



Managing Apps

The Cisco Fog Director Apps pages provide information about Cisco IOx apps, and provide access to features for managing these apps and performing related operations.

When you log in to Cisco Fog Director, the Apps View page displays, If no apps have yet been imported to Cisco Fog Director, this page displays “Welcome to Cisco Fog Director” and displays the **Import App** button.

If at least one app has been imported, this page includes these areas:

- **Installed Apps area**—Lists apps that have been installed, are scheduled to be installed, or are in the process of being installed, through Cisco Fog Director on at least one device. Also provide information about these apps and devices, and access to other features and information for managing these apps. (An app that has been installed and then removed from a device appear in this area until you manually remove it from this area.)
- **Available Apps area**—Lists apps that have been imported to Cisco Fog Director and so are available to be installed on one or more devices. Also provide information about these apps and devices, and access to other features and information for managing these apps.
- **Unpublished Apps area**—Displays only if you upgraded to this version of Cisco Fog Director from a previous version that had apps in its Unpublished Apps area. In this situation, this area lists those apps, which are apps that have been uploaded to Cisco Fog Director in the old version but not published.

If an app requires or IOxCore and IOxGPS service package, you can install the service package from the Apps View page. For more information, see, *IOx Services Architecture*, which is available here: <https://developer.cisco.com/docs/iox/#iox-services-architecture/iox-services-architecture>.

To access the Apps pages, log in to Cisco Fog Director as described in the “[Accessing Cisco Fog Director](#)” section on page 3-1, and then click the **APPS** tab. The Apps View page displays.

This chapter includes these sections:

- [Managing Installed Apps, page 4-2](#)
- [Managing Available Apps, page 4-3](#)
- [Managing Unpublished Apps, page 4-4](#)
- [Viewing Detailed Information about an App, page 4-5](#)
- [Importing an App, page 4-9](#)
- [Installing an App, page 4-11](#)
- [Uninstalling an App, page 4-22](#)
- [Changing the Version of an App, page 4-25](#)

- [Starting or Stopping an App on Selected Devices](#), page 4-28
- [Removing an App from Cisco Fog Director](#), page 4-32
- [Editing an App Icon, Docker Options, Description, and Release Notes](#), page 4-33
- [Reconfiguring App Parameters](#), page 4-34
- [Canceling an Action](#), page 4-43
- [Retrying a Failed Action for an App](#), page 4-46
- [Using Action Plans](#), page 4-50
- [Managing Outstanding and Expired Actions for Apps](#), page 4-54
- [Using the Navigation Pane](#), page 4-59
- [Exporting an App](#), page 4-59
- [Monitoring an App](#), page 4-59
- [Managing App Alerts](#), page 4-64

Managing Installed Apps

The Installed Apps area on the Apps View page lists each app that is or has been installed through Cisco Fog Director on at least one device, or that is scheduled to be installed. This area also provides information about these apps, and provides access to related features.

For an app that is scheduled to be installed, this area displays the message “*App_name* is scheduled to install on # devices.” In this message, *App_name* is the name of the app and # is the number of devices on which the app is scheduled to be installed. You can click the number to display the Actions page, which provides detailed information about the scheduled installation and lets you perform related activities (see the “[Managing Outstanding and Expired Actions for Apps](#)” section on page 4-54). For information about scheduling app actions, see the “[Using Action Plans](#)” section on page 4-50.

For each installed app, this area includes the items that [Table 4-1](#) describes.

Table 4-1 *Installed Apps Area Items*

Item	Description
Search Installed apps field	To display in the Installed Apps area only apps that have names that contain a specific character string, enter the string in this field. The display of apps updates as you type. To display all installed apps, delete all characters in the search field.
App icon, name, and version	Displays the name and version of the app and an icon for the app. Click an app icon to display more detailed information about the app and to access features for managing the app, as described in the “ Viewing Detailed Information about an App ” section on page 4-5.
Device counter	Number of devices on which the app is installed.
Alert counter	Number of Alerts that the app has generated. Click to manage alerts. See the “ Managing App Alerts ” section on page 4-64.

Table 4-1 Installed Apps Area Items (continued)




Item	Description
Status button	<p>Click to display a chart that shows the number of devices on which apps are in the following states:</p> <ul style="list-style-type: none"> • Running—App is running on a device • Pending—App is in the process of changing from one state to another state • Stopped—An app that was running has been stopped on a device • Failed—A start, stop, install, uninstall, upgrade, or configuration action that was performed on an app did not execute properly <p>Click a hostname to display Monitoring page, which provides information about the operation of an app. See the “Monitoring an App” section on page 4-59.</p>
Memory button	<p>Click to display the hostnames of up to five devices on which the app has consumed the most RAM resources during the past 24 hours, and the amount of memory, in MG, consumed on each device. The percentage value next to a hostname indicates the average amount of RAM resources the app consumed on the device during the past 24 hours.</p> <p>Click a hostname to display device details information about the device. See the “Viewing Detailed Information about a Device” section on page 5-5 for more information.</p>
CPU button	<p>Click to display the hostnames of up to 5 devices on which the app has consumed the most CPU resources during the past 24 hours. The percentage value next to a hostname indicates the average amount of CPU resources the app consumed on the device during the past 24 hours.</p> <p>Click a hostname to display device detailed information about the device. See the “Viewing Detailed Information about a Device” section on page 5-5 for more information.</p>
Remove button	<p>Appears if an app is not currently installed on any device. Click to remove the app from the Installed Apps area. This action also removes the history information and configuration files that Cisco Fog Director stores for the app.</p>

Managing Available Apps

The Available Apps area on the Apps View page lists each app that has been imported to Cisco Fog Director, provides information about these apps, and provides access to related features. An available app is ready to be installed on one or more devices.

The Available Apps area includes the items that [Table 4-2](#) describes.

Table 4-2 Available Apps Area

Item	Description
Import app button	Imports an app to Cisco Fog Director. See the “Importing an App” section on page 4-9 .
App icon, name, and version	Displays the name, version, and icon of each available app. Click an app icon to display more detailed information about the app and to access features for managing the app, as described in the “Viewing Detailed Information about an App” section on page 4-5 .
App signed status icon	If Cisco Fog Director knows whether an app is signed, a shield icon appears next to the app version number as follows: <ul style="list-style-type: none"> Green shield icon —Indicates that the app is signed and the signature has been validated with a developer certificate. Amber shield icon —Indicates that the app is signed but the signature verification with a developer certificate and the developer certificate verification with a Certificate Authority (CA) will occur during installation of the app on a device. Red shield icon —Indicates that the app is not signed. If Cisco Fog Director does not know whether an app is signed, no shield icon appears.
Remove button for each app	See the “Removing an App from Cisco Fog Director” section on page 4-32 .

Managing Unpublished Apps

The Unpublished Apps area on the Apps View page displays only if you upgraded to this version of Cisco Fog Director from a previous version that had apps in its Unpublished Apps area. In this situation, this area lists those apps, which are apps that have been uploaded to Cisco Fog Director in the old version but not published. An app in the Unpublished Apps area unpublished app must be published before it can be installed on one or more devices.



The following sections provide related information:

- [Unpublished Apps Area, page 4-4](#)
- [Publishing an App, page 4-5](#)

Unpublished Apps Area

The Unpublished Apps area includes the items that [Table 4-3](#) describes.

Table 4-3 *Unpublished Apps Area Items*

Item	Description
App icon, name, and version	Displays the name, version, and icon of each unpublished app. Click an icon to display additional information for the app, as described in Table 4-4 on page 4-6 .
App signed status icon	<p>If Cisco Fog Director knows whether an app is signed, a shield icon appears next to the app version number as follows:</p> <ul style="list-style-type: none"> Green shield icon —Indicates that the app is signed and the signature has been validated with a developer certificate. Red shield icon —Indicates that the app is not signed. <p>If Cisco Fog Director does not know whether an app is signed, no shield icon appears.</p>
Publish button for each app	Lets you publish an app, which makes it available for installation on a device. See the “Installing an App” section on page 4-11 .

When you click an app icon in the Unpublished Apps area, a configuration page displays. [Table 4-4 on page 4-6](#) describes this page.

Publishing an App

You can publish an app that appears in the Unpublished Apps area. The app then becomes available to install on devices.

To publish an app, in the Unpublished Apps area on the Apps View page, click the **Publish** button that displays under the app that you want to publish, or click its icon and then click the **Publish** button on the App Configuration page that displays.

After you perform the Publish action, the app moves from the Unpublished Apps area to the Available Apps area on the Apps View page.

Viewing Detailed Information about an App

To view detailed information about an app, click its icon on the Apps View page. The App Configuration page displays.

This page includes information and features that apply to the app. The items that this page displays vary depending on the state of the app and from which area on the Apps View page you clicked the app icon, and can include the items that [Table 4-4](#) describes.

Table 4-4 Detailed Information about an App Items





Item	Description
Navigation pane	Appears on the left side of the page. Provides information about apps that are available or installed in Cisco Fog Director, and lets you remove apps or versions of an app. See the “Using the Navigation Pane” section on page 4-59.
Publish button	Appears only if an app is in unpublished. Click to publish the app. See the “Managing Unpublished Apps” section on page 4-4.
New Version button	Click to import a new version of the app. See the “Importing an App” section on page 4-9.
MONITOR button	Displays information about the operation of the app and its resource consumption on devices. See the “Monitoring an App” section on page 4-59.
Version drop-down list	Select the version of the app to install on one or more devices. See the “Installing an App” section on page 4-11.
INSTALL button	Lets you install an app on one or more devices. See the “Installing an App” section on page 4-11.
Change App Version button	Click to replace an app that is installed on devices with another version of the app. See the “Changing the Version of an App” section on page 4-25.
More Actions button 	Click to access these functions: <ul style="list-style-type: none"> • Start—Click to start the app on selected devices. See the “Starting or Stopping an App on Selected Devices” section on page 4-28. • Stop—Click to stop the app on selected devices. See the “Starting or Stopping an App on Selected Devices” section on page 4-28. • Uninstall—Click to click to stop the app on selected devices. See the “Uninstalling an App” section on page 4-22. • Export—Click to save outside of Cisco Fog Director the version of the app that displays in the Version drop-down list. See the “Exporting an App” section on page 4-59
Signed status icon	If Cisco Fog Director knows whether an app is signed, a shield icon appears next to the app version number as follows: <ul style="list-style-type: none"> • Green shield icon —Indicates that the app is signed and the signature has been validated with a developer certificate. • Amber shield icon —Indicates that the app is signed but the signature verification with a developer certificate and the developer certificate verification with a Certificate Authority (CA) will occur during installation of the app on a device. • Red shield icon —Indicates that the app is not signed.
CPU	Number of CPU units that the app requires on a device.
Memory	Amount of RAM, in KB, that the app requires on a device.

Table 4-4 Detailed Information about an App Items (continued)

Item	Description
Disk	Amount of disk space, in MB, that the app requires on a device.
App Type	Type of the app (PaaS , VM , Ixc , or Docker)
Resource Profile	Resource profile of the app, which specifies the amount of host system CPU and memory (RAM) resources that the app requires on a device. For information about assigning resource profiles to an app, see <i>Cisco IOx Local Manager Reference Guide</i> .
Author	Entity that authored the app, as specified in the app metadata.
Edit App button	Let you updated certain information for an app. See the “ Editing an App Icon, Docker Options, Description, and Release Notes ” section on page 4-33
More/Less toggle button	Click More to display additional information, if available, for the app, including the following. Click Less to collapse this expanded display. <ul style="list-style-type: none"> • Docker Run Options—Docker run options that are used when you start an app that is created from a Docker image. If the app descriptor file (package.yaml) for the app includes run options, these options appear here after you install the app. See the “Editing an App Icon, Docker Options, Description, and Release Notes” section on page 4-33 for related information. • Description—Description of the app. Brief description of the app. See the “Editing an App Icon, Docker Options, Description, and Release Notes” section on page 4-33 for related information. • Release Notes—Release notes for the app. See the “Editing an App Icon, Docker Options, Description, and Release Notes” section on page 4-33 for related information.
Status on Devices display	Includes a graph that provides a visual representation of the number of devices on which the app in a particular state. Hover your mouse pointer over any section of the graph to see what state that section represents and the number of devices on which the app is in that state. Click any section of the graph to display in the Device table only devices on which the app is in the corresponding state. For related information, see the Device table row in this table.
Installation Successful on display	Shows the number of devices on which the app has been successfully installed. The Edit Configuration button under this display lets you update configuration parameters that apply to an app, These items may include configuration information, resource profile, networking, and port information. See the “ Reconfiguring App Parameters ” section on page 4-34 for more information.

Table 4-4 Detailed Information about an App Items (continued)



Item	Description
Actions Failed on display	<p>Shows the number of devices on which an installation, update, uninstall, or reconfiguration action failed for the app.</p> <p>Hover your mouse pointer over this area to see more detailed information about specific action failure types. You can click the Retry Now button to retry an action.</p> <p>See the “Retrying a Failed Action for an App” section on page 4-46 for more information.</p>
Versions on Devices display	<p>Includes a graph that provides a visual representation of the number of devices on which each version of the app is installed.</p> <p>Hover your mouse pointer over any section of the graph to see what version that section represents and the number and percentage of devices on which the app is in that state. For example, “1.1 - 4 (75.00 %)” means version 1.1 of the app is installed 4 devices, and those 4 devices are 75% of all devices.</p> <p>Click any section of the graph to display in the Device table only devices on which the app is in the corresponding state.</p> <p>For related information, see the Device table row in this table.</p>
View Outstanding Actions link	<p>Appears if an install, edit, upgrade, or uninstall action for the app is in Outstanding state or in Expired state as a result of an action plan. Click to display the Actions page, which provides options for managing actions that are in these states. See the “Managing Outstanding and Expired Actions for Apps” section on page 4-54 for more information.</p>
Installing Display	<p>Displays information about the devices on which the app is installing. This information includes:</p> <ul style="list-style-type: none"> • One or more <i>device squares</i>. Each one represents a device on which you are installing the app and shows the status of the install operation on that device. • The hostname of the device on which the app is installing and the status and progress of the installation operation on that device. Click the hostname to display detailed information about the device, as described in the “Viewing Detailed Information about a Device” section on page 5-5. • A search device field, which you can display by clicking the expand icon  next to Search Device. Enter the IP address or hostname of a device to see the status of the app installation process on that device.

Table 4-4 Detailed Information about an App Items (continued)

Item	Description
Device table	<p>Provides information about each device on which the app is installed. This table includes the following:</p> <ul style="list-style-type: none"> • Device Filters field—Click this field and then choose an option from the list that pops up to display in table only devices on which apps meet designated criteria. When you choose an option, it displays in this field and the table updates automatically. You can add as many device filter options as needed. To remove a device filter option from this field, click the X icon  next to the option. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Host Name—Hostname of the device. Click a hostname to display detailed information about the device. See the “Viewing Detailed Information about a Device” section on page 5-5. • IP Address—IP address of the device. Click a hostname to display device detailed information about the device. See the “Viewing Detailed Information about a Device” section on page 5-5. • Host Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. • Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. • App Status—State of the app on the device (for example, DEPLOYED). • Error Summary—For an app that is in the Failed state, provides information about the cause of the action that failed. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.

