: Object Properties for a Playbook

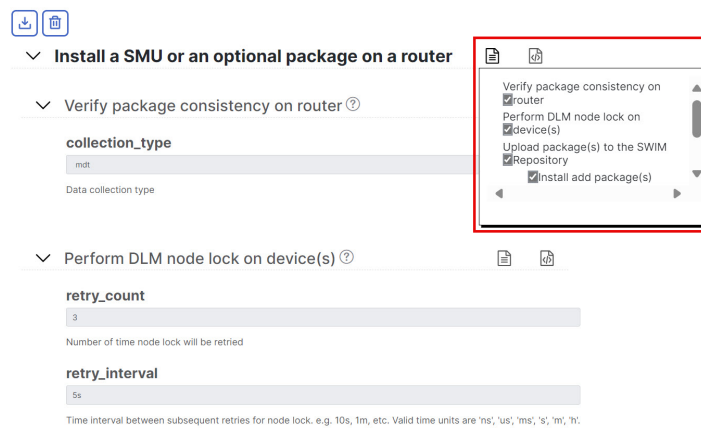


Figure 23: Object Properties for a Play

Install a SMU or an optional package on a router

Verify package consistency on router

collection_type
 mdt
Data collection type

Perform DLM node lock on device(s)

retry_count
 3
Number of time node lock will be retried

retry_interval
 5s
Time interval between subsequent retries for node lock. e.g. 10s, 1m, etc. Valid time units are 'ns', 'us', 'ms', 's', 'm', 'h'.

- Click to add additional instances of a particular parameter, if required for the Playbook you are running. Click to delete instances added in this way.
- Click to clear all the parameter values entered so far.

a.

Step 6

With the parameter values set, click **Next**. The **Execution Policy** window appears.

Figure 24: Execution Policy

Select Playbook Select Devices Parameters **Execution Policy** Confirm

Execution Mode

Continuous
 Run the playbook without interruption.

Single Stepping
 Run the Playbook one play at a time, and specify when to pause.

Dry Run
 View the configuration changes without performing a commit.

Step 7

Choose **Dry Run** and click **Next**. The **Review your Job** window appears, displaying a summary of your choices: playbook, devices, parameters, and execution policy.

Figure 25: Review your Job

Review your Job

Progress: Select Playbook | Select Devices | Parameters | Execution Policy | Confirm

Playbook Install a SMU or an optional package on a router Change
 Continuous (0)
 Pre Maintenance (1)
 Maintenance (5)
 Post Maintenance (1)

Tag interface Change

Mop Params

```
{
  "1": {
    "collection_type": "mdt"
  },
  "2": {
    "retry_count": "3",
    "retry_interval": "5s"
  },
  "3": {
    "packages": [
      "xry-9k-base-2.0.0.144-r721.CSCuv93809x86.64.rpm"
    ]
  },
  "4": {
    "packages": [
      "xry-9k-base-2.0.0.144-r721.CSCuv93809x86.64.rpm"
    ]
  },
  "5": {
    "action": "Activate"
  },
  "6": {
    "action": "Commit"
  }
}
```

Label your Job

Name *

Labels

In this window:

- You must provide a relevant **Name** for the job.
- You can enter labels for your job using the **Labels** field.
- You can click on any **Change** links in the **Review your Job** window summary to modify your choices.

Step 8 (Optional) Enter the device credentials (name and password).

Note This step is applicable only if **Credential Prompt** is enabled in the Change Automation settings. For more information, see [Configure Change Automation Settings](#).

Step 9 When you are ready to continue, click **Run Playbook**.

Step 10 At the confirmation prompt, click **Confirm**. The **Execution Mode** window is displayed.

Step 11 After the dry run is complete:

- Click the **Dry Run** tab and verify the configuration changes that would be pushed to the device had this not been a dry run. This tab will display a `no config change` message if no changes have been made. Please note that this tab shows only cumulative configuration changes, not each individual change made. For example, if a Playbook configures `set-overload-bit` in one step and then unconfigures it using `no set-overload-bit` later, the tab will show `no config change`.
- Click the **Events** tab to see success and failure messages for each step of the Playbook. This can help you diagnose and correct problems with individual plays and the run as a whole. For troubleshooting information, see [Troubleshoot Change Automation, on page 44](#).
- Click the **Console** tab to see messages that are generated during the run.

As syslog collection is disabled for dry run, the **Syslog** tab will contain only a message stating that.

Step 12 (Optional) If you want to perform a single-step debugging run, or are ready to commit the changes to the device, click **Execute Now**. The **Execution Policy** window will display all of your parameter values from the dry run.

Run Playbooks In Single Stepping Mode

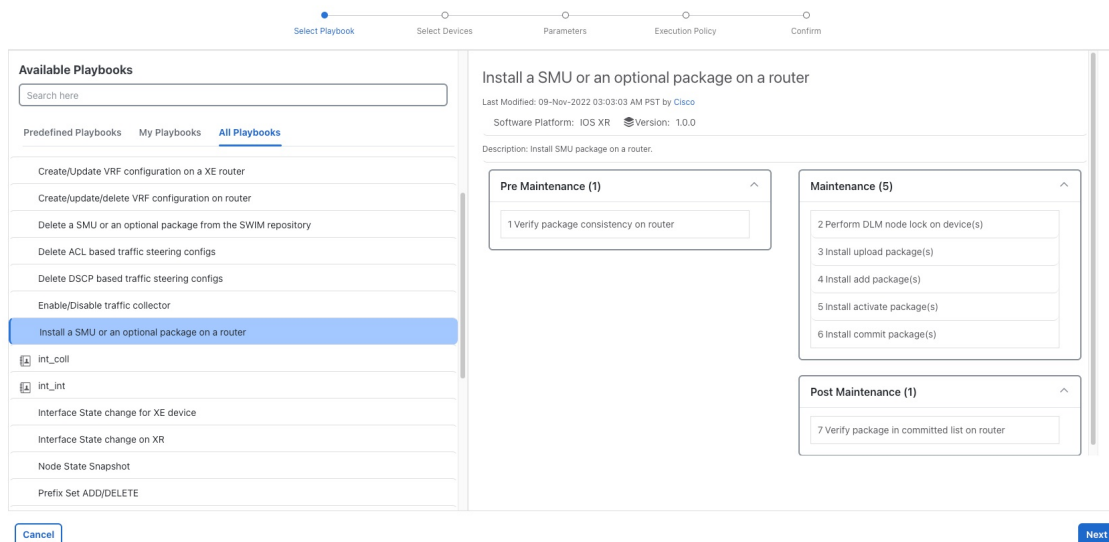
Single-stepping execution mode is a handy way to test a custom or modified Playbook or diagnose problems with a pre-packaged Playbook that does not give you the desired results. Unlike a dry run, a single-stepping execution commits configuration changes to the device as the Playbook runs. However, you can set breakpoints on or pauses after any Maintenance or Post-Maintenance action in the Playbook. Note that while you can set breakpoints on Pre-Maintenance actions, doing so will have no effect, and these actions will not pause.

