



Configuring the Cisco APIC-EM Settings

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Logging into the Cisco APIC-EM

You access the Cisco APIC-EM GUI by entering the IP address that you configured for the network adapter using the configuration wizard. This IP address connects to the external network. Enter the IP address in your browser in the following format:

https://*IP address*

Step 1

From your browser, enter the IP address of the Cisco APIC-EM in the address bar.

Step 2

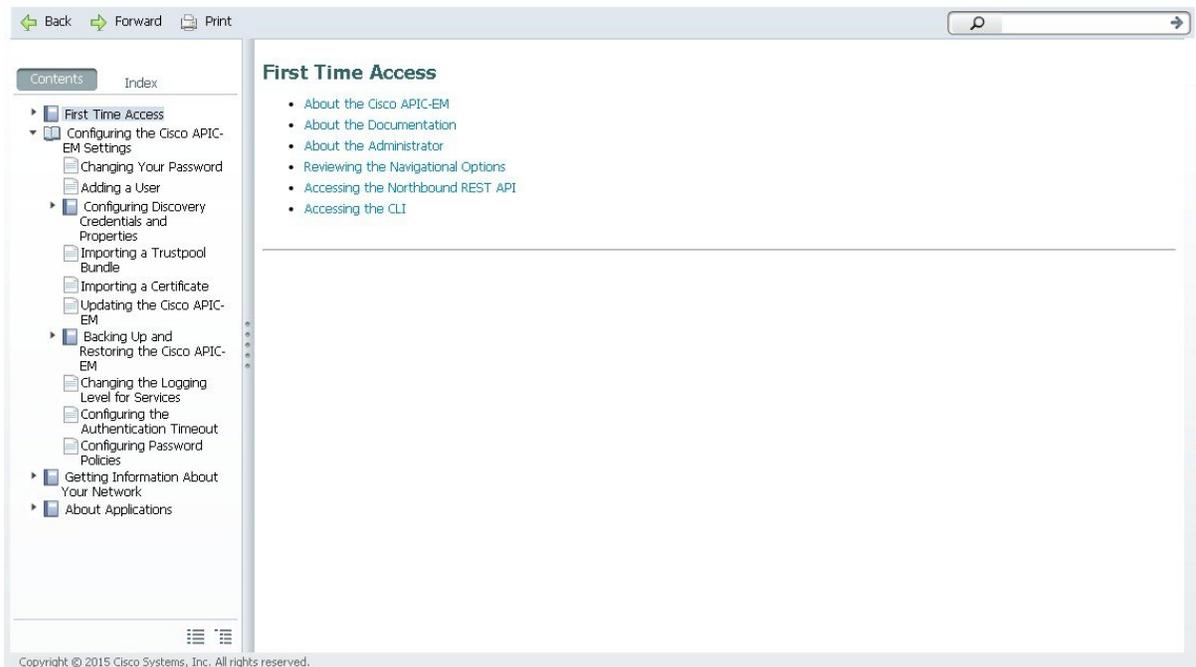
On the launch page, enter the administrator username and password that you configured during the deployment procedure. The **Home** page of the APIC-EM controller appears.

Quick Tour of the APIC-EM Graphical User Interface (GUI)

For a quick introduction to the Cisco APIC-EM GUI, log into the Cisco APIC-EM controller as an administrator and follow the procedure below.

- Step 1** Click the **Quick Start Guide** link that appears on the Cisco APIC-EM **Home** page. The *Quick Start Guide* opens in a separate window.

Figure 1: Quick Start Guide



- Step 2** Take a few moments to review the contents of the *Quick Start Guide*, which provides a short introduction to the main components of the Cisco APIC-EM graphical user interface and briefly describes how to configure some of the Cisco APIC-EM settings.