Importing an App

Importing an app uploads the app package for the app to Cisco Fog Director. When you import an app, it displays in the Available Apps area on the Apps View page and becomes available to be installed.

When you import an app, you can choose from these actions:

- Upload an app package that was created with the Cisco IOx SDK
- Have Cisco Fog Director upload an OVA file and create an app package using that OVA file

- Have Cisco Fog Director upload and create an app package from a Docker image that is on your local drive, in the Cisco Docker registry or in a third party registry such as Docker Hub.

To import an app, perform the following steps.

Before You Begin

- If you are uploading an app package, the app package must be on your local drive.
- If you are creating and uploading an app package from a Docker image, you must make the configuration update as described in the [“Docker Daemon Proxy Settings” section on page 2-7](#).

Procedure

Step 1 Take either of these actions:

- On the Apps View page or the Navigation pane, click the **Import App** button
- On the App Configuration page, click the **New Version** button

Both of these buttons have the same affect. However, you can access the **New Version** button only if another version of the app you are installing is available or installed in Cisco Fog Director.

Step 2 In the Import New App dialog box that displays, take one of these actions:

- To upload an app package that was created with the Cisco IOx SDK, click the **IOx Package** tab, and then continue to [Step 3](#)
- To upload an OVA file and create app an package using that OVA file, and then skip to [Step 4](#)
- To upload and create an app package from a Docker image that is present in a Docker registry, click the **Docker** tab, and then skip to [Step 5](#)

Step 3 If you chose the **IOx Package** tab, take these actions:

- a. Click the **Select** button, and then follow the on-screen prompts to locate and select on your local drive the app that you want to import.
- b. Click the **Import** button.

The app is imported to Cisco Fog Director.

Step 4 If you chose the **OVA** tab, take these actions:

- a. In the App Name field, enter a name for the app.
- b. In the App Version field, enter the version of the app.
- c. Click the **Select** button, and then follow the on-screen prompts to locate and select on your local drive the app that you want to import.
- d. Click the **Import** button.

Cisco Fog Director creates an app from the OVA file and imports the app. A progress bar displays while the import process executes. This process can take some time.

Step 5 If you chose the **Docker** tab, take the appropriate actions:

- If the Docker image is on your local drive:
 1. Click the **My Computer** radio button.
 2. Click the **Select** button, and then follow the on-screen prompts to locate and select on your local drive the app that you want to import.
 3. Click the **Import** button.

The app is imported to Cisco Fog Director.

- If the Docker image is in the Cisco Docker registry or in a third party registry such as Docker Hub:
 1. Click the **Docker registry** radio button.
 2. If the Docker image is in Docker Hub, check the **Use docker hub** check box. If the Docker image is in another registry, do not check this check box.
 3. If you do not check the **Use docker hub** check box, enter either of the following in the **Docker Registry** field:
 - Hostname and optional port of the Docker registry, in the format *hostname[:port]*
 - IP address and optional port of the Docker registry, in the format *ip_address[:port]*
 4. In the **Image name or ID** field, enter the name or ID of the Docker image.
 5. (Optional) In the **Image tag** field, enter a tag for the Docker image.
If you do not enter a tag name, Cisco Fog Director uses the tag named “latest.”
 6. If the Docker image is in a Docker registry other than Docker Hub, enter either of the following in the **Docker Registry** field:
 - Hostname and optional port of the Docker registry, in the format *hostname[:port]*
 - IP address and optional port of the Docker registry, in the format *ip_address[:port]*If the Docker image is in Docker Hub, leave the **Docker Registry** field blank.
 7. (Optional) If the Docker registry requires authentication before you can pull an image from it, take these actions:
 - a. Check the **Use credentials** check box.
 - b. In the **Username** field that appears, enter the user name that authenticates you to the Docker Registry.
 - c. In the **Password** field that appears, enter the password that authenticates you to the Docker Registry.
 8. Click the **Import** button.
Cisco Fog Director creates an app by packaging the Docker image and related files and imports the app.
A dialog box appear while the import process executes. This process can take some time.

Installing an App

You can install an app on a device that has been imported to Cisco Fog Director.

The following sections provide additional information:

- [Install App Options, page 4-11](#)
- [Install App Procedure, page 4-13](#)

Install App Options


To view options for installing an app, go to the App Configuration page for the app, choose the version of the app to install from the **Version** drop-down list, and then click the **Install** button.

The Filter Devices page displays. This page includes the items that [Table 4-5](#) describes.

Table 4-5 Filter Devices Page Items

Item	Description
Installed Devices table	<p>Provides information about each device that has been imported to Cisco Fog Director, and includes the following items:</p> <ul style="list-style-type: none"> • Version drop-down list—Choose the version of the app to install, if you want to change the version that you chose when you accessed this page. • Search Hostname, IP address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device on which you want to install the app. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which the app is to be installed. • IP Address—IP address of the device on which the app is to be installed. • Tags—Tags that are assigned to a device. • Installed Apps—Apps that are installed on the device • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Add Selected Devices button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-5 Filter Devices Page Items (continued)

Item	Description
Selected Devices table	<p>Provides information about each device on which you want to install the app. Devices appear in this table after you check their check boxes in the Installed Devices table and then click Add Selected Devices. This table includes the following items:</p> <ul style="list-style-type: none"> • Selected Devices—Number of devices on which you want to install the app. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Host Name—Hostname of the device on which you want to install the app. • IP Address—IP address of the device on which you want to install the app. • Tags—Tags that are assigned to the device on which you want to install the app. • Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. • Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. • Action—Click the x icon  to remove a device from the Selected Devices table. Clicking this icon does not affect the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Next button	Available if there is at least one device in the Selected Devices table. Click to continue an app install procedure.

Install App Procedure

To install an app on one or more devices, perform the following steps.

If you are installing an app on multiple devices and want to stop the installation procedure at any time, use the **Abort** button, as described in the “[Canceling an Action](#)” section on page 4-43.

Cisco Fog Director associates an action plan with each app installation procedure that you perform. An action plan instructs Cisco Fog Director to retry an installation if the installation fails due to certain conditions, or to perform the installation within a designated maintenance window. By default, the action

plan causes Cisco Fog Director to perform the installation immediately and to retry a failed installation up to 10 times at 2 minute intervals. You can change these parameters as needed when you perform the app installation procedure. For more information, see the [“Using Action Plans” section on page 4-50](#).

Before You Begin

- Add or import each device on which you are installing the app to Cisco Fog Director. See the [“Adding Devices” section on page 5-16](#) or the [“Importing Devices” section on page 5-18](#).
- Add the app to Cisco Fog Director. See the [“Importing an App” section on page 4-9](#).
- If the app that you are installing requires services from an app that provides services, the app that provides the services must first be installed on the devices on which you are installing this app. Otherwise, this app install operation fails.

Procedure

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- Step 1** In the Apps View page, click the icon for the app that you want to install.
The App Configuration page for the app displays.
- Step 2** On the App Configuration page, take these actions:
- a. From the **Version** drop-down list, choose the version of the app that you want to install.
 - b. Click the **Install** button.
- Step 3** In the Installed Devices table, check the check box for each device on which you want to install the app.
For detailed information about this table and locating devices, see the [“Install App Options” section on page 4-11](#).
- Step 4** Click the **Add Selected Devices** button.
The devices that you selected are added to the Selected Devices table. The app version will be installed on all devices in this table that are compatible with the install operation. For detailed information about this table and about removing devices from this table, see the [“Install App Options” section on page 4-11](#).
- Step 5** Click the **Next** button near the bottom of the page.
The Installation Summary page displays. This page lets you review and configure operations that are performed by Cisco Fog Director on the devices on which you are installing the app.
- Step 6** In the Installation Summary page, take the following actions as needed:
- (Optional) To change the list of devices that you selected, click the **Back** button, update information in the Selected Devices table as described earlier in this procedure, and then click the **Next** button again.
 - (Optional) To cause the app to start automatically after it installs, check the **Start app after installation** check box. Starting an app initiates its operation on a host device and puts the app in Running state. CPU and memory (RAM) resources that were reserved for the app become in use.
 - (Optional) To change the default tag that will be added to each device, type another tag name in the **Tag Selected Devices as** field.
By default, the system adds a tag with the app name to each device. You can change this name, or, if you do not want a tag to be added, delete all text in this field. See the [“Managing Tags for Devices” section on page 5-38](#) for related information.

- (Optional) Click the **VIEW INCOMPATIBLE DEVICES** button (if this button is not dimmed) to see a table that provides information about devices that you selected but on which the app cannot be installed. This table includes the following items:
 - Host Name—Hostname of the device.
 - IP Address—IP address of the device.
 - Tags—Tags that are assigned to the device.
 - Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information.
 - Incompatibility Cause—A brief description of why the app cannot be installed on the device.

You can click a pagination control to go to the first, next, last, previous, or specific page in the table. From the **Items per page** drop-down list you can choose the maximum number of devices that appear in each page of the table.

Step 7 (Optional) In the Installation Summary page, expand **Selected Devices** (if it is not expanded already) to review the following information for each device that you selected:

- Host Name—Hostname of the device.
- IP Address—IP address of the device.
- Tags—Tags that are assigned to the device.
- Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information.
- Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful.

You can click a pagination control to go to the first, next, last, previous, or specific page in the table. From the **Items per page** drop-down list you can choose the maximum number of devices that appear in each page of the table.

Step 8 (Optional) In the Installation Summary page, expand **Customize Configuration** to view and update configuration information for this app.

The configuration items that display are defined in the `package_config.ini` file for the app. The value that each field displays is the default value for that item as defined by the app. You can make updates in these fields as needed.

Step 9 (Optional) In the Installation Summary page, expand **Configure Networking** to view and update network information that relates to how the app obtains its IP address or addresses on each device.

The Configure Networking area is available only if it includes options that apply to this installation.

You can update network information for a specific device, some of devices, or all devices. If network information is not configured for a device by default, you must configure it as described in this step.

The *device squares* in the box at the left of the Configure Networking area represent devices on which you are installing the app. The **Unallocated** tab shows device squares for devices for which network allocation could not be performed, if there are any such devices. The **All Devices** tab show all devices that you selected.

You can click a device square to display the Edit Network Details dialog box. This dialog box shows the hostname, IP address, and serial number of the device, tags assigned to the device, and network interface information, if available, for the preferred network that is currently selected. You can click the hostname and IP address to display the Device Details page for the device. If the device uses a bridge network, the Edit Network Details dialog box also provides options for IP address configuration. This dialog box also shows network related errors, if any, for the device.

The Preferred Networks sub areas at the right of the Configure Networking area provide information for each network interface that is defined in the package.yaml file for the app, and lets you add new network interfaces. You can expand a sub area to display and update options in it.

If you want to limit the device squares to one or more specific devices, take either of these actions:

- To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
- To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- To configure IP address information for the current network interface for a specific device, take the following actions. You can take these action for devices that use a bridge network.

- a. Click the device square for the device that you want.

The Edit Network Details dialog box appears.

- b. Click the **IPv4** radio button or the **IPv6** radio button to designate the type of network you are configuring.
 - c. Click one of these radio buttons:
 - **Static**— Click to assign a static IP address for the currently selected network interface.
 - **Dynamic**—Click to use a dynamically assigned IP address from the DHCP pool for the currently selected network interface
 - **Disable**—Available if the device supports network dual stack networking. Click to make this network interface unavailable for the app.
 - d. If you choose **Static Mode**, configure the following fields that appear as needed:
 - **IPv# Address** and **Mask** fields—Enter the static address and subnet mask to use. If the IPv6required field is set to “true” in the app descriptor file (package.yaml) for an app, you must enter an IPv6 address. Otherwise, you can enter an IPv4 or an IPv6 address. If you enter an IPv6 address but a device on which you are installing the app does not support IPv6, the app installation will fail on that device.
 - **DNS** field—(Optional) Enter the IP address of the DNS server that the app uses for external communication.
 - **Default Gateway** field—(Optional) Enter the IP address of the default gateway that the app uses for external communication.
- To update network information for all devices for which a device square is displayed, take these actions for each network interface that you want to configure:

- a. Expand the Preferred networks sub area.

- b. Choose a network from the **Network** drop-down list. Options that display depend on the app and device.

- **iox-bridge#**—App obtains its IP address from a DHCP pool that is configured in Cisco IOS
- **iox-nat#**—App obtains its IP address from an internal network address translator
- **iox-nat_docker#**—App obtains its IP address from an internal network address translator
- **mgmt-bridge#**—App configures its vLAN via this bridge

If you configure a VLAN ID as described later in this procedure, that ID is appended to network names in this drop-down list. For example, if you configure the VLAN ID 333, you might see **mgmt-bridge-v3333**.

- c. If you choose a bridge network, click one of the following radio buttons that appear:
- **Static**—Click to assign a static IP address for this network interface
 - **Dynamic**—Click to use a dynamically assigned IP address from the DHCP pool for this network interface
 - **Disable**—Available if any selected device supports network dual stack networking. Click to make this network interface unavailable for the app.
- d. If you click the **Static** radio button, configure the following fields that appear as needed:
- **IPv# Address** and **Mask** fields—Enter the static address and subnet mask to use. If the IPv6required field is set to “true” in the app descriptor file (package.yaml) for an app, you must enter an IPv6 address. Otherwise, you can enter an IPv4 or an IPv6 address. If you enter an IPv6 address but a device on which you are installing the app does not support IPv6, the app installation will fail on that device.
 - **Default Gateway** field—(Optional) Enter the IP address of the default gateway that the app uses for external communication.
 - **DNS** field—(Optional) Enter the IP address of the DNS server that the app uses for external communication.
- e. If you choose a NAT network, configure the following fields that appear as needed.
- These fields let you map the TCP port and UDP port that the app descriptor file (package.yaml) for the app defines to other valid ports. These ports are used by the network interface for external communication with the app. The values that these fields display come from the app descriptor file for the app or are the values to which you mapped the values from the app descriptor file.
- **TCP port**—Enter a TCP port to which to map the TCP port that the app descriptor file defines. If the app descriptor file defines a range of ports, for example, 9000-9200, you must enter a range that includes the same number of ports, for example, 9400-9600. Valid TCP port numbers are 1 through 65535.
 - **UDP port**—Enter a UDP port to which to map the UDP port that the app descriptor file defines. If the app descriptor file defines a range of ports, for example, 9000-9200, you must enter a range that includes the same number of ports, for example, 10400-10600. Valid UDP port numbers are 1 through 65535.
- f. (Optional) If the device on which you are installing the app supports port mirroring on this network interface, and if the package.yaml file for the app defines mirroring on this network interface, check the **Mirror Mode Enabled** check box that appears to enable port mirroring for the app.
- Port mirroring is used to monitor network traffic. When this option is enabled, copies of incoming and outgoing packets at the ports of a network device are flooded to the network bridge domain.
- If you enable this options when you have selected multiple devices, but not all of the selected devices support mirroring on this network interface, the app installs only on the devices that support network mirroring.
- g. If the selected bridge for the devices on which you installing the app support VLAN hosting, in the **Vlan ID** field that appears, enter the unique identifier of the VLAN on which this internal network operates. Valid values are integers 1 through 4094.
- The ID that you enter can be used for other apps on the same device only if those apps use the same network interface.