Whenever the Playbook hits a breakpoint, it will stop and will not continue until you issue the command to proceed. At each pause, you can also abort the entire run and roll back all changes made or roll back to any previous play.

Step 1 From the main menu, choose **Network Automation > Run Playbook**.

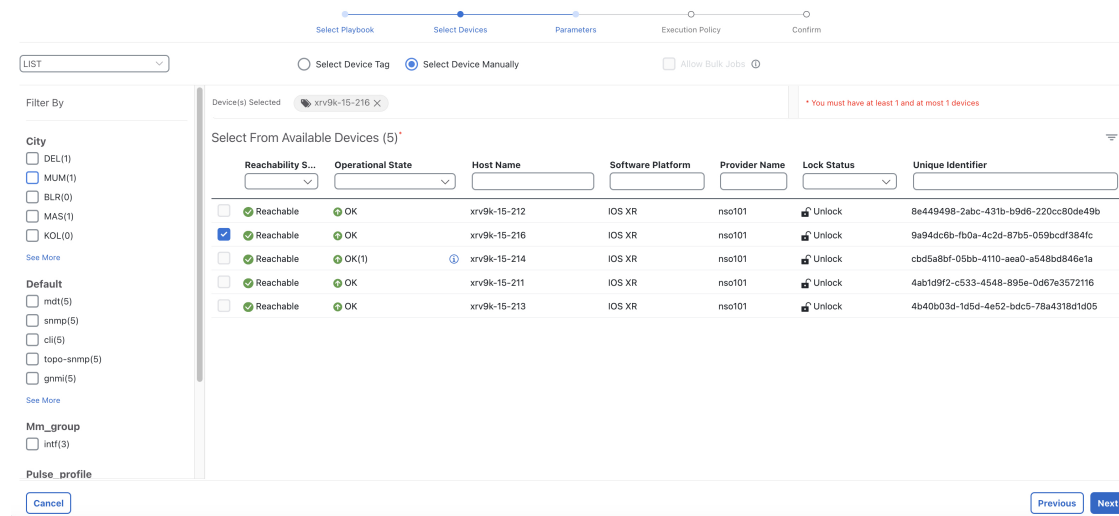
Step 2 In the **Available Playbooks** list on the left, click on the Playbook you want to run. On the right, the window displays the Playbook name, hardware and software compatibility information, and descriptions for all the plays in the selected Playbook.

Figure 26: Select Playbook






Step 3 Click **Next**. The **Select Devices** window appears.

Figure 27: Select Devices




Using this window:

- You can toggle between the table view and topology map view by clicking and selecting the relevant option on the drop-down button in the upper left corner of the window. Choose **Select Devices From List** or **Select Devices From Map** to select the table view or topology map view, respectively. By default, the table view is displayed.
- With the topology map view displayed, you can toggle between the map's geographical and logical views by clicking on the  or the . You can also zoom, display bandwidth utilization, and change logical view layouts as you do with the topology map you see when you select **Topology** from the main menu.
- You can select the devices manually or using tags. The **Select Device Tag** option targets you to select the relevant tag instead of devices from the table and all devices associated with the relevant tag are selected. The **Select Device Manually** option allows you to select the devices from the list using quick and advanced filters and filter by tags on the left. Hover the mouse pointer over the  icon next to the options for more information. You can also view the selection criteria, such as the number of devices required for the selected playbook.

Note If you are a non-admin user and selecting the devices manually, make a note of the following:

- The devices on which you want to run the Playbook must belong to a Device Access Group, and you must have access to this Device Access Group. For more information on Device Access Groups and associating a user with a Device Access Group, see the [Manage Device Access Groups](#) section in the [Cisco Crosswork Network Controller Administration Guide](#).
 - If your role is associated with an empty Device Access Group, you will receive an error message.
 - If your role is associated with multiple Device Access Groups and the device belongs to any of these Device Access Groups, then you can run the Playbook on this device. The operation fails if the device does not belong to any of your Device Access Groups.
 - If you select multiple devices (using the **Allow Bulk Jobs** option or using tags) and if any of them does not have access, an error message appears stating that this list of devices does not have access to run the Playbook.
- In the **Select Device Manually** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook on them simultaneously. Based on your selection, the system creates a static

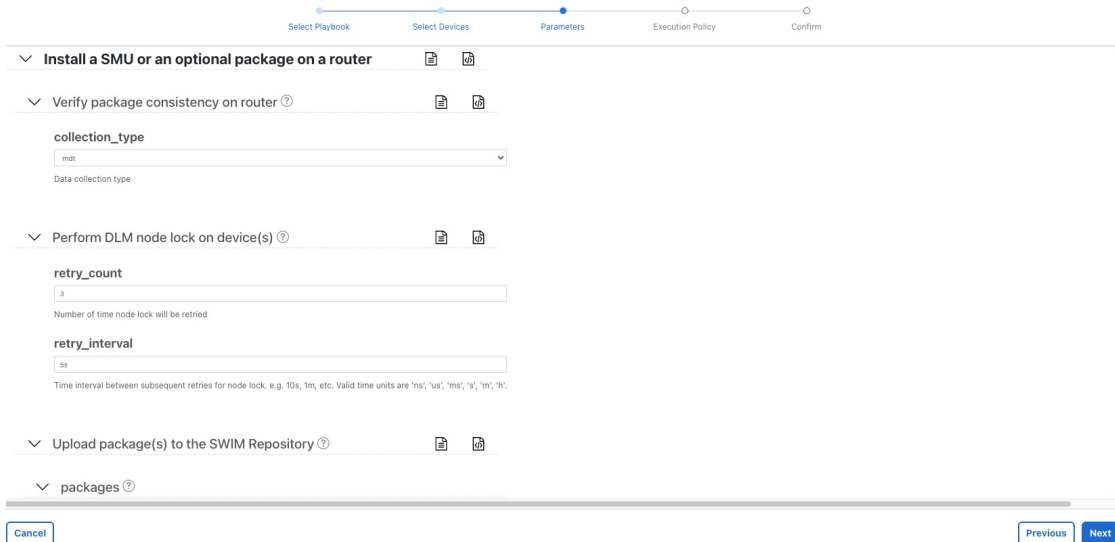
group of multiple jobs. Hover the mouse pointer over the  icon next to the check box for more information. There is no limit to the number of devices you can select for a bulk job.

