Deploying Devices

Cisco© Prime Infrastructure 3.1

Job Aid

Copyright Page

Deploying Devices Job Aid

Contents

Basics

Job Aid Overview

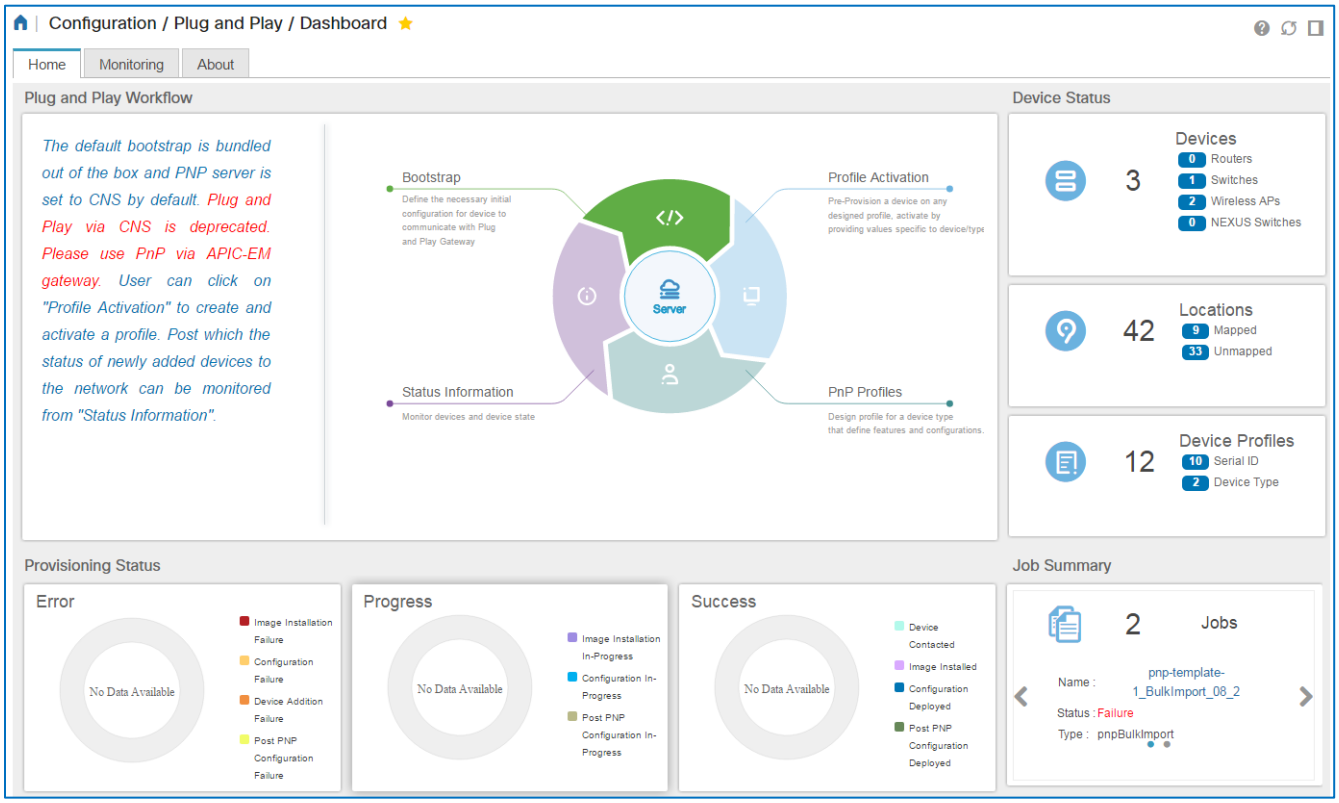
Cisco© Prime Infrastructure meets the demands of expansion, such as bringing a new site, branch, or campus online on the network, by automating device deployment and connection in the form of the Plug and Play process.

By using templates that integrate best practice configurations, system users with minimal knowledge of device configuration processes can perform large scale deployments. Templates also help ensure consistent device configuration in large-scale deployments.

By using the Cisco© Application Policy Infrastructure Controller Enterprise Module (APIC-EM) and leveraging automated installation processes, the Plug and Play process reduces device deployment timelines significantly.

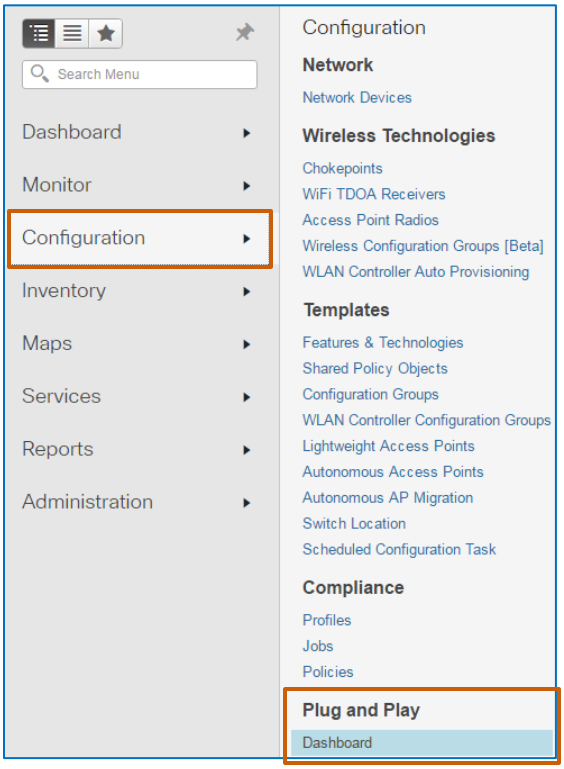
You can deploy and configure routers, switches, wireless access points, and Nexus switches with Power On Auto-Provisioning (POAP).

This job aid introduces you to the Plug and Play process, including bootstrap and profile configuration and profile activation.

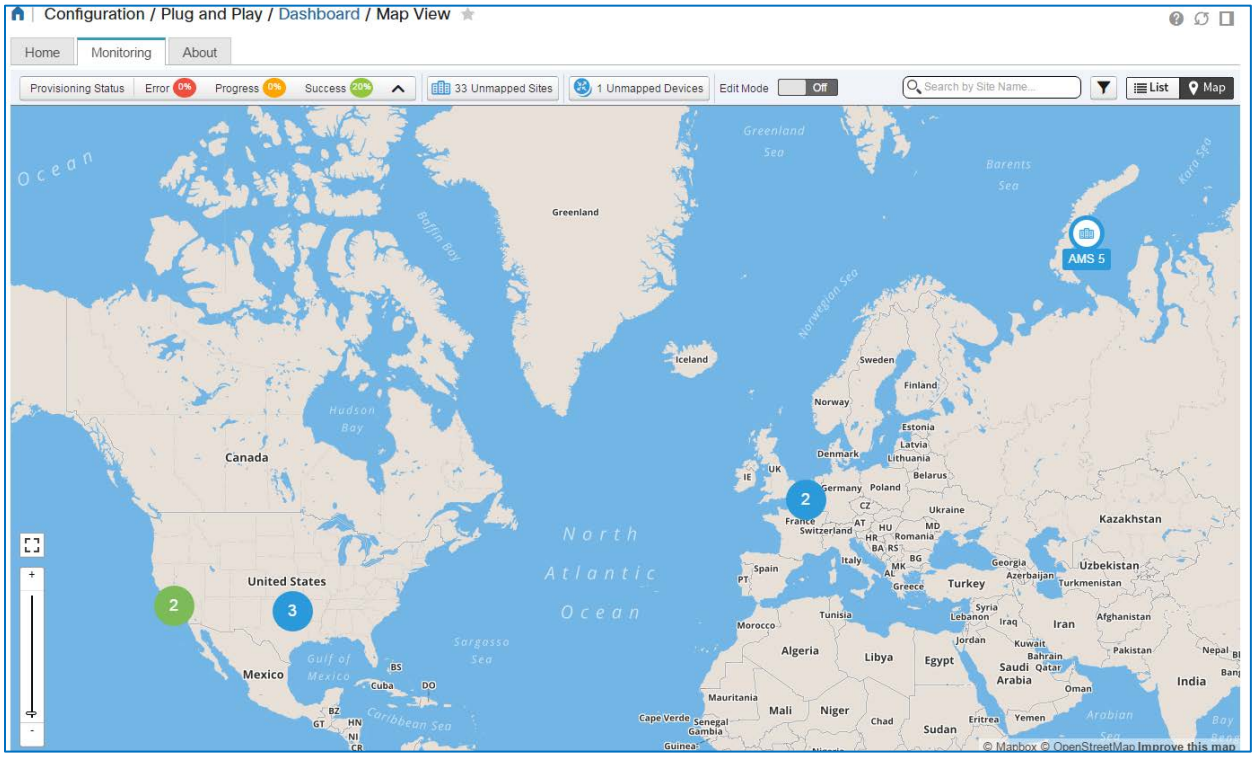


To open the Plug and Play Dashboard page:

- On the **Configuration** menu, under the **Plug and Play** heading, click **Dashboard**.



In addition to configuring and activating profiles, you can monitor the status of devices coming online. The **Monitoring** tab provides a visual method of evaluating activation jobs.



Tasks and Jobs Overview

Preparing for Deployment

To prepare for deploying device configuration files, Prime Infrastructure and pending devices must be connected and prepared for communication.

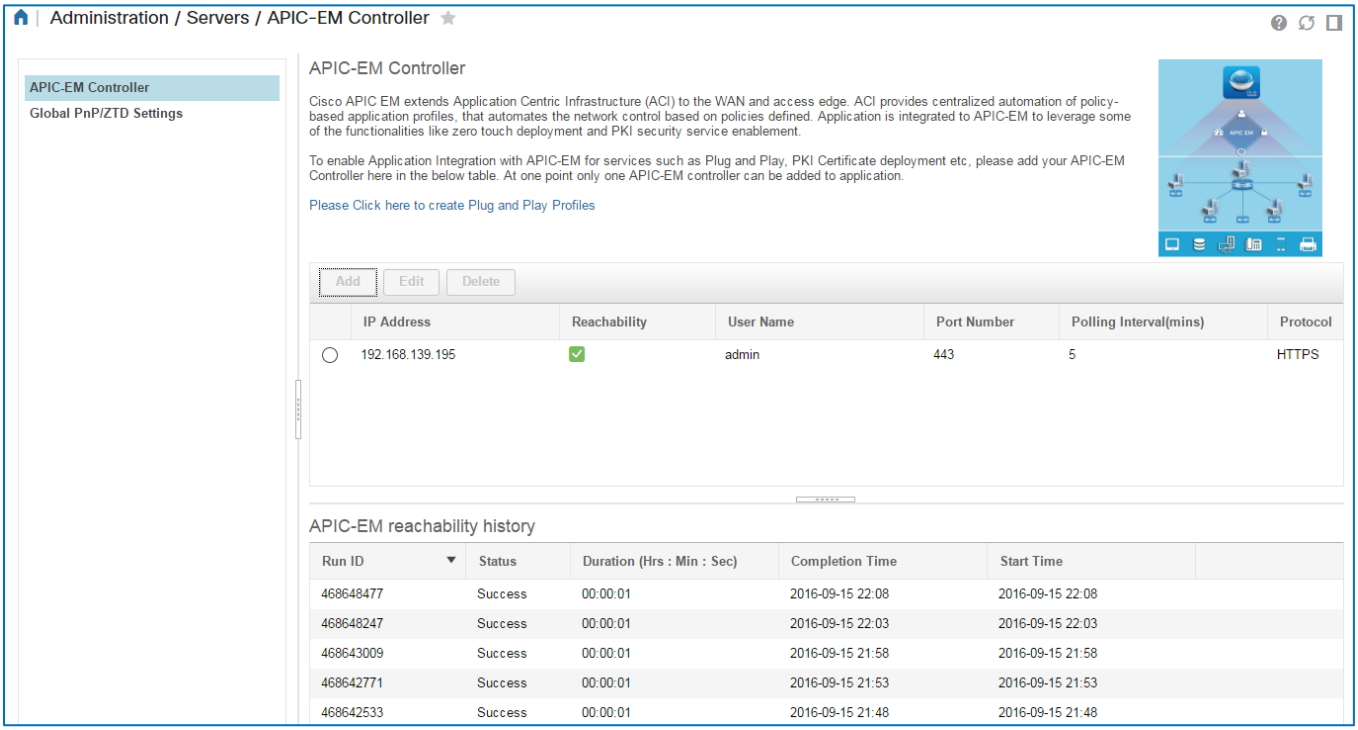
Note: For more information on the pre-requisites for deployment, refer to the topic in the **Cisco Prime Infrastructure 3.1 User Guide**.

For more information on connecting Nexus devices, which have specific communication pre-requisites, refer to the topic in the **Cisco Prime Infrastructure 3.1 User Guide**.

Integrating the APIC-EM Controller

Before using the Plug and Play process, you need to integrate the APIC-EM controller with Prime Infrastructure. This process establishes the pathway that Prime Infrastructure uses to deliver configuration files to the new devices.

Note: Prime Infrastructure 3.1 exclusively uses the APIC-EM controller to establish connectivity to devices.



