



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 consists 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.

The difference between Change Automation and other existing scripted automation frameworks is that Change Automation is 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. Define your desired network changes in a Change Automation Playbook.
2. Push configuration changes to the network device using Cisco Network Services Orchestrator API, a configuration services provider.
3. Receive real-time feedback via telemetry from the devices, telling you that the network changes were made and the impact of the changes. You can also use post-change KPIs to determine if a particular change should be undone and the devices returned to their previous configuration. In addition to telemetry, Change Automation also allows for data collection via SNMP and CLI XDE packs.

Change Automation comes with a robust library of Playbooks, each with its own collection of atomic configuration and check plays. (A Playbook consists of multiple *plays*.)

Change Automation allows you to customize and generate plays and Playbooks using its API interface. For more information, see [About Custom Plays, on page 6](#) and [About Customizing Playbooks, on page 11](#).

Configure Change Automation Settings

This section explains the initial settings that need to be configured before you can start using Change Automation.



Note Configuring Change Automation settings is a post-installation activity, and can only be performed by a user with write permissions for the **Administration APIs** under Change Automation (Go to **Administration > Users and Roles > Roles**).



Note The Change Automation settings can only be configured once. If you want to modify the settings, Change Automation must be re-installed.

After Change Automation is installed in your Crosswork platform, you can access Change Automation from the main menu (go to **Network Automation > Dashboard**). The Change Automation window is displayed prompting you to complete the configuration. Click **Start Configuration** to review the change Automation settings. Alternatively, you can navigate to **Administration > Settings > Device Override Credentials** to view the settings.

Figure 1: Change Automation settings

The screenshot shows the 'Administration / Settings' page with the 'Device Override Credentials' section selected. The page includes a sidebar with navigation options and a main content area with the following settings:

- Device Override Credentials:** These are credentials provided by an end user at runtime when executing a playbook job. They are used to authenticate NSO to device southbound APIs when configuring a device using Network Automation. A note states: "The settings below can only be modified once. To revert them back the application must be re-installed."
- Playbook Job Scheduling:** Control the scheduling of future playbook jobs using this setting.
 - Enabled: When enabled, the jobs scheduled for future will use the generic device credentials configured in NSO authorization settings to access the device(s).
 - Disabled: When disabled, users can only use the "Run Now" policy when executing the playbook job. User prompted device credentials will be used to access the device(s).
- Credential Prompt:** Control accepting the device override credentials prompt when running an on-demand playbook job i.e. using "Run Now" policy. This will be enabled by default when scheduling is disabled. For the override credentials to work, user must have a credential profile with name "ca_device_auth_nso" for the special NSO user that will be used by Network Automation. This can be added here. Additionally the NSO provider must be configured with a property with key and value as "ca_device_auth_nso" to link this profile. This can be added here.
 - Enabled: When enabled, the user will be prompted to provide credentials for accessing the device.
 - Disabled: When disabled, the user will not be prompted to provide credentials for accessing the device.

At the bottom of the settings area, there are 'Save' and 'Cancel' buttons.

Click **Save** after you configure the following settings:

- **Playbook Job Scheduling:** Enable or disable the ability the schedule the Playbook jobs.
- **Credential Prompt:** Device override credentials are an additional level of authentication that can improve change auditing. If enabled, users will be prompted to enter the credentials (device override credentials) before each Playbook execution. You need to create the relevant credential profile and provider settings for the override credentials to work. Follow the prompts on the window to meet each requirement.



Note If **Playbook Job Scheduling** is **disabled**, then the **Credential Prompt** is **enabled**, by default. You cannot disable the credential prompt in this case.



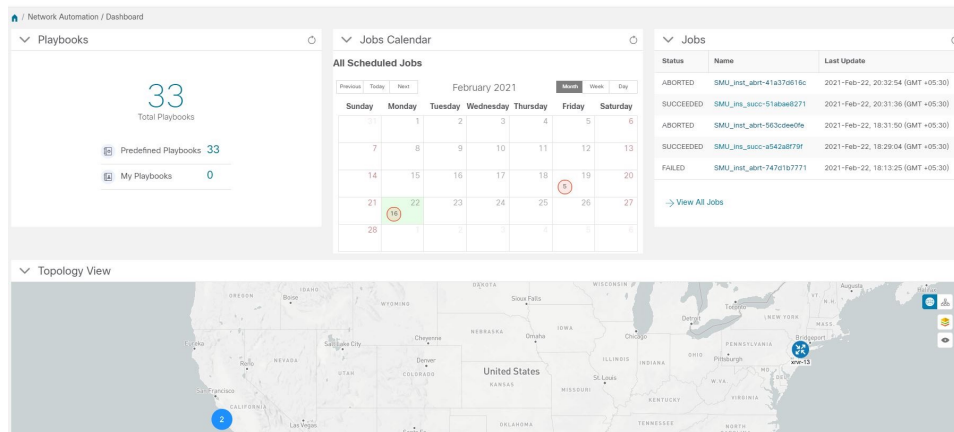
Note While executing Device Config plays, entering incorrect device override credentials will cause the playbook execution to fail. However, for a Check play or Data Collection play, the device override credentials are not validated and the Playbook will execute successfully irrespective of the accuracy of the override credentials. Device override credentials are only validated while pushing configuration changes.