Note **Allow Bulk Jobs** option is enabled for playbooks that can be executed on a single device.

Step 4 Click **Next**. The **Parameters** window appears.

Step 5 In the fields provided in the **Parameters** window, enter the Playbook parameter values for this run.

Figure 28: Parameters



With the **Parameters** window displayed, you can also:



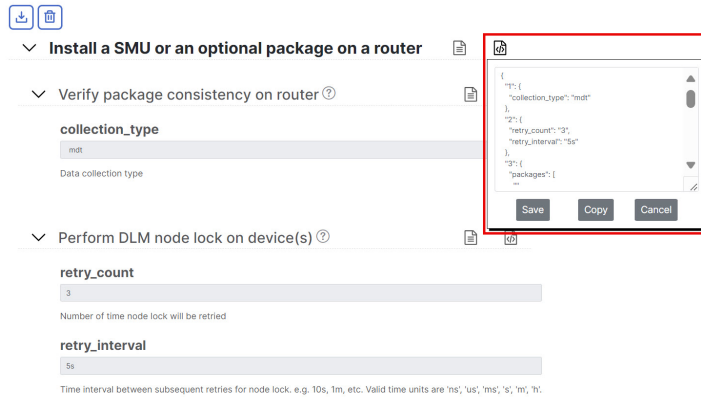
- Click  to upload a JSON file with the parameter values you want. You will be prompted to navigate to the JSON parameters file you have previously prepared (or downloaded from a previous Playbook run) and then upload it as appropriate for your browser and operating system.
- Click  to enter the parameter values in JSON format. A popup text window displays the full list of JSON parameters with empty values in quotes. Edit the values, and when you are finished, click **Save**.

Figure 29: Edit JSON




- Click  to select the items you want to configure. A pop-up text window will appear, displaying the complete list of plays or parameters that can be configured. For the Playbook, it will show a list of Plays and, for each selected Play, it will display a list of parameters that can be configured for that Play. If you unselect any item, it will not appear for configuration. Uneditable options indicate mandatory items that cannot be deselected.

Figure 30: Object Properties for a Playbook

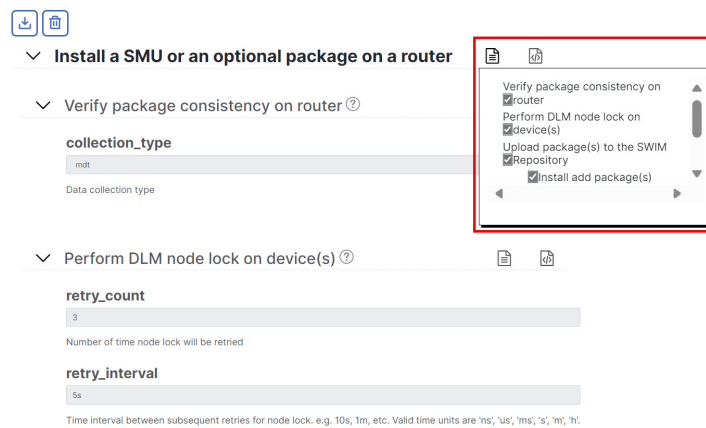


Figure 31: Object Properties for a Play

▼ Install a SMU or an optional package on a router

▼ Verify package consistency on router

collection_type
mdt
Data collection type

▼ Perform DLM node lock on device(s)

retry_count
3
Number of time node lock will be retried

retry_interval
5s
Time interval between subsequent retries for node lock. e.g. 10s, 1m, etc. Valid time units are 'ns', 'us', 'ms', 's', 'm', 'h'.

- Click to add additional instances of a particular parameter, if required for the Playbook you are running. Click to delete instances added in this way.
- Click to clear all the parameter values entered so far.

Step 6

With the parameter values set, click **Next**. The **Execution Policy** window appears.

Step 7

Choose **Single Stepping**. The **Execution Policy** window displays additional features to customize the job:

Figure 32: Execution Policy

Execution Mode

Continuous
Run the playbook without interruption.

Single Stepping
Run the Playbook one play at a time, and specify when to pause.

Dry Run
View the configuration changes without performing a commit.

Collect Syslog
 Yes No

Failure policy
On failure: Abort

Timeout
3600

Single stepping breakpoints
Pause after: Every step

Schedule
Run Now

All Scheduled Jobs

November 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2

- Under **Collect Syslog**, click **Yes** if you want syslogs to be collected during and immediately after the run and **No** if you do not. **Yes** is the default selection only if you have a syslog provider configured.
- From the **Failure Policy** dropdown, select:
 - **Abort** to abort the entire run without rolling back any changes, if a failure occurs at any point. This is the default. Any configuration changes made up to the point of failure will not be rolled back.

- **Pause** to pause the run and allow you to decide how to handle the failure. This pause will be in addition to any breakpoints you set using the **Single stepping breakpoints** dropdown.
- **Complete Roll Back** to abort the entire run and roll back all configuration changes made.
- In the **Schedule** area, uncheck the default **Run Now** selection to schedule the job for a later time. See [Schedule Playbook Runs, on page 39](#) for help on using the **Schedule** area features.