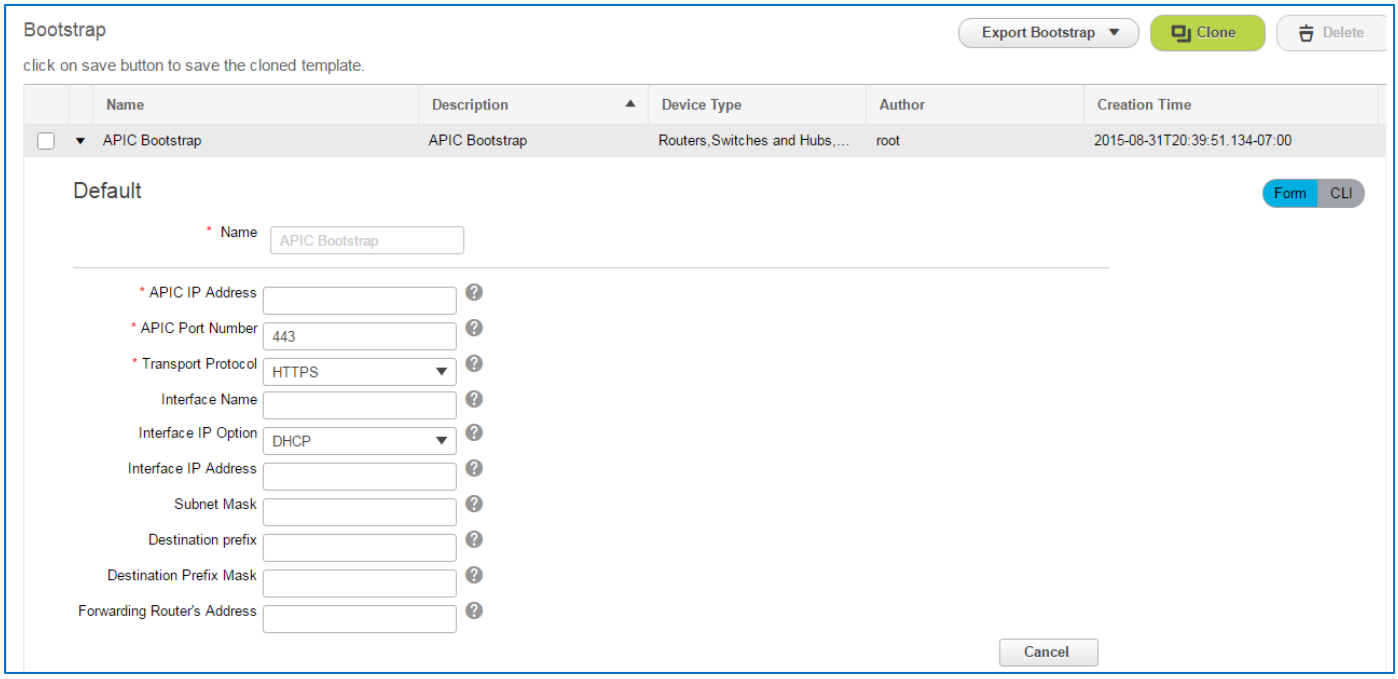
Configuring Bootstrap Files

Bootstrap files provide the initial configuration that new network devices require for connectivity to the APIC-EM controller. The primary methods that you can use to deliver bootstrap files, including:

- Connecting an iOS or Android mobile digital device to the device and downloading the bootstrap file by using the Cisco Plug and Play Mobile App (mobile application).
- Saving the bootstrap file to a USB flash drive, connecting the drive to the device, and then booting the device.
- Based on availability, by using the Plug and Play Redirect Service method, which delivers the bootstrap file through a cloud environment integrated with the APIC-EM controller.
- By using another device as a DHCP server.

On delivery of the bootstrap configuration, it establishes communication between the device and the APIC-EM controller.

Bootstrap configuration files are one component of Plug and Play profiles. On installation, the system provides a standard bootstrap configuration file, which you need to clone and configure based on network requirements.



Configuring Plug and Play Profiles

Plug and Play profiles organize and deliver configuration or software image files to devices and can include:

- A credential profile, which applies a common credential set to the devices receiving the profile.
- A bootstrap configuration file.
- A device software image file.
- The templated configuration file that contains the device configuration that you expect the device to run when it comes online.
- A post-deployment template, which delivers additional configuration to the device after successful configuration file deployment and management by Prime Infrastructure.

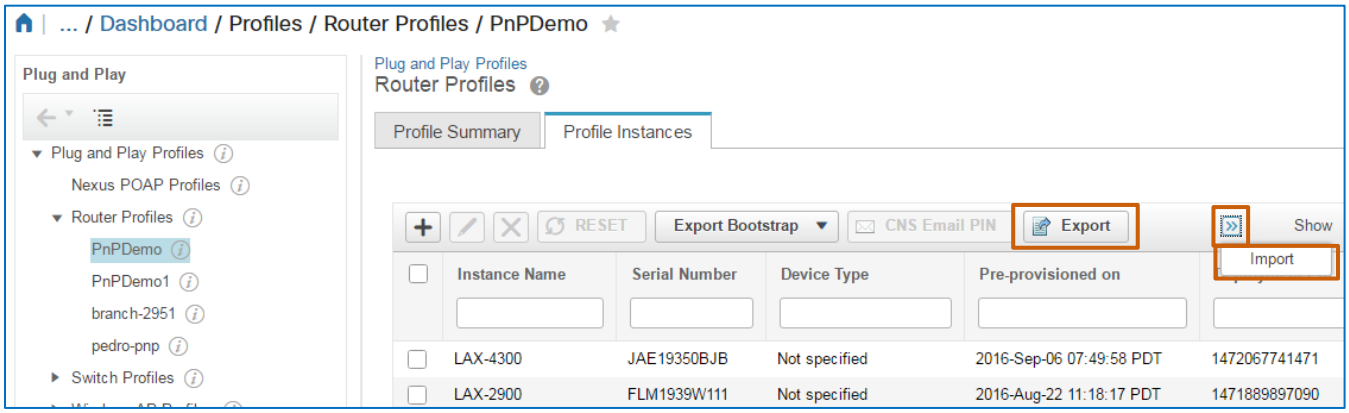
Tip: You can configure Plug and Play profiles separately or as part of the profile activation process.

Pre-Provisioning Devices

To support device pre-provisioning before profile activation occurs, you can:

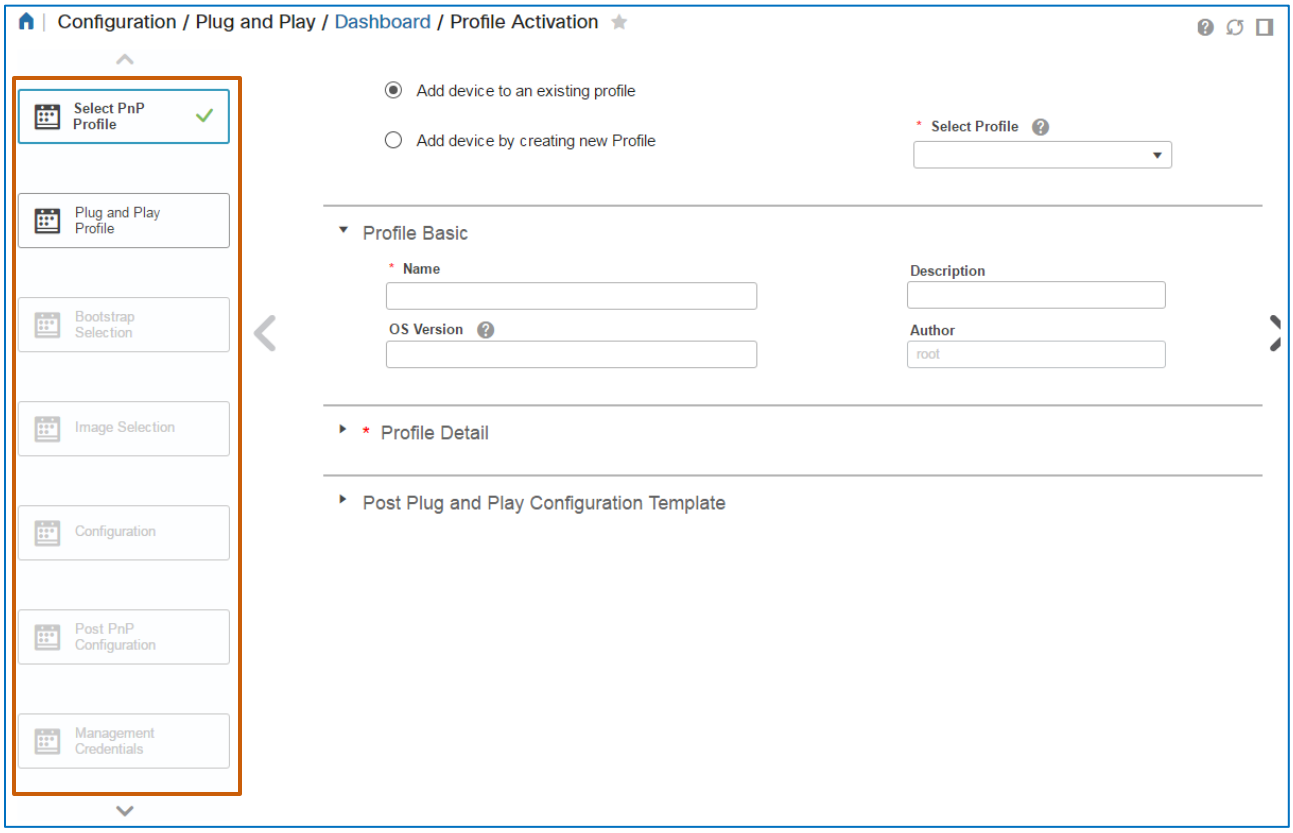
1. Export a .CSV-formatted template file.
2. In the .CSV file, add the values for the device plug and play profile variables for each device that requires pre-provisioning.
3. Import the completed .CSV file, which populates the values for each device in the system.

Then, when pre-provisioned devices connect to the network, the system delivers the configuration files by using the values in the .CSV file for each device.



Activating a Plug and Play Profile

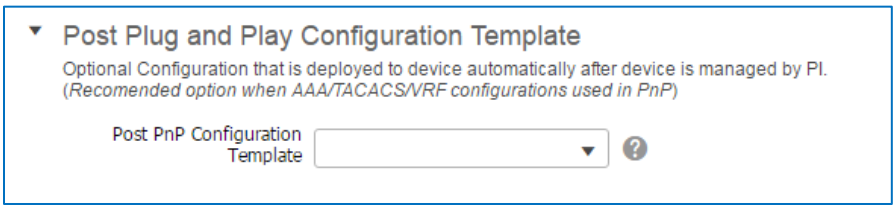
Following a wizard that takes you through the steps, you can activate previously configured plug and play profiles or configure a profile during the activation process. The **Profile Activation** wizard provides the steps that you need to take to deploy all of the configuration files that you expect.



Plug and Play Jobs

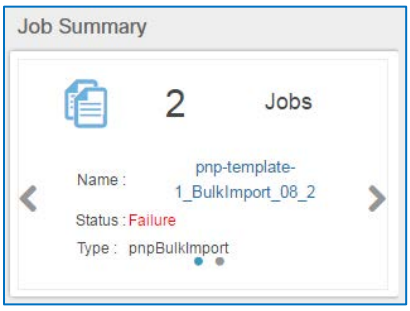
Prime Infrastructure executes the following two types of jobs:

- Importing device profiles
- Deploying a post Plug and Play configuration as part of the profile activation process when a profile includes a post Plug and Play configuration template



On the **Dashboard** page, you can scroll through a summary of completed bulk import or post Plug and Play configuration template deployment jobs to evaluate their statuses.

You can click a job link to review job details.



Skills

To deploy devices by using the Plug and Play process, deployment engineers need the following experience.

Proficient

- Prime Infrastructure user interface navigation and behaviors
- CLI commands and usage

Expert

- Practical networking experience and knowledge

Terms

APIC-EM Controller

Assumes the role of the Plug and Play Gateway to manage Prime Infrastructure's connection to, and communication with, the devices that require deployment.

The controller receives the bootstrap configuration from Prime Infrastructure, and on device installation, devices contact the controller to obtain the applicable configuration files.

Bootstrap Configuration Files

Provide device connectivity to the network and allow the Plug and Play agent embedded in the device's operating system to communicate with Prime Infrastructure through the APIC-EM controller

Call Home Automated Process

An embedded operating system function that causes a device to request its configuration from a designated IP address on initial connection to the network

Credential Profiles

Define communication protocols and their management credentials for use in Plug and Play profiles, including:

- SNMP
- Telnet/SSH
- HTTP

Using credentials profiles expedites the definition and helps ensure consistent application of communication protocols to large groups of devices.

Bringing the Initial Router at a New Site Online

Use Case Scenario

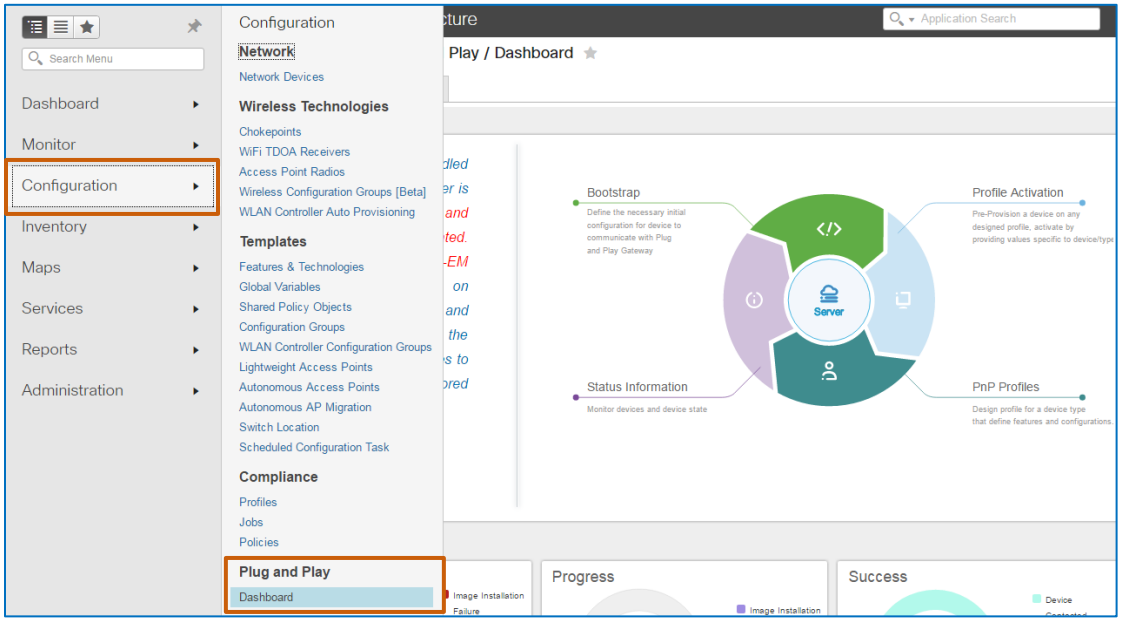
In support of company growth, your organization is opening its first remote sales site. As part of the IT organization, you are tasked with connecting the site to the enterprise network by bringing the router online with the correct configuration for network communication.

Because the sales site is the first remote location with devices that the enterprise will manage by using Prime Infrastructure, you need to:

1. Integrate an APIC-EM controller with Prime Infrastructure, which will provide the gateway that supports remote device configuration.
2. Configure the bootstrap file, which will provide the router with the configuration that it needs to communicate with the APIC-EM controller.
3. Configure the Plug and Play profile, which will provide the router with the applicable software image and apply security or other settings.
4. Activate the Plug and Play profile, which initiates the configuration process when the router connects to the controller and manages configuration deployment.
5. Evaluate the completed activation process.