- h. To configure additional network interfaces for the device, click **Add New Network Interface** and take the following actions.

You can configure up to three network interfaces, unless the `package.yaml` file for the app asks for more than three network interfaces, in which case you can configure as many as that file asks for.


.By default, Cisco Fog Director displays each preferred network that `package.yaml` for the app asks for.

- In the Interface Name field, enter a name for the interface. For example, **eth1**. The name must be unique among the list of interfaces in the Preferred Networks sub area. The name is not case sensitive.

- (Optional) In the Interface Description field, enter a description for the interface.

- Click **Save**.

- Click the down-arrow next to the interface you added to configure its options.

To remove an interface that you have added, click the Delete Interface Icon  next to the interface name. You cannot remove an interface that is specified in the `package.yaml` file for the app.

- i. After you configure each network interface that you want, click the **REASSIGN NETWORKS** button.

- Step 10** (Optional) In the Installation Summary page, expand **Network Status** to view network, resource, and related information for apps and devices.

The Network Status area displays the following information:

- How many of the devices that you selected for installation of the app are reachable. (“Reachable” means that Cisco Fog Director can communicate with the device.) Hover your mouse pointer over a graph to see more detailed information.
- The *device squares* in the box in the middle of the area. Each box represents a device on which you are installing the app. You can hover your mouse pointer over a device square to display the following information:
 - **Cartridges**—Cisco cartridges that a PAAS app requires to run. These cartridges must already be uploaded to Cisco Fog Director (see [Chapter 7, “Managing Cartridges”](#)) and are installed automatically on the device as part of the app installation process.
 - **CPU Availability**—Number of free CPU units on the device.
 - **Memory Availability**—Amount of free RAM, in MB, on the device.
- How often the Cisco Fog Director updates the information in this area. You can choose a value from the **Collect resource usage at least every** drop-down list. Options are **Every 15 mins**, **Every 1 hour**, **Every 4 hour**, **Every 8 hour**, **Every 16 hour**, and **Never ever**.

- Step 11** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Configure Resource Profiles** to view and update the resource profiles that have been assigned for the app on each device.

You can update the resource profile for a specific device, some devices, or all devices.

The *device squares* in the box in the middle of the Configure Resource Profile area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit Resource Profile dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the resource profile that has been assigned for the app on the device. You can click the hostname and IP address in the dialog box to exit the installation and display the Device Details page for the device.

To update a resource profile on one or more devices, take these actions:

- a. If you want to limit the device squares displays to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- b. Take the desired action:
 - To change the resource profile for a specific device, hover your mouse pointer over the device square for that device, and in the Edit Resource Profile dialog box, choose a resource profile from the **Select Profile** drop-down list.
 - To change the resource profile for all devices for which a device square displayed, click the desired profile radio button and then click the **REASSIGN PROFILE** button:
 - **Exact matching profile**—Assigns the resource profile that is defined for the app in its metadata, if the resources are available on a device.
 - **Largest available profile**—Assigns the largest resource profile that is currently available on each device on which you are installing.
 - **Allocate all available resources**—Assigns all CPU and memory resources that are available on each device on which you are installing.
 - **Custom profile**—On each device on which you are installing, assigns the CPU and memory resources that you specify. After you click this radio button, the **CPU** and the **Memory** fields appear. Enter the CPU resources, in units, and memory resources, in MB, to assign on each device. The Max value under each field shows the maximum value that you can enter without exceeding the available corresponding resource on at least one device. If you enter a value that exceeds this maximum value, the **REASSIGN PROFILE** button is dimmed and cannot be used.

Step 12 (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Configure VNC Password** to set the VNC password that is required to access an app on devices via a VNC session.

The Configure VNC Password area is available only if the app requests a serial port.

The *device squares* in the box in the middle of the Configure VNC Password area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit VNC password dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and provides a field for entering the VNC password for the device.

To set the VNC password for an app on one or more devices, take these actions:

- a. If you want to limit the device squares to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- b. Take either of these actions:
 - To set the VNC password for a specific device, hover your mouse pointer over the device square for that device, and in the Edit VNC Password dialog box, enter the password in the **VNC Password** field
 - To set the VNC password for all devices for which a device square is displayed, enter the password in the **VNC Password** field that displays to the right of the device squares, and then click the **Assign** button.

- Step 13** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Configure VCPUs** to configure the number of virtual CPUs that the app requires on a device.

The Configure VCPUs area is available only if the app requests virtual CPUs and has more than one virtual CPU to offer.

The *device squares* in the box in the middle of the Configure VCPUs area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit VCPU Details dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the number of virtual CPUs that have been assigned for the app on the device.

To configure the number of virtual CPUs that an app requires on one or more devices, take these actions:

- a. If you want to limit the device squares to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- b. Take either of these actions:
 - To configure the number of virtual CPUs for a specific device, hover your mouse pointer over the device square for that device, and in the Edit VCPU dialog box, type or use the up or down arrow buttons to enter the desired value.
 - To configure the number of virtual CPUs for all devices for which a device square is displayed, in the **Select VCPU Value** field that displays to the right of the device square, type or use the up or down arrow buttons to enter the desired value, and then click the **REASSIGN VCPU** button. The text above the **Select VCPU Value** field indicates the number of virtual CPUs that the descriptor file for the app specifies and the maximum number of virtual CPUs that you can designate for the app on the devices that you selected.

- Step 14** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Configure Device Resource Ports** to view and update the serial port that an app uses on a device.

The Configure Device Resource Ports area is available only if the app requests a serial port.

The *device squares* in the box in the middle of the Configure Device Resource Ports area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit Serial Details dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the serial port that has been assigned for the app on the device.

To update a serial port for an app on one or more devices, take these actions:

- a. If you want to limit the device squares to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- b. Hover your mouse pointer over the device square for the device that you want to update, and in the Edit Serial Details dialog box, choose a port from the **Select Serial Port** drop-down list.

- Step 15** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Configure Action Plan** to choose, view, modify, or add an action plan.

The action plan designates how many times and at what interval Cisco Fog Director retries an action if the action fails on a device due to certain device reachability or network connectivity issues. If Cisco Fog Director cannot complete the app installation action after the number of retries that the action plan designates, the app installation does not complete.

When you expand **Configure Action Plan**, the **Selected Action Plan** field shows the name of the action plan that is in effect. The **Details** field describes the number of retries and time between retries that the selected action plan defines.

You can choose the action plan that you want from the Selected Action Plan drop-down list.


For information about modifying or adding action plans, see the [“Using Action Plans” section on page 4-50](#).

- Step 16** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Upload App Data** to upload an app data file for the app to each device.

An app data file is a file that an app requires, such as a configuration file.

To update an app data file to one or more devices, take these actions:

- a. (Optional) In the **File path on app container** field, enter the name of a directory under the /data/appdata directory on the device in which to upload the app data file. If you enter the name of a directory that does not exist, Cisco Fog Director creates that directory under the /data/appdata directory. If you do not enter the name of a directory, Cisco Fog Director uploads the file to the /data/appdata directory.
- b. (Optional) In the **New file name** field, enter a name to which Cisco Fog Director changes the name of the file that you upload when that file is placed on the device. If you do not enter a file name, Cisco Fog Director does not change the original name of the uploaded file. For example, if you upload a file that is named abc.txt but you want the file to be stored as abc_ver2.txt, enter **abc_ver2.txt** in this field.
- c. Click the **SELECT FILES** button and then follow the on-screen prompts to locate and select the app data file that you want to upload.

Each file that you select appears in a list of files to upload under the SELECT FILES button. To remove a file from this list, click the Remove icon  next to the file.

- Step 17** (Optional) In the Installation Summary page, expand **Advanced Settings** and then expand **Docker Runtime Options** to configure Docker options for an app that is created from a Docker image.

To configure Docker options, take these actions:

- a. In the Docker Run Options field, enter one or more Docker run options to be used when the app starts.
This field includes the --rm option by default.
- b. If you want to remove the writable container layer from the app container when the app is stopped, check the **Remove writable layer on container stop** check box.

Checking this check box adds the --rm run option to the Docker Run Options field.

- Step 18** When you are satisfied with the information on the Installation Summary page, click the **Done, Let's Go** button.

The App Configuration page displays, as described in the [“Viewing Detailed Information about an App” section on page 4-5](#).

While the app is installing on a device:

- Near the top of the page, a message indicates the approximate time remaining until the installation completes on all selected devices, and a progress bar displays the progress of the installation across all selected devices.
- A table under the progress bar, you can click **View top 5 slowest devices** to view a table that displays information for up to five devices on which the installation progress is slowest. This information includes the hostname of the device, the IP address of the device, the port that the app being installed uses on the device, the number of bytes uploaded to the device (shown as Bytes Transferred), the total number of bytes to be uploaded to the device, and the approximate time remaining until the installation completes on the device. (During some phases of the installation process, the time remaining and bytes information displays as “NA.”)
- The status of the installation displays in the Device Details area for that device. Click the device hostname to see the progress of the installation on the device.
- The Device Details area also displays the number of bytes uploaded to the device (shown as Bytes Transferred), followed by the total number of bytes to be uploaded to the device, and the approximate time remaining until the installation completes on the device. (During some phases of the installation process, the time remaining and bytes information displays as “NA.”)
- You can click the **ABORT** button under the status display to cancel the installation action, as described in the [“Canceling an Action” section on page 4-43](#).

If the Actions Failed display on this page indicates that the installation failed on any device, you can take any of these actions:

- Click the **RETRY NOW** button to try the installation on these devices again. See the [“Retrying a Failed Action for an App” section on page 4-46](#).
- Click the **View Outstanding Actions** link to display the Actions page, which provides options for managing failed actions for which an action plan is in effect. See the [“Managing Outstanding and Expired Actions for Apps” section on page 4-54](#) for more information.
- Wait for Cisco Fog Director to retry the failed action according to an action plan that is in effect. See the [“Using Action Plans” section on page 4-50](#).

Uninstalling an App

You can uninstall an app from any devices on which it is running. Uninstalling an app removes it from the device and releases device CPU and memory (RAM) resources that were reserved for it.

The following sections provide additional information:

- [Uninstall App Options, page 4-22](#)
- [Uninstall App Procedure, page 4-24](#)

Uninstall App Options


To view options for uninstalling an app, click the **UNINSTALL APP** button on the App Configuration page for the app.

A page displays that includes the items that [Table 4-6](#) describes.

Table 4-6 Uninstall App Items

Item	Description
Installed Devices table	<p>Provides information about each device on which the app is installed, and includes the following items:</p> <ul style="list-style-type: none"> • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device from which you want to uninstall the app. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which the app is installed. • IP Address—IP address of the device on which the app is installed. • Tags—Tags that are assigned to the device. • Installed Apps—Apps that are installed on the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
ADD SELECTED DEVICES button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-6 Uninstall App Items (continued)

Item	Description
Selected Devices table	<p>Provides information about each device from which you want to uninstall the app. Devices appear in this table after you check their check boxes in the Installed Devices table and then click ADD SELECTED DEVICES. This table includes the following items:</p> <ul style="list-style-type: none"> • Selected Devices—Number of devices from which you want to remove the app. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Host Name—Hostname of the device from which you want to uninstall the app. • IP Address—IP address of the device from which you want to uninstall the app. • Tags—Tags that are assigned to the device from which you want to uninstall the app. • Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. • Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. • Action—Click the x icon  to remove a device from the Selected Devices table. Clicking this icon does not affect the device and does not remove the app from the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
DONE, LET'S GO button	Executes an uninstall operation.

Uninstall App Procedure

Uninstalling an app removes the installed app from one or more devices.


When you uninstall a Docker app, layers that are used by that app are not deleted automatically. If you want to delete these layers, see the [“Managing Layers” section on page 5-42](#). If you do not delete a layer, it is reused if you later install an app that requires it.

Cisco Fog Director associates an action plan with each app uninstallation procedure that you perform. An action plan instructs Cisco Fog Director to retry an uninstallation if the uninstallation fails due to certain conditions, or to perform the uninstallation within a designated maintenance window. By default, the action plan causes Cisco Fog Director to perform the uninstallation immediately and to retry a failed

uninstallation up to 10 times at 2 minute intervals. You can change these parameters as needed when you perform the app uninstallation procedure. For more information, see the [“Using Action Plans” section on page 4-50](#).

To uninstall an app, follow these steps:

Step 1 In Cisco Fog Director, click the **APPS** tab, and then in the Installed Apps area, click the name of the app that you want to start.

Step 2 On the App Configuration page for the app, click the **More Actions** button  and then choose **Uninstall** from the pop-up menu.

Step 3 In the Installed Devices table, check the check box for each device on which you want to uninstall the app.

For detailed information about this table and locating devices, see the [“Uninstall App Options” section on page 4-22](#).

Step 4 Click the **Add Selected Devices** button.

The devices with checked check boxes are added to the Selected Devices table. The app will be uninstalled on devices that this table list. For detailed information about this table and about removing devices from this table, see the [“Uninstall App Options” section on page 4-22](#).

Step 5 Click the **Done, Let’s Go** button to uninstall the app on the devices that you selected.

The App Configuration page displays, as described in the [“Viewing Detailed Information about an App” section on page 4-5](#).

While the app is uninstalls on a device, the status of the action displays for that device. Click the device to see the progress of the action. You can click the **ABORT** button under the status display to cancel the uninstall action, as described in the [“Canceling an Action” section on page 4-43](#).

If the Actions Failed display on this page indicates that the uninstall action failed on any device, you can take any of these actions:

- Click the **RETRY NOW** button to try the action on these devices again. See the [“Retrying a Failed Action for an App” section on page 4-46](#).
 - Click the **View Outstanding Actions** link to display the Actions page, which provides options for managing failed actions for which an action plan is in effect. See the [“Managing Outstanding and Expired Actions for Apps” section on page 4-54](#) for more information.
 - Wait for Cisco Fog Director to retry the failed action according to an action plan that is in effect. See the [“Using Action Plans” section on page 4-50](#). While the action is in progress, you can click the **ABORT** button on the App Configuration page that displays, as described in the [“Canceling an Action” section on page 4-43](#).
-

Changing the Version of an App

The **Change App Version** button on the App Configuration page provides a convenient way to replace an app that is installed on one or more devices with another version of the app. This section describes how to use this button.

You also can change the version of an app by uninstalling it from selected devices and then installing the replacement version of the app.

Only one version of an app can be installed on a device at a time, but different devices can have different versions of the same app installed.