What to Do Next

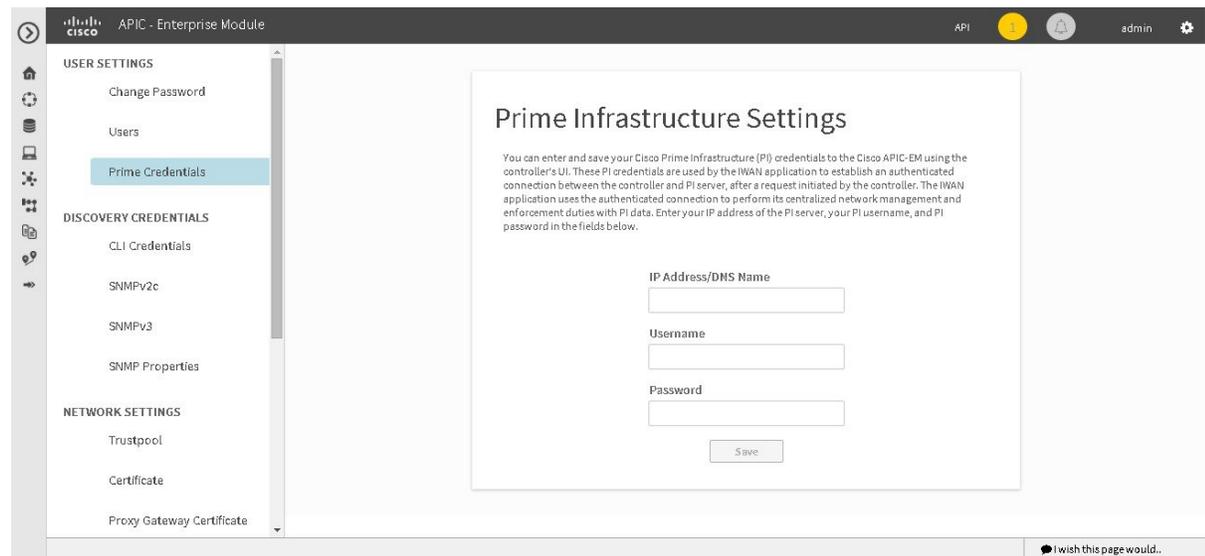
If you are using the IWAN application with Cisco Prime Infrastructure for your network, then proceed to configure your Prime credentials. If you are not using the IWAN application with Cisco Prime Infrastructure, then proceed to configure the discovery credentials for your network.

Configuring the Prime Infrastructure Settings

You can enter and save your Cisco Prime Infrastructure (PI) settings to the Cisco APIC-EM using the controller's UI. These PI settings are used by the IWAN application to establish an authenticated connection between the controller and PI server, after a request initiated by the controller. The IWAN application uses the authenticated connection to perform its centralized network management and enforcement duties with PI data.

You can configure the PI settings using the **Prime Infrastructure Settings** window in the Cisco APIC-EM GUI.

Figure 2: Prime Infrastructure Settings Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

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- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **Prime Credentials** to view the **Prime Infrastructure Settings** window.
 - Step 4** Enter either the IP address of the PI server or the DNS domain name of the PI server.
 - Step 5** Enter the PI credentials username.
 - Step 6** Enter the PI credentials password.
 - Step 7** Click the **Save** button to save the PI credentials to the Cisco APIC-EM database.
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What to Do Next

Proceed to configure the discovery credentials for your network.

Discovery Credentials

The Cisco APIC-EM supports two different types of discovery credentials: global and discovery request-specific (request-specific). Both types of discovery credentials can consist of CLI or SNMP credentials that are configured using the controller's GUI.

The global credentials (CLI and SNMP) are configured in the **Discovery Credentials** windows as described in this chapter. These global credentials are used in addition to any request-specific credentials that are configured in the **Discovery** window. For information about the procedure to configure request-specific credentials in the **Discovery** window, see the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Both CLI and SNMP credentials are required for a successful discovery. The SNMP credentials (either global or request-specific) are used for *device* discovery. The CLI credentials (either global or request-specific) are used for capturing *device configurations* for the controller's inventory.

You should enter at least one set of SNMP credentials, either SNMPv2c or SNMPv3, for your device discovery. If you are going to configure SNMPv2 settings in your network, then SNMP Read Only (RO) community string values should be entered in the controller to assure a successful discovery and populated inventory. However, if an SNMP RO community string is not entered into the controller, as a *best effort*, discovery will run with the default SNMP RO community string "public."



Note

You can enter values for both SNMP versions (SNMPv2c and SNMPv3) for a single discovery. The controller supports multiple SNMP credential configurations. Altogether, you can enter a maximum of 5 global device credentials (SNMP or CLI) using the **Discovery Credentials** windows as described in this chapter, with an additional credentials set being created in the **Discovery** window. Therefore, for a single discovery scan request, you can configure a total of 6 credential sets of each type (CLI or SNMP).