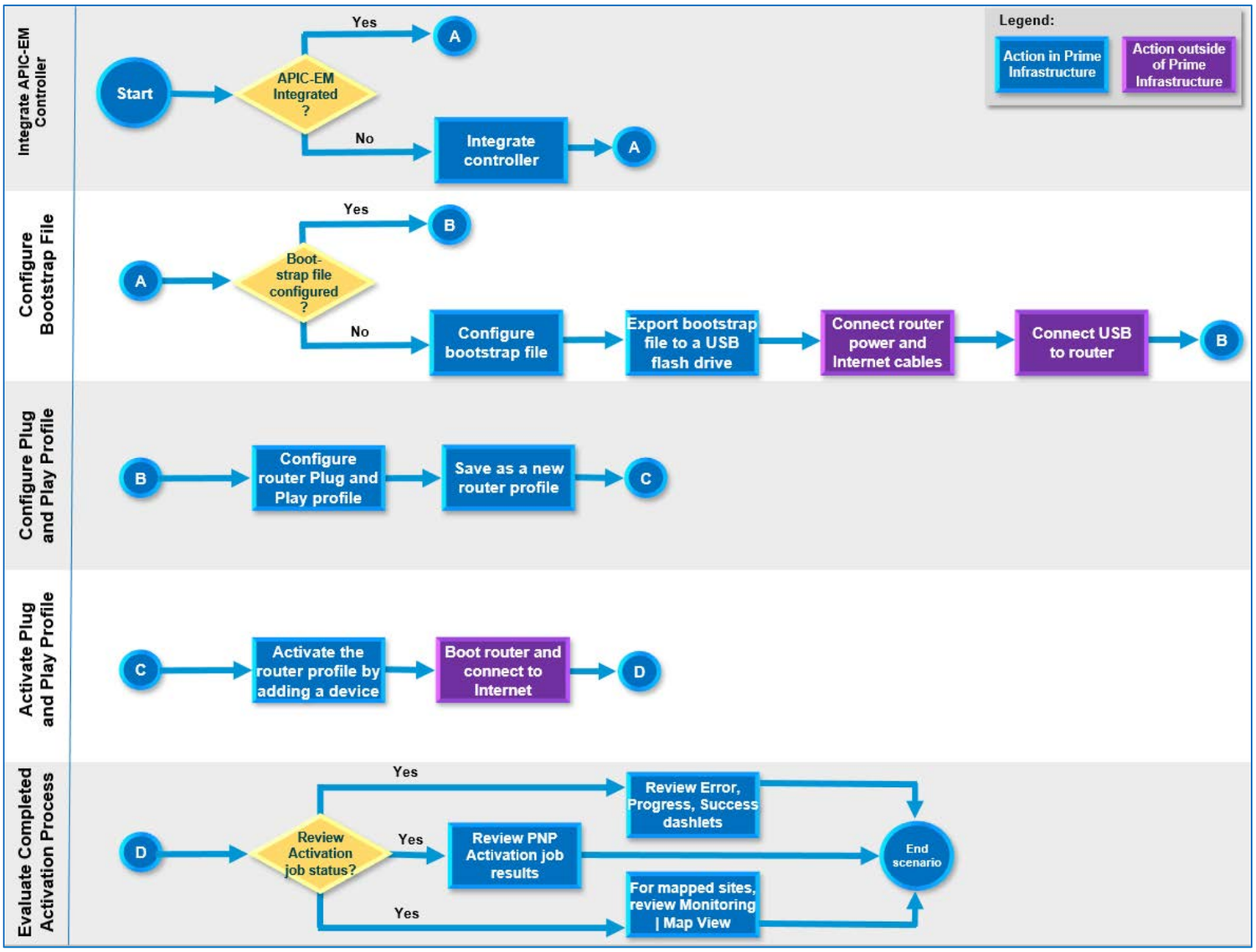
To start this use case:

- On the **Configuration** menu, open the **Plug and Play | Dashboard** page.



Process Flow

For optimal legibility, set the PDF zoom level to 100%.



Process Steps

Task 1: Integrate APIC-EM with Prime Infrastructure

In the use case, you are deploying the first remote site for the enterprise. You need to integrate the APIC-EM controller with Prime Infrastructure to support establishing communication with the initial router that will be coming online after installation and delivering the software image that it needs.

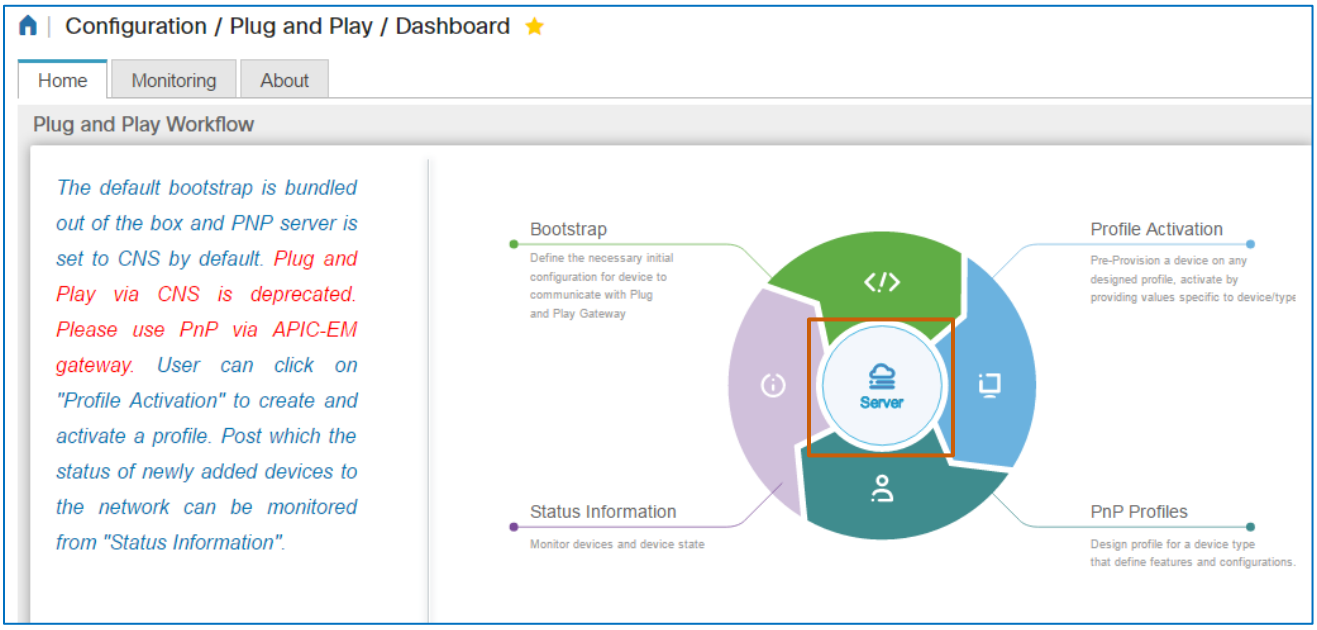
To integrate the controller, you need the following information:

- The APIC-EM controller IP address or hostname
- The management credentials for the controller

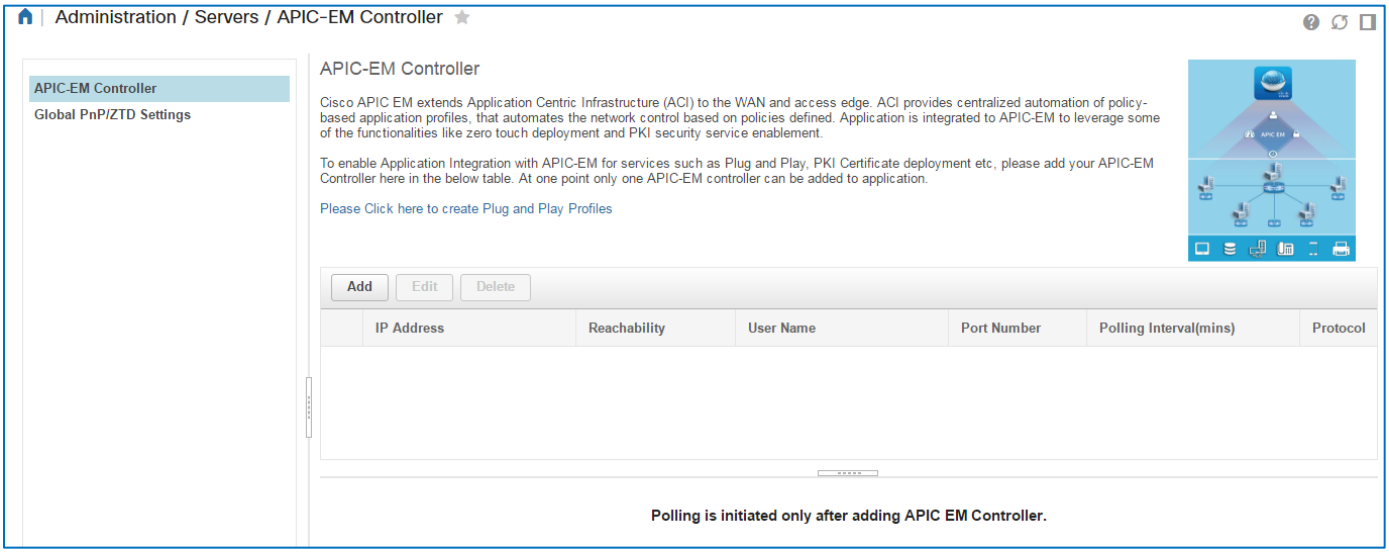
Note: You can only integrate one APIC-EM controller with Prime Infrastructure.

To integrate an APIC-EM controller, follow these steps:

1. On the **Dashboard** page, click the **Server** icon.

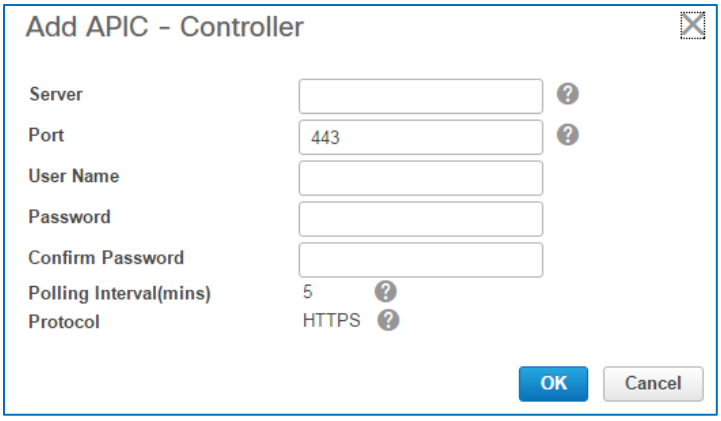


The **APIC-EM Controller** page opens.



2. On the toolbar, click **Add**.

The **APIC – Controller** dialog box opens.



3. In the dialog box:
   a. In the **Server** field, type the IP address or hostname of the APIC-EM controller.
   b. In the **Port** field, accept the default port number.

Note: The APIC-EM controller uses port 443 to support HTTPS secure communication.

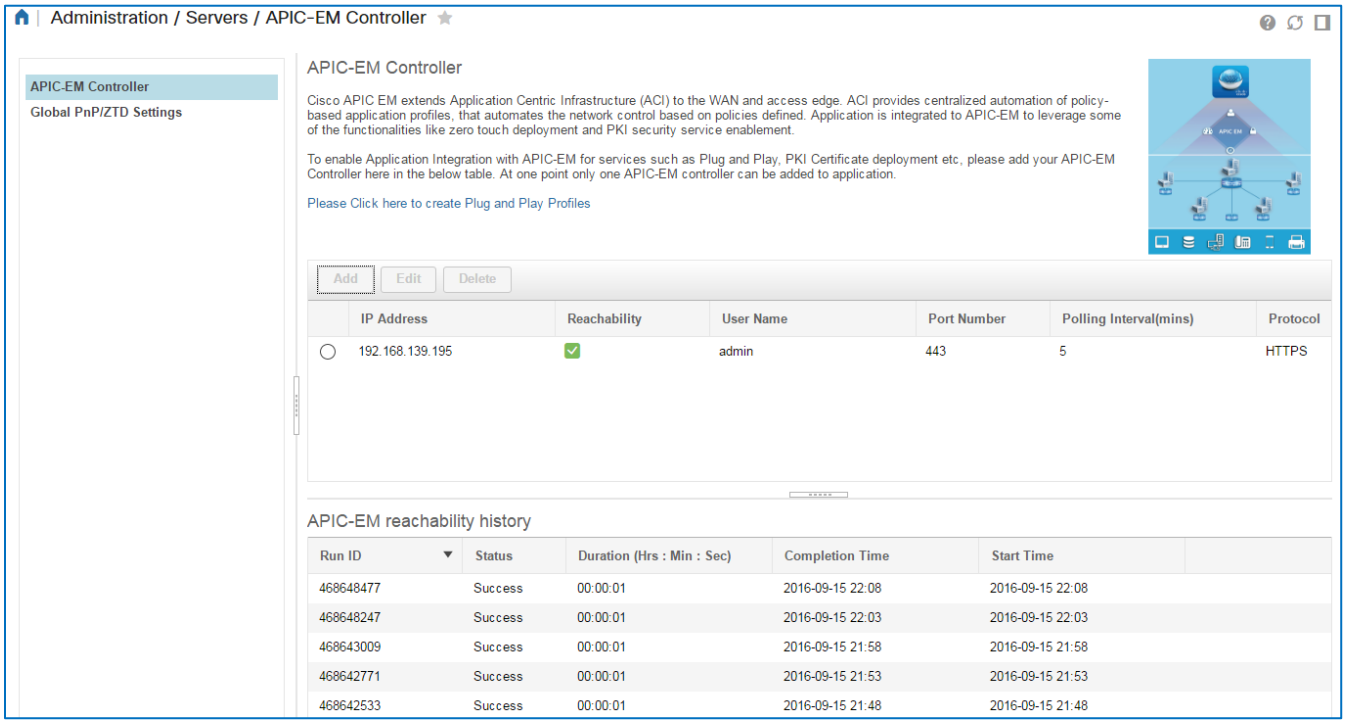
   c. In the **User Name and Password** fields, type the credentials to log in to the APIC-EM controller.

Note: The interval at which Prime Infrastructure polls the device and the secure protocol that it uses to communicate with APIC-EM are pre-defined and not available for changes.

d. To save the controller configuration, click **OK**.

The dialog box closes and the page lists the controller that you added. The system immediately verifies and reports the controller's reachability status in the **Reachability** column.

At each polling interval, it reports the status and logs an entry in the **APIC-EM reachability history** list.



With the APIC-EM controller now integrated with Prime Infrastructure, you can use Prime Infrastructure to deliver software image that you need the router to run.

Task 2: Configure a Bootstrap File

In this use case, because this is a new router at the company's first remote site, you need to deliver the bootstrap file to the router at it initial power on by using a USB flash drive.

