CHAPTER 9

Managing Software Images

Manually upgrading your network elements to the latest software version can be an error-prone and time-consuming process. The Network Element Image Management (NEIM) feature ensures rapid, reliable software upgrades, and automates the steps associated with upgrade planning, scheduling, downloading, and monitoring. Apart from Cisco devices, NEIM supports Redback devices.

Note Support for Redback devices is available only if you install the device support package available on Cisco.com.

Using NEIM, you can:

- Analyze software upgrades; for example, you can:
  - Generate Upgrade Analysis reports.
  - Determine prerequisites for a new software deployment.
  - Determine the hardware upgrades (device access, boot ROM, Flash memory, RAM, NVRAM and boot Flash, if applicable) required before you can perform the upgrade.

    See Upgrade Analysis, page 9-9 for more information.
- Import images into the software repository; for example, you can:
  - Determine the images missing from your repository and import them into the software repository.
  - Keep the repository up-to-date and periodically synchronize it with the images running on your network devices.
  - Schedule an image import for a later, more convenient time.
- Distribute software images to groups of network elements; for example, you can:
  - Configure upgrades for groups of network elements to the same software image or to different software images, depending on system complexity.
  - Run the network element upgrade job sequentially or in parallel.
  - Specify the reboot order after upgrading the network elements.

    See Distributing Images, page 9-13 and Activating an Image on the Device, page 9-21 for more information.

Note We recommend that you verify that an image operation is correct on a single device, preferably in a lab, prior to distributing and activating a change in image on multiple devices in a production network.

- Manage packages for Cisco IOS XR devices

  Along with the NEIM basic functionalities, you can perform tasks specific to Cisco IOS XR.

  See Managing Cisco IOS XR Devices, page 9-23 and Performing Package Management Tasks, page 9-26 for more information.

- Manage Redback devices

  Cisco ANA supports Redback devices in addition to Cisco devices.

  The following NEIM features are supported for Redback SMS 10000 Series Routers and SMS 1800 Series Routers:

  - Adding Images from a File System to a Local Image Repository, page 9-6
  - Distributing Images, page 9-13
  - Activating an Image on the Device, page 9-21

NEIM Administrative Task: Setting Up Image Management Preferences

You can set the following image management parameters:

- Vendor Credentials— Credentials required to access vendor websites for NEIM tasks.
- Image Import Directory—Directory to which the imported images are saved.

See NEIM Preferences, page 14-27 for details.

Logging Into Cisco.com

Login privileges are required for all NEIM tasks that access Cisco.com. To get access, you must have a Cisco.com account. If you do not have a user account and password on Cisco.com, contact your channel partner or enter a request on the main Cisco website.

You can register by going to the following URL:

http://tools.cisco.com/RPF/register/register.do

To download cryptographic images from Cisco.com, you must have a Cisco.com account with cryptographic access.

To obtain the eligibility to download strong encryption software images:

Step 1 Go to the following URL:

http://tools.cisco.com/legal/k9/controller/do/k9Check.x?eind=Y&return_url=http://www.cisco.com

Step 2 Enter your Cisco.com username and password, and click **Log In**.

Step 3 Follow the instructions provided in the page and update the user details.

Step 4 Click **Accept** to submit the form.

Step 5 To verify whether you have obtained the eligibility to download encrypted software:

a. Go to the following URL:

http://tools.cisco.com/legal/k9/controller/do/k9Check.x?eind=Y&return_url=http://www.cisco.com

b. Enter your username and password, and click **Log In**.

The following confirmation message is displayed:

```
You have been registered for download of Encrypted Software.
```

Related Topics

- Understanding the NEIM User Interface, page 9-3
- Image Repository Management, page 9-5

Understanding the NEIM User Interface

This topic describes the NEIM user interface. The roles required to perform NEIM tasks are described in Roles Required to Perform NEIM Tasks, page 9-4.

Figure 9-1 shows the NEIM Image browser.

Figure 9-1 Image Browser

Icons in the Image Browser

Table 9-1 explains the icons found in the Image browser.

Table 9-1 Image Browser Buttons

Icon	Description
	Refresh the image browser.
	Add images.
	Edit existing images.
	Delete images.

Roles Required to Perform NEIM Tasks

Table 9-2 lists the roles that are required to perform NEIM functions. For more information on roles, see Creating and Managing Cisco ANA User Accounts.

Table 9-2 Roles Required to Perform NEIM Functions

Task	Role Required
Adding image from vendor website	Configurator, Administrator
Adding image from file system	Configurator, Administrator
Distributing image by image	Configurator, Administrator
Distributing image by network element	Configurator, Administrator
Distributing image from external location	Configurator, Administrator
Performing image distribution	Configurator, Administrator
Performing upgrade analysis	Configurator, Administrator
Activating image	Configurator, Administrator
Managing packages	Configurator, Administrator
Distributing packages	Configurator, Administrator
Performing rollback	Configurator, Administrator

Related Topic

- Image Repository Management, page 9-5

Image Repository Management

You can maintain a copy of the images in the local repository. You can add, remove, and browse images in the repository. You can also edit and update image attributes.

The image repository stores the binary data and displays image attributes in the Image browser. The images available on vendor websites can be added to the repository.