Global Credentials

Global credentials are defined as preexisting credentials that are common to the devices in a network. Global credentials (CLI and SNMP) are configured on the devices using the GUI (**Discovery Credentials**) and permit successful login to the devices. Global credentials are used by the Cisco APIC-EM to authenticate and access the devices in a network that share this device credential when performing network discoveries.

You configure the global CLI credentials in the **CLI Credentials** window. You access this window, by clicking either **admin** or the **Settings** icon (gear) on the menu bar at the upper right of the screen. You then click the **Settings** link from the drop-down menu and then click **CLI Credentials** on the Setting Navigation pane.

You configure the global SNMP credentials in the **SNMPv2c** or **SNMPv3** window. You access these windows, by clicking either **admin** or the **Settings** icon (gear) on the menu bar at the upper right of the screen.

You then click the **Settings** link from the drop-down menu and then click one of the SNMP window links on the Setting Navigation pane.



Note Multiple credentials can be configured in the **CLI Credentials** window.

Related Topics

[Configuring CLI Credentials—Global, on page 8](#)

Discovery Request-Specific Credentials

Discovery request-specific credentials (request-specific credentials) are defined as preexisting *device* credentials for a specific network device or set of devices that do not share the global credentials.

You configure the request-specific credentials in the **Discovery** window prior to performing a discovery that is exclusive for that set of network devices. You access this window by clicking **Discovery** on the Navigation pane.

Discovery Credentials Example

The following example describes how a user would configure and run a series of discoveries to authenticate and access all of the devices in a network by the Cisco APIC-EM.

Assume a network of 20 devices that form a CDP neighborhood. In this network, 15 devices share a global credential (Credential-0) and the 5 remaining devices each have their own unique or discovery request-specific credentials (Credential 1- 5).

To properly authenticate and access the devices in this network by the Cisco APIC-EM, you perform the following tasks:

- 1 Configure the CLI global credentials as Credential-0 for the controller.

You configure the global credentials in the **CLI Credentials** window. You access this window, by clicking either **admin** or the **Settings** icon (gear) on the menu bar at the upper right of the screen. You then click the **Settings** link from the drop-down menu and then click **CLI Credentials** on the Setting Navigation pane.

- 2 Configure the SNMP (v2c or v3) global credentials.

You configure these global credentials in the two SNMP windows. You access these GUI windows by clicking the **Settings** button at the top right and then clicking **SNMPv2c** or **SNMPv3** on the Setting Navigation pane.

- 3 Run a **CDP** discovery using one of the 15 device IP addresses (15 devices that share the global credentials) and selecting the global credentials in the GUI. You run a **CDP** discovery in the **Discovery** window. You access this window, by clicking **Discovery** on the Navigation pane.

- 4 Run 5 separate **Range** discoveries for each of the remaining 5 devices using the appropriate discovery request-specific credentials and SNMP values (for example, Credential-1, Credential-2-5, etc.).

You configure the discovery request-specific credentials in the **Discovery** window. You access this window, by clicking **Discovery** on the Navigation pane.

- Review the **Device Inventory** table in the **Device Inventory** window to check the discovery results.

Discovery Credentials Rules

Discovery credentials (global and discovery request-specific) operate under rules as described in the bullet list and table below.

Discovery request-specific credentials rules:

- These credentials can be provided when creating a new network discovery, but only a single set of these credentials is allowed per network discovery.
- These credentials take precedence over any configured global credentials.
- If the discovery request-specific credentials cause an authentication failure, then discovery is attempted a second time with the configured global credentials (if explicitly selected in the **Discovery** window). If discovery fails with the global credentials then the device discovery status will result in an authentication failure.
- If the discovery request-specific credentials (both CLI and SNMP) are not provided as part of network discovery, then the global credentials (both CLI and SNMP) are used to authenticate devices.

Global credentials rules:

Table 1: Global Credentials Rules

Global Credentials	Discovery Request-Specific Credentials	Result
Not configured	Not configured	The default SNMP read community string (public) is used for the discovery scan, but the device discovery will fail since both CLI and SNMP credentials must be configured for a successful device discovery.
Not configured	Configured	The specified discovery request-specific credentials will be used for discovery.
Configured	Not configured	Configured global credentials will be used for discovery if selected in Discovery .
Configured but not selected	Configured	Only the request-specific credentials will be used.
Configured and selected	Not configured	Only selected global credential will be used.