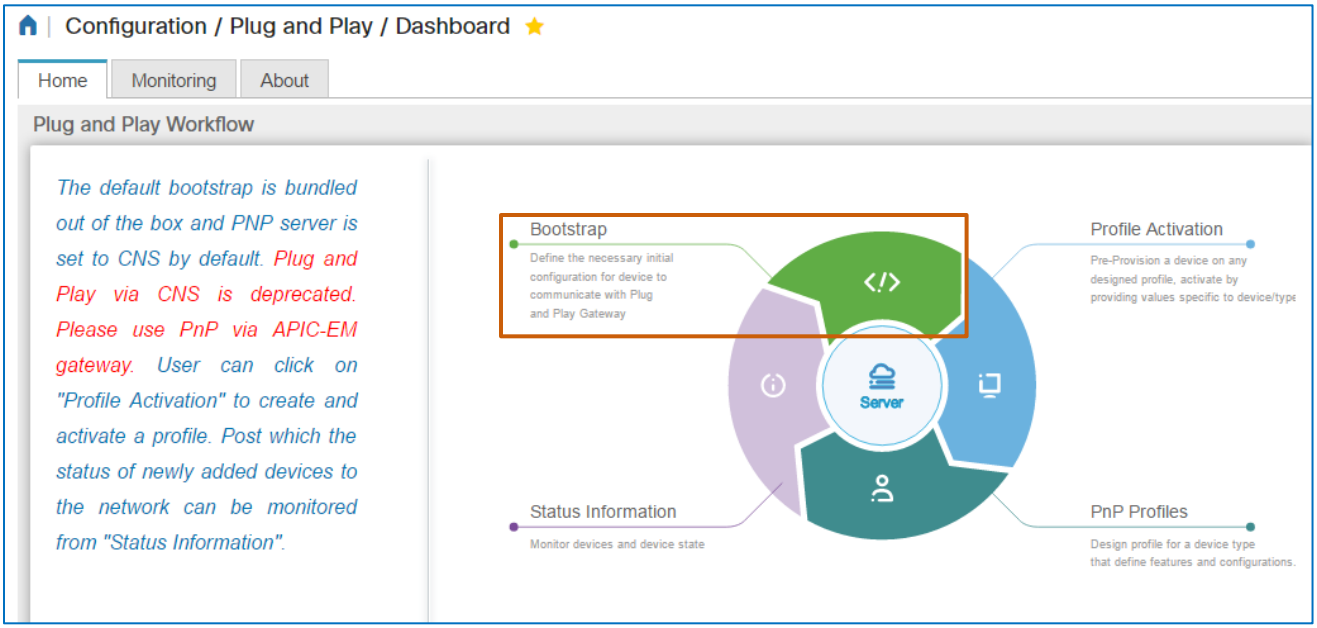
To do so, you configure the bootstrap file in Prime Infrastructure and download it to a USB flash drive that an installer can connect to the router before powering it on. Then when initially powered, the router will locate and download the bootstrap file automatically.

To configure a bootstrap file, you need the following information:

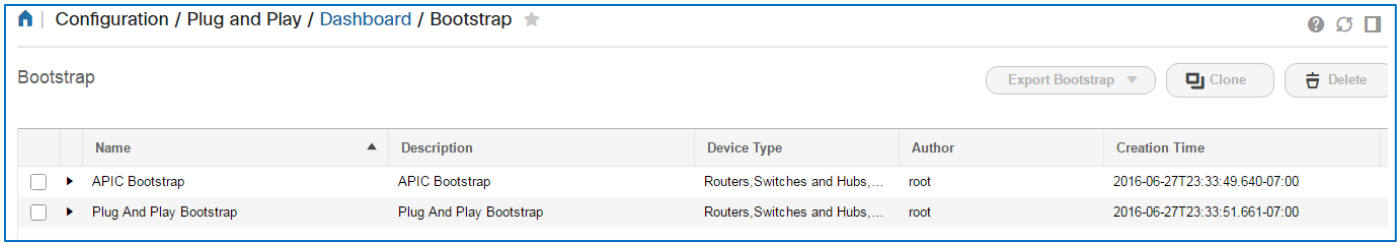
- The APIC-EM controller IP address
- The port number on the controller
- Whether to use a secure or non-secure communication protocol
- The interface option, which indicates whether to use the interface as a DHCP server or apply a static IP address
- Additional routing details, as needed

To configure a bootstrap file, follow these steps:

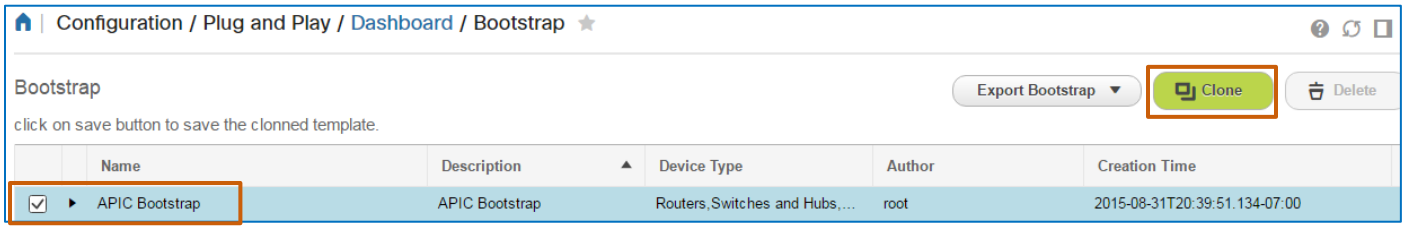
1. On the **Dashboard** page, click the **Bootstrap** icon.



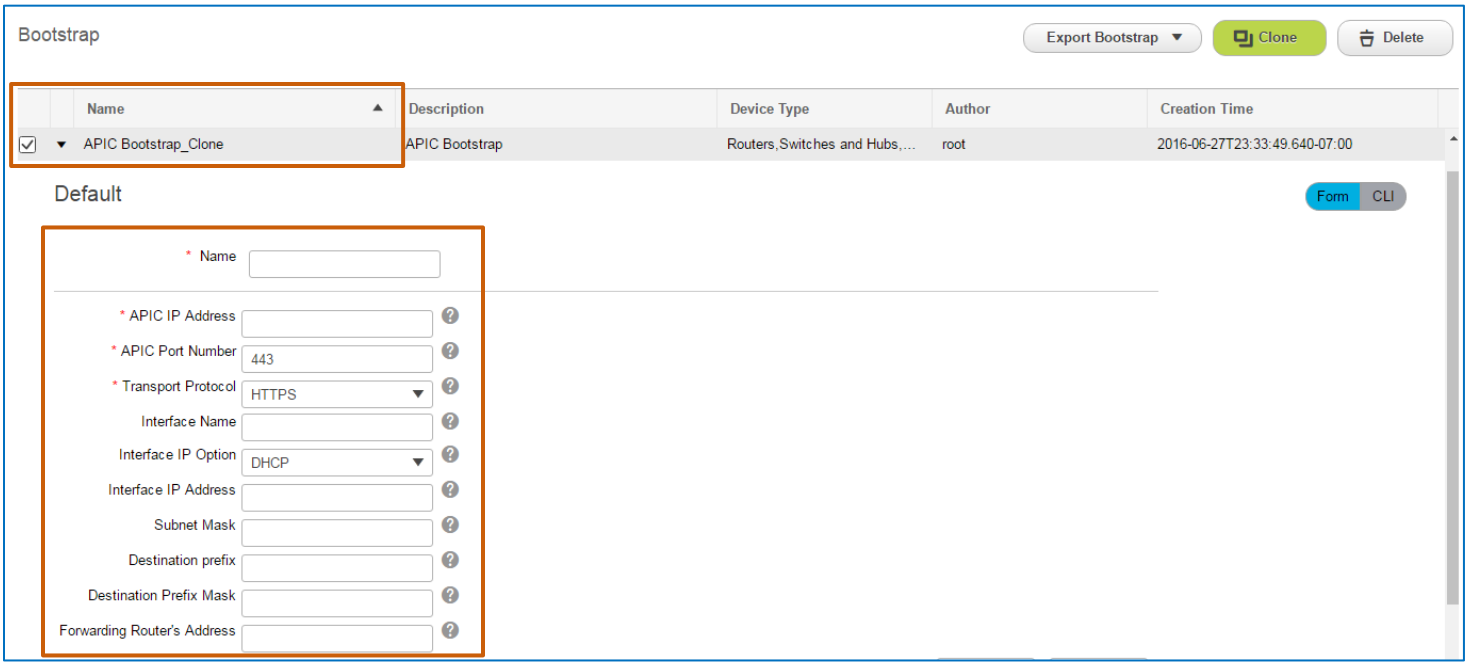
The **Bootstrap** page opens.



2. To configure an APIC-EM bootstrap file, select the check box in the **APIC Bootstrap** row, and then click **Clone**.



The page opens the fields of the cloned file, which are available for editing.



3. To identify the bootstrap file, in the **Name** field, type the file name.

   Important Note: You can only name the file when you configure it initially. When you save the cloned file, the name becomes read-only, which helps avoid naming conflicts.

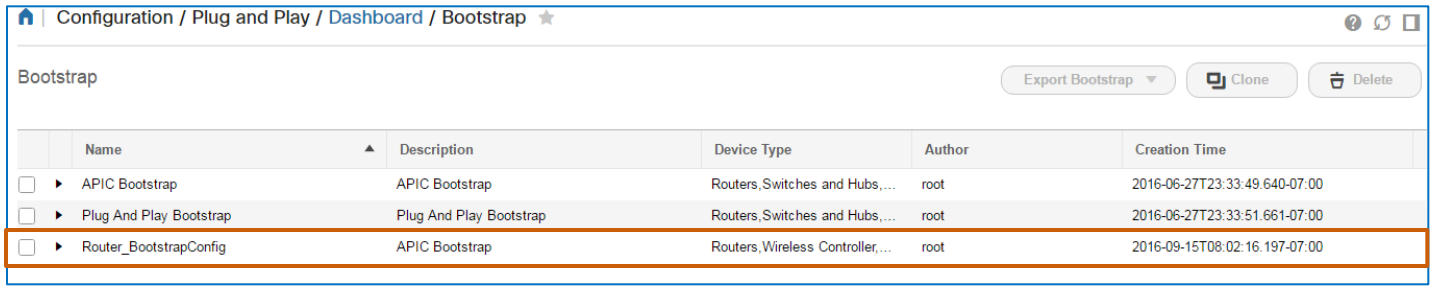
4. In the **APIC IP Address** field, type the APIC-EM controller's IPv4 IP address.
5. To identify the port on the APIC-EM to which the device connects, in the **APIC Port Number** field, accept the default port number.

   Important Note: APIC-EM uses the default port number of 443 to support HTTPS secure communication.

   If you change the APIC-EM port number to 80 in this step, which indicates using the HTTP protocol, the system automatically changes the port number to 443 when the device initially establishes its connection (handshakes) with the APIC-EM controller.

6. In the **Transport Protocol** field:
   - To configure a secure connection protocol, accept the default selection of **HTTPS**.
   - To configure a non-secure connection protocol, select **HTTP**.
7. Optionally, in the **Interface Name** field, type the interface name.
8. In the **Interface IP Option** drop-down list:
   - To configure the interface as a DHCP server, accept the default selection.
   - To apply a static IP address that the controller will use for communication, select **IP Address**; and then, in the **Interface IP Address** field, type the static IP address.
9. Optionally, you can indicate additional routing commands, as needed.
10. To add the APIC-EM bootstrap file, click **Save**.

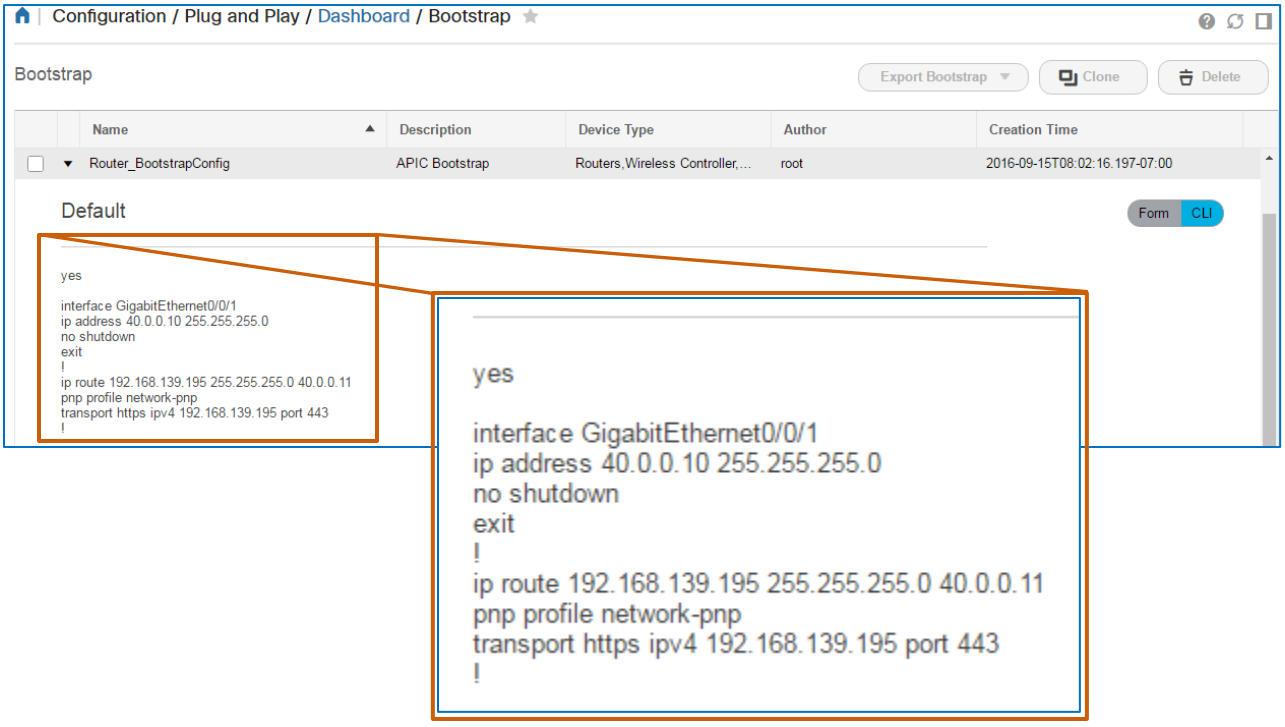
The bootstrap file that you added appears in the **Bootstrap** list. It is available for installation or use when you configure and activate Plug and Play profiles.