Step 8 From the **Single stepping breakpoints** dropdown, select either

- **Every step** to pause automatically after every step in the Playbook.
- **Customize** to select the steps where you want the Playbook to pause.

If you select **Customize**, the **Customize Check Point** pop-up displays a list of all the plays in the Playbook, with a **⏸** at the step between each play. Click the **⏸** at each step where you want to set a breakpoint. When you are finished, click **Done**.

Step 9 Click **Next**. The **Review your Job** window appears, displaying a summary of your choices: playbook, devices, parameters, and execution policy. In this window:

- You must provide a relevant **Name** for the job.
- You can enter labels for your job using the **Labels** field.
- You can click on any **Change** links in the **Review your Job** window summary to modify your choices.

Step 10 (Optional) Enter the device credentials (name and password).

Note This step is applicable only if **Credential Prompt** is enabled in the Change Automation settings. For more information, see [Configure Change Automation Settings](#).

Step 11 When you are ready to continue, click **Run Playbook**.

Step 12 At the confirmation prompt, click **Confirm**. Click **View Job Set** to view the status of the current job. The job details include job status, job set tags, the title of the selected playbook, execution parameters and policy, last updated date, and updated comments (if any).

Step 13 While the run is executing, the **Running** tile at the top of the window will change to **Paused** for each step at which you have set a breakpoint. Your choices at each pause will be displayed as buttons below the tiles:

- Click **Resume** to resume running from this point, with no changes. The **Resume** request includes the runtime parameters from the previous step; you can edit these, as needed, later.
- Click **Roll Back** to roll back any changes made so far. You can choose how far to rollback:
 - Click **Complete Roll Back** to roll back all changes to the start of the Playbook run. Once you have rolled back to the start, you can choose to **Resume** from that point, **Abort** the run entirely, or **Edit runtime parameters** of the run.
 - Click **Select Roll Back Point** to roll back changes to your selected step. All the previous steps will have a roll back point icon next to them. Click this icon for the step to which you want to roll back. Once you have selected the step, you can choose to **Resume** from that step, **Roll Back** further, **Abort** the run entirely or **Edit runtime parameters**.
- Click **Abort** to abort the run entirely. No changes made will be rolled back.
- Click **Edit runtime parameters** to edit the parameters the run is using. You edit using a pop-up version of the **Parameters** window, just as you did in step 6. When resuming, the parameters exposed for editing are specific

to the task being resumed, meaning they are not the same global parameters you defined in step 6. Most of the time, they are a subset of the global parameters. When you are finished, click **Apply**. You can then choose to **Resume** execution with the changed parameters.

Step 14 While the run is executing, you can also use the following features of the progress window:

- View the execution status of each play in the Playbook in the **Maintenance** play list at the left side of the window. Plays that fail are indicated with a red icon; plays that succeed are indicated with a green icon.
- See reminders of your choices in the **Playbook** and **Devices** tiles at the top of the window.
- See the current status of the run in the **Running** tile at the top of the window.
- Click **View** in the **Parameters** tile to view the run's parameters. While viewing the parameters, you can click **Download Parameters** to save them in a JSON file. You will be prompted to name and save the file appropriately for your browser and operating system.
- Use the network topology in the map at the right side of the window to view the device and its connections to the rest of your network.

Step 15 After the run is complete:

- Click the **Events** tab to see success and failure messages for each step of the Playbook. This can help you diagnose and correct problems with individual plays and the run as a whole.
- Click the **Syslog** tab to access syslog messages collected during and immediately after the run. If syslog collection is enabled, the tab will provide a pointer to the path on the syslog storage provider where collected syslogs are stored. If you chose not to collect syslogs, or no syslog storage provider has been configured, this tab will display a message indicating that syslog collection is disabled.
- Click the **Console** tab to see relevant commands and responses from the device consoles that took place during the run. These messages can also help with diagnostics.
- An event is created in the audit log (**Administration** > **Audit Log**). The audit log includes details like the name of the Playbook, the user who ran the Playbook, and the commit label, if present.

Run Playbooks In Continuous Mode

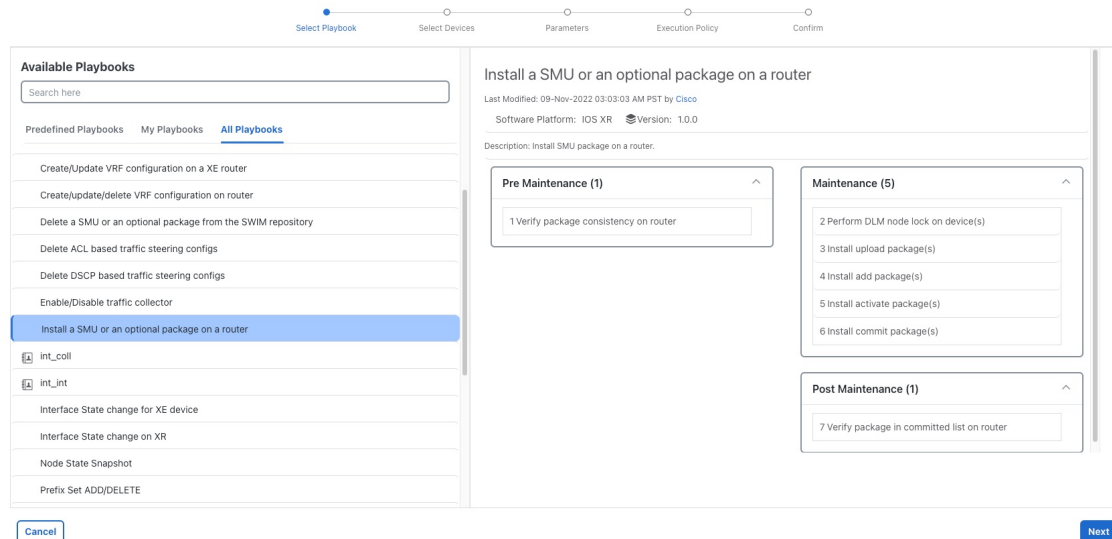
Continuous execution mode is the standard way to run Playbooks. Configuration changes are committed to the device during the run, with no checks or delays except those programmed for system resets or other purposes. The run continues until it succeeds or fails. If it fails, you can use the run's Failure Policy to abort, rollback all changes made to the device, or pause execution at the failure point.