You can add images to the image repository by:

- Adding them from vendor websites (see Adding Images from Vendor Websites to a Local Repository, page 9-5).
- Adding them from a file system to a local repository (see Adding Images from a File System to a Local Image Repository, page 9-6).

Adding Images from Vendor Websites to a Local Repository

While adding images:

- You can select a network element and download the image for the selected network element. NEIM checks to determine whether Flash and RAM available on the network element are sufficient to deploy the image. A warning message is displayed to the user about the discrepancy, if any.
- You can select an image and download the file. NEIM checks for file size and checksum before adding the image to the repository.

Note You must ensure that the Cisco ANA server has access to the vendor website.

Algorithm for Adding Images from Cisco.com to the Image Repository

The following steps describe the algorithm for adding images from Cisco.com to the image repository:

1. Select the vendor website as the source of the image.
2. (Optional) Select a network element from the device selector.
3. NEIM provides a list of images.
4. Select the platform.
5. NEIM provides all supported versions of the platform. NEIM also displays information on the image deployment status.
6. Select the specific image version.
7. NEIM lists all the features for the selected image version.
8. Select the feature.
9. NEIM adds the selected image.
10. To add multiple images, repeat Steps 2 through 9.
11. NEIM checks to determine whether Flash and RAM available on the device are sufficient to deploy the image. A warning message is displayed to the user about the discrepancy, if any. You can still download the image from the website.
12. Provide the job details. NEIM displays the job ID as reference to the job.

To add an image from a vendor website:

Step 1 Go to the Tasks tab in the Inventory perspective and select **Configuration** drawer.

Step 2 Expand the Network Element Image Management and the Add Images nodes and click **From Vendor Website**.

Alternatively, from the main menu choose **Configuration > Network Element Image Management > Add Images > From Vendor Website**.

The Vendor and Network Element selection page is displayed.

Step 3 Select the vendor from the Vendor drop-down list.

Step 4 (Optional) Select the network element and click **Add** to add it to the Selected Network Elements column.

Step 5 Click **Next**.

The Image Selection page is displayed.

Step 6 Select a platform.

Step 7 Select a version.

Step 8 Select a feature.

Step 9 Scroll down to see the selected images.

You can add multiple images, and you can use the Clear All function to clear all the selected images.

Step 10 Click Next.

The Schedule Job page is displayed.

Step 11 Specify the following details:

- Job description.
- Start date.

  If you want to perform the job immediately, click the **Perform Now** icon provided at the top right of the page.
- The number of times the job should be run.
- Delete interval between jobs.

Step 12 Click **Finish**.

Adding Images from a File System to a Local Image Repository

Use this method to add software images from a file system to the software repository.

You add an image staged on the gateway file system to the local image repository. NEIM checks for the image family, image version, and image type information before adding it to the repository. Before the image is added, the repository is checked to determine whether the selected image already exists. NEIM does not allow the addition of duplicate images to the image repository.

Algorithm for Adding Images from a File System to a Local Image Repository

The following steps describe the algorithm for adding images from a file system to a local image repository:

1. Select the file system as the source of the image.
2. NEIM lists available image filename and vendor.
3. You can select a file at a time.
4. Select multiple images from the list, by checking the check box for images.
5. NEIM validates the selected files for file size, and for image family, type, and version. The results are displayed.
6. NEIM displays all the errors that occur during the parsing.
7. You can add to the image repository only those image files for which valid information is retrieved.
8. On successful completion of the operation, you can view the images in the repository browser.

To add images from a file system:

Step 1 Go to the Tasks tab in the Inventory perspective and click the **Configuration** drawer.

Expand the Add Images node and click **From File System**.

Alternatively, from the main menu choose **Configuration > Network Element Image Management > Add Images > From File System**.

The From File System window displays a table that lists all the images available in the file system.

Step 2 Check the check box corresponding to the image you want to add. You can add multiple images.

Step 3 Click on the appropriate row in the Select Vendor column and choose a vendor from the drop-down list.

Note Cisco ANA supports Redback SMS 10000 series routers and SMS 1800 series routers.

Step 4 Click the **Next**. The Image Details screen is displayed.

For Cisco images, the fields are prepopulated. For Redback images, you must enter the following details:

- Version
- Image type
- Image family

Step 5 Click **Finish**.

The images are added to the local repository.

Related Topics

- Understanding the NEIM User Interface
- Upgrade Analysis
- Using the Image Browser
- Distributing Images
- Activating an Image on the Device
- Managing Cisco IOS XR Devices

- Performing Package Management Tasks
- NEIM Log Files

Upgrade Analysis

The upgrade analysis feature allows you to determine if an image can be deployed on a set of network elements.

Note This feature is applicable only for devices running Cisco IOS software or Cisco Catalyst OS software. It is not applicable for other vendor devices (Redback) and devices running Cisco IOS XR software.

During analysis, NEIM fetches the attributes of the selected image and checks the amount of RAM and Flash available on the network element. This analysis is based on the network element information available in the Cisco ANA inventory. For analysis, the Cisco ANA inventory must contain information on active images on the network element, Flash memory, modules, and processor details.