To replace the version of an app that is installed on one or more devices with another version of the app, perform the following steps

Before You Begin

Import the replacement version of the app to Cisco Fog Director. See the [“Importing an App”](#) section on page 4-9,

Procedure

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- Step 1** In the Installed Apps area on the Apps View page, click the icon of the app whose version you want to change.
- The App Configuration page for the app that you chose displays.
- Step 2** From the Version drop-down list, choose the app version that you want to replace the existing version.
- Step 3** Click the **Change App Version** button.
- Step 4** In the Installed Devices table, check the check box for each device on which you want to change the version of the app.
- For detailed information about this table and locating devices, see the [“Install App Options”](#) section on page 4-11.
- Step 5** Click the **Add Selected Devices** button.
- The devices that you selected are added to the Selected Devices table. The app version will be changed on all devices in this table that are compatible with the change operation. For detailed information about this table and about removing devices from this table, see the [“Install App Options”](#) section on page 4-11.
- Step 6** Click the **Next** button near the bottom of the page.
- The Upgrade Summary page displays. This page lets you review and configure operations that are performed by Cisco Fog Director on the devices on which you are changing the version of the app.
- Step 7** In the Upgrade Summary page, take the following actions as needed:
- (Optional) Check the **Retain App Data** check box to cause the change app version process to retain existing information that the app has written to the device.

This information includes files and data that the app has written to the device, such as app log files and app property files, and that is stored in the /data directory for the app on the device.

If this check box is not checked, the change app version process deletes existing information that the app has written to the device.

This check box is checked by default.
 - (Optional) To change the list of devices that you selected, click the **Back** button, update information in the Selected Devices table as described earlier in this procedure, and then click the **Next** button again.
 - (Optional) To change the default tag that will be added to each device, type another tag name in the **Tag Selected Devices as** field.

By default, the system adds a tag with the app name to each device. You can change this name, or, if you do not want a tag to be added, delete all text in this field. See the [“Managing Tags for Devices”](#) section on page 5-38 for related information.

- (Optional) Click the **VIEW INCOMPATIBLE DEVICES** button (if this button is not dimmed) to see a table that provides information about devices that you selected but on which the app version cannot be changed. This table includes the following items:
 - Host Name—Hostname of the device.
 - IP Address—IP address of the device.
 - Tags—Tags that are assigned to the device.
 - Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information.
 - Incompatibility Cause—A brief description of why the app cannot be installed on the device.

You can click a pagination control to go to the first, next, last, previous, or specific page in the table. From the **Items per page** drop-down list you can choose the maximum number of devices that appear in each page of the table.

Step 8 (Optional) In the Upgrade Summary page, expand **Configure Action Plan** to choose, view, modify, or add an action plan.

The action plan designates how many times and at what interval Cisco Fog Director retries an action if the action fails on a device due to certain device reachability or network connectivity issues. If Cisco Fog Director cannot complete the app installation action after the number of retries that the action plan designates, the app installation does not complete.

When you expand **Configure Action Plan**, the **Selected Action Plan** field shows the name of the action plan that is in effect. The **Details** field describes the number of retries and time between retries that the selected action plan defines.

You can choose the action plan that you want from the Selected Action Plan drop-down list.

For information about modifying or adding action plans, see the [“Using Action Plans” section on page 4-50](#).

Step 9 (Optional) In the Installation Summary page, expand **Network Status** to view network, resource, and related information for apps and devices.

The Network Status area displays the following information:

- How many of the devices that you selected for installation of the app are reachable. (“Reachable” means that Cisco Fog Director can communicate with the device.) Hover your mouse pointer over a graph to see more detailed information.
 - The *device squares* in the box in the middle of the area. Each box represents a device on which you are installing the app. You can hover your mouse pointer over a device square to display the following information:
 - **Cartridges**—Cisco cartridges that a PAAS app requires to run. These cartridges must already be uploaded to Cisco Fog Director (see [Chapter 7, “Managing Cartridges”](#)) and are installed automatically on the device as part of the app installation process.
 - **CPU Availability**—Number of free CPU units on the device.
 - **Memory Availability**—Amount of free RAM, in MB, on the device.
-

Starting or Stopping an App on Selected Devices

Starting an app from the App Configuration page initiates its operation on selected host devices and puts the app in Running state. CPU and memory (RAM) resources that were reserved for the app become in use.

Stopping an app shuts from the App Configuration page down its operation on selected host devices and puts the app in Stopped state. CPU and memory (RAM) resources that were used by the app remain reserved for it but stop being used.

The following sections describe how to start and stop an app from the App Configuration page. You also can start and stop an app from the DEVICES page as described in the “[Starting or Stopping an App on a Device](#)” section on page 5-40, and from the App Monitoring Page by using the **START** and **STOP** buttons under the Status Charts as described in the “[Viewing General Monitoring Information](#)” section on page 4-60.)

- [Start App and Stop App Options](#), page 4-28
- [Starting an App on Selected Devices](#), page 4-30
- [Stopping an App on Selected Devices](#), page 4-31

Start App and Stop App Options

[Table 4-6](#) describes the options that appear when you choose **Start** or **Stop** from the More Actions drop-down menu on the App Configuration page. To view options for uninstalling an app, click the **UNINSTALL APP** button on the App Configuration page for the app.

A page displays that includes the items that [Table 4-6](#) describes.

Table 4-7 Uninstall App Items

Item	Description
Installed Devices table	<p>Provides information about each device on which the app is installed, and includes the following items:</p> <ul style="list-style-type: none"> • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device from which you want to uninstall the app. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which the app is installed. • IP Address—IP address of the device on which the app is installed. • Tags—Tags that are assigned to the device. • Installed Apps—Apps that are installed on the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
ADD SELECTED DEVICES button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-7 Uninstall App Items (continued)

Item	Description
Selected Devices table	<p>Provides information about each device from which you want to uninstall the app. Devices appear in this table after you check their check boxes in the Installed Devices table and then click ADD SELECTED DEVICES. This table includes the following items:</p> <ul style="list-style-type: none"> Selected Devices—Number of devices from which you want to remove the app. Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. Host Name—Hostname of the device from which you want to uninstall the app. IP Address—IP address of the device from which you want to uninstall the app. Tags—Tags that are assigned to the device from which you want to uninstall the app. Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. Action—Click the x icon x to remove a device from the Selected Devices table. Clicking this icon does not affect the device and does not remove the app from the device. Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
DONE, LET'S GO button	Executes an uninstall operation.


Starting an App on Selected Devices

Starting an app initiates its operation on selected host devices and puts the app in Running state. An app must be installed before you can start it.

To start an app on a device, follow these steps:

Procedure

- Step 1** In Cisco Fog Director, click the **APPS** tab, and then in the Installed Apps area, click the name of the app that you want to start.

- Step 2** On the App Configuration page for the app, click the **More Actions** button  and then choose **Start** from the pop-up menu.
- Step 3** In the Installed Devices table, check the check box for each device on which you want to start the app. For detailed information about this table and locating devices, see the [“Start App and Stop App Options” section on page 4-28](#).
- Step 4** Click the **Add Selected Devices** button.
- The devices with checked check boxes are added to the Selected Devices table. The app will be started on devices that this table list. For detailed information about this table and about removing devices from this table, see the [“Start App and Stop App Options” section on page 4-28](#).
- Step 5** Click the **Done, Let’s Go** button to start the app on the devices that you selected
- The App Configuration page displays, as described in the [“Start App and Stop App Options” section on page 4-28](#).
- While the app is starting on a device, the status of the action displays for that device. Click the device to see the progress of the action. You can click the **ABORT** button under the status display to cancel the start action, as described in the [“Canceling an Action” section on page 4-43](#).
- If the Actions Failed display on this page indicates that the start action failed on any device, you can take any of these actions:
- Click the **RETRY NOW** button to try the action on these devices again. See the [“Retrying a Failed Action for an App” section on page 4-46](#).
 - Click the **View Outstanding Actions** link to display the Actions page, which provides options for managing failed actions for which an action plan is in effect. See the [“Managing Outstanding and Expired Actions for Apps” section on page 4-54](#) for more information.
 - Wait for Cisco Fog Director to retry the failed action according to an action plan that is in effect. See the [“Using Action Plans” section on page 4-50](#). While the action is in progress, you can click the **ABORT** button on the App Configuration page that displays, as described in the [“Canceling an Action” section on page 4-43](#).
-


Stopping an App on Selected Devices

Stopping an app shuts down its operation on selected host devices and puts the app in Stopped state.

You cannot stop an app that provides services if the services that it provides are being used by one or more other apps that are in Running state. Before you stop an app that provides services, stop each app that uses the services that it provides.

To stop an app on a device, follow these steps:

Procedure

- Step 1** In Cisco Fog Director, click the **APPS** tab, and then in the Installed Apps area, click the name of the app that you want to start.
- Step 2** On the App Configuration page for the app, click the **More Actions** button  and then choose **Stop** from the pop-up menu.
- Step 3** In the Installed Devices table, check the check box for each device on which you want to start the app.

For detailed information about this table and locating devices, see the [“Start App and Stop App Options” section on page 4-28](#).

Step 4 Click the **Add Selected Devices** button.

The devices with checked check boxes are added to the Selected Devices table. The app will be stopped on devices that this table list. For detailed information about this table and about removing devices from this table, see the [“Start App and Stop App Options” section on page 4-28](#).

Step 5 Click the **Done, Let’s Go** button to stop the app on the devices that you selected.

The App Configuration page displays, as described in the [“Viewing Detailed Information about an App” section on page 4-5](#).

While the app is stopping on a device, the status of the action displays for that device. Click the device to see the progress of the action. You can click the **ABORT** button under the status display to cancel the stop action, as described in the [“Canceling an Action” section on page 4-43](#).

If the Actions Failed display on this page indicates that the stop action failed on any device, you can take any of these actions:

- Click the **RETRY NOW** button to try the action on these devices again. See the [“Retrying a Failed Action for an App” section on page 4-46](#).
- Click the **View Outstanding Actions** link to display the Actions page, which provides options for managing failed actions for which an action plan is in effect. See the [“Managing Outstanding and Expired Actions for Apps” section on page 4-54](#) for more information.
- Wait for Cisco Fog Director to retry the failed action according to an action plan that is in effect. See the [“Using Action Plans” section on page 4-50](#). While the action is in progress, you can click the **ABORT** button on the App Configuration page that displays, as described in the [“Canceling an Action” section on page 4-43](#).

Removing an App from Cisco Fog Director

Removing an app removes it from Cisco Fog Director.

This section describes how to remove an app from Cisco Fog Director from the Apps View page. You also can remove an app by using the Navigation pane as described in the [“Using the Navigation Pane” section on page 4-59](#).

If multiple versions of an app have been imported to Cisco Fog Director, this remove action removes that most recently imported version only.

To remove an app, perform the following steps.

Procedure

Step 1 Uninstall the app as described in the [“Uninstalling an App” section on page 4-22](#).

Step 2 In the Available Apps area, click the **Remove** button under the icon for the app.

Editing an App Icon, Docker Options, Description, and Release Notes

You can add or update the following items for an app:

- **Icon**—The icon that displays in Cisco Fog Director for the app.
This icon comes from an image file that you specify. The image size should be 250 x 250 pixels. The system accepts images that are other sizes, but those images are scaled and may not appear as desired. The image file can in any of these formats: ai, bmp, drw, gif, ico, jpe, jpeg, jpg, pct, png, psd, psp, raw, scf, svg, svgz, tif, or tiff.
- **Docker Run Options**—Docker run options that are used when you start a Docker app.
- **Description**—Brief description of the app that displays when you view detailed information for the app.
- **Release Notes (optional)**—Notes for the app that appear when you view detailed information for the app. For example, notes might include a list and descriptions of features added in an updated app.

To add or update an icon, description, or release notes for an app, follow these steps:

Procedure

-
- Step 1** If you are not viewing the page that displays when you import an app, in the Available Apps area on the Apps View page, click the icon for the app for which you want to add or update the icon, Docker options, description, or release notes.
 - Step 2** Click the **Edit App** button.
 - Step 3** To add or update Docker run options, enter or edit options in the Docker Run Options field.
 - Step 4** To add or update an icon, take these actions:
 - a. Click the image of the app.
 - b. Click the **SELECT APP ICON** button in the Edit App Icon dialog box that displays.
 - c. Follow the on-screen prompts to locate and select the image file for the icon that you want.
 - Step 5** To add or update a description, enter or edit text in the Description field.
You can use the formatting tools at the top of the Description field to format the text and perform related operations.
 - Step 6** To add or update release notes, enter or edit text in the Release Notes field.
You can use the formatting tools at the top of the Description field to format the text and perform related operations.
 - Step 7** Click the **Save** button near the top right of the page.
-

Reconfiguring App Parameters

You can reconfigure a variety of items that apply to an app. Depending on the app, items that you can reconfigure include:

- Configuration information—Configuration items that are defined in the `package_config.ini` file for the app
- Resource profile—Amount of host system CPU and memory (RAM) resources that the app requires on a device
- Networking—Network from which the app obtains its IP address or addresses
- Resource port—Serial port that the app uses on a device
- Action plan—The number of times and at what intervals Cisco Fog director retries an install, reconfigure, upgrade, or uninstall action that fails due to certain device reachability or network connectivity issues

The configuration settings that you make affect the app on all selected devices. You also can reconfigure app settings for a specific devices as described in the [App Configuration Items](#) rows in [Table 5-3 on page 5-11](#)

The following sections provide additional information:

- [Reconfigure App Options, page 4-34](#)
- [Reconfigure App Procedure, page 4-36](#)


Reconfigure App Options

To view options for reconfiguring an app, click the **Edit Configuration** button on the App Configuration page for the app. This button is under the “Installation Successful on” display and is available only for an app that is installed on at least one device. The Reconfigure App page displays, which displays that includes the items that [Table 4-8](#) describes.

Table 4-8 Reconfigure App Page Items

Item	Description
Installed Devices table	<p>Provides information about each device on which the app is installed, and includes the following items:</p> <ul style="list-style-type: none"> • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device on which you want to reconfigure the app. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which the app is installed. • IP Address—IP address of the device on which the app is installed. • Tags—Tags that are assigned to the device on which the app is installed. • Installed Apps—Apps that are installed on the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Add Selected Devices button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-8 Reconfigure App Page Items (continued)

Item	Description
Selected Devices table	<p>Provides information about each device on which you want to reconfigure the app. Devices appear in this table after you check their check boxes in the Installed Devices table and then click Add Selected Devices. This table includes the following items:</p> <ul style="list-style-type: none"> • Selected Devices—Number of devices on which you want to reconfigure the app. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Host Name—Hostname of the device on which you want to reconfigure the app. • IP Address—IP address of the device on which you want to reconfigure the app. • Tags—Tags that are assigned to the device on which you want to reconfigure the app. • Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. • Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. • Action—Click the x icon  to remove a device from the Selected Devices table. Clicking this icon does not affect the device and does not remove the app from the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.

Reconfigure App Procedure

Reconfiguring an app applies the reconfiguration to multiple devices.

If you are reconfiguring an app that provides services, you must first uninstall other apps that uses the services that this app provides.