Global Credentials	Discovery Request-Specific Credentials	Result
Configured and selected	Configured	Both specified credentials (global and discovery request-specific) will be used for discovery.
Configured, but wrong global credential IDs are mentioned in the discovery POST REST API.	Correct request-specific credentials configured	Discovery fails. Note This scenario is only possible by API not from the controller GUI.
Configured, but wrong global credential IDs are mentioned in the discovery POST REST API.	Not configured	Discovery fails. Note This scenario is only possible by API not from the controller GUI.

Discovery Credentials Caveats

The following are caveats for the Cisco APIC-EM discovery credentials:

- If a device credential changes in a network device or devices after Cisco APIC-EM discovery is completed for that device or devices, any subsequent polling cycles for that device or devices will fail. To correct this situation, an administrator has following options:
 - Update the global credentials with the new device credential. Execute a new discovery scan with the new global credentials.
 - Start a new discovery scan with changed discovery request-specific credentials that matches the new device credential.
- If the ongoing discovery fails due to a device authentication failure (for example, the provided discovery credential is not valid for the devices discovered by current discovery), then the administrator has following options:
 - Stop or delete the current discovery. Create one or more new network discovery jobs (either a **CDP** or **Range** discovery type) with a discovery request-specific credential that matches the device credential.
 - Create a new global credential or modify one of the global credentials, and execute a new discovery selecting the correct global credential.
- Deleting a global credential does not affect already discovered devices. These already discovered devices will not report an authentication failure.
- The Cisco APIC-EM provides a REST API which allows the retrieval of the list of managed network devices in the Cisco APIC-EM inventory, including certain administrative credentials (SNMP community strings and CLI usernames). The purpose of this API is to allow an external application to synchronize its own managed device inventory with the devices that have been discovered by the Cisco APIC-EM. For example, for Cisco IWAN scenarios, Prime Infrastructure makes use of this API in order to populate its inventory with the IWAN devices contained in the Cisco APIC-EM inventory in order to provide monitoring of the IWAN solution. Any user account with a `ROLE_ADMIN` has access to this API.

**Note**

Only the username is provided in clear text. SNMP community strings and passwords are not provided in cleartext for security reasons.

Configuring CLI Credentials—Global

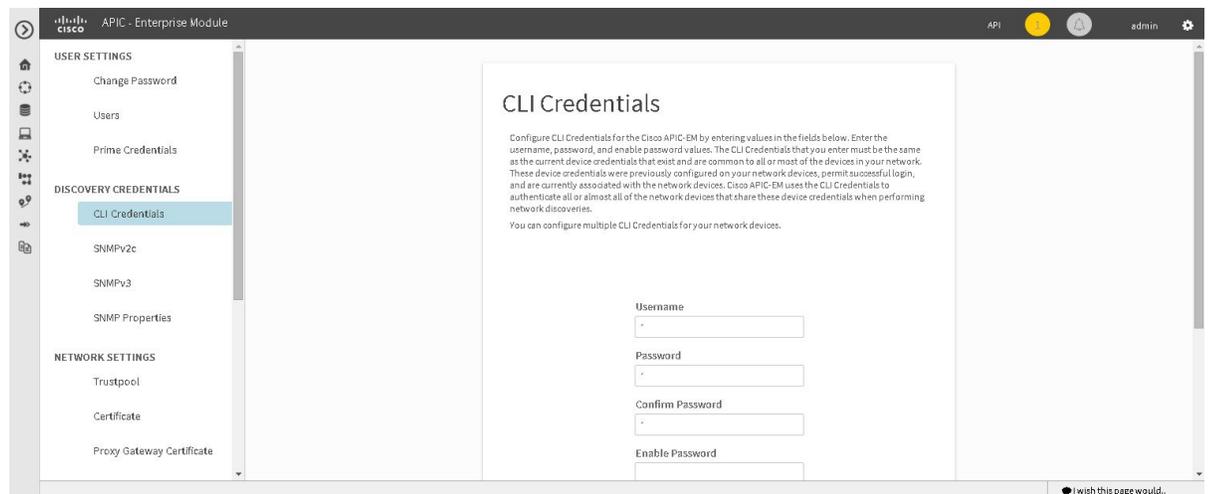
CLI credentials are defined as preexisting *device* credentials that are common to most of the devices in a network. CLI credentials are used by the Cisco APIC-EM to authenticate and access the devices in a network that share this CLI credential when performing devices discoveries.