NEIM assumes that while images are added to the repository, information such as minimum RAM, minimum Flash, and so on, is available in the image header. This information is stored in the image repository. NEIM cannot analyze effectively if this information is not available in the image header.

You can perform image analysis using:

- Application image repository (see Image Analysis Using the Application Image Repository, page 9-9).
- Vendor website (see Image Analysis Using a Vendor Website, page 9-10).

Image Analysis Using the Application Image Repository

Use the Local Repository Analysis feature to analyze images in your software repository and determine the impact to, and prerequisites for, a new software deployment. This feature enables you to get the Upgrade Analysis report, which shows the required boot ROM, Flash memory, and RAM.

Image Analysis helps you answer such questions as:

- Does the network element have sufficient RAM to hold the new software?
- Have the minimum ROM version requirements been met?
- Is the Flash memory large enough to hold the new software?

Algorithm for Upgrade Analysis Using the Local Image Repository

The following steps describe the algorithm for upgrade analysis using the local image repository:

1. Select the local repository as the source of the image.
2. Select an image from the image repository.
3. Select a network element.
4. NEIM triggers the analysis operation.
5. NEIM generates a discrepancy report. This report contains:
   - The name of the image selected.
   - Active image information as obtained from the inventory.
   - Available and required Flash information along with the amount of Flash that is required to upgrade, to enable you to deploy the image.
   - Available and required RAM information along with the amount of RAM that is required to upgrade, to enable you to deploy the image.

To perform upgrade analysis using the application image repository:

Step 1 Go to Tasks tab in the Inventory perspective and select **Configuration** drawer.

Expand the Network Element Image Management node.

Step 2 Click **Upgrade Analysis**.

Alternatively, from the main menu choose **Configuration > Network Element Image Management > Upgrade Analysis**.

The Upgrade Analysis window is displayed.

Step 3 Click the Application Image Repository radio button and click **Next**.

The Device Selector is displayed.

Step 4 Select the network elements and click **Next**.

The Select Image page is displayed, showing the Network Element Information column that lists the network elements and the Image Information column that lists the details of images in each network element.

Step 5 Select the image from the Image Information drop-down list.

Step 6 Click **Next**.

The Upgrade Analysis Report is displayed.

Image Analysis Using a Vendor Website

Use the Vendor Website feature to determine the impact to, and prerequisites for, a new software deployment using images that reside on vendor websites.

This option allows you to identify only images that meet certain criteria. It then analyzes the images to determine the required hardware upgrades (boot ROM, Flash memory, RAM, and access).

This option helps you answer such questions as:

- Does the device have sufficient RAM to hold the new software?
- Have the minimum ROM version requirements been met?
- Is the Flash memory large enough to hold the new software?
- Do I need to add Telnet access information for the device?
- Have I performed an upgrade path and NVRAM analysis on my Catalyst devices?

Algorithm for Image Analysis Using Cisco.com

The following steps describe the algorithm for image analysis using Cisco.com:

1. Select vendor website as the source of the image.
2. Select a network element.
3. NEIM displays all the applicable images on the vendor website for the selected network element.
4. Select an image to analyze.

5. NEIM triggers the analysis operation.
6. NEIM generates a discrepancy report. A separate report is generated for each of the network elements selected for analysis. This report contains:
   - The name of the selected network element.
   - The name of the selected image.
   - Active image information as obtained from the inventory.
   - Available and required Flash information along with the amount of Flash that is required to upgrade to deploy the image.
   - Available and required RAM information along with the amount of RAM that is required to upgrade to deploy the image.

To perform image analysis using a vendor website:

Step 1 Go to Tasks tab in the Inventory perspective and select **Configuration** drawer.

Expand the Network Element Image Management node.

Step 2 Click **Upgrade Analysis**.

Alternatively, from the main menu choose **Configuration > Network Element Image Management > Upgrade Analysis**.

The Upgrade Analysis window is displayed.

Step 3 Click the Vendor Website radio button and click **Next**.

The Device Selector is displayed.

Step 4 Select the network elements and click **Next**.

The Select Image page is displayed, showing the Network Element Information column that lists the network elements and the Image Information column that lists the details of images in each network element.

Step 5 Select the image from the Image Information drop-down list.

Step 6 Click **Next**.

The Upgrade Analysis Report is displayed.

Related Topics

- Understanding the NEIM User Interface
- Image Repository Management
- Using the Image Browser
- Distributing Images
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- Performing Package Management Tasks
- NEIM Log Files

Using the Image Browser

The Image browser helps you to view all the available images in the image repository and also:

- Edit the image attributes
- Search for an image in the repository. This is a filter-based search.
- Delete an image

You can view the following image attributes:

- Image Name
- Image Family
- Image Type

- Version
- Size
- Vendor

In the Image browser, you can do a filter operation based on image family; image type, version, size, and status; and time of update. You can sort images in the repository based on image family and image types. The Refresh button refreshes the image list and displays the latest list of images.

To view the Image browser:

Step 1 Go to Tasks tab in the Inventory perspective and select **Configuration** drawer.

Step 2 Expand the Network Element Image Management node and click **Image Browser**.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Image Browser**. The Image browser is displayed.