Cisco Fog Director associates an action plan with each app reconfiguration procedure that you perform. An action plan instructs Cisco Fog Director to retry a reconfiguration if the reconfiguration fails due to certain conditions, or to perform the reconfiguration within a designated maintenance window. By default, the action plan causes Cisco Fog Director to perform the reconfiguration immediately and to retry a failed reconfiguration up to 10 times at 2 minute intervals. You can change these parameters as needed when you perform the app reconfiguration procedure. For more information, see the [“Using Action Plans”](#) section on page 4-50.

To reconfigure an app from the Apps View page, perform the following steps. The items that you can reconfigure depend on the app, so some configuration options that the following procedure includes may not be available for some apps.

Before You Begin



Make sure that the app is installed as described in the [“Installing an App” section on page 4-11](#).

Procedure

-
- Step 1** In the Installed Apps area on the Apps View page, click the icon for the app that you want to reconfigure, and then click the **Edit Configuration** button on the App Configuration page.
- Step 2** In the Installed Devices table, check the check box for each device on which you want to reconfigure the app.
- For detailed information about this table and locating devices, see the [“Reconfigure App Options” section on page 4-34](#).
- Step 3** Click the **Add Selected Devices** button.
- The devices with checked check boxes are added to the Selected Devices table. The app can be reconfigured on devices that this table list. For detailed information about this table and about removing devices from this table, see the [“Reconfigure App Options” section on page 4-34](#).
- Step 4** To change configuration information for this app, take the following actions.
- Click the Expand icon  next to **Customize Configuration**.
This area is available only if configuration items are defined in the package_config.ini file for the app. The configuration items that display are defined in that file.
 - Make updates as needed in the fields that appear.
The value that each field displays is the default value for that item as defined by the app. To see the current value of an item on a particular device, from the Devices tab, choose a device, and then click **Edit Configuration** near the bottom of the page that displays for the device.
 - (Optional) **Check the Restart app** after configuration check box if you want the app to restart after you save the configuration updates. Some apps require a restart after a configuration change.
 - Click the **Done, Let's Go** button to complete the changes to configuration information.
- Step 5** To reconfigure resource profiles that have been assigned for the app, take these actions:
- Click the Expand icon  next to **Customize Resources**, if this area is not expanded already.
 - Click the Expand icon  next to **Configure Resource Profiles**.
You can update the resource profile for a specific device, some devices, or all devices.
The *device squares* in the box in the middle of the Configure Resource Profile area represent devices on which the app is installed. You can hover your mouse pointer over a device square to display the Edit Resource Profile dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the resource profile that has been assigned for the app on the device. You can click the hostname and IP address in the dialog box to exit the reconfigure procedure and display the Device Details page for the device.
 - If you want to limit the device squares displays to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.

- To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- d. Take the desired action:
- To change the resource profile for a specific device, hover your mouse pointer over the device square for that device, and in the Edit Resource Profile dialog box, choose a resource profile from the **Select Profile** drop-down list.
 - To change the resource profile for all devices for which a device square displayed, click the desired profile radio button and then click the **Reassign Profile** button:
 - **Exact matching profile**—Assigns the resource profile that is defined for the app in its metadata, if the resources are available on a device.
 - **Largest available profile**—Assigns the largest resource profile that is currently available on a device.
 - **Allocate all available resources**—Assigns all CPU and memory resources that are available on each device on which you are installing.
 - **Custom profile**—On each device on which you are installing, assigns the CPU and memory resources that you specify. After you click this radio button, the **CPU** and the **Memory** fields appear. Enter the CPU resources, in units, and memory resources, in MB, to assign on each device. The Max value under each field shows the maximum value that you can enter without exceeding the available corresponding resource on at least one device. If you enter a value that exceeds this maximum value, the **REASSIGN PROFILE** button is dimmed and cannot be used.
- e. If you are finished reconfiguring the app, click the **EDIT RESOURCES** button. Otherwise, continue to the following step, and click the **EDIT RESOURCES** button after you complete that step.

Step 6 To reconfigure network information that relates to how the app obtains its IP address or addresses on each device, take these actions:

- a. Click the Expand icon  next to **Customize Resources**, if this area is not expanded already.
- b. Click the Expand icon  next to **Configure Networking**.

The Configure Networking area is available only if its options apply to this installation. In this case, you can update the network for a specific device, some devices, or all devices.

The *device squares* in the box at the left of the Configure Networking area represent devices on which you are installing the app. The **Unallocated** tab shows device squares for devices for which network allocation could not be performed, if there are any such devices. The **All Devices** tab show all devices that you selected.

You can click a device square to display the Edit Network Details dialog box. This dialog box shows the hostname, IP address, and serial number of the device, tags assigned to the device, and network interface information, if available, for the preferred network that is currently selected. You can click the hostname and IP address to display the Device Details page for the device. If the device uses a bridge network, the Edit Network Details dialog box also provides options for IP address configuration. This dialog box also shows network related errors, if any, for the device.

The Preferred Networks sub areas at the right of the Configure Networking area provide information for each network interface that is defined in the package.yaml file for the app, and lets you add new network interfaces. You can expand a sub area to display and update options in it.

If you want to limit the device squares to one or more specific devices, take either of these actions:

- To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.

- To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- To configure IP address information for the current network interface for a specific device, take the following actions. You can take these action for devices that use a bridge network.
 - a. Click the device square for the device that you want.
The Edit Network Details dialog box appears.
 - b. Click the **IPv4** radio button or the **IPv6** radio button to designate the type of network you are configuring.
 - c. Click one of these radio buttons:
 - **Static**— Click to assign a static IP address for the currently selected network interface.
 - **Dynamic**—Click to use a dynamically assigned IP address from the DHCP pool for the currently selected network interface
 - **Disable**—Available if the device supports network dual stack networking. Click to make this network interface unavailable for the app.
 - d. If you choose **Static Mode**, configure the following fields that appear as needed:
 - **IPv# Address** and **Mask** fields—Enter the static address and subnet mask to use. If the IPv6required field is set to “true” in the app descriptor file (package.yaml) for an app, you must enter an IPv6 address. Otherwise, you can enter an IPv4 or an IPv6 address. If you enter an IPv6 address but a device on which you are installing the app does not support IPv6, the app installation will fail on that device.
 - **DNS** field—(Optional) Enter the IP address of the DNS server that the app uses for external communication.
 - **Default Gateway** field—(Optional) Enter the IP address of the default gateway that the app uses for external communication.
- To update network information for all devices for which a device square is displayed, take these actions for each network interface that you want to configure:
 - a. Expand the Preferred networks sub area.
 - b. Choose a network from the **Network** drop-down list. Options that display depend on the app and device.
 - **iox-bridge#**—App obtains its IP address from a DHCP pool that is configured in Cisco IOS
 - **iox-nat#**—App obtains its IP address from an internal network address translator
 - **iox-nat_docker#**—App obtains its IP address from an internal network address translator
 - **mgmt-bridge#**—App configures its vLAN via this bridge

If you configure a VLAN ID as described later in this procedure, that ID is appended to network names in this drop-down list. For example, if you configure the VLAN ID 333, you might see **mgmt-bridge-v3333**.
 - c. If you choose a bridge network, click one of the following radio buttons that appear:
 - **Static**—Click to assign a static IP address for this network interface
 - **Dynamic**—Click to use a dynamically assigned IP address from the DHCP pool for this network interface
 - **Disable**—Available if any selected device supports network dual stack networking. Click to make this network interface unavailable for the app.
 - d. If you click the **Static** radio button, configure the following fields that appear as needed.

- **IPv# Address** and **Mask** fields—Enter the static address and subnet mask to use. If the IPv6required field is set to “true” in the app descriptor file (package.yaml) for an app, you must enter an IPv6 address. Otherwise, you can enter an IPv4 or an IPv6 address. If you enter an IPv6 address but a device on which you are installing the app does not support IPv6, the edit configuration operation will fail on that device.

- **Default Gateway** field—(Optional) Enter the IP address of the default gateway that the app uses for external communication.

- **DNS** field—(Optional) Enter the IP address of the DNS server that the app uses for external communication.

- e. If you choose a NAT network, configure the following fields that appear as needed.

These fields let you map the TCP port and UDP port that the app descriptor file (package.yaml) for the app defines to other valid ports. These ports are used by the network interface for external communication with the app. The values that these fields display come from the app descriptor file for the app or are the values to which you mapped the values from the app descriptor file.

- **TCP port**—Enter a TCP port to which to map the TCP port that the app descriptor file defines. If the app descriptor file defines a range of ports, for example, 9000-9200, you must enter a range that includes the same number of ports, for example, 9400-9600. Valid TCP port numbers are 1 through 65535.

- **UDP port**—Enter a UDP port to which to map the UDP port that the app descriptor file defines. If the app descriptor file defines a range of ports, for example, 9000-9200, you must enter a range that includes the same number of ports, for example, 10400-10600. Valid UDP port numbers are 1 through 65535.

- f. (Optional) If the device on which you are installing the app supports port mirroring on this network interface, and if the package.yaml file for the app defines mirroring on this network interface, check the **Mirror Mode Enabled** check box that appears to enable port mirroring for the app.

Port mirroring is used to monitor network traffic. When this option is enabled, copies of incoming and outgoing packets at the ports of a network device are flooded to the network bridge domain.

If you enable this options when you have selected multiple devices, but not all of the selected devices support mirroring on this network interface, the app installs only on the devices that support network mirroring.

- g. If the selected bridge for the devices on which you installing the app support VLAN hosting, in the **Vlan ID** field that appears, enter the unique identifier of the VLAN on which this internal network operates. Valid values are integers 1 through 4094.

The ID that you enter can be used for other apps on the same device only if those apps use the same network interface.

- h. To configure additional network interfaces for the device, click **Add New Network Interface** and take the following actions.

You can configure up to three network interfaces, unless the package.yaml file for the app asks for more than three network interfaces, in which case you can configure as many as that file asks for.


Cisco Fog Director displays the interfaces that are common for all device that you selected, including interfaces that you added.

- In the Interface Name field, enter a name for the interface. For example, **eth1**. The name must be unique among the list of interfaces in the Preferred Networks sub area. The name is not case sensitive.

- (Optional) In the Interface Description field, enter a description for the interface.



- Click **Save**.

- Click the down-arrow next to the interface you added to configure its options.

To remove an interface that you have added, click the Delete Interface Icon  next to the interface name. You cannot remove an interface that is specified in the package.yaml file for the app.

- After you configure each network interface that you want, click the **REASSIGN NETWORKS** button.

Step 7 To reconfigure a VNC password that is required to access an app on devices via a VNC session, take these actions:



- Click the Expand icon  next to **Customize Resources**, if this area is not expanded already.
- Click the Expand icon  next to **Configure VNC Password**.

The Configure VNC Password area is available only if the app requests a serial port.

The *device squares* in the box in the middle of the Configure VNC Password area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit VNC password dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and provides a field for entering the VNC password for the device.

- If you want to limit the device squares to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- Take either of these actions:
 - To set the VNC password for a specific device, hover your mouse pointer over the device square for that device, and in the Edit VNC Password dialog box, enter the password in the **VNC Password** field
 - To set the VNC password for all devices for which a device square is displayed, enter the password in the **VNC Password** field that displays to the right of the device squares, and then click the **Assign** button.

Step 8 To reconfigure the number of virtual CPUs that the app requires on a device:

- Click the Expand icon  next to **Customize Resources**, if this area is not expanded already.
- Click the Expand icon  next to **Configure VCPUs**.

The Configure VCPUs area is available only if the app requests virtual CPUs and has more than one virtual CPU to offer.

The *device squares* in the box in the middle of the Configure VCPUs area represent devices on which you are installing the app. You can hover your mouse pointer over a device square to display the Edit VCPU Details dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the number of virtual CPUs that have been assigned for the app on the device.

- If you want to limit the device squares to one or more specific devices, take either of these actions:

- To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
- To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.

b. Take either of these actions:

- To configure the number of virtual CPUs for a specific device, hover your mouse pointer over the device square for that device, and in the Edit VCPU dialog box, type or use the up or down arrow buttons to enter the desired value.
- To configure the number of virtual CPUs for all devices for which a device square is displayed, in the **Select VCPU Value** field that displays to the right of the device square, type or use the up or down arrow buttons to enter the desired value, and then click the **REASSIGN VCPU** button. The text above the **Select VCPU Value** field indicates the number of virtual CPUs that the descriptor file for the app specifies and the maximum number of virtual CPUs that you can designate for the app on the devices that you selected.


Step 9 To reconfigure the serial port that the app uses on a device, take these actions:

- a. Click the Expand icon  next to **Customize Resources**, if this area is not expanded already.
- b. Click the Expand icon  next to **Configure Device Resource Ports**.

The Configure Device Resource Ports area is available only if the app requests a serial port.

The *device squares* in the box in the middle of the Configure Device Resource Ports area represent devices on which the app is installed. You can hover your mouse pointer over a device square to display the Edit Serial Details dialog box. This dialog box shows the hostname and IP address of the device, tags assigned to the device, and the serial port that has been assigned for the app on the device.

- a. If you want to limit the device squares to one or more specific devices, take either of these actions:
 - To limit the device display to a specific device based on its hostname or IP address, enter all or part of the hostname or IP address in the **Search Hostname, IP Address** field.
 - To limit the device display to specific devices based on a tag, choose a tag from the **Show** drop-down list.
- b. Hover your mouse pointer over the device square for the device that you want to update, and in the Edit Serial Details dialog box, choose a port from the **Select Serial Port** drop-down list.
- c. When you are finished reconfiguring resources, click the **EDIT RESOURCES** button.

Step 10 To choose, view, modify, or add an action plan, click the Expand icon  next to **Configure Action Plan**.

The action plan designates how many times and at what interval Cisco Fog Director retries an action if the action fails on a device due to certain device reachability or network connectivity issues. If Cisco Fog Director cannot complete the app reconfiguration action after the number of retries that the action plan designates, the app reconfiguration does not complete.

When you expand **Configure Action Plan**, the **Selected Action Plan** field shows the name of the action plan that is in effect. The **Details** field describes the number of retries and time between retries that the selected action plan defines.


You can choose the action plan that you want from the Selected Action Plan drop-down list.

For information about modifying or adding action plans, see the [“Using Action Plans” section on page 4-50](#).

Step 11 To upload an app data file for the app to devices, expand **Upload App Data** and take the following actions as needed.


An app data file is a file that an app requires, such as a configuration file.

- a. Check the **Delete all files in /appdata** check box if you want Cisco Fog Director to delete all files and subdirectories that are in the /data/appdata directory on a device before uploading an app data file.
- b. In the **File path on app container** field, enter the name of a directory under the /data/appdata directory on the device in which to upload the app data file. If you enter the name of a directory that does not exist, Cisco Fog Director creates that directory under the /data/appdata directory. If you do not enter the name of a directory, Cisco Fog Director uploads the file to the /data/appdata directory.
- c. In the **New file name** field, enter a name to which Cisco Fog Director changes the name of the file that you upload when that file is placed on the device. If you do not enter a file name, Cisco Fog Director does not change the original name of the uploaded file. For example, if you upload a file that is named abc.txt but you want the file to be stored as abc_ver2.txt, enter **abc_ver2.txt** in this field.
- d. Click the **SELECT FILES** button and then follow the on-screen prompts to locate and select the app data file that you want to upload.
- e. Repeat Step 11a through Step 11d to select additional app files to upload.