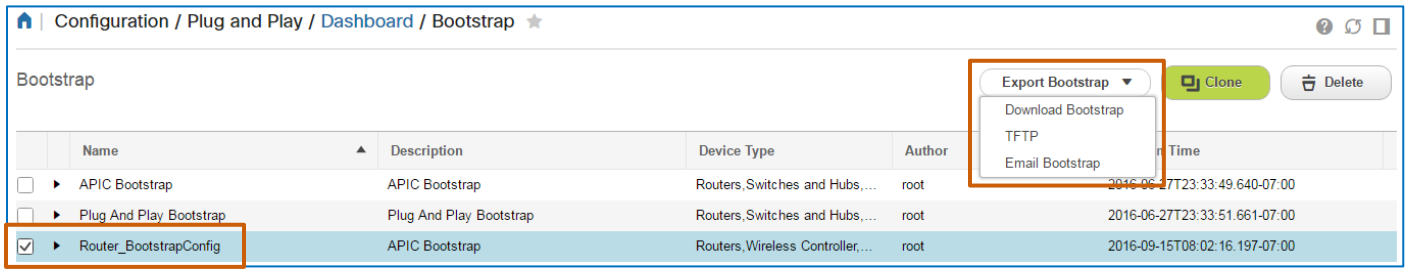
Note: When you configure a bootstrap file in the **Form** view, you can review the commands that the bootstrap file will send to the device.

To review the commands:

- Click **CLI**. The system displays the read-only commands. You can return to the **Form** view to make changes, as needed.



11. To deliver the bootstrap file, select the check box beside the name, and then click **Export Bootstrap**.



- To download the bootstrap file to a drive or other location, click **Download Bootstrap,** and then browse to and select the location.

Important Note: When you need a new device to install the file from a USB drive during the power on process, you must rename the file **ciscortr.cfg**.

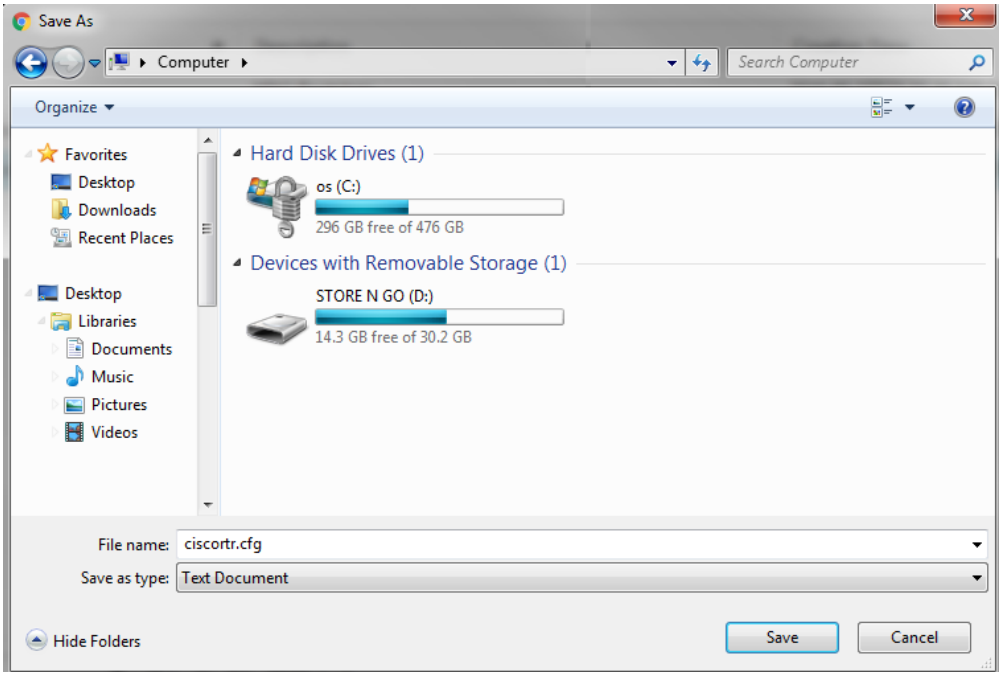
Do not accept the default name that appears in the **File name** field.

Note: The option to export to TFTP for CNS systems is no longer supported.

- To send the bootstrap file to someone by using e-mail, click **Email Bootstrap**, and then, type the user's Prime Infrastructure e-mail identifier.

Note: An administrator must configure an e-mail server in Prime Infrastructure to support the **Email Bootstrap** function.

In our case, we download the bootstrap file to the USB flash drive and follow the naming convention to name the file.



Task 3: Configure the Plug and Play Profile

To prepare for device connection to the APIC-EM controller, the next step is to configure a Plug and Play profile that will apply any configuration, including bootstrap, feature, or technology configurations; or apply a software image to the device.

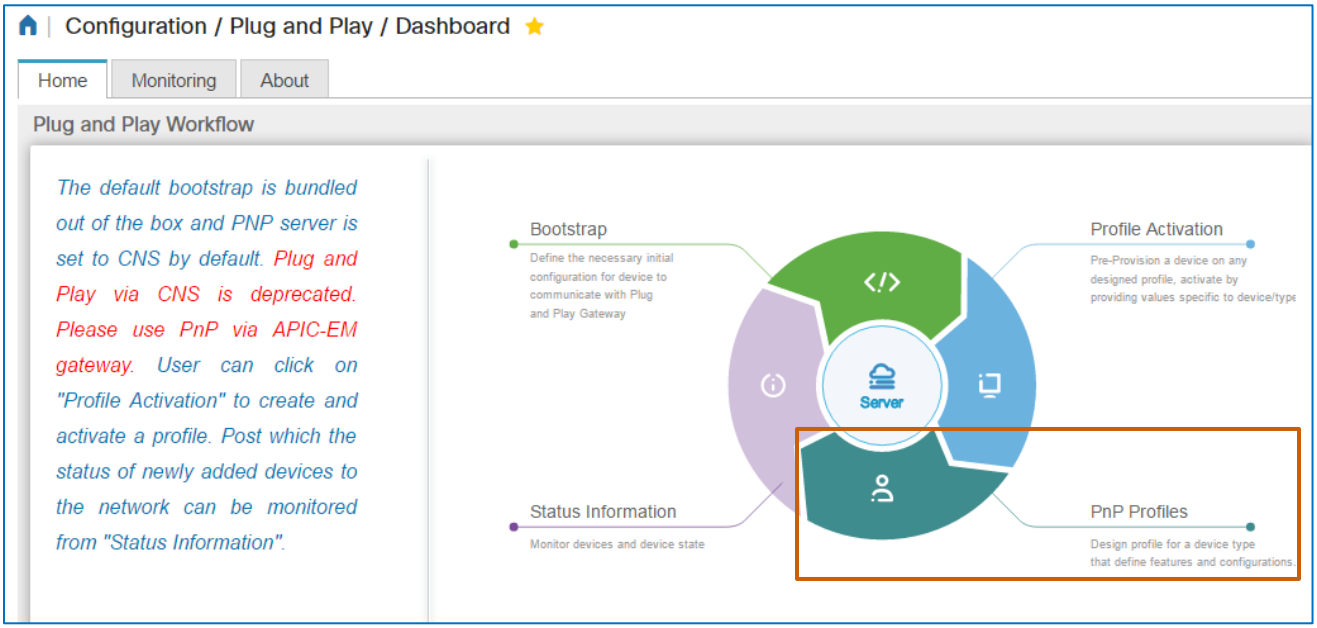
The information that you need to configure a Plug and Play profile varies based on the device type. You can configure profiles for the following device types:

- Nexus switches with power-on auto-provisioning (POAP)
- Routers
- Switches
- Wireless access points (APs)

In our scenario, we are applying the bootstrap to the router through a manual process and using the Plug and Play profile to deliver the software image that the router needs to run. Configuration of additional features is not necessary.

To configure a Plug and Play profile, follow these steps:

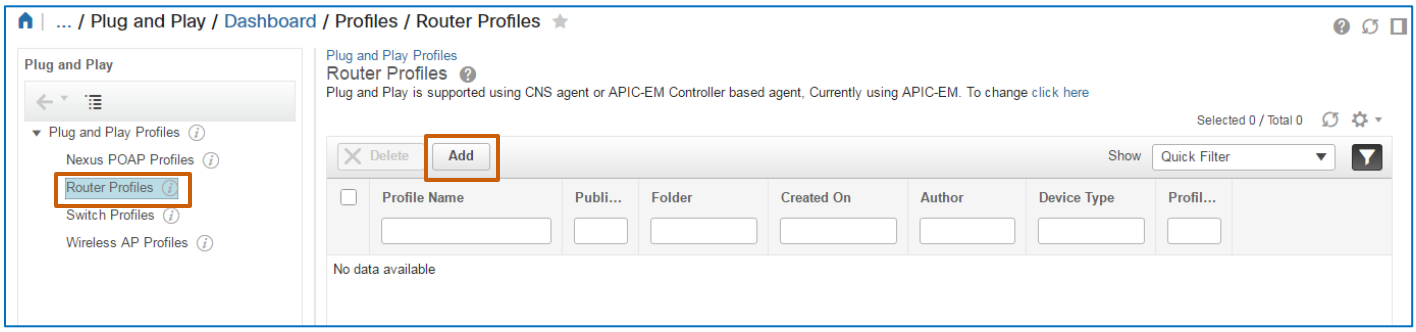
1. On the **Dashboard** page, click the **PnP Profiles** icon.



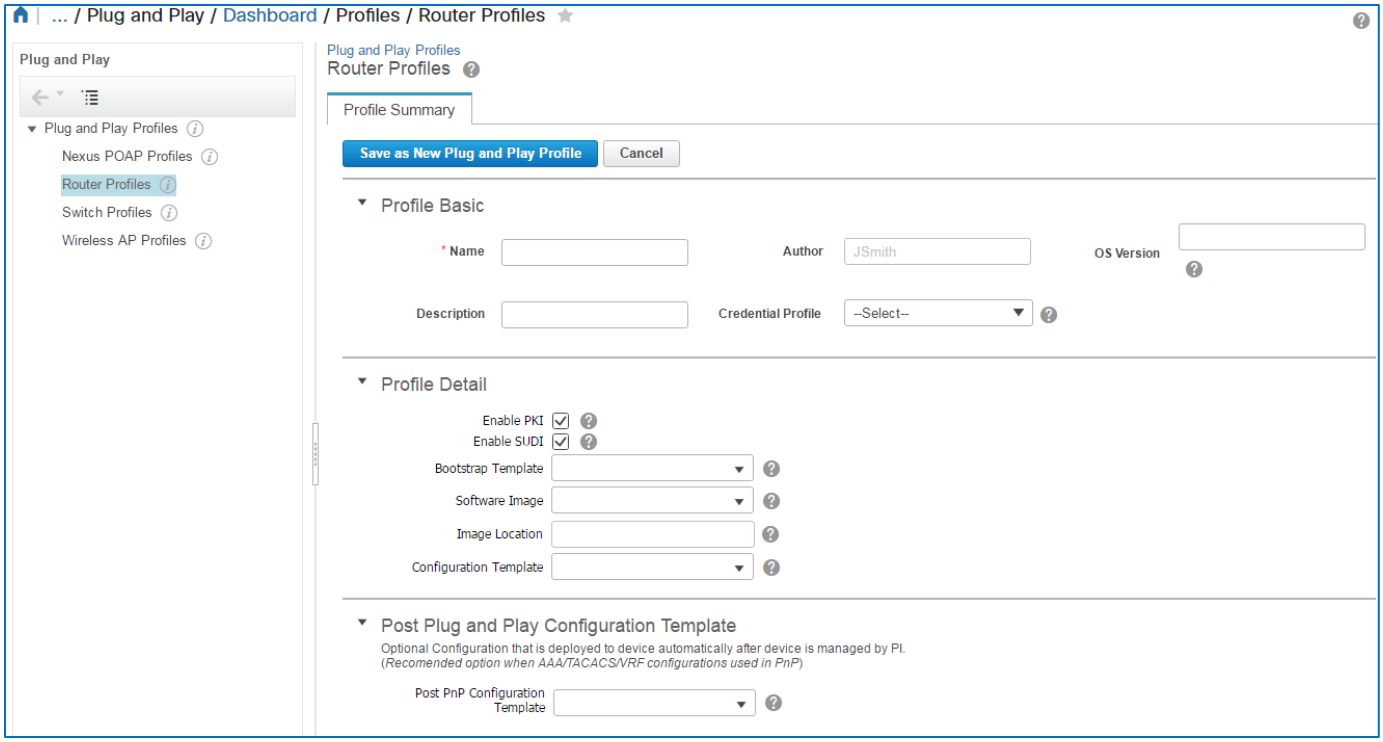
The **Plug and Play Profiles** page opens.

Note: If you have opened the **Plug and Play Profiles** page previously, the system opens the last page that you visited when you click the **PnP Profiles** icon.

2. In the **Plug and Play** list, select the category of the type of devices for which you are configuring the profile, and then, on the toolbar, click **Add**.



The associated profiles page opens.

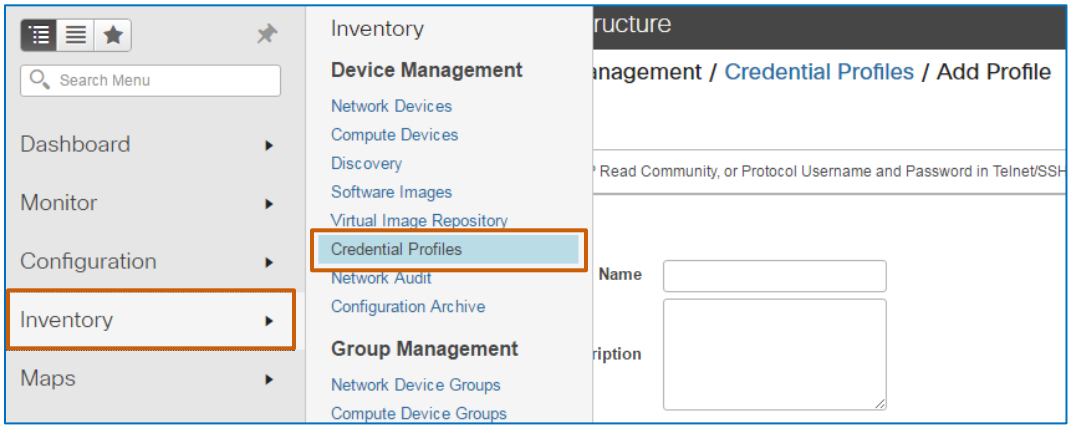


3. To complete a router profile, on the **Profile Summary** tab:
   a. In the **Profile Basic** section, in the **Name** field, type a unique profile name that makes its use recognizable.
   b. In the **Description** field, type a description of the profile's use.

Note: The system populates the **Author** field with your system user name automatically and is not available for editing.

c. To include the applicable SNMP, Telnet/SSH, or HTTP credentials that the profile will use to communicate with the router, in the **Credential Profile** drop-down list, select the applicable profile.

Note: System users can configure credential profiles by using the **Credential Profiles** feature on the **Inventory** menu.



d. To indicate the oldest acceptable operating system version that can accept the profile, in the **OS Version** field, type the operating system name and version.

Note: When you leave the **OS Version** field blank, the device can accept the profile based on the device's family, series, or type regardless of the operating system version.

e. To provision the device with Public Key Infrastructure (PKI) certificates, accept the default selection of the **Enable PKI** check box.