Use the Change Automation Dashboard

The Change Automation application's **Dashboard** window (shown in the following figure) 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 2: 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.



Note **My Playbooks** indicate the number of custom Playbooks created by the current user. However, the **Total Playbooks** will include the number of custom Playbooks created by all users, apart from the Cisco-supplied Playbooks.

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 on the desired job set to view the execution details.



Note 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 **grey** circle indicates that all job sets are either 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



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

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.

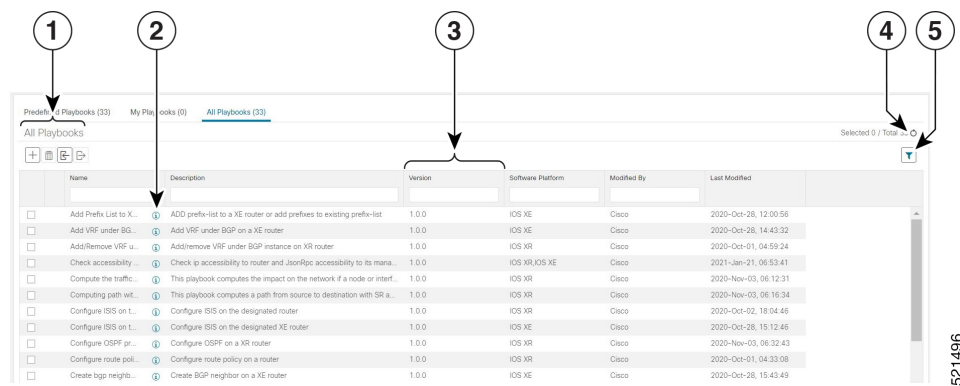
From the main menu, select **Network Automation > Play List** to view the **Play List** window.








Item	Description
1	Click to create a custom Play. See Create a Custom Play, on page 6 .
	Click to delete a custom Play. See Delete Custom Plays, on page 10 .
	Click to import custom Play from a gzipped TAR archive file. See Import 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 popup Play Details window showing the Play's description and schema. When you are finished viewing these details, click to close the popup window.
3	The Type column indicates the type of the Play. You can click on the column headings (Name, Description, Type, Labels, and Modified by) to sort the table by that column's data.


Item	Description
4	Click  to refresh the Plays list.
5	Click  to set filter criteria on one or more columns in the table.
	Click the Clear Filter link 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**.



Item	Description
1	Click  to create a custom Playbook. See Create a Custom Playbook, on page 13 .
	Click  to delete the currently selected custom Playbook. See Delete Custom Playbooks, on page 18 .
	Click  to import Playbooks from a gzipped TAR archive file. See Import Playbooks, on page 17 .
	Click  to export the currently selected Playbook(s) as a gzipped TAR archive file. See Export Playbooks, on page 16 .
2	Click  to see a popup Playbook Details window showing the Playbook's description, software compatibility, version number, and its plays. When you are finished viewing these details, click  to close the popup window.
3	Click on 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 on any column.
4	Click  to refresh the Playbooks list.

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

About Custom Plays

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



Note Cisco-supplied Plays cannot be edited, exported or deleted by the user.

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

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



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

Create a Custom Play


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

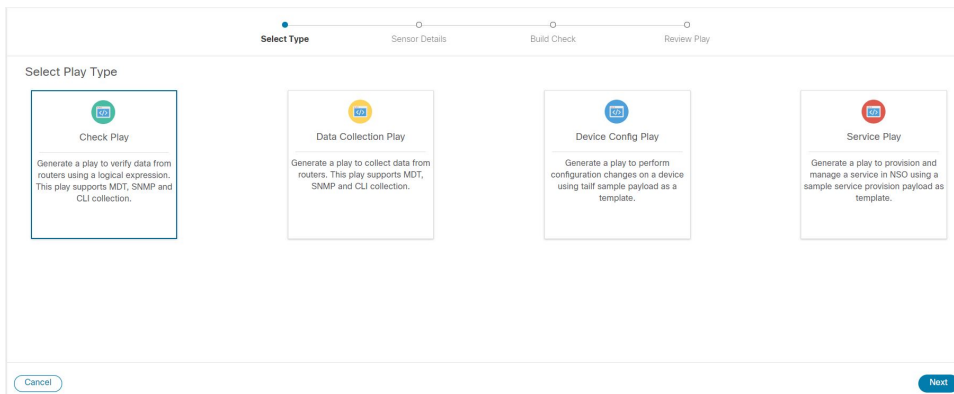
- **Check Play:** *Select Play Type > Select Sensor Path > Build Check Expression > Review Play*
- **Data Collection Play:** *Select Play Type > Select Sensor Path > Build Filter Expression > Review Play*
- **Device Config Play or Service Play:** *Select Play Type > Configure Play (using sample payload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