You can perform the following operations from the Image browser:

- Add Images—Click the **Add Images** icon to add images to the repository. See Adding Images from Vendor Websites to a Local Repository, page 9-5 and Adding Images from a File System to a Local Image Repository, page 9-6 for details.
- Edit Images—You can edit or update attributes of the images in the image repository. You can update the unknown image attributes of the images. You can edit the comment and the values required for RAM, NVRAM, BootROM version, and Flash. To edit an image, select the image from the Image browser and click the **Edit** icon.
- Delete Images—Select an image from the Image browser and click the **Delete** icon. The selected images are immediately removed from the database.

Related Topics

- Understanding the NEIM User Interface
- Upgrade Analysis
- Image Repository Management
- Distributing Images
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- Performing Package Management Tasks
- NEIM Log Files

Distributing Images

The Image Distribution feature allows you to:

- Copy an image from a specified location to a specified storage location on a network element using the TFTP protocol. We recommend that the /tftpboot subdirectory used by the TFTP server that comes with NEIM be a local disk. If this is a mounted subdirectory, you might have problems.
- Activate the copied image on the network element.

Note This feature is applicable only for devices running Cisco IOS software. For Cisco IOS XR devices, you must go to **NEIM > Package Management > Distribute Packages**.

NEIM supports both monolithic and patch image distribution on network elements. Network elements with multiple upgrade entities are supported. Module cards or entities with independent IP addresses are identified as separate network elements.

NEIM uses the instrumentation embedded in the network element and information such as minimum RAM or minimum Flash, encapsulated in image headers, to perform image distribution on the network element.

Image distribution may be done in two ways:

- By image. See Image-Centric Distribution, page 9-15 for details.
- By network element. See Device-Centric Image Distribution, page 9-18 for details.

Related Topics

- Understanding the NEIM User Interface
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- Performing Package Management Tasks
- NEIM Log Files

Image-Centric Distribution

In Image-Centric mode, you can select an image from a local repository or an external location and perform distribution on one or more network elements. You can specify a destination partition on the device where the image needs to be copied. This is useful when you have to distribute the same image to multiple network elements.

You cannot use this procedure to upgrade:

- Bootloader for Cisco IOS software
- Catalyst modules other than the Supervisor module

You can either activate the image on the network element along with the distribution task or schedule the image activation as a different job.

These topics describe how to perform image-centric distribution:

- Image-Centric Distribution Using a Local Repository with Image Activation, page 9-15
- Image-Centric Distribution Using an External Repository with Image Activation, page 9-16

Image-Centric Distribution Using a Local Repository with Image Activation

You can create an image distribution job to deploy and activate the selected image onto a set of managed devices. The images are copied from the local repository.

Algorithm for Image-Centric Distribution Using a Local Repository with Image Activation

The following steps describe the algorithm for image-centric distribution using a local repository. After the image distribution, activation of the image on the selected network elements is performed as part of the same job:

1. Select an image in the local repository.
2. Select one or more network elements for the distribution.
3. NEIM filters all the irrelevant network elements based on the selected image type and image family.
4. NEIM displays the available upgradable modules and the storage partitions (if any) on the network element for the image distribution.

5. NEIM verifies the suitability of the image for the selected storage destination and displays the status of the verification operation. NEIM checks the network element type and includes other generic checks such as checking for valid licensing and Flash overwrite.
6. NEIM displays the details of the verification result.
7. NEIM prevents you from proceeding further with the distribution operation for the network element. All such network elements are removed from the list of network elements. The Verification report contains all warnings and messages generated during the verification.
8. Apply the job policy and schedule the distribution operation job.
9. NEIM generates a work order report containing a new image selected for distribution, network elements selected and existing image on the selected network elements, image verification details for each network element, and job control options as defined for the job.
10. NEIM schedules the job and displays the job ID as reference to the job.

Image-centric distribution fails if:

- The job schedule service fails.
- All network elements in the job fail during verification.
- The image activation cannot be scheduled due to failure of the image copy operation.
- The image copy operation fails and activation is not performed. If the image distribution is successful for a subset of the selected network elements, then the image is activated only on those network elements.

Image-Centric Distribution Using an External Repository with Image Activation

You can create an image distribution job to deploy, and activate the selected images on a set of managed devices. The images are copied from the external repository.

Algorithm for Image-Centric Distribution Using an External Repository

1. Select an image from an external location.
2. Provide the details of the image residing on the external locations.
3. Select one or more network elements for the distribution.
4. NEIM does not perform compatibility checks for the selected image.
5. NEIM displays the available upgradable modules and all the storage partitions (if any) on the device.
6. Choose a storage partition for the selected image.
7. Define the job policy and schedule the distribution operation job.
8. NEIM does not verify based on the selected image; however, generic checks, such as valid licensing, are performed.
9. NEIM generates a work order comprising the new image selected for distribution, network elements selected, existing images on the selected network elements, and job control options as defined for the job.
10. The report for this flow always contains a warning that image compatibility is not checked.
11. NEIM schedules the job and displays the job ID as reference to the job.
12. During job execution, NEIM uses TFTP to transfer images from the external location to the device.

To perform image-centric distribution:

Step 1 Go to the Tasks tab in the Inventory perspective, and click the **Configuration** drawer.

Step 2 Expand the Network Element Image Management node and the Image Distribution node.