Each file that you select appears in a list of files to upload under the **SELECT FILES** button. To remove a file from this list, click the Remove icon  next to the file.

- f. Click the **UPLOAD** button to upload the app data files.

Step 12 To enter Docker run options to be used when you start the app, take these actions:

- a. Click the Expand icon  next to **Runtime Options**.
- b. In the Docker Run Options field, enter one or more Docker run options to be used when the app starts.
This field includes the --rm option by default.
- c. If you want to remove the writable container layer from the app container when the app is stopped, check the **Remove writable layer on container stop** check box.
Checking this check box to adds the --rm run option to the Docker Run Options field.
- d. Click the **Update** button.

Canceling an Action

Cisco Fog Director provides the ability to cancel a variety of actions after you start them. This feature is useful if you start an action that is to take place on several devices and you want to stop the action before it completes on all devices.

To use this feature, you select the devices on which to cancel the action. Cisco Fog Director then does not perform the action on any selected device on which the action has not yet started. The action might continue on devices on which it has started already, but Cisco Fog Director stops monitoring and displaying status information about the action on those devices.

You can cancel the following actions:

- Installing an app

- Uninstalling an app
- Upgrading an app
- Reconfiguring app parameters from the Apps View page
- Retrying failed actions for an app

The following sections provide additional information:

- [Table 4-8 Cancel Ongoing Actions Options, page 4-44](#)
- [Canceling an Action on Selected Devices, page 4-45](#)

Cancel Ongoing Actions Options


Options for canceling actions appear in the Abort Ongoing Actions page. This page displays when you click the ABORT button on a page that displays after you start an action.

The Abort Ongoing Actions page displays. This page includes the items that [Table 4-9](#) describes.

Table 4-9 *Abort Ongoing Actions Page Items*

Item	Description
Devices table	<p>Provides information about each device on which you specified that the action be performed:</p> <ul style="list-style-type: none"> • Search Hostname, IP address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device on which you want to cancel the action. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which you specified that the action be performed. • IP Address—IP address of the device on which you specified that the action be performed. • Tags—Tags that are assigned to a device. • Installed Apps—Apps that are installed on the device • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Add Selected Devices button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-9 Abort Ongoing Actions Page Items (continued)

Item	Description
Selected Devices table	<p>Provides information about each device for which you want to cancel the action. Devices appear in this table after you check their check boxes in the Devices table and then click ADD SELECTED DEVICES. This table includes the following items:</p> <ul style="list-style-type: none"> • Selected Devices—Number of devices on which you want to cancel the action. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Host Name—Hostname of the device on which you want to cancel the action. • IP Address—IP address of the device on which you want to cancel the action. • Tags—Tags that are assigned to the device on which you want to cancel the action. • Health—Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information. • Last Heard—How long ago Cisco Fog Director last communicated with the device, or a brief explanation of why the last attempt to communicate with the device was unsuccessful. • Action—Click the x icon  to remove a device from the Selected Devices table. Clicking this icon does not affect the device. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
SUBMIT button	Appears when one or more devices appear in the Selected Devices table. Click to cancel the action on the devices in the Selected Devices table.

Canceling an Action on Selected Devices

To cancel an action, follow these steps:

Procedure

- Step 1** In the page that displays after you start the action, click the **ABORT** button. The Abort Ongoing Actions page displays.

- Step 2** In the Installed Devices table, check the check box for each device for which you want to cancel the action.
- For detailed information about this table and locating devices, see the [“Cancel Ongoing Actions Options” section on page 4-44](#).
- Step 3** Click the **Add Selected Devices** button.
- The devices that you selected are added to the Selected Devices table. The action will be canceled on the devices that this table lists. For detailed information about this table and about removing devices from this table, see the [“Cancel Ongoing Actions Options” section on page 4-44](#).
- Step 4** Click the **SUBMIT** button.
- The action cancels on the devices that you selected. If the action has started on a device, the action might continue on that device, but Cisco Fog Director stops monitoring and displaying status information about the action on that device.
-

Retrying a Failed Action for an App

If any of the following actions fails on one or more devices, you can use the **RETRY NOW** button on the App Configuration page to retry the action:

- Installing an app
- Reconfiguring app parameters
- Upgrading an app
- Uninstalling an app
- Editing app resources



Note

If a failed action has an associated action plan that instructs Cisco Fog Director to retry an app, you also can manually retry the action by using the **RETRY NOW** button on the Actions page as described in the [“Outstanding and Expired Actions Management Procedure” procedure on page 4-57](#).

For detailed information about action plans, see the [“Using Action Plans” procedure on page 4-50](#).

The following sections provide additional information:

- [Retry Failed Action Options, page 4-46](#)
- [Retry Failed Action Procedure, page 4-49](#)

Retry Failed Action Options

To view options for retrying a failed action, click the **RETRY NOW** button on the App Configuration page for the app.

The Select Retry Actions page displays. This page includes the items that [Table 4-10](#) describes.

Table 4-10 Select Retry Actions Page Items

Item	Description
Redeploy app on devices where it failed installation area	
Redeploy button	Click to retry the failed installation operation on the devices that you select in the Devices table in this area.
REMOVE FOREVER button	Click to delete information about the action that failed on the devices that you select in the Devices table in this area and to clear the error from the system.
VIEW DEPLOY ACTION HISTORY button	Click to display the Actions History window for the devices that you select in the Devices table in this area. For a description of this window, see Table 4-11 on page 4-48 .
Devices table	<p>Provides information about each device on which an installation action failed, and includes the following items:</p> <ul style="list-style-type: none"> • Search Hostname, IP address field—Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device on which you want to perform an action. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name—Hostname of the device on which the action is to be performed. • IP Address—IP address of the device on which action is to be performed. • Tags—Tags that are assigned to a device. • Installed Apps—Apps that are installed on the device • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Edit configuration on devices where configuration failed area	
Edit Configuration button	Click to retry the failed configuration operation on the devices that you select in the Devices table in this area.
VIEW EDIT CONFIGURATION ACTION HISTORY button	Click to display the Actions History window for the devices that you select in the Devices table in this area. For a description of this window, see Table 4-11 on page 4-48 .
Devices table	Provides information about each device on which an edit configuration action failed. This table contains the information that the Devices table row in this table describes.

Table 4-10 *Select Retry Actions Page Items (continued)*

Item	Description
Restart app after configuration check box	Check this check box if you want the app to restart after the configuration operation completes. Some apps require a restart after a configuration change.
Customize configuration fields	Displays configuration items that are defined in the package_config.ini file for the app. You can make updates in these fields as needed.
Upgrade app on devices where upgrade failed area	
Upgrade button	Click to retry the failed upgrade operation on the devices that you select in the Devices table in this area.
VIEW UPGRADE ACTION HISTORY button	Click to display the Actions History window for the devices that you select in the Devices table in this area. For a description of this window, see Table 4-11 on page 4-48 .
Devices table	Provides information about each device on which an upgrade action failed. This table contains the information that the Devices table row in this table describes.
Uninstall app from devices where uninstall failed area	
Uninstall button	Click to retry the failed uninstall operation on the devices that you select in the Devices table in this area.
VIEW UNINSTALL ACTION HISTORY button	Click to display the Actions History window for the devices that you select in the Devices table in this area. For a description of this window, see Table 4-11 on page 4-48 .
Devices table	Provides information about each device on which an uninstall action failed. This table contains the information that the Devices table row in this table describes.
Allocate resource for app on devices where resource allocation failed area	
EDIT RESOURCES button	Click to retry the failed resource allocation operation on the devices that you select in the Devices table in this area.
VIEW EDIT RESOURCES ACTION HISTORY button	Click to display the Actions History window for the devices that you select in the Devices table in this area. For a description of this window, see Table 4-11 on page 4-48 .
Devices table	Provides information about each device on which a resource allocation action failed. This table contains the information that the Devices table row in this table describes.

The Action History window displays when you click a **VIEW TYPE ACTION HISTORY** button for a failed action in the Select Retry Actions page. This window includes the items that [Table 4-11](#) describes.

Table 4-11 *Action History Window Items*

Item	Description
Outstanding tab	Click to display devices on which the action is in Outstanding state.
Expired tab	Click to display devices on which the action is in Expired state.

Table 4-11 Action History Window Items (continued)

Item	Description
Host Name field	Hostname of a device on which the action is in Outstanding state or Expired state. You can click a hostname to display the Device Details page for the corresponding device.
IP Address field	IP address of a device on which the action is in Outstanding state or Expired state. You can click an IP address to display the Device Details page for the corresponding device.
Last Attempted field	Date and time that Cisco Fog Director last attempted to perform the action on a device.
Message	Brief description of why the action last failed on the device.
Next attempt	Date and time that Cisco Fog Director will next attempt to perform the action on the device, according to the action plan that is in effect for this action.
Action Type	Type of the outstanding action (Install, Uninstall, Upgrade, Edit Configuration, or Edit Resources).
Pending attempts	For a device with actions in Outstanding state, displays the maximum number of additional times that Cisco Fog Director will attempt to perform the action on the device, according to the action plan that is in effect for this action. For a device that you moved to Expired state by manually canceling future retries, displays the maximum number of retries that were pending when you canceled the retries.

Retry Failed Action Procedure

To retry a failed action, follow these steps:

Procedure

-
- Step 1** From the App Configuration page for the app, click the **RETRY NOW** button. This button is available only if an action failed. The Select Retry Actions page displays, as described in [Table 4-10 on page 4-47](#). This page includes areas that relate to the following failed actions types:
- App install action
 - App reconfigure action
 - App upgrade action
 - App uninstall action
 - App resource allocation action
- Step 2** (Optional) To view a history of failed actions on one or more devices, take these actions:
- a. In the Devices table in the area for the type of failed action for which you want to view history, check the check box for each device for which you want to see information.
 - b. **VIEW TYPE ACTION HISTORY** button in the same area.

Step 3 Take the desired actions:

- To retry an install action, take these actions in the **Redeploy app on devices where it failed installation** area:
 - a. In the devices table, check the check box for each device on which you want to retry the action.
 - b. Click the **REDEPLOY** button to retry the installation operation on the devices that you selected, or click the **REMOVE FOREVER** button delete information about the action that failed on the devices that you select and to clear the error from the system.
- To retry an edit configuration action, take these actions in the **Edit Configuration on devices where configuration failed** area:
 - a. In the devices table, check the check box for each device on which you want to retry the action.
 - b. If needed, edit information that displays the Customize Configuration fields. These fields display configuration items that are defined in the package_config.ini file for the app.
 - c. Check the **Restart app after configuration** check if you want the app to restart after the edit configuration operation completes. Some apps require a restart after a configuration change.
 - d. Click the **EDIT CONFIGURATION** button to retry the edit configuration operation on the devices that you selected.
- To retry an upgrade action, take these actions in the **Upgrade app on devices where upgrade failed** area:
 - a. In the devices table, check the check box for each device on which you want to retry the action.
 - b. Click the **UPGRADE** button to retry the upgrade operation on the devices that you selected.
- To retry an uninstall action, take these actions in the **Uninstall app on devices where uninstall failed** area:
 - a. In the devices table, check the check box for each device on which you want to retry the action.
 - b. Click the **UNINSTALL** button to retry the uninstall operation on the devices that you selected.
- To retry a resource allocation action, take these actions in the **Allocate resource for app on devices where resource allocation failed** area:
 - a. In the devices table, check the check box for each device on which you want to retry the action.
 - b. Click the **EDIT RESOURCES** button to retry the resource allocation operation on the devices that you selected.

The App Configuration page displays, as described in the [“Viewing Detailed Information about an App” section on page 4-5](#).

While the system is retrying an action on a device, the status of the retry operation displays for that device. Click the device to see the progress of the operation. You can click the **ABORT** button under the status display to cancel the operation, as described in the [“Canceling an Action” section on page 4-43](#).

Using Action Plans

An *action plan* is a Cisco Fog Director policy that instructs Cisco Fog Director to retry an app installation, configuration, upgrade, or uninstallation action if the action fails due to certain conditions, or to perform the action within a designated maintenance window.

Cisco Fog Director automatically associates an action plan with each app installation, configuration, upgrade, or uninstallation that you perform. By default, the action plan causes Cisco Fog Director to perform the action immediately and to retry a failed action up to 10 times at 2 minute intervals. You can change these parameters as needed when you perform an app installation, configuration, upgrade, or uninstallation procedure.

If you perform an action that has an action plan that instructs Cisco Fog Director to retry the action and the action does not complete successfully when you execute it, or if the action plan instructs Cisco Fog to perform the action in a designated maintenance window, the action will be in one of these states:

- **Outstanding**—The action will be retried or executed in a maintenance window according to the action plan that is associated with the action
- **Expired**—The action did not complete successfully but will no longer be retried because the maximum number of retries that the associated action plan specifies, the maintenance window or windows that were scheduled for the action no longer exist, you manually canceled future retries of the action, or the failure is not related to certain device reachability or network connectivity issues

For more information about these states and how to manage actions that are in these states, including information about manually retrying or canceling future retries of an action, see the [“Managing Outstanding and Expired Actions for Apps” procedure on page 4-54](#).

- The following sections provide more detailed information about action plans:
- [Action Plan Guidelines, page 4-51](#)
- [Managing Action Plans, page 4-52](#)

Action Plan Guidelines

The following guidelines apply to action plans:

- Cisco Fog Director associates an action plan with every app installation, configuration, upgrade, and uninstallation procedure that you perform.
- Cisco Fog Director includes the action plan named `FogDirectorDefaultPolicy`. By default, this action plan designates that an action that fails be retried up to 10 times at 2 minute intervals. The system uses this action plan unless you specify that it use another one.
- You can modify or create an action plan when you perform an app installation, configuration, upgrade, or uninstallation procedure. If you do so, Cisco Fog Director saves the modifications or creation when you complete the procedure. If you exit the procedure without completing it, your action plan changes are not saved.
- For each action plan, you can designate that it take effect immediately or within a maintenance window, the number of times and at what interval it causes an action to be retried, and whether it is the default action plan.
- After action plan modifications or creations are saved, the updates that you made are available and used for all future app installation, configuration, upgrade, or uninstallation actions.
- If you delete an action plan, it is removed from Cisco Fog Director immediately. You do not need to complete the app installation, configuration, upgrade, or uninstallation procedure to save the deletion.
- The action plan that is currently designated as the default cannot be deleted from Cisco Fog Director.
- When you make an action plan the default, any actions that are pending under an action plan that was the previous default are not affected.

- If you do not want Cisco Fog Director to automatically retry a failed action, you can set the existing default action plan to 0 retries, or create a new default action plan that designates 0 retries.
- If Cisco Fog Director cannot complete an action after the number of retries that the action plan designates, the action does not complete.