It is always good practice to perform a dry run and verify the configuration changes before committing to a continuous run (see [Perform a Dry Run of a Playbook, on page 21](#)). You can also run the Playbook in single-stepping mode, which will allow you to pause execution after any play you select, abort and rollback changes as needed, and even change runtime parameters in the middle of the run (see [Run Playbooks In Single Stepping Mode, on page 27](#)).

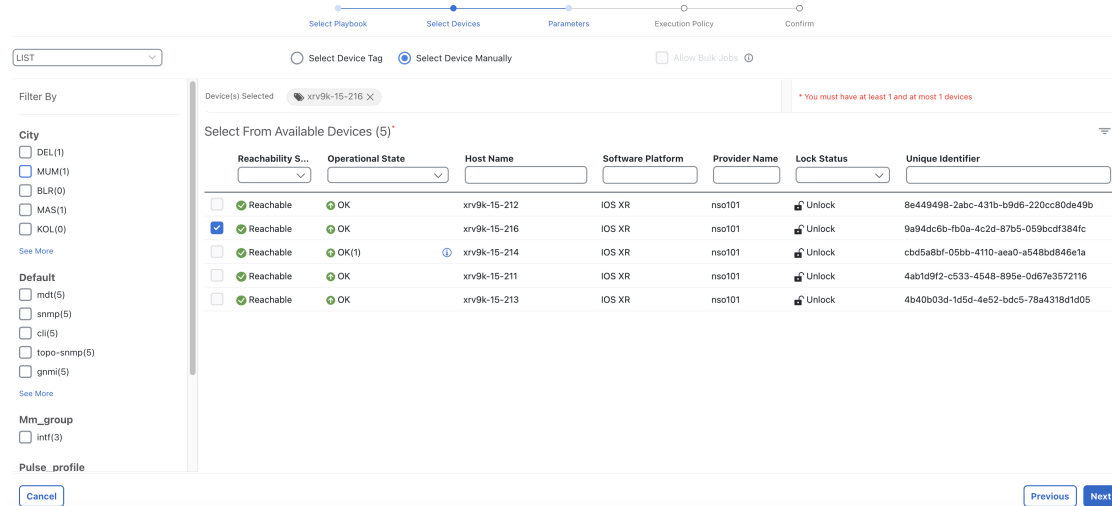
Step 1 From the main menu, choose **Network Automation** > **Run Playbook**.

Step 2

In the **Available Playbooks** list on the left, click on the Playbook you want to run. On the right, the window displays the Playbook name, hardware and software compatibility information, and descriptions for all the plays in the selected Playbook.




Figure 33: Select Playbook**Step 3**

Click **Next**. The **Select Devices** window appears.


Figure 34: Select Devices

Using this window:

- You can toggle between the table view and topology map view by clicking and selecting the relevant option in the drop-down button on the upper left corner of the window. Choose **Select Devices From List** or **Select Devices From Map** to select the table view or topology map view, respectively. By default, the table view is displayed.

- With the topology map view displayed, you can toggle between the map's geographical and logical views by clicking on the  or the . You can also zoom, display bandwidth utilization, and change logical view layouts as you do with the topology map you see when you select **Topology** from the main menu.
- You can select the devices manually or using tags. The **Select Device Tag** option targets you to select the relevant tag instead of devices from the table and all devices associated with the relevant tag are selected. The **Select Device Manually** option allows you to select the devices from the list using quick and advanced filters and filter by tags on the left. Hover the mouse pointer over the  icon next to the options for more information. You can also view the selection criteria such as number of devices required for the selected playbook.

Note If you are a non-admin user and selecting the devices manually, make a note of the following:

- The devices on which you want to run the Playbook must belong to a Device Access Group and you must have access to this Device Access Group. For more information on Device Access Groups and associating a user with a Device Access Group, see the [Manage Device Access Groups](#) section in the [Cisco Crosswork Network Controller Administration Guide](#).
 - If your role is associated with an empty Device Access Group, you will receive an error message.
 - If your role is associated with multiple Device Access Groups and if the device belongs to any one of these Device Access Groups, then you can run the Playbook on this device. If the device does not belong to any of your Device Access Groups, the operation fails.
 - If you are selecting multiple devices (using **Allow Bulk Jobs** option or using tags) and if any devices does not have access, an error message appears stating that this list of devices does not have access to run the Playbook.
- In the **Select Device Manually** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook simultaneously. Based on your selection, the system creates a static group of multiple jobs. Hover the mouse pointer over the  icon next to the check box for more information. There is no limit to the number of devices you can select for a bulk job.

Note **Allow Bulk Jobs** option is enabled for playbooks that can be executed on a single device.

Step 4 Click **Next**. The **Parameters** window appears.

Step 5 In the fields provided in the **Parameters** window, enter the Playbook parameter values to use for this run.

Figure 35: Parameters

With the **Parameters** window displayed, you can also:



- Click  to upload a JSON file with the parameter values you want. You will be prompted to navigate to the JSON parameters file you have previously prepared (or downloaded from a previous Playbook run) and then upload it as appropriate for your browser and operating system.
- Click  to enter the parameter values in JSON format. A popup text window displays the full list of JSON parameters with empty values in quotes. Edit the values, and when you are finished, click **Save**.

Figure 36: Edit JSON


- Click  to select the items you want to configure. A pop-up text window will appear, displaying the complete list of plays or parameters that can be configured. For the Playbook, it will show a list of Plays and, for each selected Play, it will display a list of parameters that can be configured for that Play. If you unselect any item, it will not appear for configuration. Uneditable options indicate mandatory items that cannot be deselected.