Step 3 Click **By Image**.

The Image Selection page is displayed.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Image Distribution > Distribute by Image**.

The Image Selection page is displayed.

Note Cisco IOS XR packages are not displayed here.

Step 4 Select an image and click **Next**.

The Network Element Selector is displayed.

Step 5 Select a network element and click **Next**.

The Storage Selection page is displayed. It has the following fields:

- Device—Device name.
- Module—The software you are upgrading; for example, the OS or bootloader.
- Storage—Location at which to store the image. Lists the storage available in the device.
- Error—Errors, if any. Click near the icon to get details. If you have selected an incompatible device, an error is displayed.

Step 6 Select the storage and click **Next**.

The verification page is displayed.

Step 7 Verify the details, then click **Next**.

The Schedule Job page is displayed.

Step 8 Specify the following in the Image Copy Options pane:

- Start date.
- The number of times this job should be run. We recommend not clicking the Infinite radio button.
- Delay interval between jobs.

Step 9 Specify the image copy mode. To do this, click either of the two radio buttons:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

Step 10 Specify the activation options. Select from the following options:

- Never—If you do not want to activate the image.
- Immediately—To activate the image immediately.
- Schedule Activation—To schedule activation for a later time. If you select this option, specify the reboot schedule parameters in the Activation Schedule pane.

Step 11 Select the activation mode. This applies only if you want to activate the image. Select either of the following:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

When scheduling image operations which can reload the router, we recommend you choose sequential image activation mode. If you choose parallel mode, routers which are in the connectivity path of other routers participating in the job may reload, causing problems.

Step 12 Click **Next**. A summary of the selected image and storage is displayed.

Step 13 Click **Finish**.

Related Topics

- Device-Centric Image Distribution from an External Location
- Understanding the NEIM User Interface
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- Performing Package Management Tasks
- NEIM Log Files

Device-Centric Image Distribution

In device-centric mode, you choose a set of network elements and schedule image distribution. To perform this from an external location, see Image-Centric Distribution Using a Local Repository with Image Activation, page 9-15.

Before you begin distributing the images, you should:

- Prepare for this upgrade. You must meet all of the prerequisites for loading the software on the network element and verify whether the necessary software images are present in the software image repository.
- Consider the effect of the upgrade on your network and your network users.
- Supply the information required by Software Management for each network element.

Algorithm for Device-Centric Distribution with Image Activation

The following steps describe the algorithm for device-centric distribution:

1. Select the network elements.
2. Select the image and storage partition.
3. NEIM displays a list of images that can be deployed on the network element and the storage partitions available on the network element.
4. NEIM displays only those images stored in the repository.
5. Select an image and the storage partition on the network element where the image is to be deployed.
6. NEIM verifies whether the image is compatible with the network element and allows you to proceed with the flow if the verification is successful. You can specify the job control policies and either perform activation in the same job or schedule it for a later time.
7. Apply the job policy and schedule the distribution operation job.

8. NEIM generates a work order report comprising the new images selected for distribution, network elements selected, existing images on the selected network elements, image verification details for each network element, and job control options as defined for the job.
9. NEIM schedules the job and displays the job ID as reference to the job.

To perform device-centric image distribution:

Step 1 Go to the Tasks tab in the Inventory perspective, and click **Configuration** drawer.

Step 2 Expand the Network Element Image Management and Image Distribution nodes.

Step 3 Click **By Network Element**.

The Device Selector is displayed.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Image Distribution > By Network Element**.

The Device Selector is displayed.

Step 4 Select the network elements and click **Next**.

The Image and Storage options page is displayed.

Alternatively, go to the Objects tab in the Inventory perspective.

Right-click a managed network element, and select **Network Element Image Management > Distribute Image**.

The Image and Storage options page is displayed, showing the following details:

- Devices—Device names.
- Module—The software you are upgrading.
- Storage—Location at which to store the image. Lists the storage available in the device.
- Error—Errors, if any. Click near the icon to get details. If you have selected an incompatible device, an error is displayed.

Step 5 Select the storage and click **Next**.

The Verification page is displayed.

Step 6 Verify the details, then click **Next**.

The Schedule Job page is displayed.

Step 7 Specify the following in the Image Copy Options pane:

- Start date.
- The number of times this job should be run. We recommend not clicking the Infinite radio button.
- Delay interval between jobs.

Step 8 Specify the image copy mode. To do this, click either of the two radio buttons:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

Step 9 Specify the activation options. Select from the following options:

- Never—If you do not want to activate the image.
- Immediately—To activate the image immediately.
- Schedule Activation—To schedule activation for a later time. If you select this option, specify the reboot schedule parameters in the Activation Schedule pane.

Step 10 Select the activation mode. This applies only if you want to activate the image. Select either of the following:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

When scheduling image operations which can reload the router, we recommend you choose sequential image activation mode. If you choose parallel mode, routers which are in the connectivity path of other routers participating in the job may reload, causing problems.

Step 11 Click **Next**. A summary of the selected image and storage is displayed.

Step 12 Click **Finish**.

Device-Centric Image Distribution from an External Location

You can perform device-centric image distribution of an image stored in any external TFTP server.

Note This feature is supported for Cisco IOS XR devices.