Note 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.

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

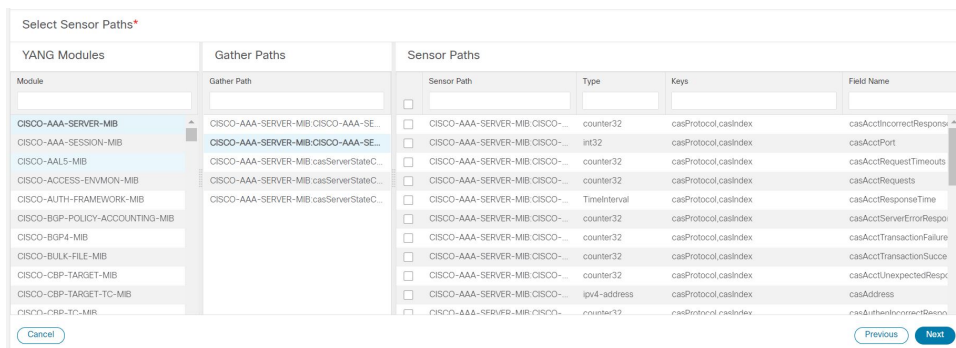
Step 2 Click  to create a custom Play. The **Select Play Type** window opens displaying the types of Plays supported and a description for each. The stages of creation is also displayed, and it will vary depending on the Play type you select.



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

Step 3 If you are creating a **Check Play** or **Data Collection Play**, perform the following:

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




- b) Depending on the Play type you have selected, you need to **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 dropdown lists. Select the desired logic operation (AND/OR) between each rule or group.

Click on **Runtime** checkbox if you prefer to enter the value of the sensor field dynamically during runtime. If you select this checkbox, 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 runtime.

Click **Next** to continue.

Step 4 If you are creating a **Device Config Play** or **Service Play**, perform the following:

- 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 acknowledgement 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**.

Reachability	State	Provider ...	UUID	Conn...	Family	Model Pr...	Model Ve...
<input checked="" type="checkbox"/>		nso	f6d2f1e3-...	NETC...	NSO	Cisco-IOS...	6.6.1
<input type="checkbox"/>		tstprov	855a41a1...	TCP	NSO	Cisco-IOS...	11

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

- 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.

Title	Value	Path	Type	Description	Actions
tailf-ncs:devices		/tailf-ncs:devices			
device		/tailf-ncs:devices/device			
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		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet	list	GigabitEthernet/IEEE 802.3 interface(s)	
id	0/0/0/1	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/id	string	Gigabit Ethernet interface id	✓
description	*to xrv9k-2 using dport-rtr	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/description	string	Set description for this interface	✓
ipv4		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/ipv4	container	IPv4 interface subcommands	
address		/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/ipv4/address	container	Set the IPv4 address of an interface	
ip	11.11.11.12	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/ipv4/address/ip	string	IP address	✓
mask	255.255.255.0	/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0/ipv4/address/mask	string	IP subnet mask or /prefix	✓

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

Path	Description	Default Value
/tailf-ncs:devices		
/tailf-ncs:devices/device		
/tailf-ncs:devices/device/0		
/tailf-ncs:devices/device/0/name		
/tailf-ncs:devices/device/0/config	NCS copy of the device configuration	
/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface	Select an interface to configure	
/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet	GigabitEthernet/IEEE 802.3 interface(s)	
/tailf-ncs:devices/device/0/config/tailf-ned-cisco-ios-xr:interface/GigabitEthernet/0		

```

Sample Payload
{
  "tailf-ncs:devices": {
    "device": {
      "name": "xrv9k-1",
      "config": {
        "tailf-ned-cisco-ios-xr:interface": {
          "GigabitEthernet": {
            "id": "0/0/0/1",
            "description": "*to xrv9k-2 using dport-rtr-1 VLAN*",
            "ipv4": {
              "address": {

```

Label your Play

Name * Configure GigE interfaces

Description * Detailed description

Labels demo

- 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

You can export any custom Play authored by you or another user, or have imported into Cisco Crosswork Change Automation and Health Insights.