Figure 37: Object Properties for a Playbook

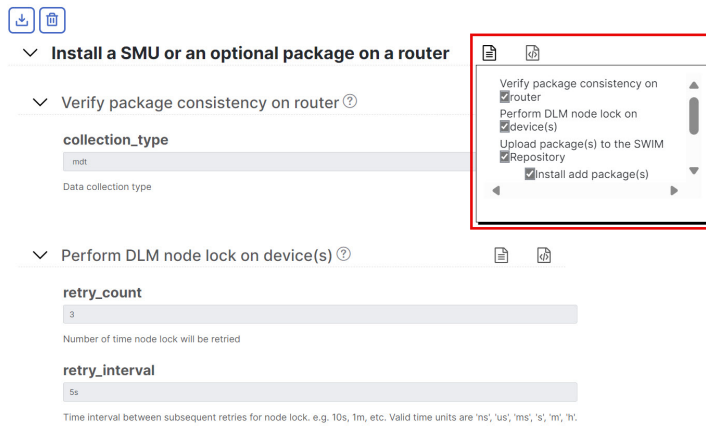
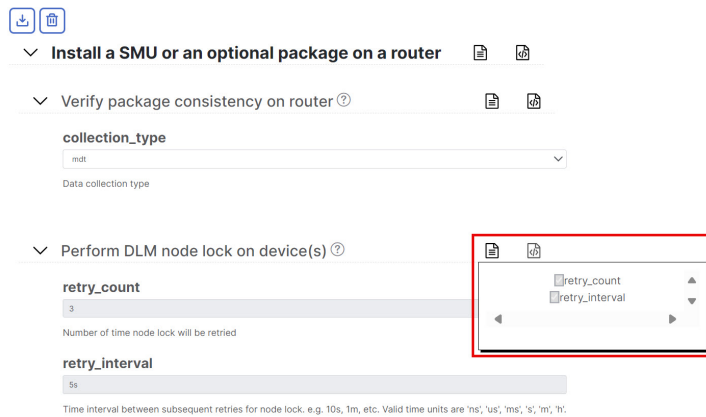





Figure 38: Object Properties for a Play



- Click  to add additional instances of a particular parameter, if required for the Playbook you are running. Click  to delete instances added in this way.
- Click  to clear all the parameter values entered so far.

Step 6

With the parameter values set, click **Next**. The **Execution Policy** window appears.

Step 7

Choose **Continuous**. The **Execution Policy** window displays additional features to customize the job:

Figure 39: Execution Policy

The screenshot displays the 'Execution Policy' configuration window. At the top, a progress bar shows the steps: Select Playbook, Select Devices, Parameters, Execution Policy, and Confirm. The 'Execution Mode' section offers three options: 'Continuous' (selected), 'Single Stepping', and 'Dry Run'. Below this, the 'Collect Syslog' section has radio buttons for 'Yes' and 'No'. The 'Failure policy' section has a dropdown menu set to 'Abort' and a 'Timeout' field set to '3600'. The 'Schedule' section includes a 'Run Now' checkbox, two 'Schedule' entries (Pre-check and Perform) with date and time increment/decrement controls, and a calendar for 'October 2023' showing a job scheduled for the 4th. Navigation buttons 'Cancel', 'Previous', and 'Next' are at the bottom.

- Under **Collect Syslog**, click **Yes** if you want syslogs to be collected during and immediately after the run, and **No** if you do not. **Yes** is the default selection only if you have a syslog provider configured.
- From the **Failure Policy** dropdown, select:
 - **Abort** to abort the entire run without rolling back any changes, if a failure occurs at any point. This is the default. Any configuration changes made up to the point of failure will not be rolled back.
 - **Pause** to pause the run and allow you to decide how to handle the failure.
 - **Complete Roll Back** to abort the entire run and roll back all configuration changes made.
- In the **Schedule** area, uncheck the default **Run Now** selection to schedule the job for a later time. See [Schedule Playbook Runs, on page 39](#) for help on using the **Schedule** area features.

Step 8 Click **Next**. The **Review your Job** window appears, displaying a summary of your choices: playbook, devices, parameters, and execution policy. In this window:

- You must provide a relevant **Name** for the job.
- You can enter labels for your job using the **Labels** field.
- You can click on the **Change** links in the **Review your Job** window summary to modify your choices.

Step 9 (Optional) Enter the device credentials (name and password).

Note This step is applicable only if **Credential Prompt** is enabled in the Change Automation settings. For more information, see [Configure Change Automation Settings](#).

Step 10 When you are ready to continue, click **Run Playbook**.

- Step 11** At the confirmation prompt, click **Confirm**. Click **View Job Set** to view the status of the current job. The job details include information such as job status, job set tags, the title of the selected playbook, execution parameters, and policy, last updated date, and update comments (if any).
- Step 12** While the run is executing, the **Running** tile at the top of the window will change to **Paused** if you chose a **Failure Policy** of **Pause**. Your choices will be displayed as buttons below the tiles:
- Click **Resume** to resume running from this point, with no changes.
 - Click **Roll Back** to roll back any changes made so far.
 - Click **Abort** to abort the run entirely. No changes made will be rolled back.
- Step 13** While the run is executing, you can also use the following features of the progress window:
- View the execution status of each play in the Playbook in the **Maintenance** play list at the left side of the window. Plays that fail are indicated with a red icon; plays that succeed are indicated with a green icon.
 - See reminders of your choices in the **Playbook** and **Devices** tiles at the top of the window.
 - See the current status of the run in the **Running** tile at the top of the window.
 - Click **View** in the **Parameters** tile to view the run's parameters. While viewing the parameters, you can click **Download Parameters** to save them in a JSON file. You will be prompted to name and save the file as appropriate for your browser and operating system.
 - Use the network topology in the map at the right side of the window to view the device and its connections to the rest of your network.
- Step 14** After the run is complete:
- Click the **Events** tab to see success and failure messages for each step of the Playbook. This can help you diagnose and correct problems with individual plays and the run as a whole.
 - Click the **Syslog** tab to access syslog messages collected during and immediately after the run. If syslog collection is enabled, the tab will provide a pointer to the path on the syslog storage provider where collected syslogs are stored. If you chose not to collect syslogs, or no syslog storage provider has been configured, this tab will display a message indicating that syslog collection is disabled.
 - Click the **Console** tab to see relevant commands and responses from the device consoles that took place during the run. These messages can also help with diagnostics.
 - An event is created in the audit log (**Administration > Audit Log**). The audit log includes details like the name of the Playbook, the user who ran the Playbook, and the commit label, if present.