Step 1 Go to the Objects tab in the Inventory perspective.

Step 2 Right-click a managed network element and select **Network Element Image Management > Distribute from External Location**.

The Image Selection page is displayed, listing the available images.

Step 3 Select the image or add an image location. To add, click **Add**.

The Add an Image dialog box is displayed.

Step 4 Enter an image location in the following format:

tftp://*servernameorIPAddress*/*imagename*

Note The external location must be a TFTP server.

A table listing the following details is displayed:

- Devices—Device names.
- Image—The image you selected in the previous step.
- Storage—Location at which to store the image. Lists the storage available in the device. Choose the storage location from the drop-down list.
- Error—Errors, if any. Click near the icon to get details. If you have selected an incompatible device, an error is displayed.

Step 5 Select the storage location and click **Next**.

The Verification page is displayed.

Step 6 Verify the details, then click **Next**.

The Schedule Job page is displayed.

Step 7 Specify the following in the Image Copy Options pane:

- Start date.

- The number of times this job should be run. We recommend not clicking the Infinite radio button.
- Delay interval between jobs.

Step 8 Specify the image copy mode. To do this, select either of the two radio buttons:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

Step 9 Specify the activation options. Select from the following options:

- Never—If you do not want to activate the image.
- Immediately—To activate the image immediately.
- Schedule Activation—To schedule activation for a later time. If you select this option, specify the reboot schedule parameters in the Activation Schedule pane.

Step 10 Select the activation mode. This applies only if you want to activate the image. Select either of the following:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

When scheduling image operations which can reload the router, we recommend you choose sequential image activation mode. If you choose parallel mode, routers which are in the connectivity path of other routers participating in the job may reload, causing problems.

Step 11 Click **Next**. A summary of the selected image and storage is displayed.

Step 12 Click **Finish**.

Related Topics

- Image-Centric Distribution
- Understanding the NEIM User Interface
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- Performing Package Management Tasks
- NEIM Log Files

Activating an Image on the Device

Image activation is the process of making a copied image active on a network element. After the image copy is successfully completed, the activation process can be triggered immediately in the context of a distribution job, or you can schedule it for a later time.

Note This feature is applicable only for devices running Cisco IOS software.

Algorithm for Image Activation

The following steps describe the algorithm for image activation on a network element:

1. Select the network elements for the image activation.
2. NEIM displays the list of images in the Flash memory that can be activated for the network element.
3. Select the images existing on the network element; for example, system image on Flash and bootloader image on bootflash.
4. Schedule the activation in either sequential or parallel mode:
   - In sequential mode, when there are multiple network elements in the job, you are prompted to define the order in which the new image is activated for the network elements in the list.
   - In parallel mode, NEIM activates images on multiple network elements simultaneously, so all the network elements in the list are activated with the new image at the same time.
5. Apply the job policy and schedule the activation job.
6. NEIM generates a work order comprising the selected images for activation, network elements selected, existing images on the selected network elements, and job control options as defined for the job.
7. NEIM schedules the job and displays the job ID as reference to the job.

To activate an image on a network element:

Step 1 Go to Tasks tab in the Inventory perspective and select **Configuration** drawer.

Step 2 Expand the Network Element Image Management node and click **Activate Images**.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Activate Images**.

The Activate Images window is displayed.

Step 3 Select the network element from the Device Selector and click **Next**.

The Select Image page is displayed. It lists the network element information and the corresponding image information.

Step 4 Select the required image and click **Next**.

The Schedule Job page is displayed.

Step 5 Specify the following details to schedule an image activation job:

- Start date.
- Number of times this job should run. The value should be 1.
- Delay interval between jobs.

Related Topics

- Understanding the NEIM User Interface
- Image Repository Management
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser

Managing Cisco IOS XR Devices

NEIM supports distribution of Cisco IOS XR images onto network elements. These topics describe how to manage these devices:

Tasks to be performed to populate the repository with packages obtained from vendor websites or transferred to the file system are the same for Cisco IOS XR network elements as for other device types.

The next task is to distribute the packages. We recommend that you perform the distribution as one job, and do the activation as a separate job.

If you want to revert to a previous package configuration, you can do a rollback operation. After a period of successful operation, you may want to remove inactive packages to save Flash space or make room for a subsequent package installation.

After you perform operations such as activation, deactivation, or rollback, all of which change the package composition on the router, you must use Command Builder to run the **ImageCommit** command, a Cisco IOS XR-specific, system-defined command. Changes made will not be committed unless the command is run. The commit operation should be done only after you have verified that the new packages are operating correctly. See Using the Image Browser, page 9-12 for information on running commands.

Note The device must be in a managed state (Communication State=Device Reachable and Investigation State=Normal or Incomplete) when you run the command. See VNE States (Investigation and Communication States), page 2-17 for details.

Along with the core NEIM functionalities such as image distribution repository and analysis, capabilities specific to Cisco IOS XR are also supported. The following are the specific Cisco IOS XR features:

- List Active Package
- List Installed Packages
- View Rollback Point Details
- Perform Rollback
- Activate Packages
- Deactivate Packages
- Remove Installed Packages

You can select a single network element or multiple network elements to perform all these tasks.