Note: The APIC-EM controller houses a certificate authority (CA) server to support PKI certificates.

f. On Cisco 4000 and newer routers, to enable the secure unique device identifier (SUDI) for device authentication on the network, accept the default selection of the **Enable SUDI** check box.

g. To install a configured bootstrap file when the device connects to the APIC-EM controller, in the **Bootstrap Template** drop-down list, under the **User-Defined** category, select the bootstrap file.

h. To run a specific software image on the device, select a software image that is available in the software image repository.

Note: When deploying a software image to a device, the system saves it to a pre-defined location on the device, so the **Image Location** field is unavailable for editing.

i. To install additional configuration data, available in the **Features and Technologies** templates area of the application, during device activation, in the **Configuration Template** drop-down list, select the configuration file.

j. In the **Post Plug and Play Configuration Template** section, to install additional configuration after the device activation process is complete and Prime Infrastructure is managing the device, in the **Post PnP Configuration Template** drop-down list, select the configuration file.

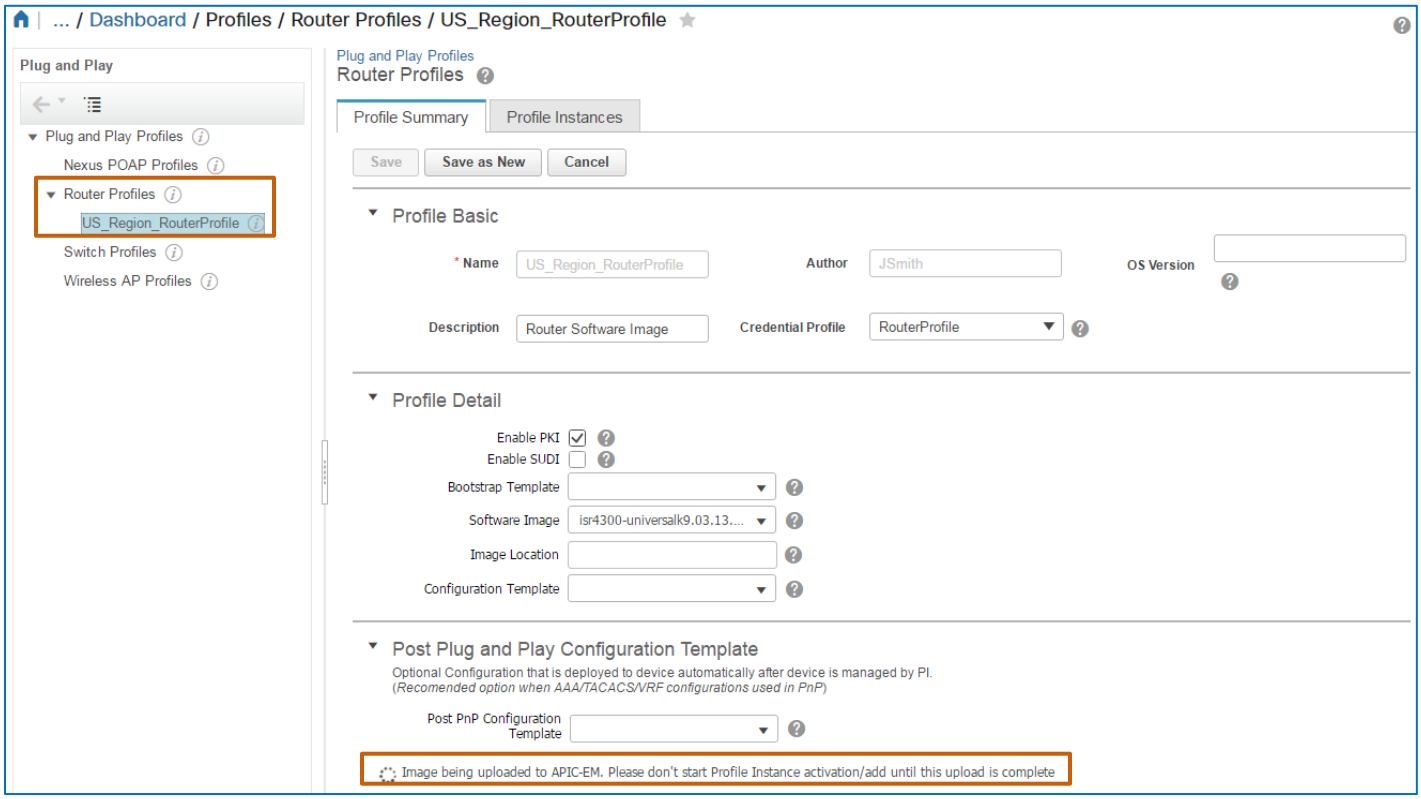
4. To save the profile configuration, click **Save as New Plug and Play Profile**.

A system message opens, prompting you to save the profile.

5. In the message, click **Save**.

   The **Plug and Play** list includes the profile in the applicable category and begins uploading the files included in the profile to the APIC-EM controller.

Important Note: Wait until upload is complete to activate the profile. If the file is not intact on the controller, activation will fail.



When the upload is complete, the profile is ready for activation on the router.

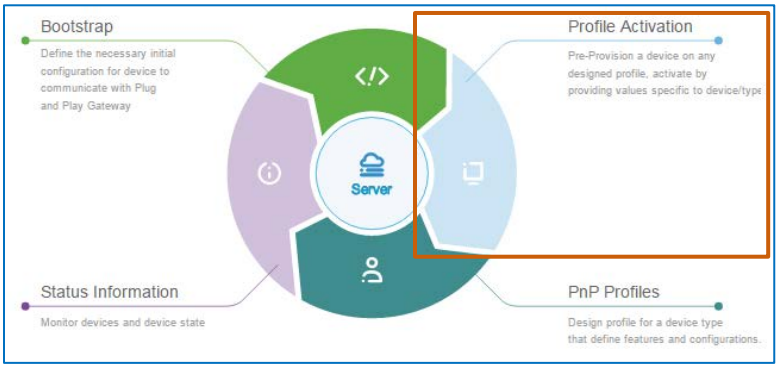
Task 4: Activate the Plug and Play Profile

In the profile activation process, Prime Infrastructure deploys the configuration files or software image that a system user has configured in the profile, so that the device runs as expected when Prime Infrastructure begins managing it.

When the device, in this case the router, connects to the APIC-EM controller, it requests its configuration in the automated 'call home' process. By using the device's identifiers, the controller can locate and obtain the applicable profile in Prime Infrastructure. The router then downloads the associated configuration files or software image and can begin running them.

Note: When adding a profile that you want to activate immediately, you can activate it following the process in this use case.

When you want to activate a previously configured profile, you can use the **Profile Activation** function on **the Plug and Play | Dashboard** page.

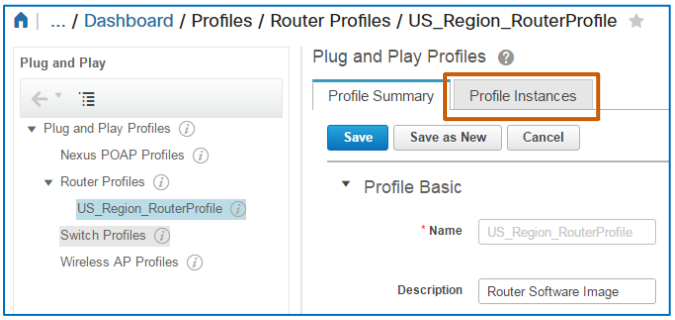


To activate the profile, you need the following information:

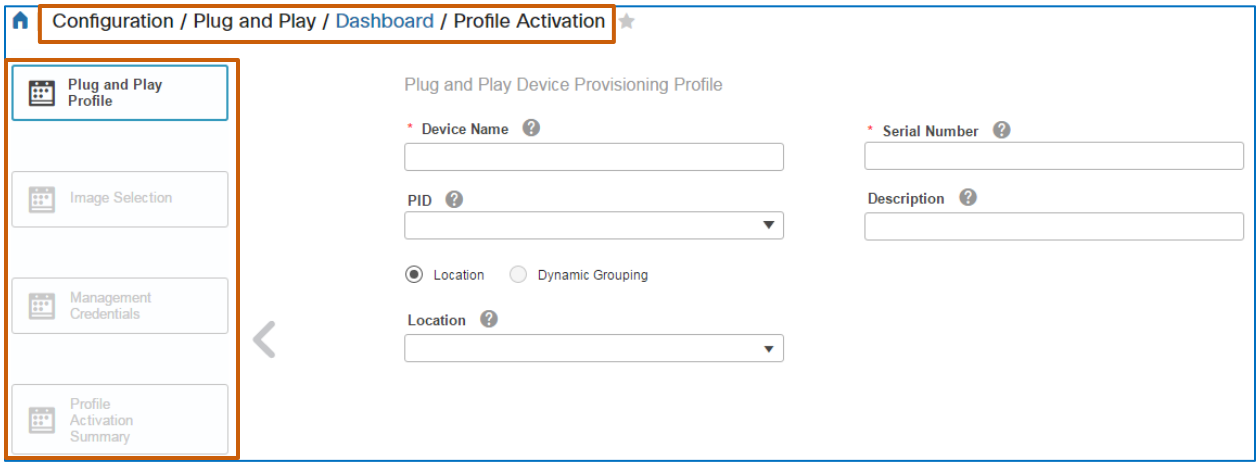
- The serial number of each device requiring provisioning
- When provisioning wireless access points, the MAC address of each device
- The device product identification number (PID)

Based on the use case, to activate the plug and play profile, follow these steps:

1. On the **Router Profile** page, click the **Profile Instances** tab.

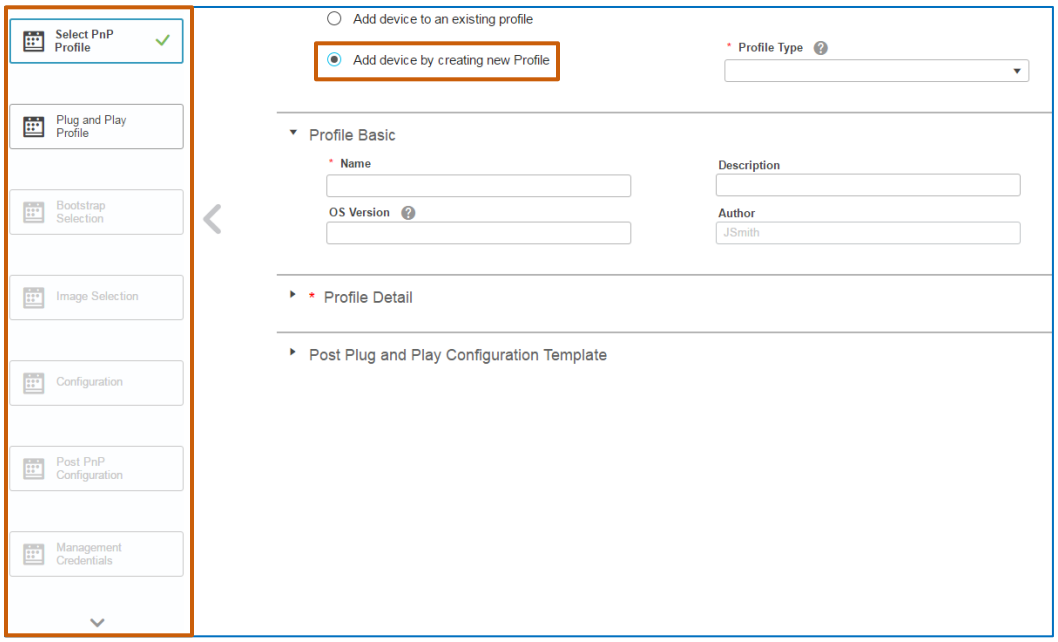


The system navigates to **Profile Activation** and opens the **Plug and Play Device Provisioning Profile** page, which provides a wizard to step you through the process.



The wizard includes only the steps that are required based on the profile.

Note: When using the **Profile Activation** function, if you add a device by creating a new profile, all of the wizard steps are available to you so that you can add the configuration details or software image that you need.



In this case, the profile contains a software image only, which makes the **Image Selection** step available.

2. On the **Plug and Play Device Provisioning Profile** page:
   a. To indicate a profile name, type it in the **Device Name** field.

   Important Note: The **Device Name** field supports using no spaces or using underscores to indicate spaces.

   If you include spaces in the device name, activation will fail.

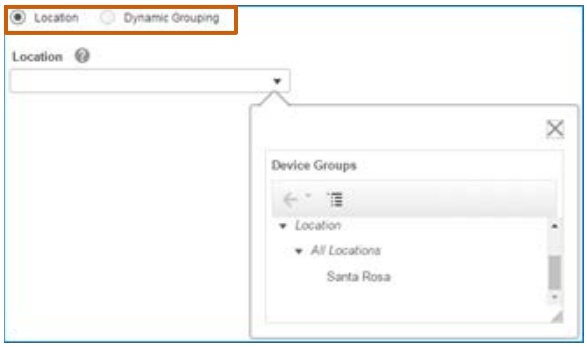
   b. To indicate the serial number of the device on which you need to activate the profile, in the **Serial Number** field, type the number.

   Note: When activating wireless access points, type the MAC address in the **Serial Number** field.

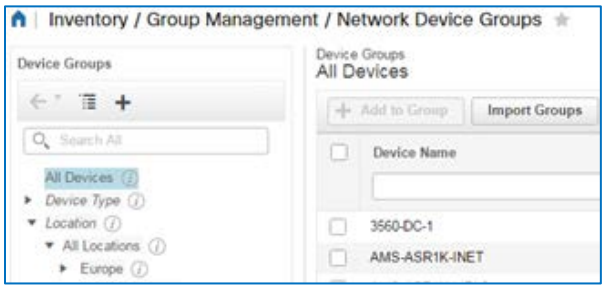
   c. To identify the device type by using the Cisco product identification number of the device, in the **PID** drop-down list, select the identifier.
   d. Optionally, to indicate details about the devices or provisioning, in the **Description** field, type the description text.

   Tip: Adding descriptions about the devices or provisioning that is occurring is particularly helpful when a group of system users are responsible for managing provisioning operations.

   e. To assign a device to a location group:
      - Manually
        - Accept the default selection of **Location**, and then, in the **Location** drop-down list, browse to and select the location group.
      - Automatically
        - Click **Dynamic Grouping**. The system will follow the group rules to determine the group to which it adds the device.