Schedule Playbook Runs

The Change Automation application's **Execution Mode** window allows you to schedule future Playbook runs as jobs and view all the jobs that have been scheduled. Use the **Schedule** area on the left to schedule a job. Use the **All Scheduled Jobs** area on the right to view scheduled jobs on the calendar.



Note **Playbook Job Scheduling** is only available if enabled when Change Automation was installed and initially configured. For more information, see [Configure Change Automation Settings](#). To change this setting, you must uninstall and then reinstall Change Automation.



Note If you are a non-admin user, ensure you have access to the Schedule Playbook task. You cannot schedule playbooks without this task.

Prerequisites:

Ensure that **Playbook Job Scheduling** is enabled on the Device Override Credentials page. For more information, see [Configure Change Automation Settings](#).

To enable the task permission, do the following:

1. Go to **Administration > Users and Roles > Roles**.
2. Under the **Roles** pane, select the role for which you want to grant the access.
3. Under the **Task Permissions** tab, enable the **Schedule Playbook** check box and click **Save**.

The **Execution Mode** window's scheduling features are only displayed when you have chosen to run a Playbook in continuous or single-stepping mode. You cannot schedule a dry run of a Playbook.

Figure 40: Execution Mode Scheduling Features

Item	Description
1	Run Now: Running Playbooks immediately is the default for continuous and single-stepping execution modes. To schedule a run for a future time and date, you must uncheck this box.
2	Schedule Selectors: Use these fields to select the future time and date when the Playbook runs. Although it is the default for the Pre-Maintenance and Maintenance phases of a scheduled Playbook to start simultaneously, you can use the upper Schedule Pre-check and lower Schedule Perform fields to schedule the start of Pre-Maintenance and the start of Maintenance independently. The Schedule Perform time must always be greater than or equal to the Schedule Pre-check time.

Item	Description
3	Previous/Today/Next Selectors: Use these three selectors with the Month/Week/Day selectors to focus the calendar's display of scheduled jobs on the time range in which you are interested. For example: To show only those jobs scheduled for next week, click Next and Week .
4	Job Icons: Red, numbered icons in the squares representing each calendar date show how many jobs are scheduled for that date. Yellow circle icons represent each scheduled job.
5	Job Details pop-up: Hover your mouse cursor over a yellow circle icon to see the details for the scheduled job represented by that icon. The pop-up shows the execution ID of the job and the name of the Playbook to be run.
6	Show jobs for selected devices only: Check this box to restrict the calendar display to only jobs scheduled to run on the devices you have already selected. This is a handy way to see if the schedule you plan for your Playbook run conflicts with other scheduled jobs on the same devices.
7	Month/Week/Day Selectors: Use these three selectors with the Previous/Today/Next selectors to focus the calendar's display of scheduled jobs on the time range in which you are interested. For example: To show only those jobs scheduled for last month, click Last and Month .



Note Change Automation Playbooks have a `mop_timeout` parameter, which is a user-specified input needed to schedule any Playbook.

If you are scheduling a Playbook with **Failure Policy** set to **Complete Roll Back**, first dry run the Play and note the time taken. Then, add a buffer time (for example, 10 minutes) to the time taken during the dry run. After that, double the time value and enter it to the `mop_timeout` parameter, as it can take as much time to roll back the Playbook as it takes to run it until the last step. Without sufficient `mop_timeout`, the Playbook can end up incomplete (in between transitions) if the timeout gets triggered while rollback is in progress. If this happens, you have to revert the changes manually or create a Playbook with the changes you want to revert.

View or Abort Playbook Jobs

The **Automation Job History** window lets you click on any individual job in the list to see that job's detailed execution progress panel. This panel displays the name of the Playbook, its plays, the devices it ran on, the parameters used, and all events, Syslog, console, and other messages. These details are helpful when diagnosing failures.

The **Automation Job History** window also allows you to abort *running* jobs.

You can also navigate to **Automation Job History** window from the **Jobs** panel in the Change Automation Dashboard.

Before you begin

A user must have the permission for specific Playbook label to run or abort a Playbook. For more information on assigning Playbooks to specific roles, see [Assign Playbooks to Specific Roles, on page 19](#).

Step 1 From the main menu, select **Network Automation > Automation Job History**. The **Automation Job History** window displays a list of Job Sets.

Figure 41: Automation Job History

Status	Name	PlayBook Title	Id
<input type="checkbox"/>	test-3ee5d106da	Add VRF under BGP...	router_config_...
<input checked="" type="checkbox"/>	snap-f2d9857906	Node State Snapshot	router_op_sna...
<input type="checkbox"/>	run-191d85c929	int_coll	int_coll
<input type="checkbox"/>	int_int-d76003cf15	int_int	int_int
<input type="checkbox"/>	ad-88dba5f19f	Node State Snapshot	router_op_sna...
<input type="checkbox"/>	ad-ec6eebf997	Check accessibility ...	router_check_...
<input type="checkbox"/>	pol-5302b6ccf0	Check accessibility ...	router_check_...
<input type="checkbox"/>	ad-b800bf8b9f	Check accessibility ...	router_check_...
<input type="checkbox"/>	ad-88eba7d58c	Check accessibility ...	router_check_...
<input type="checkbox"/>	ad-65f668f78c	Check accessibility ...	router_check_...
<input type="checkbox"/>	ad-d37f0c7a96	Check accessibility ...	router_check_...
<input type="checkbox"/>	as-fbacc9af7	Check accessibility ...	router_check_...
<input type="checkbox"/>	root-c90062e869	Check accessibility ...	router_check_...
<input type="checkbox"/>	test-f50d56721c	Check accessibility ...	router_check_...
<input type="checkbox"/>	test-3b8af6f0ea	Check accessibility ...	router_check_...
<input type="checkbox"/>	test-de4bf4f409	Check accessibility ...	router_check_...

Status	Device	Execution ID	Start Time	End Time
<input checked="" type="checkbox"/>	Succeeded	xrv9k-1	1696504675550-9c6332a8-d264-46ac-05-Oct-2023 04:47:55 P...	05-Oct-2023 04:54:35 P...

The list in **Automation Job History** window is sorted by the last update time, with running or most recently executed jobs at the top. You can apply quick or advanced filters to the table as you would with columns in other table windows.