Note If you attempt a package removal operation after a deactivation without first doing a commit, Cisco IOS XR prevents the operation, because the operation removes a package that the currently committed configuration needs. The required sequence is (a) deactivate, (b) commit, and (c) remove.

See Performing Package Management Tasks, page 9-26 for more details.

Additional Notes on Performing Package Management Tasks

Read the following before performing package management tasks using NEIM:

- For Secure Domain Router (SDR) partitions, the owner partition is represented as a separate device, with its own IP address. Similarly, any nonowner (child) partitions are also represented as separate devices with their own IP addresses.

  For package management operations that involve upgrading the core packages, such as c12k-mini, on the device, the operation should be done only on the owner partition. Cisco IOS XR automatically upgrades nonowner partitions and initiates reload on both owner and nonowner partitions.

- If any package management CLI operations are done on the router, they must be done at admin level unless operating on a nonowner SDR partition. This ensures that subsequent image management operations done by NEIM will succeed. NEIM always operates in admin mode unless on a nonowner partition. On nonowner partitions, NEIM always runs in exec mode, because that is the only mode available.
- When doing a version upgrade (which upgrades the core image and involves a router reload) on a Cisco IOS XR device, all of the packages on the router should be upgraded at the same time, as part of the same job. For example, if the c12k-mini, c12k-mgbl, c12k-mpls, c12k-k9sec, and c12k-mcast packages are on the router at version 3.4.1, when upgrading to version 3.5.0, all of the packages must be upgraded at the same time to version 3.5.0.
- When upgrading the core router package (such as c12k-mini or comp-hfr-mini), the manageability package (such as c12k-mgbl or hfr-mgbl-p) must be upgraded at the same time to ensure that the router remains manageable after the reload.
- Cisco IOS XR routers support the **clear install rollback oldest x** command that allows you to manage the number of rollback points maintained on the router. Executing this CLI command periodically on the router allows you to limit the number of rollback points. When executing this command, you must ensure that at least one valid rollback point is always maintained to enable Cisco ANA to show the package status correctly. We recommend that you maintain about 20 rollback points on the router.
- For devices running Cisco IOS XR software, NEIM only operates on .pie files. Files with a .vm extension are for use when initializing the router in common mode, and are not supported by NEIM.
- Currently, NEIM does not support upgrading a router running Cisco IOS software to Cisco IOS XR software. The router must be running Cisco IOS XR software before any NEIM operations involving Cisco IOS XR software are done.

Activating Cisco IOS XR Packages

You can select one or more Cisco IOS XR device on which to perform the *activate* task. The NEIM user interface displays the list of installed packages that are not activated yet on the selected network element.

You must select the software package that you intend to activate and schedule a job for execution immediately or at a specific time. The result of the activation task can be viewed as a job result.

For multiple network elements, you must select the packages to be activated for each of the network elements and schedule a job. The job results contains the details of the packages that were activated and a transcript of network element interaction for each network element. See Performing Package Management Tasks, page 9-26 for more details.

Deactivating Cisco IOS XR Packages

You can select one or more Cisco IOS XR devices on which to perform a deactivation task. The NEIM user interface displays the list of installed packages that are activated on that network element.

You must select the software package that you intend to deactivate and schedule a job for execution immediately or at a specific time. The result of the task can be viewed as a job result.

For multiple network elements, you must provide the packages to be deactivated for each of the network elements and schedule a job. The job results contain the details of the packages that were deactivated and a transcript of network element interaction for each network element. The deactivation task can be performed on the device cards and modules. See Performing Package Management Tasks, page 9-26 for more details.

Rolling Back Cisco IOS XR Packages

You can select a set of network elements on which to perform a rollback task. The NEIM user interface displays the list of available rollback IDs to which you can roll back on that network element.

You must select the rollback ID and schedule the rollback job. The result of the rollback task can be viewed as a job result. When performing this task on multiple network elements, rollback points for each of the network elements selected are displayed. You can select the rollback ID for each of the network elements and schedule a job. The job results contain the details of the rollback action on each network element and a transcript of interactions with the network element for all the network elements in the job.

The removal of a package can make a rollback point invalid. If a package or version of a package that is associated with a specific rollback point is removed, it is no longer possible to roll back to that point. An error message is generated by the Cisco IOS XR device and shown in the job status details. See Performing Package Management Tasks, page 9-26 for more details.

Removing Cisco IOS XR Packages

You can select one or more network elements from which to remove packages. The NEIM UI displays the list of available packages on each of the selected network elements.

Related Topics

- Understanding the NEIM User Interface
- Image Repository Management
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Distributing Images
- Activating an Image on the Device
- Performing Package Management Tasks
- NEIM Log Files

Performing Package Management Tasks

You can perform the following tasks:

- Manage Packages. See Managing Packages, page 9-26 for details.
- Perform Rollback. See Performing Rollback, page 9-27 for details.
- Distribute Packages. See Distributing Packages, page 9-28 for details.

These tasks can be performed only for Cisco IOS XR devices. You might encounter errors on other devices. See Additional Notes on Performing Package Management Tasks, page 9-24 before you perform package management tasks.

Managing Packages

To manage packages:

Step 1 Go to Tasks tab in the Inventory perspective and select **Configuration** drawer.