The exported archive will contain 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.

Your user ID must have Change Automation read permission to export Plays.

- 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 to use when saving the gzipped tar archive. Follow the prompts to save the file.
-


Import 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 that 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. Take precautions to ensure that you do not overwrite your custom Plays accidentally.


Your user ID must have Change Automation write permissions to import Plays.

- 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 there is no existing Plays with the same name as the Play you intent to import, unless it is your intent to overwrite the existing custom Play.
- Step 3** Follow the prompts to import the archive file.
-

Delete Custom Plays

You can delete user-defined 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 that you want to delete.
- Step 3** Click  icon.
- Step 4** When prompted, click **Delete** again to confirm.
-

About Customizing Playbooks

Users can download and customize Cisco-supplied Playbooks, or create their own based on Cisco models or from scratch. They 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 Cisco Crosswork Change Automation and Health Insights. As such, they are outside the scope of this User Guide.

Cisco supplies developer-level documentation for Cisco-supplied Playbooks, Cisco verbs used in these Playbooks, and tutorials on how to create custom plays and Playbooks. For help, see the:

- ["Playbooks" and "Verbs" 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 a variety of 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 own definitions, and not all of 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. The following table explains the function of each of these components, explains how they are implemented, and shows which of them you can customize.

Table 1: Playbook Components and Files

Component	Description	File/Format	Customizable?
Play	A Play is a single task to be executed. A task is a list of actions to be performed in service of that play. A Play is typically a script that uses one or more verbs.	YAML/YML in the Playbook file	Yes
Playbook	A Playbook is an aggregation of one or more Plays, and is structured by the plays it contains. There can be many plays inside a Playbook. The function of a Playbook is to map a set of actions onto the features of a particular host. For example: A query and configuration change script with abstract variables that can be mapped to a particular instance of a device. For more details, see the "Playbooks" and "Verbs" references in the Change Automation Developer Guide on Cisco Devnet .	YAML/YML file	Yes

Component	Description	File/Format	Customizable?
Verb	A verb is a Cisco-supplied module, and functions as a granular unit of activity. These are Cisco intellectual property, supplied as object code, used under license and not modifiable by users. For more on Cisco verbs and how to use them, see the "Custom Playbooks" tutorial in the Change Automation Developer Guide on Cisco DevNet .	Binary executable file	No
Params	Params are simply variables, used in Playbooks just as variables are used in any programming language. A Params file in a Playbook is an optional file that collects all the user-defined input variables in one place. It is optional because all these variables are also in the plays.	JSON file	Yes
Specs	Short for "specifications", specs are Cisco verb-specific object files, written in JSON schema format. They define all the Playbook input parameters and their constraints.	JSON Schema file	Yes
Tags	<p>Tags are predefined phases of execution for plays within a Playbook, and define the order of execution of all plays:</p> <ul style="list-style-type: none"> • Continuous • Pre-Maintenance • Maintenance • Post-Maintenance <p>Any play tagged as Continuous or runs in parallel with other plays with the same tags. All plays tagged as Maintenance or Post-Maintenance run serially. Some Pre-Maintenance plays (check plays which use the Crosswork Data Gateway collections) run in parallel, while other Pre-Maintenance plays run once the concurrent plays have run successfully. These tags are Cisco intellectual property, used under license and not modifiable by users.</p>	Binary Executable files	No, but you select from the predefined tag set.
Role	A role is a built-in wrapper for Cisco's verbs. These files are Cisco intellectual property, used under license and not modifiable by users.	YAML/YML file	No

Create a Custom Playbook

Change Automation allows users to custom Playbooks using the available Plays.



Note You cannot edit a custom Playbook. If you need to make changes to a custom Playbook, you have to recreate your Playbook with the relevant changes.

To create a custom Playbook, follow the below procedure:

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. The stages of creation is also displayed, and it will vary depending on the Play type you select.