Managing Action Plans

This section describes how to manage action plans. Action plan management tasks include:

- Modifying the number of times and at what interval an action plan causes Cisco Fog Director to retry a failed action
- Configuring (scheduling) an action plan to execute or retry actions only during one or more designated time periods, called *maintenance windows*
- Setting an action plan as the default action plan
- Creating a new action plan, called a *custom action plan*
- Deleting an action plan that is not the current default action plan or in use










To manage an action plan, follow these steps:

Procedure

-
- Step 1** When performing an app installation, configuration, upgrade, or uninstallation procedure, expand **Configure Action Plan** when this option becomes available during the procedure.
- Step 2** Take one of these actions:
- To create a new custom action plan, from the **Selected Action Plan** drop-down list, choose **[Define a new plan...]**. Continue to [Step 3](#).
 - To modify an custom action plan, from the **Selected Action Plan** drop-down list, choose the name of the plan, and click the Edit Action Plan icon  next to the action plan name. Skip to [Step 4](#).
You cannot modify an action plan when an action is in Outstanding state according to the plan. In this situation, the Edit Action Plan icon is dimmed.
 - To delete an action plan, from the **Selected Action Plan** drop-down list, choose the name of the plan, and click the Delete icon  next to the name.
The action plan is removed from Cisco Fog Director immediately and no further steps are needed, although you can complete the app installation, configuration, upgrade, or uninstallation procedure.
You cannot delete an action plan that is the current default or when an action is in Outstanding state according to the plan. In these situations, the delete icon is dimmed.
- Step 3** In the **Plan Name** field, enter a descriptive name for the new action plan.
- Step 4** (Optional) Check the **Make this plan the default** check box to make this action plan the default action plan.
Cisco Fog Director uses the default action plan if you do not choose another one when performing an action.
This check box does not appear if this action plan is the current default.
- Step 5** Choose one of the following **Action Type** radio buttons (*Action* identifies the type of procedure that you are performing when you access this option):

- **Now**—Causes the action plan to take effect as soon as you complete the app installation, configuration, upgrade, or uninstallation procedure. In this situation, if an action that is associated with this action plan fails, Cisco Fog Director immediately begins to retry the action according to this action plan. Skip to [Step 7](#).
- **In a maintenance window**—Causes the action plan to be in effect according to the schedule (called a *maintenance window*) that you specify. In this situation, an action that is associated with this action plan does not execute until the beginning of the maintenance window, and if the action fails, Cisco Fog Director retries the action according to this action plan only within the maintenance window. Continue to [Step 6](#).

Step 6 From the **Maintenance window type** drop-down list, choose one of the following options to define the schedule for this action plan:

- **Once**—Causes the action plan to be in effect for the designated time period on the designated date. If you choose this option, enter information in the **Maintenance window date and time** fields that appear as follows:
 - **Date** field—Click the calendar icon  and then choose the date on which the action plan should be in effect.
 - **From** field—Click the clock icon  and then choose the time on the selected date at which the action plan should begin to take effect.
 - **To** field—Click the clock icon  and then the time on the selected date after which the action plan should no longer be in effect.
 - **Time zone** field—Specifies the time zone for the times in the **From** and **To** fields. By default, this field displays the time zone of your PC. We recommend that you use the time zone of the server on which Cisco Fog Director is running. To change the time zone that displays in this field, click this field, click its delete icon , and then start typing the time zone that you want. You can choose a time zone from the list that displays.
- **Every day**—Causes the action plan to be in effect for the designated time period every day or until the action goes to Expired state. If you choose this option, enter information in the **Maintenance window** fields that appear as follows:
 - **From** field—Click the clock icon  and then choose the time on the selected date at which the action plan should begin to take effect.
 - **To** field—Click the clock icon  and then the time on the selected date after which the action plan should no longer be in effect.
 - **Time zone** field—Specifies the time zone for the times in the **From** and **To** fields. By default, this field displays the time zone of your PC. We recommend that you use the time zone of the server on which Cisco Fog Director is running. To change the time zone that displays in this field, click this field, click its delete icon , and then start typing the time zone that you want. You can choose a time zone from the list that displays.
- **On selected days of the week**—Causes the action plan to be in effect for the designated time period on each day that you choose or until the action goes to Expired state. If you choose this option, enter information in **Maintenance days** and **Maintenance window** fields that appear:
 - **Maintenance days** field—Check the check box for each day on which the action plan should be in effect.
 - **From** field—Click the clock icon  and then choose the time on each day at which the action plan should begin to take effect.
 - **To** field—Click the clock icon  and then the time on the selected date after which the action plan should no longer be in effect.

- **Time zone** field—Specifies the time zone for the times in the **From** and **To** fields. By default, this field displays the time zone of your PC. We recommend that you use the time zone of the server on which Cisco Fog Director is running. To change the time zone that displays in this field, click this field, click its delete icon **X**, and then start typing the time zone that you want. You can choose a time zone from the list that displays.
- **On a cron schedule**—Causes the action plan to be in effect for a time period that begins according to a cron schedule that you designate and lasts for the amount of time that you specify. If you choose this option, enter information in the **Cron Expression** and **Maintenance window duration** fields that appear:
 - **Cron expression** field—Enter a cron expression that defines date and time that the action plan should start. The expression should be in the format *MinuteHourDateMonthDayYear*, where:
 - *Minute*—Minutes after the hour. Valid values are 1 through 59.
 - *Hour*—Hour of the day, in 24-hour format. Valid values are 0 through 23.
 - *Date*—Date of the month. Valid values are 1 through 31.
 - *Month*—Month of the year. Valid values are 1 (January) through 12 (December).
 - *Day*—Day of the week. Valid values are 1 (Sunday) through 7 (Saturday).
 - *Year*—Four-digit year.
 - **Maintenance window duration** field—Enter the number of minutes that the action plan should be in effect from the time that it starts.

Step 7 In the **Number of times to retry failed installs** field, enter the number of times that Cisco Fog Director retries a failed action.

If you do not want Cisco Fog Director to retry a failed action, enter **0** in this field.

Step 8 In the **Minimum duration between retries** field, enter the minimum number of minutes that Cisco Fog Director waits from the time that an action last failed before retrying the action.

In some situations, internal system factors can cause the system to wait for a time that is longer than the minimum.

Step 9 Complete the app installation, configuration, upgrade, or uninstallation procedure to save modifications that you made to this custom action plan.

You do not need to complete the procedure if you deleted this action plan.

Managing Outstanding and Expired Actions for Apps

If an action does not complete successfully when you execute it and it has an action plan that instructs Cisco Fog Director to retry a failed action, or if an action has an action plan that instructs Cisco Fog to perform the action in a designated maintenance window, the action will be in one of these states:

- **Outstanding**—The action will be retried or executed in a maintenance window according to the action plan that is associated with the action
- **Expired**—The action did not complete successfully but will no longer be retried due to any of the following situations:
 - The maximum number of retries that an action plan specifies for the action has been reached
 - The maintenance window or windows that were scheduled for the action no longer exist

- You manually cancel future retries of the action
- The failure is not related to certain device reachability or network connectivity issues

You can manage actions that are in these states by using information and options on the Actions page.

The following sections provide additional information:

- [Outstanding and Expired Actions Management Options, page 4-55](#)
- [Outstanding and Expired Actions Management Procedure, page 4-57](#)

Outstanding and Expired Actions Management Options

To view options for outstanding actions, click the **View outstanding actions** link on the App Configuration page. This link displays if one or more app actions are in Outstanding state. The following information displays:

- **Install**—Number of devices on which an app install action is in Outstanding state
- **Edit**—Number of devices on which an app configuration action is in Outstanding state
- **Upgrade**—Number of devices on which an app upgrade action is in Outstanding state
- **Uninstall**—Number of devices on which an app uninstall action is in Outstanding state

To see detailed information about the install, edit, upgrade, or uninstall action that are in Outstanding state or Expired state, click the display for the action type that you want. The Actions page displays. This page includes the items that [Table 4-12](#) describes.

Table 4-12 *Actions Page Items*

Item	Description
Search box	Type all or part of a hostname or IP address to display information for devices with matching information. The table display updates as you type.
Show drop-down list	Choose an option to designate the devices that display in the Devices table: <ul style="list-style-type: none"> • All—Displays devices on which one or more app install, configuration, upgrade, or uninstall action is in Outstanding state or Expired state • Install—Displays devices on which one or more app install action is in Outstanding state or Expired state • Edit—Displays devices on which one or more app configuration action is in Outstanding state or Expired state • Upgrade—Displays devices on which one or more app upgrade action is in Outstanding state or Expired state • Uninstall—Displays devices on which one or more app uninstall action is in Outstanding state or Expired state
Outstanding button	Click to displays devices for which actions are in Outstanding state.
Expired button	Click to displays devices for which actions are in Expired state.

Table 4-12 Actions Page Items (continued)

Item	Description
Devices table	<p>Provides information about each device on which actions are in Outstanding state or Expired state:</p> <ul style="list-style-type: none"> • Check box—Check the check box for each device on which you want to manually retry the action or cancel additional retries of an action. You can click the check box in the title row of the table to quickly check all boxes in the table. • Host Name field—Hostname of a device on which the action is in Outstanding state or Expired state. • IP Address field—IP address of a device on which the action is in Outstanding state or Expired state. • Last Attempted field—Date and time that Cisco Fog Director last attempted to perform the action on the device. • Message—Brief description of why the action last failed on the device. • Next attempt—Date and time that Cisco Fog Director will next attempt to perform the action on the device, according to the action plan that is in effect for this action. • Action Type—Type of the outstanding action (Install, Uninstall, Upgrade, Edit Configuration, or Edit Resources). • Pending attempts—For a device with actions in Outstanding state, displays the maximum number of additional times that Cisco Fog Director will attempt to perform the action on the device, according to the action plan that is in effect for this action. For a device that you moved to Expired state by manually canceling future retries, displays the maximum number of retries that were pending when you canceled the retries. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Add Selected Devices button	Click to add devices with checked check boxes to the Selected Devices table.

Table 4-12 *Actions Page Items (continued)*

Item	Description
Selected Devices table	<p>Provides information about each device on which you want to manually retry an action or cancel additional retries of an action. Devices appear in this table after you check their check boxes in the Installed Devices table and then click Add Selected Devices. This table includes the following items:</p> <ul style="list-style-type: none"> • Host Name field—Hostname of a device on which to manually retry or cancel future retries of an action • IP Address field—IP address of a device on which to manually retry or cancel future retries of an action • Message—Can display the following information: <ul style="list-style-type: none"> – Brief description of why the action last failed on the device – “Scheduled”—Indicates that the action is scheduled to run in an a future maintenance window – “Expired because no future maintenance window exists”—Indicates that the action is in Expired state • Action Type—Type of the outstanding action (Install, Uninstall, Upgrade, Edit Configuration, or Edit Resources) • Action—Click the x icon x to remove a device from the Selected Devices table • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table
RETRY NOW button	Click to immediately execute on the devices that are listed in the Selected Devices table an action that is in Outstanding device.
CANCEL OUTSTANDING button	Click to stop Cisco Fog Director from retrying the action on the devices that are listed in the Selected Devices table. Choosing this option cancels the action plan that is in effect for the action on this device and moves the action on this device to Expired state.

Outstanding and Expired Actions Management Procedure

This section describes how to manage actions that are in Outstanding state or Expired state. Management tasks include:

- Viewing information about actions.
- Manually retrying actions. You can manually retry actions that are in Outstanding state or in Expired state.
- Canceling future retries of actions.

You also can manually retry an action as described in the [“Retrying a Failed Action for an App”](#) section on page 4-46, and cancel future retries for outstanding actions on a device as described in the [“Device Details Area”](#) section on page 5-6.

To view information about, manually retry, or cancel future retries of actions in Outstanding state or Expired state, follow these steps:

Procedure

-
- Step 1** On the App Configuration page, click the **View outstanding actions** link, and then click the Action display (**Install**, **Edit**, **Upgrade**, or **Uninstall**) for the action type that you want.
- The Actions page displays. By default, this page shows devices on which the action that you chose is in Outstanding state. For descriptions of the items on this page, see [Table 4-12 on page 4-55](#).
- Step 2** (Optional) To display information in the Devices table for devices that have actions of a specific type or in a specific state, take these actions:
- To display information for devices that have outstanding actions of a particular type, choose one of the following options from the **Show** drop-down list:
 - **All**—Displays devices on which one or more app install, configuration, upgrade, or uninstall actions are in Outstanding state or Expired state
 - **Install**—Displays devices on which one or more app install actions are in Outstanding state or Expired state
 - **Edit**—Displays devices on which one or more app configuration action is in Outstanding state or Expired state
 - **Upgrade**—Displays devices on which one or more app upgrade actions are in Outstanding state or Expired state
 - **Uninstall**—Displays devices on which one or more app uninstall actions are in Outstanding state or Expired state
 - To display devices on which an action type is in Expired state, click the **Expired** button.
 - To display devices on which an action type is in Outstanding state, click the **Outstanding** button.
- Step 3** To manually retry an action or cancel future retries of an action, take these actions:
- a. In the Installed Devices table, check the check box for each device on which you want to manually retry an action or cancel future retries of an action.
- For detailed information about this table and locating devices, see the [“Outstanding and Expired Actions Management Options” section on page 4-55](#).
- b. Click the **Add Selected Devices** button.
- The devices with checked check boxes are added to the Selected Devices table. Actions will be retried or canceled on the devices that this table lists. For detailed information about this table and about removing devices from this table, see the [“Outstanding and Expired Actions Management Options” section on page 4-55](#).
- c. Click the desired button:
 - **RETRY NOW**—Click to immediately retry the actions on the devices that are listed in the Selected Devices table.
 - **CANCEL OUTSTANDING**—Click to stop Cisco Fog Director from retrying the action on the devices that are listed in the Selected Devices table.

Choosing this option cancels the action plan that is in effect for the action on this device and moves the action on this device to Expired state. In his situation, Cisco Fog Director no longer retries the action or runs it a future maintenance window.
-





Using the Navigation Pane

The Navigation pane displays at the left side of the App Configuration page and the App Monitoring page.

This page lists the names of apps that are available or installed in Cisco Fog Director. The number in parentheses next to an app name indicates the number of devices on which the app is installed.

This pane also displays the Import App button, which you can use to import an app as described in the [“Importing an App” section on page 4-9](#).

In the Navigation page, you can perform any of these tasks:


- See a list of versions of the app that are installed or available for installation—Click the **Expand** icon  next to an app name. The number in parentheses next to an app version indicates the number of devices on which the version is installed.
- Remove all versions of an app from Cisco Fog Director:
 1. Uninstall the app as described in the [“Uninstalling an App” section on page 4-22](#).
 2. Hover your mouse over the app name and click the **Remove** icon  that displays.
- Remove a specific version of an app from Cisco Fog Director:
 1. Uninstall the app as described in the [“Uninstalling an App” section on page 4-22](#).
 2. Click the **Expand** icon  next to the name of the app whose version you want to remove.
 3. Hover your mouse over the version and click the **Remove** icon  that displays.

Exporting an App

The export feature saves an app that appears in the Available or the Installed areas on the Apps View page to a file outside of Cisco Fog Director. The format of the exported file is the same format as the original app file (.tar or .tar.gz).