Step 2 Expand the Network Element Image Management and the Package Management nodes and click **Manage Packages**.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Manage Packages**.

The Manage Packages window is displayed.

Step 3 Select the network elements and click **Add** to add them to the Selected Network Elements column.

Step 4 Click **Next**.

The Select Packages page is displayed. This page has the following details:

- Device—Device name.
- Package—Available package for the device.
- Status—Active or Inactive.
- Operation—Select any of the following operations:
  - Activate
  - Deactivate
  - Remove

Step 5 Select packages.

Step 6 Choose an operation from the drop-down list.

Step 7 Click **Next** to specify to schedule a package management job. Enter the following details:

- Start date.
- Number of times this job should run. The value should be 1.
- Delay interval between jobs.

If you want to perform a package compatibility check, check the **Choose Compatibility Test** check box. A verification is done, and a report is made available on the Reports page.

The Choose Compatibility Test check box controls whether the operation is done normally (by default, the check box is unchecked) or as a test only (if the check box is checked). A test-only job shows the results of doing the job, but does not actually change the configuration of the network element.

Step 8 Click **Finish**.

Performing Rollback

To perform a rollback operation:

Step 1 Go to Tasks tab in the Inventory perspective and click the **Configuration** drawer.

Step 2 Expand the Network Element Image Management and the Package Management nodes and click **Rollback**.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Rollback**.

The Rollback window is displayed.

Step 3 Select the network elements and click **Next**.

The Select Rollback Point page is displayed. It lists the following details:

- Devices—Device name.
- Rollback ID—Choose a rollback point from the drop-down list.

  It is not possible to roll back to all of the rollback points present. Not all rollback points shown are reachable. If you try to roll back to an unreachable rollback point, the operation fails. An error message is displayed, indicating that the rollback point is invalid. This can be due to a package that has been removed from the system.
- Errors—Errors, if any. When you click the button adjacent to the error icon, a popup window displays the details.
- Details—The package name and the module details for the rollback point. The Details column is displayed when you choose a rollback point.

Step 4 Select the desired row and click **Next**.

Step 5 Specify the following details to schedule the rollback job:

- Start date.
- Number of times this job should run. The value should be 1.
- Delay interval between jobs.

If you want to perform an image compatibility check, check the **Choose Compatibility Test** check box.

This check box controls whether the operation is done normally (by default, the check box is unchecked) or as a test only (if the check box is checked). A test-only job shows the results of doing the job, but does not actually change the configuration of the network element.

Step 6 Click **Finish**.

Distributing Packages

To distribute a package:

Step 1 Go to Tasks tab in the Inventory perspective and click the **Configuration** drawer.

Step 2 Expand the Network Element Image Management and the Package Management nodes and click **Distribute Packages**.

Alternatively, from the main menu, choose **Configuration > Network Element Image Management > Package Management > Distribute Packages**.

The Image Selection page is displayed. It has the following details.

- Devices—Device names.
- Image—The software you are upgrading. You can select multiple images, by clicking the check boxes.
- Storage—Location at which to store the image. Lists the storage available in the device.
- Error—Errors, if any. Click near the icon to get details. If you have selected an incompatible device, an error message is displayed.

Step 3 Select the images and a storage location and click **Next**.

The Verification page is displayed. It displays the verification results. Status is always shown as Passed.

Step 4 Click **Next**. The Schedule Job page is displayed.

Step 5 Specify the following in the Image Copy Options pane:

- Start date.
- The number of times this job should be run. We recommend not clicking the infinite radio button.
- Delay interval between jobs.

Step 6 Specify the image copy mode. To do this, select either of the two radio buttons:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

Step 7 Specify the activation options.

Note Devices running Cisco IOS XR software do not have a separate activation flow.

Select from the following options:

- Never—If you do not want to activate the image.
- Immediately—To activate the image immediately.
- Schedule Activation—To schedule activation for a later time. If you select this option, specify the reboot schedule parameters in the Activation Schedule pane.

Step 8 Select the activation mode. This applies only if you want to activate the image. Select either of the following:

- Parallel.
- Sequential—You can reorder network elements if you select sequential mode.

When scheduling image operations which can reload the router, we recommend you choose sequential image activation mode. If you choose parallel mode, routers which are in the connectivity path of other routers participating in the job may reload, causing problems.

Step 9 Click **Next**. A summary of selected images and the storage location is displayed.

Step 10 Click **Finish**.

Related Topics

- Understanding the NEIM User Interface
- Image Repository Management
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Distributing Images
- Activating an Image on the Device
- Managing Cisco IOS XR Devices
- NEIM Log Files

NEIM Log Files

There is no NEIM-specific log file for Cisco ANA. However, you can check the following to see NEIM debug messages:

- $*ANAHOME*/Main/logs/jboss.log
- $*ANAHOME*/Main/logs/*avm number*.log

On the client, you can check the following log file:

- $*CLIENTINSTALLDIR*/logs/12.log

Related Topics

- Understanding the NEIM User Interface
- Image Repository Management
- Upgrade Analysis
- Image Repository Management
- Using the Image Browser
- Distributing Images
- Activating an Image on the Device
- Managing Cisco IOS XR Devices

- Performing Package Management Tasks