You configure the CLI global credentials in the **CLI Credentials** window.

**Note**

You can configure up to five CLI credentials.

Figure 3: CLI Credentials Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, "Managing Users and Roles," in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

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- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **CLI Credentials** to view the **CLI Credentials** window.
In the **CLI Credentials** window, enter the appropriate CLI global credentials for the devices within your network or networks.
- Step 4** Enter the CLI Credentials username in the **Username** field.
- Step 5** Enter the CLI Credentials password in the **Password** field.
- Step 6** Reenter the CLI Credentials password in the **Confirm Password** field to confirm the value that you just entered.
- Step 7** If your network devices have been configured with an enable password, then enter the CLI Credentials for the enable password in the **Enable Password** field.
- Note** Both the CLI credentials password and enable password are saved in the device's configuration in encrypted form. You cannot view these original passwords after you enter them.
- Step 8** If you entered an enable password in the **Enable Password** field, reenter it in the **Confirm Enable Password** field to confirm the value that you just entered.
- Step 9** In the **CLI Credentials** window, click **Add** to save the credentials to the Cisco APIC-EM database.
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What to Do Next

Proceed to configure SNMP values for your network device discovery.

For a successful device discovery (with all the device information to be collected), CLI credentials (global and/or discovery request-specific) should be configured using the controller. The global credentials for CLI and SNMP (v2c or v3) are configured in the **Discovery Credentials** windows as described in this chapter, and are used in addition to any discovery request-specific credentials (for CLI and SNMP) that are configured in the **Discovery** window.

Related Topics

[Global Credentials, on page 4](#)

Configuring SNMP

You configure SNMP for device discovery using the following **Discovery Credentials** windows in the Cisco APIC-EM GUI:

- **SNMPv2c**
- **SNMPv3**
- **SNMP Properties**

Configuring SNMPv2c

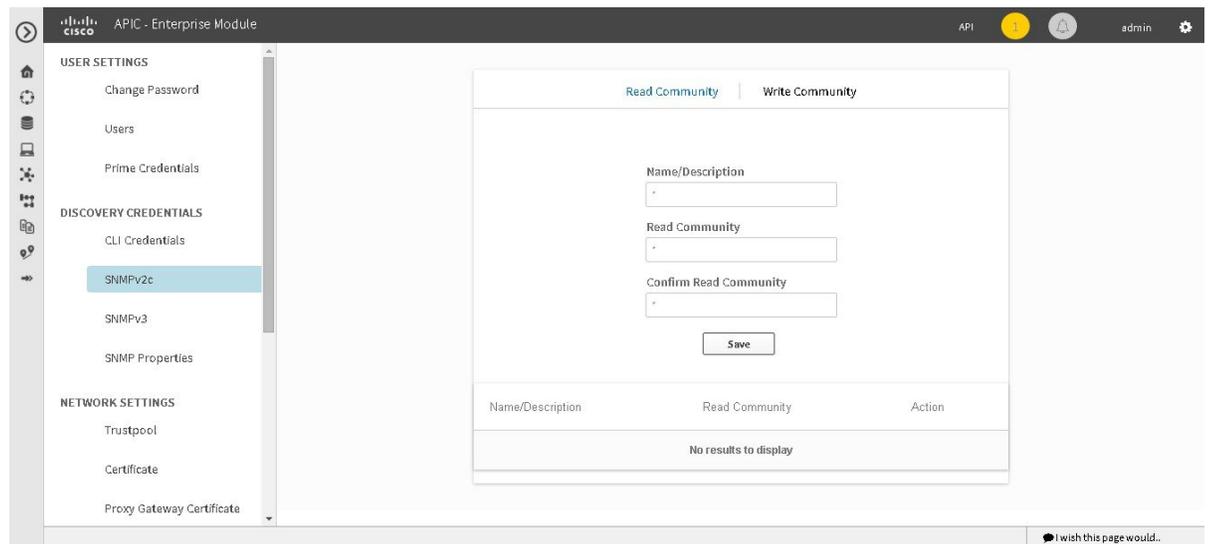
You configure SNMPv2c for device discovery in the **SNMPv2c** window in the Cisco APIC-EM GUI. The SNMP values that you configure for SNMPv2c for the controller must match the SNMPv2c values that have been configured for your network devices.