Name	Type	Play Id	Labels	Description	Modified By	Last Modified
Add VRF under BGP on	Device Config	router_cfg_bgp_vrf...	IOS XE, cisco-ios-cl-6.33	Play to add a VRF under BGP on a router	Cisco	2020-Oct-23, 05:28:00
Add or delete Ethernet	Device Config	router_cfg_modify...	IOSXR, cisco-iosxr-cl-7.2	Play adds interfaces to or deletes interfaces from an existing Et...	Cisco	2021-Jan-21, 02:11:00
Add or remove VRF un	Device Config	router_cfg_bgp_vrf	IOS XR, cisco-iosxr-cl-7.1	Play to add or remove VRF under BGP on router	Cisco	2020-Oct-01, 04:55:00
Add or remove an addi	Device Config	router_cfg_bgp_ad...	IOS XR, cisco-iosxr-cl-7.2	This play adds or removes an IPv4 address family under either ...	Cisco	2020-Oct-08, 17:23:00
Add prefix list to the ro	Device Config	router_cfg_prefix_li...	IOS XE, cisco-ios-cl-6.33	Play to configure a new prefix-list and also can be used to mod...	Cisco	2020-Oct-27, 19:11:00
Add/Delete prefix set	Device Config	router_cfg_prefix_set	IOS XR, cisco-iosxr-cl-7.1	This play creates a new or modifies or deletes an existing pref...	Cisco	2020-Oct-01, 16:41:00
Add/Remove Traffic co	Device Config	router_cfg_traffic_c...	IOS XR, SR, cisco-iosxr	Play to add or remove traffic collector on a XR router	Cisco	2020-Oct-22, 11:12:00
Capture and compare	Action	router_op_state_sn...	CLI, Check	Play to capture node states based on the given sensor path an...	Cisco	2020-Oct-22, 06:23:00
Change interface state	Device Config	router_cfg_interfac...	IOS XR, cisco-iosxr-cl-7.2	Shut or unshut one or more interface on an XR router	Cisco	2020-Nov-04, 01:17:00
Change interface state	Device Config	router_cfg_interfac...	IOS XE, cisco-ios-cl-6.33	Play to change the GigE interface state on a IOS XE router	Cisco	2020-Oct-22, 12:57:00
Check BGP neighbor st	Check	router_chk_bgp_ne...	SNMP	Play checks the state of the given BGP neighbor and passes if t...	Cisco	2020-Oct-23, 02:15:00

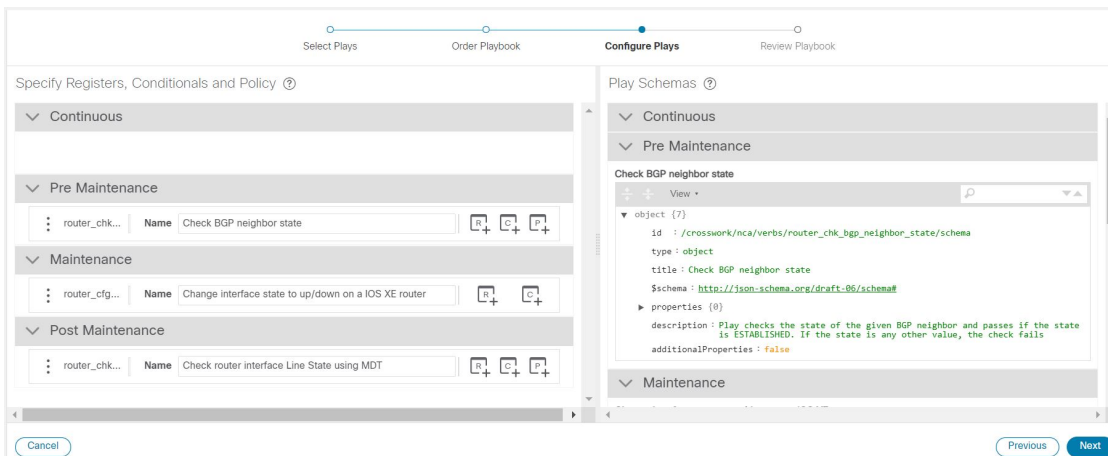
Select all the Plays you want in your Playbook, and click **Next**.

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). You can click and drag the play to rearrange them in the sequence you prefer. You can also duplicate or delete a play by clicking on the icons provided.

Note By default, all the selected plays are displayed within the Maintenance phase. Depending on the type of Play you have selected, it may be restricted in being used in certain phases. For example, a configuration Play cannot be used outside of the maintenance phase.

Click **Next** to continue.

Step 4 The **Configure Plays** window opens displaying the Plays in each execution phase, and the Play schemas. You can perform the following:



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

Note Policies are mainly applicable to Check Plays. When you specify a custom policy for a Check play, you must select the **Required** and **Consecutive** checkboxes, as shown in the image below. If you fail to do so, the Change Automation collection jobs may not get deleted at the end of the Playbook execution.

Figure 3: Specify Policy for Check Play

Specify Policy

Minimum passes ?

Pass rate ?

Maximum fails ?

Fail rate ?

Security Required ?

Consecutive ?

Alert on State Change ?