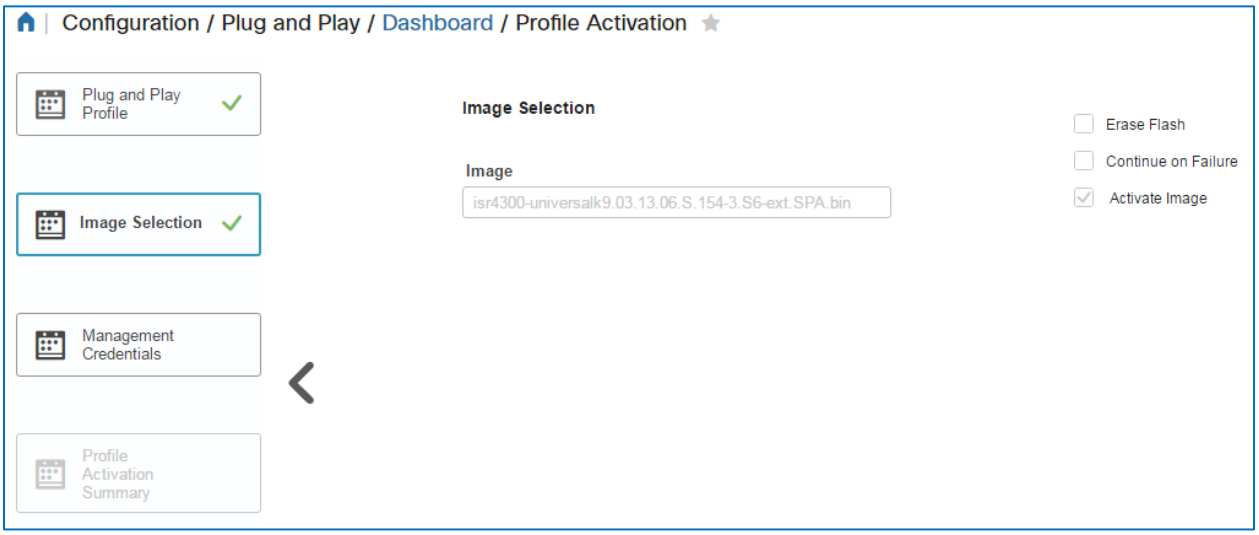
Note: To assign a device to a location group, either manually or dynamically, a system user must configure those groups previously so that they are available in the system.



3. To continue, click **Image Selection**.

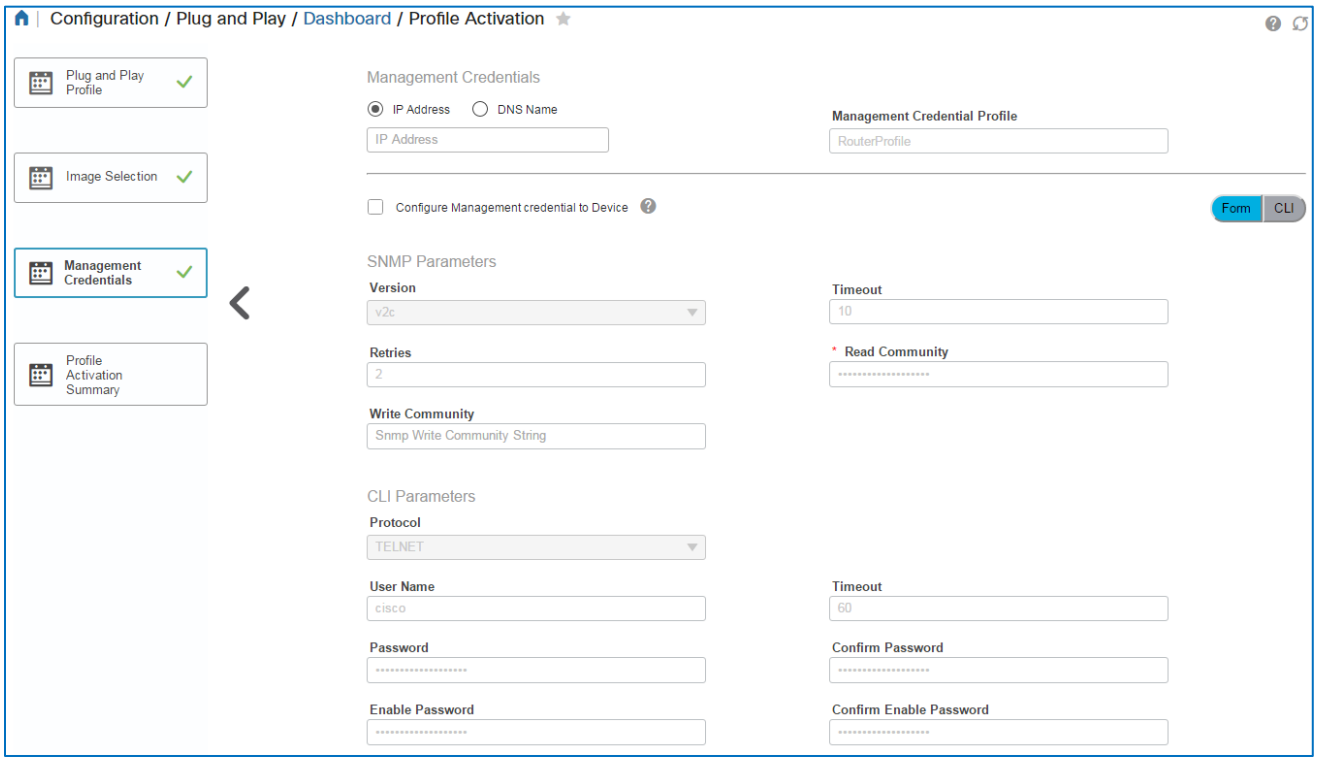
   Because the router Plug and Play profile contains a software image based on the use case, the **Image Selection** page opens and provides read-only details, including:

   - The image that the profile will deploy.
   - The applicable activation options, which an administrator configures in the Administration system settings.



4. To continue, click **Management Credentials**.

   The **Management Credentials** page opens and, when a credential profile is included in the **Plug and Play Profile**, populates the credentials fields with the read-only profile information.



5. Optionally, to apply the credentials that the system will use to discover and manage the device:

   - To indicate the management IP address that the device needs to use, accept the default selection of **IP Address**, and then, in the **IP Address** field, type the IP address.

     Important Note: When activating a profile on Nexus switches with POAP, you must use the management IP address.

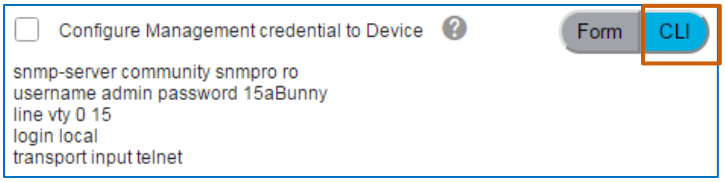
   - To indicate the domain name server that the device needs to use, click **DNS Name**, and then, in the **DNS Name** field, type the domain name server name.

     Note: When you do not indicate an IP address or DNS name, the controller dynamically determines the address that it will use for device discovery and management.

6. To use the Plug and Play process to configure the credentials that the system will use to manage the device, select the **Configure Management credential to Device** check box.

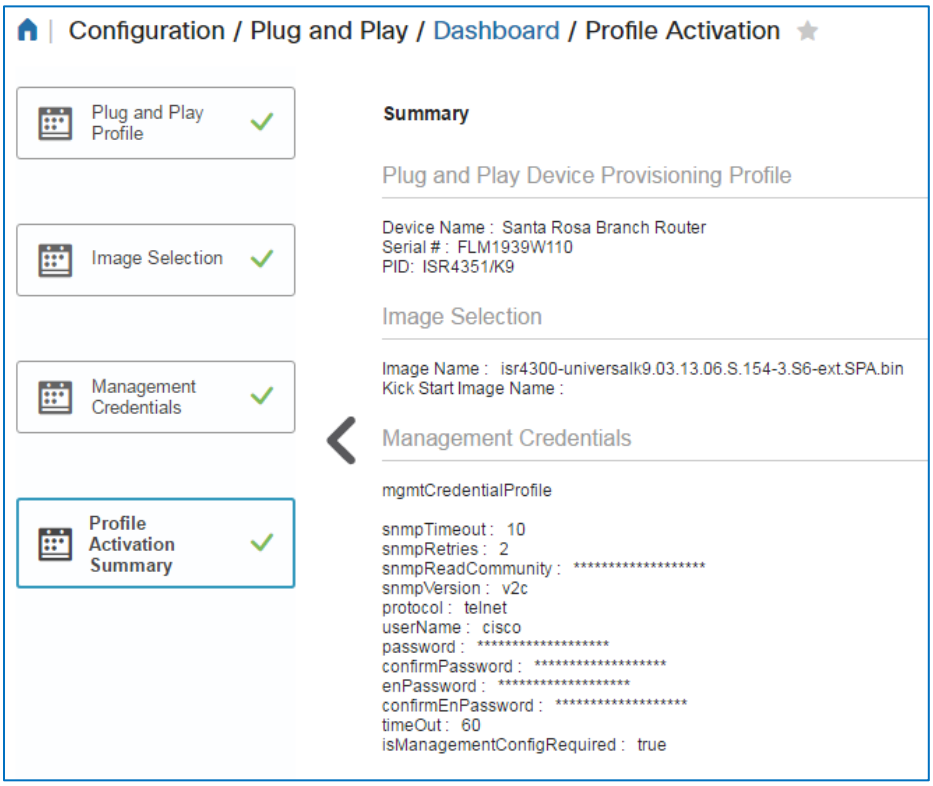
Note: When you use a configuration template or other method to configure management credentials, you do not need to select the check box.

To see the commands that the profile will send to the device, click **CLI**.



7. To continue, click **Profile Activation Summary**.

The **Summary** page opens and provides the details related to configuration that the system will activate on the device.



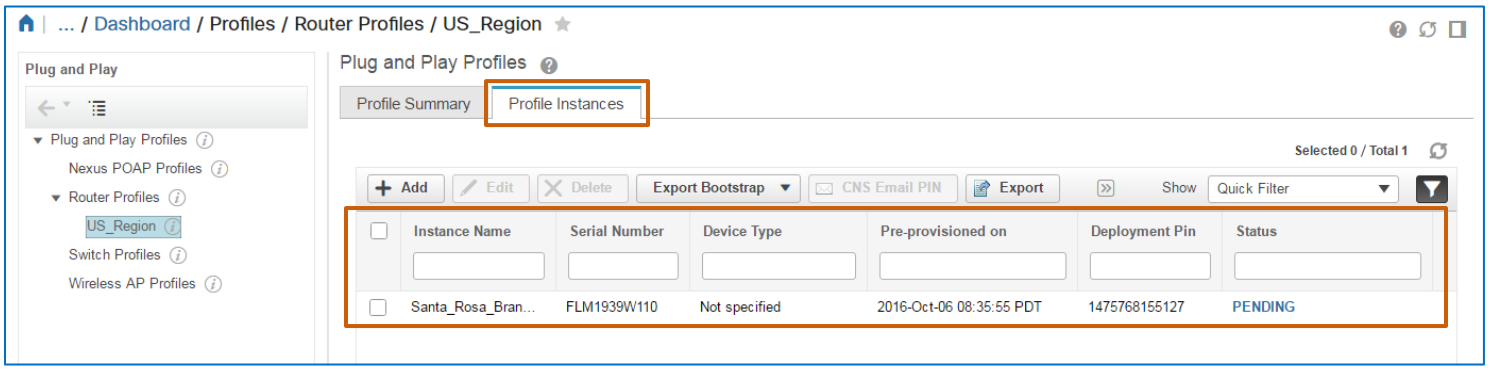
8. To continue:
   - If the summarized details look accurate, to continue the activation process, click **Finish**.
   - If you want to make changes to any configuration information, you can:
     - Click a previous page in the wizard to return to and edit details.
     - Click **Exit**. This action closes the wizard and returns you to the **Plug and Play Profiles** page and opens the profile that you were using in the wizard.

When you click **Finish**, the system returns to the **Profile Instances** tab and lists the activation activity, indicating that the process is in a pending status.

The process remains pending until the device that you identified in the activation wizard comes online and initially connects to the APIC-EM controller.

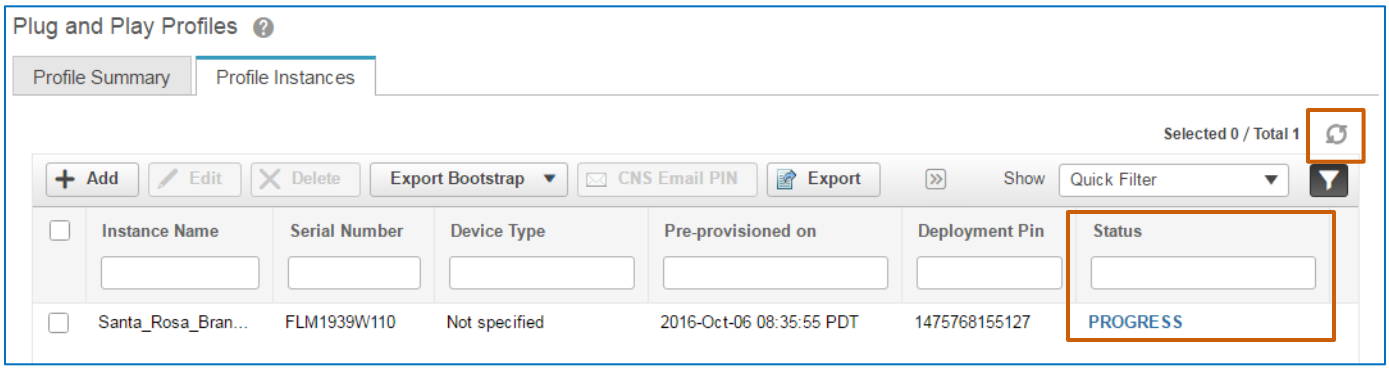
On connection, the APIC-EM controller begins delivering the files associated with profile. In this case, it begins deploying the software image when the router connects to controller.

Note: The activation profile becomes available to deploy all of its associated files to the applicable devices when they initially connect to the APIC-EM controller.

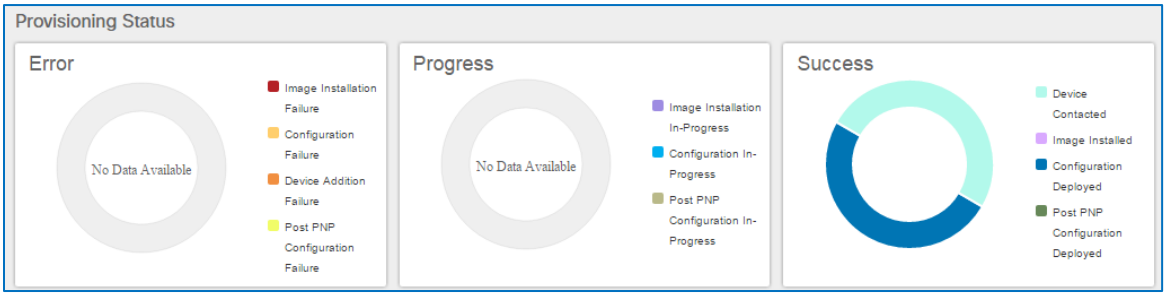


Task 5: Evaluate the Activation Process

When devices connect to the controller and the profile activation process begins, you can refresh the **Profile Instances** tab to monitor activation progress.