To export an app, follow these steps:

Procedure

Step 1 From the App Configuration page for the app, click the **More Actions** button  and then choose **Export** from the pop-up menu.

Step 2 Follow the on-screen prompts to save the app in the location of your choice.

The file is named *app-name_version.tar* or *app-name_version.tar.gz*, depending on the format of the original app file.

Monitoring an App

Monitoring an app provides information about the operation of an app across all devices on which it is installed. This information can be useful for evaluating the operation of the app or for troubleshooting. The following sections describe the app monitoring features:

- [Viewing General Monitoring Information, page 4-60](#)

- [Viewing Detailed Monitoring Information, page 4-63](#)

Viewing General Monitoring Information

To view general monitoring information about an installed app, take any of these actions:

- In the Installed Apps area on the Apps View page, click a status for the app
- From the App Configuration page, click the **MONITOR** button

The App Monitoring page displays. This page includes information and features that apply to the app, and includes some or all of the items that [Table 4-13](#) describes.

Table 4-13 App Monitoring Page Items

Item	Description
Navigation pane	Appears on the left side of the page. Provides information about apps that are available or installed in Cisco Fog Director, and lets you remove apps or versions of an app. See the “Using the Navigation Pane” section on page 4-59.
Installed-on information	Shows the number of devices on which the app has been successfully installed.
Configure View link	Click to display detailed information about the app, as described in the “Viewing Detailed Information about an App” section on page 4-5.
APP DOWNTIME	Shows the number of devices on which the app has been in Running state or in Stopped state during the designated time period. Hover your mouse pointer over any part of the chart to see detailed information about a data point. You can click Day , Week , or Month above this graph to designate the time period for the information.

Table 4-13 App Monitoring Page Items (continued)

Item	Description
Status charts	<p>Show information about devices on which an app is running and on which an app is stopped. For each state, a chart shows the name of the state, and the number of devices on which the app is in that state, and the percentage of devices on which the app is installed that the app is in that state.</p> <p>You can click the following buttons under a status chart:</p> <ul style="list-style-type: none"> • STOP—Appears under the Running chart. Click to stop the app, which shuts down its operation on the host devices on which it is running and puts it in Stopped state on these devices. • START—Appears under the Stopped chart. Click to start the app, which initiates its operation on the host devices on which it is stopped and puts it in Running state on these devices. • VIEW DETAIL—Appears under each chart and provides access to information that can be useful for troubleshooting. See the “Viewing Detailed Monitoring Information” section on page 4-63. <p>Note You also can start and stop an app from the Devices View page as described in the “Starting or Stopping an App on a Device” section on page 5-40.</p> <p>You cannot stop an app that provides services if the services that it provides are being used by one or more other apps that are in Running state. To stop an app that provides services, first stop each app that uses the services that it provides.</p>
Alert Information	<p>Appears if Cisco Fog Director has detected one or more alerts for the app and you have not yet responded to the alerts. This area includes these items:</p> <ul style="list-style-type: none"> • Alerts bar—Displays the number of alerts for this app that you have not ignored. • Critical Issues—Displays the number of alerts whose severity is critical. Click to display the App Alerts table on this page with information about these alerts. • Warnings—Displays the number of alerts whose severity is warning. Click to display the App Alerts table on this page with information about these alerts. • Info Events—Displays the number of alerts whose severity is info. Click to display the App Alerts table on this page with information about these alerts. <p>See the “Managing App Alerts” section on page 4-64.</p>

Table 4-13 App Monitoring Page Items (continued)

Item	Description
App Alerts table	<p>Appears if you click Critical Issues, Warnings, or Info Events in the Alert Information area and provides information about each active alert for the app. Includes the following items:</p> <ul style="list-style-type: none"> • Show drop-down list—Choose the type of alert to display in the App Alerts table. Options are All (to display all alerts), Status, Health, Configuration, Resources, Memory Consumption, Disk Consumption, CPU Consumption, Device Clock Sync, and Device Reachability. • VIEW ALL button—Click to display the Alerts page, on which you can view alerts for the app and respond to alerts. See the “Managing App Alerts” section on page 4-64. • Search Hostname, IP address field—Type all or part of a hostname or IP address of a device to display alert information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display alert information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Type—Type of alert (status, health, config, resource, reachability, memoryconsumption, diskconsumption, cpuconsumption, clocksync). • IP Address—IP address of the device on which the alert is active. • Time—Date and time that the alert was generated. • Message—Brief description of the alert. • Suggestion—Recommended action for you to take to clear the alert. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.

Table 4-13 App Monitoring Page Items (continued)

Item	Description
App Consumption	<p>Displays the following charts, which provide information about device resources that the app consumes:</p> <ul style="list-style-type: none"> • Mean CPU Consumption—Average (mean) CPU resources that the app used on devices on which it ran during the designated time period. • Mean Disk Consumption—Average (mean) hard disk space that the app used on devices on which it ran during the designated time period. • Mean Memory Consumption—Average (mean) RAM resources that the app used on devices on which it ran during the designated time period. • Mean Network Consumption—Average (mean) network bandwidth that the devices on which the app ran used for the app during the designated time period. <p>You can click Day, Week, or Month above these charts to designate the time period for the information that the charts display.</p> <p>Hover your mouse pointer over any part of a chart to see detailed information about a data point.</p> <p>Click a chart to display a table with detailed information about the corresponding resource consumption for individual devices. The tables include the following items:</p> <ul style="list-style-type: none"> • Host Name—The hostname of the device on which the resource is consumed. Click a hostname to display device details information for the device. See the “Viewing Detailed Information about a Device” section on page 5-5. • IP Address—The IP Address of the device on which the resource is consumed. Click an IP address to display device details information for the device. See the “Viewing Detailed Information about a Device” section on page 5-5. • Tags—Tags that have been assigned to the device. See the “Managing Tags for Devices” section on page 5-38. • CPU Consumption, Disk Consumption, Memory Consumption, or Network Consumption (depending on the chart that you clicked)—Shows the average (mean) resource consumption of the app on the device during the designated time period.

Viewing Detailed Monitoring Information

To view general monitoring information about an installed app, click either of these buttons on the App Monitoring page:

- **VIEW DETAIL** under the Running Devices chart—Displays a table for the devices on which the app is in Running state. This table includes the **Running Devices** tab and the **Error** tab.

This button is dimmed if the app is not in the Running state on at least one device.

- **VIEW DETAIL** under the Stopped Devices chart—Displays a table for the devices on which the app is in Stopped state. This table includes the **Stopped Devices** tab and the **Error** tab.

This button is dimmed if the app is not in the Stopped state on at least one device.

The **Running Devices** or **Stopped devices** tab in the table provide information for devices on which the app is in the corresponding state. The **Error** tab provides information about devices on which the app is in an error state of some kind.

This table includes the items that [Table 4-3](#) describes.

Table 4-14 Detailed Monitoring Information for an App

Item	Description
Search Hostname, IP Address field	Type all or part of a hostname or IP address of a device to display information for devices with matching information. The table display updates as you type.
Host Name	Hostname of the device on which the app is in the state. Click a hostname to display device details information for the device. See the “ Viewing Detailed Information about a Device ” section on page 5-5.
IP Address	IP Address of the device on which the app is in the state. Click an IP address to display device details information for the device. See the “ Viewing Detailed Information about a Device ” section on page 5-5.
Tags (on Running Devices or Stopped Devices tab only)	Tags that have been assigned to the device. See the “ Managing Tags for Devices ” section on page 5-38.
Health	Icons that represent information about CPU use or memory use on the device. Hover your mouse pointer over an icon to see more detailed information.
View App Log button (on Running Devices or Stopped Devices tab only)	Click to display log information that is generated by the app on a device.
Error Summary (on Error tab only)	Brief description of the error that occurred.
Pagination controls	Click a control to go to the first, next, last, previous, or specific page in the table. From the Items per page drop-down list, choose the maximum number of devices that appear in each page of the table.

Managing App Alerts

Cisco Fog Director generates alerts in various situations. An alert is information that the system collects and provides when it detects certain issues with an app or device.

Each alert has one of the following types, depending on the situation that caused Cisco Fog Director to generate the alert:

- **Status**—App has a state mismatch on a device or failed to install or uninstall on a device. An app state mismatch situation occurs when the state of the app (Running, In Progress, Stopped, or Failed) is not the state that Cisco Fog Director expects.
- **App Health**—App is corrupted on a the device or has some other issue with its health.
- **App Configuration**—Configuration of the app does not match the app configuration settings on the device. This situation can occur if the app configuration is modified outside of Cisco Fog Director.
- **App Resource**—Resources of the app do not match the app resource settings on the device. This situation can occur if the app resources are modified outside of Cisco Fog Director.
- **Device Reachability**—Cisco Fog Director cannot contact the device after making the number of consecutive polling attempts as configured for **Heartbeat Miss Count** for the device profile of the device. In this situation, there is one Device Reachability alert for each app that is installed on the device.
- **Memory Consumption**—During the last hour, an app has consumed more than 95% of the memory that is configured for it on the device.
- **Disk Consumption**—During the last hour, an app has consumed more than 95% of the disk space that is configured for it on the device.
- **CPU Consumption**—During the last hour, an app has consumed more than 95% of the CPU resources that are configured for it on the device.
- **Device Clock Sync**—The time of the device clock is ahead of the time of the Cisco Fog Director clock.
- **Read Rate**—App has read data from the from the disk on a device at a rate faster than the maximum read rate threshold that is configured for the device. This threshold is configured by using the `max_read_rate` parameter in the device `system-config.ini` file.
- **Write Rate**—App has written data to the from the disk on a device at a rate faster than the maximum write rate threshold that is configured for the device. This threshold is configured by using the `max_write_rate` parameter in the device `system-config.ini` file.

In addition, each app has one of the following severity levels, which helps you determine the importance of the alert:

- **Critical**—App has crashed or has a state mismatch.
- **Warning**—App has a configuration mismatch or resource mismatch.
- **Info**—App was detected on the device but Cisco Fog Director does not know the intended state of the app. This situation occurs in a app is installed on a device through Cisco Fog Director and then the device is deleted from and then added again to Cisco Fog Director.

Cisco Fog Director provides detailed alert information on the Alerts page and on the App Monitoring page. An alert that Cisco Fog Director displays on these pages is an *active alert*. You can choose to ignore any alert, which permanently removes it from the display on these pages and from Cisco Fog Director.

The following sections provide additional information:

- [App Alert Options, page 4-65](#)
- [Ignoring App Alerts, page 4-68](#)

App Alert Options

To display options for viewing and ignoring alerts for an app take either of these actions:

- On the Apps View page, click **Alerts** under the app name and icon for the app whose alerts you want to view or ignore
- In the Alerts area on the App Monitoring page, click **Critical Issues**, **Warnings**, or **Info Events** to display the Alerts table for alerts of the corresponding severity, and then click the **VIEW ALL** button that appears above the table


The Alerts page displays. This page includes the items that [Table 4-15](#) describes.

If you accessed this page from the Apps View page, the App Alerts table shows by default all active alerts. If you accessed this page from the App Monitoring page, the App Alerts table shows by default only alerts that match the severity that you chose (critical, warning, or info).

Table 4-15 Alerts Page Items

Item	Description
App Alerts table	<p>Provides information about active alerts for the app, and includes the following items:</p> <ul style="list-style-type: none"> • Show drop-down list—Choose the type of alert to display in the App Alerts table. Options are All (to display all alerts), Status, Health, Configuration, Resources, Memory Consumption, Disk Consumption, CPU Consumption, Device Clock Sync, and Device Reachability. • Critical button—Click to display in the App Alerts table only alerts with a severity of Critical. • Warning button—Click to display in the App Alerts table only alerts with a severity of Warning. • Info button—Click to display in the App Alerts table only alerts with a severity of Info. • Search Hostname, IP address field—Type all or part of a hostname or IP address of a device to display alert information for devices with matching information. The table display updates as you type. • Show field—Enter the name of a tag and then press the Enter key to display alert information for devices with a matching tag. You can choose a tag from a drop-down list of available tags by typing the first few letters of the tag and then clicking the tag that you want. • Check box—Check the check box for each device on which you want to ignore the alert. You can click the check box in the title row of the table to quickly check all boxes in the table. • Type—Type of alert (status, health, config, resource, reachability, memoryconsumption, diskconsumption, cpuconsumption, clocksycn). • IP Address—IP address of the device on which the alert is active. • Time—Date and time that the alert was generated. • Message—Brief description of the alert. • Suggestion—Recommended action for you to take to resolve the issues that generated the alert • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
ADD SELECTED ALERTS button	Click to add devices with checked check boxes to the Selected Alerts table.

Table 4-15 Alerts Page Items (continued)

Item	Description
Selected Alerts table	<p>Provides information about each alert that you want to ignore. Alerts appear in this table after you check their check boxes in the App Alerts table and then click ADD SELECTED ALERTS. This table includes the following items:</p> <ul style="list-style-type: none"> • Selected Alerts—Number alerts that you want to ignore. • Search Hostname, IP Address field—Type all or part of a hostname or IP address of a device to display alerts for devices with matching information. The table display updates as you type. • Type—Type of alert (status, health, config, resource, reachability). • IP Address—IP address of the device on which the alert is active. • Time—Date and time that the alert was generated. • Action—Click the x icon  to remove an alert from the Selected Alerts table. Clicking this icon does not affect the alert. • Pagination controls—Click a control to go to the first, next, last, previous, or specific page in the table. • Items per page drop-down list—Choose the maximum number of devices that appear in each page of the table.
Ignore button	Available if there is at least one device in the Selected Alerts table. Click to remove the alert from Cisco Fog Director.

Ignoring App Alerts

You remove an app alert from Cisco Fog Director by choosing to ignore it. When you ignore an app, it is removed from the Alerts page, from the alert counters on the Apps View page, and from the Alert Information area and the Alerts table on the App Monitoring page.

To ignore an app alert, follow these steps:

Procedure

Step 1

Take either of these actions:

- On the Apps View page, click **Alerts** under the app name and icon for the app whose alerts you want to ignore
- In the Alerts area on the App Monitoring page, click **Critical Issues**, **Warnings**, or **Info Events** to display the Alerts table for alerts of the corresponding severity, and then click the **VIEW ALL** button that appears above the table

The Alerts page displays. If you accessed this page from the Apps View page, the App Alerts table shows by default all active alerts. If you accessed this page from the App Monitoring page, the App Alerts table shows by default only alerts that match the severity that you chose (Critical Issues, Warning, or Info Events).

Step 2 In the App Alerts table, check the check box for each alert that you want to ignore.

For detailed information about this table and locating alerts, see the [“App Alert Options” section on page 4-65](#).

Step 3 Click the **ADD SELECTED ALERTS** button.

The alerts that you selected are added to the Selected Alerts table. You can ignore the alerts that this table lists. For detailed information about this table and about removing alerts from this table, see the [“App Alert Options” section on page 4-65](#).

Step 4 Click the **IGNORE** button, which appears under the Selected Alerts table