Save Cancel

- Click to apply a conditional to a Play. During execution, the play execution will be proceeded only if the condition is met. In the **Specify Conditionals** dialog box, click **Add Condition** to add a conditional. Click **Save** to save your conditional values.
- Click to specify a register for a Play. Specifying registers allow you to use the output of a previous Play as the input for another Play. Click **Save** to save your registers.
- (Optional) Rename the plays as how you want it to be displayed 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.

Step 6 (Optional) After you enter the relevant details, click **Dry Run** to validate the parameters. A dialog box opens displaying the Playbook Details.

Step 7 Click **Create** to create the Playbook.

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

Export Playbooks


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

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

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](#). You can then import them as explained in [Import Playbooks, on page 17](#).

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

Your user ID must have Change Automation read permission to export 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 of the Playbooks for export.
- Step 4** Click . Your browser will prompt you to select a path and the file name to use 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.


Your user ID must have Change Automation write permissions to import Playbooks.

-
- 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 intent to import, unless it is your intent to overwrite the existing Playbook.
- 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 that you want to delete.
- Step 3** Click  icon.
- Step 4** When prompted, click **Delete** again to confirm.
-

About Running Playbooks

Running any Playbook consists of five steps:

1. Select the **Playbook** you want to run (see [View the Playbook List, on page 5](#)).
2. Select the **device or devices** you want to run it on.
3. Enter the appropriate runtime **parameters** you want the Playbook to apply.
4. Select the **execution mode** you want to use:
 - a. [Perform a Dry Run of a Playbook, on page 19](#), where you can see what the Playbook will do before you commit to making changes to the network.
 - b. [Run Playbooks In Single Stepping Mode, on page 21](#), so you have a chance to pause after each Playbook check or action, and roll back changes you did not intend.
 - c. [Run Playbooks In Continuous Mode, on page 24](#) and apply the changes immediately.

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

- [Schedule Playbook Runs, on page 27](#) 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 in case a failure occurs at any time during the Playbook run.

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

Depending on their complexity and on network factors, some Playbooks may take a lot of time to run. At any time during and after completion of a run, you can view the run details and status. If the Playbook is still running, you can also choose to abort it. For details, see [View or Abort Playbook Jobs, on page 28](#).

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 also runs 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 that there are 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 actual device configuration changes via Cisco NSO. See the "Playbooks" and "Verbs" 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 **Select Playbook** 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.
- Step 3** Click **Next**. The **Select Devices** window appears. 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 using **Static** or **Dynamic using Tags** device selection options. **Static** selection allows you to select devices from the list using quick and advanced filters and filter by tags on the left. **Dynamic using Tags** selection targets you to select the relevant tag instead of devices from the table on the left side, and all devices associated with the relevant tag are selected. 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.
 - In **Static** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook on them at the same time. 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 limitation on 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** The **Select Devices** window will prompt you to select one or more of the devices shown (depending on the Playbook). Click on the devices you want to select, then 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 dry run. With the **Parameters** window displayed, you can also:
- Click **JSON** 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**.
 - 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 + **Add** to add additional instances of a particular parameter, if required for the Playbook you are running. Click **X Remove** 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 **Dry Run** and click **Next**. The **Review your Job** window appears, displaying a summary of all of your choices: playbook, devices, parameters, and execution policy. In this window:
- You must provide a relevant **Name** for the job.

- You can assign tags to your job. Click **New Job Tag**, provide a name and color and save your settings to create your own tag. You can also select from the list of existing job tags by clicking the corresponding checkboxes. Click **Manage Job Tags** to create, edit or delete job tags.
- You can click on any of the **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, on page 2](#).

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 would 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` in a later step, 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.
- Click the **Console** tab to see messages that are generated during the run.

As syslog collection is disabled for drying runs, 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, with all of your parameter values from the dry run pre-filled.

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 is not giving you the results you want. 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. Please 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 choose to abort the entire run and roll back all changes made, or rollback to any previous play.

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

Step 2 In the **Select Playbook** 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.

Step 3 Click **Next**. The **Select Devices** window appears. 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 using **Static** or **Dynamic using Tags** device selection options. **Static** selection allows you to select devices from the list using quick and advanced filters and filter by tags on the left. **Dynamic using Tags** selection allows you to select the relevant tag from the table on the left side, and all devices associated with the relevant tag are selected. 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.
- In **Static** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook on them at the 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 limitation on 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 The **Select Devices** window will prompt you to select one or more of the devices shown (depending on the Playbook). Click on the devices you want. Click **Next**.

Step 5 Click **Next**. The **Parameters** window appears.

Step 6 In the fields provided in the **Parameters** window, enter the Playbook parameter values to use for this run.

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

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

Step 7 With the parameter values set, click **Next**. The **Execution Policy** window appears.