Note

You can configure up to five read community strings and five write community strings.

Figure 4: Configuring SNMPv2c



SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. SNMP provides a standardized framework and a common language used for the monitoring and management of devices in a network. The different versions of SNMP are SNMPv1, SNMPv2, SNMPv2c, and SNMPv3.

SNMPv2c is the community string-based administrative framework for SNMPv2. Community string is a type of password, which is transmitted in clear text. SNMPv2c does not provide authentication or encryption (noAuthNoPriv level of security).



Note

In addition to configuring SNMPv2c for device discovery in the controller, a "best effort" Cisco APIC-EM discovery is in place, meaning that devices having SNMP with Read-Only (RO) community string set to "public" will be discovered all the time irrespective of the configured SNMP Read/Write community string.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have your network's SNMP information available for this configuration procedure.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, "Managing Users and Roles," in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Settings** link from the drop-down menu.

Step 3 In the **Settings** navigation pane, click **SNMPv2c** to view the **SNMPv2c** window.

Step 4 In the **SNMPv2c** window, click **Read Community**.

Enter your **Read Community** values:

- **Name/Description**—Description of the Read-Only (RO) community string value and/or the device or devices that are configured with it.
- **Read Community**—Read-Only community string value configured on devices that you need the controller to connect to and access. This community string value must match the community string value pre-configured on the devices that the controller will connect to and access.
- **Confirm Read Community**—Reenter the Read-Only community string to confirm the value that you just entered.

Note If you are configuring SNMPv2c for your discovery, then configuring **Read Community** values is mandatory.

Step 5 Click **Save** to save your **Read Community** values.
The **Read Community** values will appear in the table below.

Step 6 (Optional) In the **SNMPv2c** window, click **Write Community**.
Enter your **Write Community** values:

- **Name/Description**—Description of the Write community string value and/or the device or devices that are configured with it.
- **Write Community**—Write community string value configured on devices that you need the controller to connect to and access. This community string value must match the community string value pre-configured on the devices that the controller will connect to and access.
- **Confirm Write Community**—Reenter the Write community string to confirm the value that you just entered.

Step 7 (Optional) Click **Save** to save your **Write Community** values.
The **Write Community** values will appear in the table below.

What to Do Next

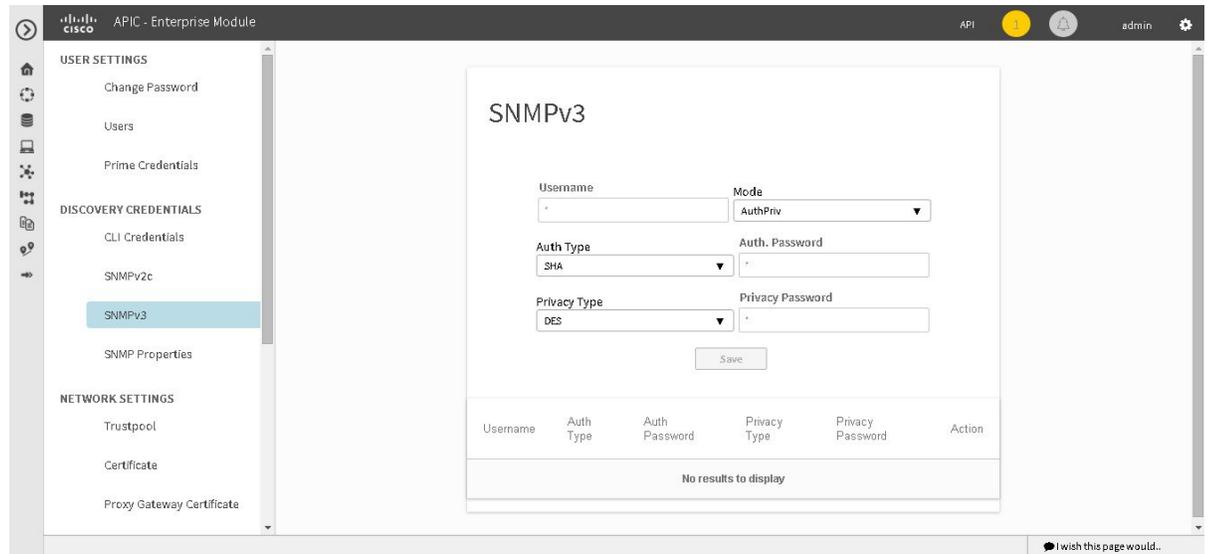
If required for your SNMP configuration, proceed to configure either **SNMPv3** or **SNMP Properties** using the GUI.