Tip: You also can monitor progress on the **Dashboard** page in the **Provisioning Status** dashlets.

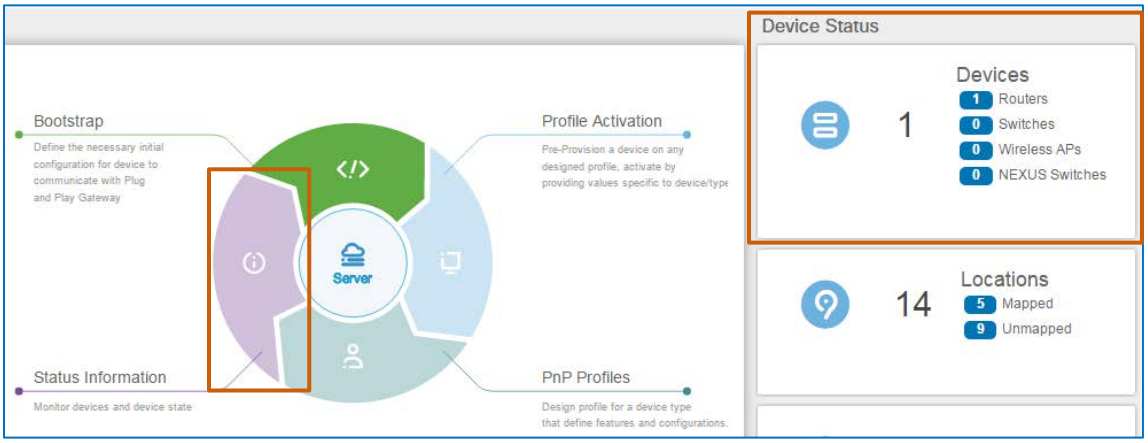


To review the activation statuses for all devices:

- Click **Status Information** on the dashboard.

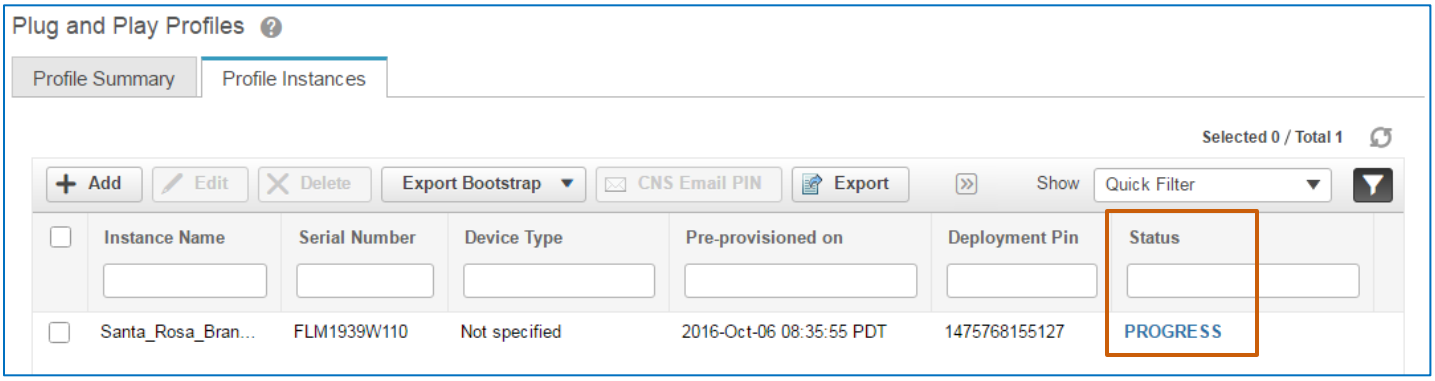
OR

- Click the **Device Status | Devices** dashlet.



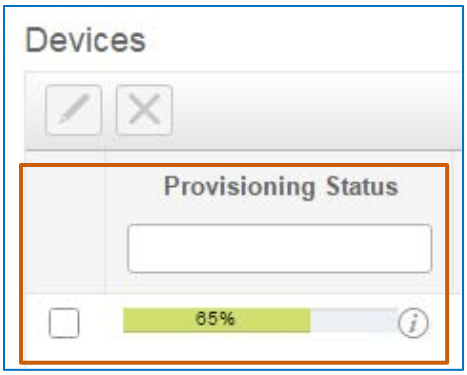
To review activation progress in detail:

1. On the **Profile Instance** tab, in the **Status** field, click the **Progress** link.



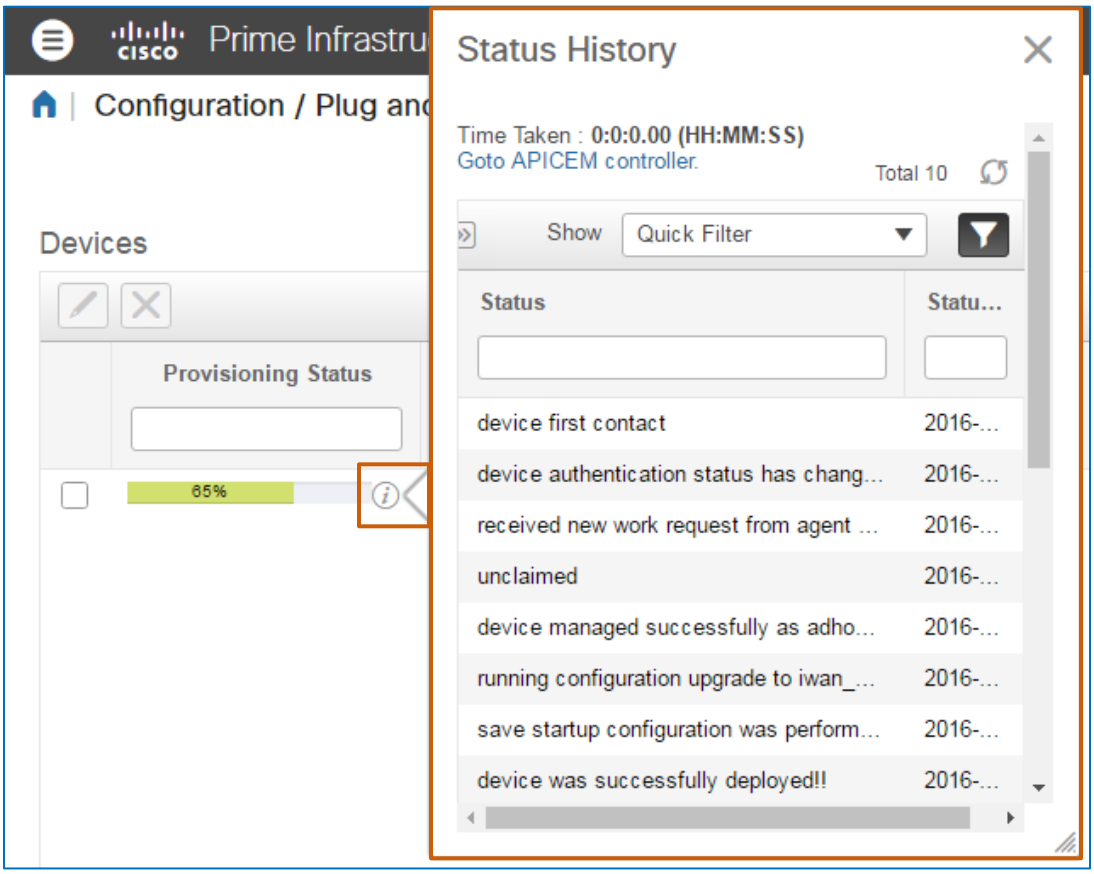
The system opens the **Device Status** page, which is filtered to list the device undergoing provisioning.

The **Provisioning Status** field progress indicator reports the percentage of progress as activation proceeds.

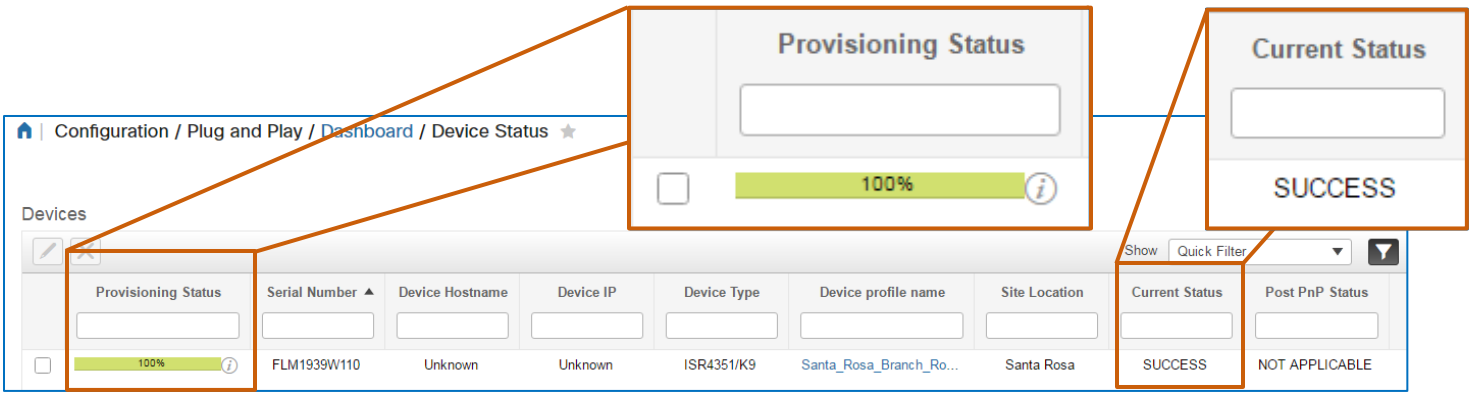


2. To review the actions that are occurring during activation and their statuses, in the **Provisioning Status** field, click the information button.

   The **Status History** pop-up window opens and reports the stages and results of the process.

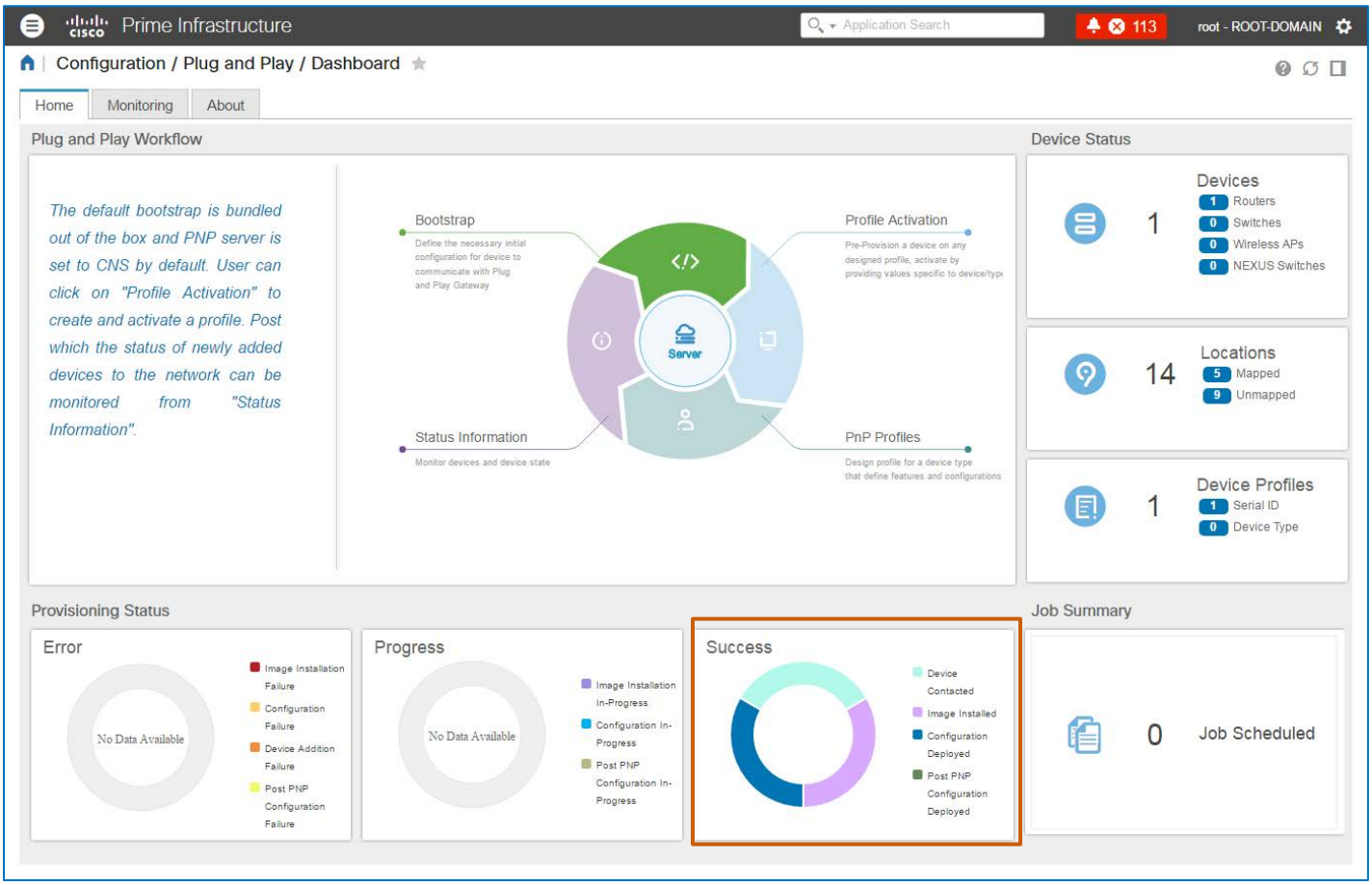


When activation is complete, the system reports the final result on the **Device Status** page…



…and on the **Dashboard** page.

In this case, activation is complete and successful.



Video Demonstration

Watching Demonstrations

To watch a demonstration:

- Click the associated link, which opens an MP4 file.

  Based on your system and configuration, you might need to start the video manually.

Notes: Video download and streaming times can vary.
Demonstrations do not include narration.

Plug and Play Process Overview

Watch the Demonstration

To review the Plug and Play background processes, watch the **Plug and Play Overview** video.
Approximate runtime: **1 min**

Bringing the Initial Router at a New Site Online

Watch the Demonstration

To review the steps to deploy a device in a greenfield scenario by using the Plug and Play process, watch the **Bringing the Initial Router at a New Site Online** video.
Approximate runtime: **15 mins**

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