Step 8 Choose **Single Stepping**. The **Execution Policy** window displays additional features to customize the job:



- Under **Collect Syslogs**, click **Yes** if you want syslogs to be collected during and immediately after the run, **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 27](#) for help on using the **Schedule** area features

Step 9 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 Breakpoints** popup 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 10 Click **Next**. The **Review your Job** window appears, displaying a summary of all of your choices: playbook, devices, parameters, and execution policy. In this window:

- You must provide a relevant **Name** for the job.
- You can assign tags to your job. Click **New Job Tag**, provide a name and color and save your settings to create your own tag. You can also select from the list of existing job tags by clicking the corresponding checkboxes. Click **Manage Job Tags** to create, edit or delete job tags.
- You can click on any of the **Change** links in the **Review your Job** window summary to modify your choices.



Step 11 (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, on page 2](#).

Step 12 When you are ready to continue, click **Run Playbook**.

Step 13 At the confirmation prompt, click **Confirm**. The **Automation Job History** window is displayed, with the details of the current job displayed on the right side. The job details include information such as job status, job set tags, title of selected playbook, execution parameters and policy, last updated date and update comments (if any). Click the  icon next to the detail to view more information.

Step 14 While the run is executing, the blue **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 blue 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 the step you select. All the previous steps will then have a roll back point icon displayed next to them: . Click the  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 popup version of the **Parameters** window, just as you did in step 6. The parameters exposed for editing when resuming are specific to the task being resumed, which means that 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 15 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 blue **Playbook** and **Devices** tiles at the top of the window.
- See the current status of the run in the blue **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 16 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 **Syslogs** 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.

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 into it 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 19](#)). 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 21](#)).

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

- Step 2** In the **Select Playbook** 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.
- Step 3** Click **Next**. The **Select Devices** window appears. 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 using **Static** or **Dynamic using Tags** device selection options. **Static** selection allows you to select devices from the list using quick and advanced filters and filter by tags on the left. **Dynamic using Tags** selection allows you to select the relevant tag from the table on the left side, and all devices associated with the relevant tag are selected. 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.
 - In **Static** selection mode, you can check the **Allow Bulk Jobs** check box to select multiple devices and run the selected playbook on them at the 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 limitation on 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** The **Select Devices** window will prompt you to select one or more of the devices shown (depending on the Playbook). Click on the devices you want to select them, then 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 dry run. With the **Parameters** window displayed, you can also:
- Click **JSON** 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**.
 - 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 + **Add** to add additional instances of a particular parameter, if required for the Playbook you are running. Click **X Remove** 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:
- Under **Collect Syslogs**, click **Yes** if you want syslogs to be collected during and immediately after the run, **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 27](#) for help on using the **Schedule** area features


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

- You must provide a relevant **Name** for the job.
- You can assign tags to your job. Click **New Job Tag**, provide a name and color and save your settings to create your own tag. You can also select from the list of existing job tags by clicking the corresponding checkboxes. Click **Manage Job Tags** to create, edit or delete job tags.
- You can click on any of 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, on page 2](#).

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

Step 11 At the confirmation prompt, click **Confirm**. The **Automation Job History** window is displayed, with the details of the current job displayed on the right side. The job details include information such as job status, job set tags, title of selected playbook, execution parameters and policy, last updated date and update comments (if any). Click the  icon next to the detail to view more information.

Step 12 While the run is executing, the blue **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 blue 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 blue **Playbook** and **Devices** tiles at the top of the window.
- See the current status of the run in the blue **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.

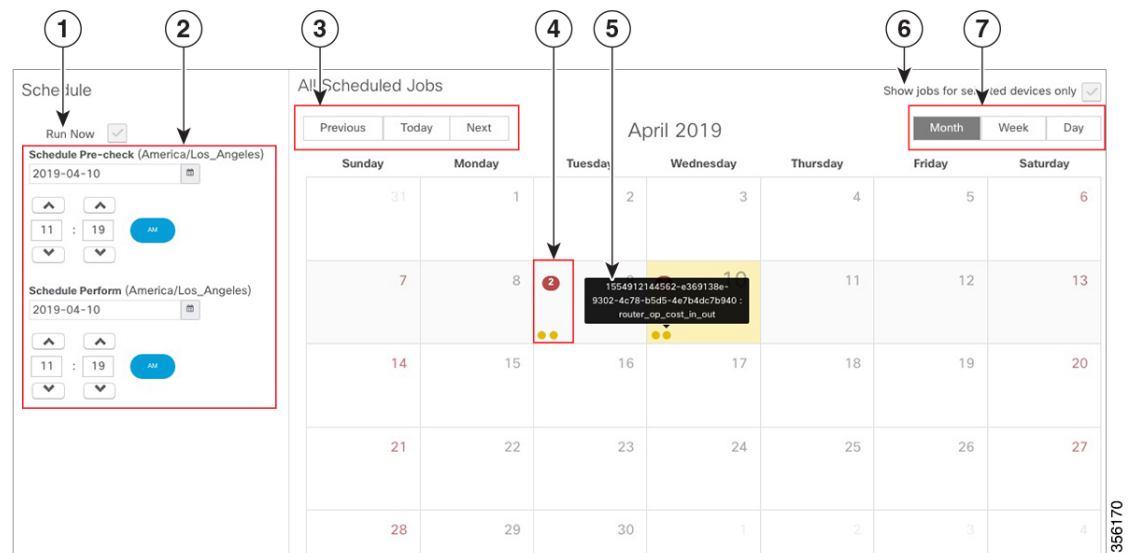
- Click the **Syslogs** tab to access syslog messages collected during and immediately after the run. If syslog collection is enabled, the tab will provide a pointer to the path on the syslog storage provider where collected syslogs are stored. If you chose not to collect syslogs, or no syslog storage 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.