Step 2 To view information about a Playbook job, click the relevant job ID checkbox on the left. The job's status and execution details are displayed on the right side. Click on the **i** icon next to each detail to get more information about the selected job set.

Step 3 You can abort a job set in running, paused or scheduled status, as follows:

- To abort a specific job, click the check box next to it and then click **Abort Selected**.
- To abort all jobs immediately, click **Abort All**.

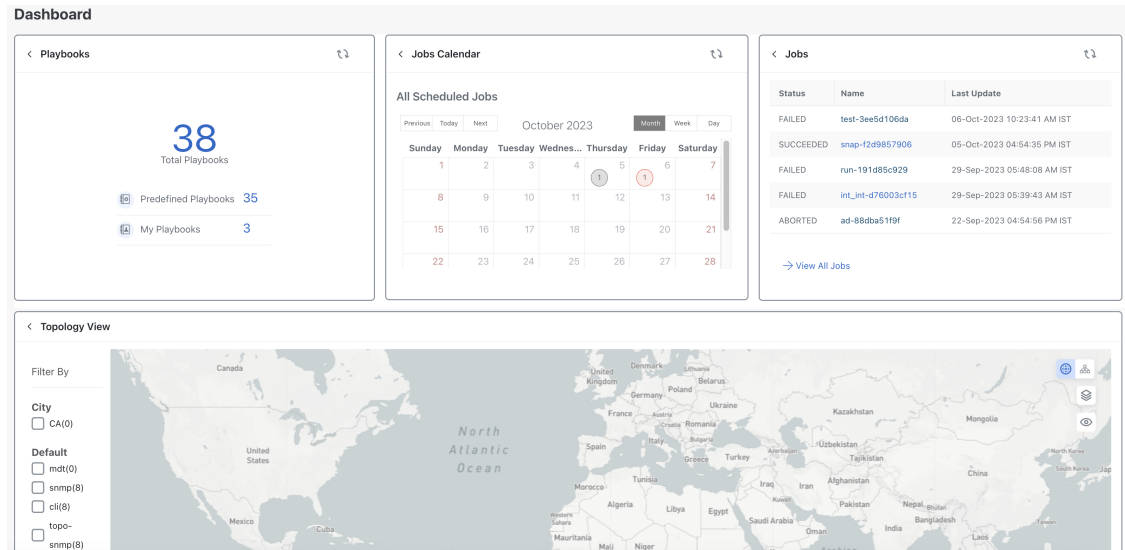
When prompted, click **Confirm**. Jobs currently running, paused, or scheduled will abort once the current task has been completed.

Use the Change Automation Dashboard

The Change Automation **Dashboard** window (shown in the figure below) lets you view all Playbook-related activity and initiate Playbook runs. It displays the total number of Playbooks, the Playbook Jobs Calendar, the most recently run Playbook jobs, and the same network topology map you see when you select **Topology** from the main menu.

To view the Change Automation **Dashboard** window, select **Network Automation > Dashboard**.

Figure 42: Change Automation Dashboard Window



The **Playbooks** tile displays the total number of Playbooks (pre-defined and custom). Clicking on a specific number displays all the Playbooks that correspond to the selected category:

- **Total Playbooks** indicate the total number of pre-defined and user-created Playbooks (My Playbooks) in the system.
- **Predefined Playbooks** indicate the number of pre-defined Playbooks that exist in the system.
- **My Playbooks** indicate the number of custom Playbooks created by the current user.

Creating Playbooks does not use a license. The license count is incremented only upon the first execution of a Playbook (pre-defined or user-created), irrespective of whether the Playbook runs successfully. Subsequent execution of the Playbook does not increment the license count.

The **Jobs Calendar** tile displays a calendar (month, week, day) with the number of job sets executed on a given day marked in a circle against the corresponding date. Clicking on the number displays a dialog box with the names of the Playbook job sets and their execution time. Click the desired job set to view the execution details.

The color of the circle indicates the overall status of the job sets:

- A **red** circle indicates at least one job set with **Failed** status among the day's overall job sets.
- A **gray** circle indicates that all job sets are in **Scheduled** or **Running** status.
- A **blue** circle indicates at least one critical job set in **Recovered** status among the day's overall job sets.
- A **green** circle indicates most of the Playbooks are in success state. Clicking on it displays all the jobs that are **Recovered**, **Scheduled**, or **Running**.

The **View All Jobs** link on the **Jobs** tile gives you direct access to the Change Automation **Automation Job History** window.

Troubleshoot Change Automation

The following table describes issues you may encounter when using the Change Automation application and their solutions or workarounds.

Table 1: Change Automation Troubleshooting

Issue	Solution
Playbook run fails with messages indicating that Cisco Network Services Orchestrator (Cisco NSO) and the target device are out of sync or communication. Message text varies but may include "device out of sync," "NC client timeout," and other text indicating connectivity or sync issues between Cisco NSO and the device.	Ensure that the Playbook does not include a sync operation. Get the device and Cisco NSO back in sync, and then re-run the Playbook. Alternatively, you can create a new Playbook that includes a sync operation to avoid future problems.
Playbook run fails with "access error" messages indicating failure "to set device override credentials in NSO".	Ensure that "admin" is a member of the ncsadmin user group in Cisco NSO.
"Failed to end NSO transaction, 500:fatal:YClientError: Failed to send RPC:" error is displayed while running the playbook.	Include the below settings in the Cisco NSO configuration file (<code>ncs.conf</code>): <pre><ssh> <client-alive-interval>infinity</client-alive-interval> <client-alive-count-max>5</client-alive-count-max> </ssh></pre> <p>Note This configuration could increase the load on Cisco NSO, so it is better to do it only when necessary.</p>
Playbook aborted due to failure in locking the device nodes.	In the Devices window, select the relevant devices and clear the lock by moving the device to DOWN and then UP. Go to Administration > Crosswork Manager , click the Change Automation tile, and restart the robot-nea process. Once the protocols are reachable, you can schedule to run a new playbook.
SMU install fails at "Verify package in committed list on router".	Instead of using the tar.gz file in the packages field under Verify package in the committed list on router sub-option, use the committed package name to verify the package.