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.

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 4: 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 at the same time, 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. Note that 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 Popup: Hover your mouse cursor over a yellow circle icon to see the details for the scheduled job represented by that icon. The popup 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 those 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 will conflict 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**, you must double the value of the `mop_timeout` parameter as it can possibly take as much time to roll back the Playbook as it takes to run it until the last step. For example, if Playbook timeout is typically set to 1 hour, set it to 2 hours instead when enabling complete rollback on failure policy. Without sufficient `mop_timeout`, the Playbook can end up in a bad state if the timeout gets triggered while roll back is in progress.

View or Abort Playbook Jobs

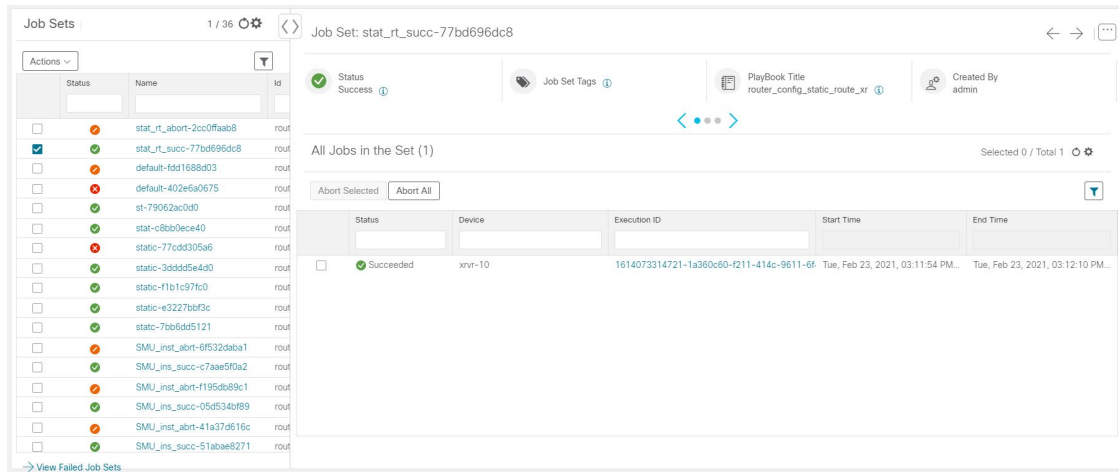
The **Automation Job History** window let you click on any individual job in the list to see that job's detailed execution progress panel, which displays the name of the Playbook, its plays, the devices it ran on, the parameters used, and all event, syslog, console and other messages. These details are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

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



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

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



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 specific 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 that are currently paused or scheduled will abort once the current task has run to completion.

Troubleshoot Change Automation

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

Table 2: 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 otherwise out of communication. Message text will vary, but may include "device out of sync", "NC client timeout", and other text indicating that there are connectivity or sync issues between Cisco NSO and the device.	Run the Playbook again. Under normal circumstances, doing so will initiate a sync operation between the device and NSO. Alternatively, you can also perform a sync-from or sync-to operation in NSO.

Issue	Solution
<p><i>"Failed to end NSO transaction, 500:fatal:YClientError: Failed to send RPC:"</i> error is displayed while running the playbook.</p>	<p>Include the below settings in the Cisco NSO configuration file (<code>ncs.conf</code>):</p> <pre data-bbox="922 373 1487 499"><ssh> <client-alive-interval>infinity</client-alive-interval> <client-alive-count-max>5</client-alive-count-max> </ssh></pre>
<p>Playbook aborted due to failure in locking the device nodes.</p>	<p>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-nca process. Once the protocols are reachable, you can schedule to run a new playbook.</p>