If you are finished with your SNMP configuration, then proceed to import an X.509 certificate and private key into the controller, if necessary for your network configuration.

Configuring SNMPv3

You configure SNMPv3 for device discovery in the **SNMPv3** window in the Cisco APIC-EM GUI. The SNMP values that you configure for SNMPv3 for the controller must match the SNMPv3 values that have been configured for your network devices. You can configure up to five SNMPv3 settings.

Figure 5: Configuring SNMPv3



SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. SNMP provides a standardized framework and a common language used for the monitoring and management of devices in a network. The different versions of SNMP are SNMPv1, SNMPv2, SNMPv2c, and SNMPv3.

SNMPv3 provides secure access to devices by a combination of authenticating and encrypting frames over the network. The following are supported SNMPv3 security models:

- Message integrity—Ensures that a packet has not been tampered with in-transit.
- Authentication—Determines the message is from a valid source
- Encryption—Scrambles the packet contents to prevent it from being seen by unauthorized sources

SNMPv3 provides for both security models and security levels. A security model is an authentication strategy that is set up for a user and the role in which the user resides. A security level is the permitted level of security within a security model. A combination of a security model and a security level determines which security mechanism is employed when handling an SNMP packet.

The security level determines if an SNMP message needs to be protected from disclosure and if the message needs to be authenticated. The various security levels that exist within a security model are as follows:

- noAuthNoPriv—Security level that does not provide authentication or encryption
- AuthNoPriv—Security level that provides authentication but does not provide encryption
- AuthPriv—Security level that provides both authentication and encryption

The following table identifies what the combinations of security models and levels mean:

Table 2: SNMP Security Models and Levels

Model	Level	Authentication	Encryption	What Happens
v2c	noAuthNoPriv	Community String	No	Uses a community string match for authentication.
v3	noAuthNoPriv	User Name	No	Uses a username match for authentication.
v3	AuthNoPriv	Either: <ul style="list-style-type: none"> • HMAC-MD5 • HMAC-SHA 	No	Provides authentication based on the Hash-Based Message Authentication Code (HMAC) Message Digest 5 (MD5) algorithm or the HMAC Secure Hash algorithm (SHA)
v3	AuthPriv	Either: <ul style="list-style-type: none"> • HMAC-MD5 • HMAC-SHA 	Either: <ul style="list-style-type: none"> • CBC-DES • CBC-AES-128 	Provides authentication based on the HMAC-MD5 or HMAC-SHA algorithms. Provides Data Encryption Standard (DES) 56-bit encryption in addition to authentication based on the Cipher Block Chaining (CBC) DES (DES-56) standard or CBC-mode AES for encryption.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have your network's SNMP information available for this configuration procedure.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

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- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **SNMPv3** to view the **SNMPv3** window.
If you use SNMPv3 in your network to monitor and manage devices, then configure the SNMPv3 values for discovery for your network.
- Step 4** In the **SNMPv3** window, enter a **Username** value and choose a **Mode** from the drop down menu.
The following **Mode** options are available:
- **AuthPriv**
 - **AuthNoPriv**
 - **NoAuthNoPriv**
- Note** Subsequent **SNMPv3** configuration options might or might not be available depending upon your selection for this step.
- Step 5** If you selected **AuthPriv** or **AuthNoPriv** as a **Mode** option, then choose an **Authentication** type from the drop down menu and enter an authentication password.
The following **Authentication** options are available:
- **SHA**—Authentication based on the Hash-Based Message Authentication Code (HMAC), Secure Hash algorithm (SHA) algorithm
 - **MD5**—Authentication based on the Hash-Based Message Authentication Code (HMAC), Message Digest 5 (MD5) algorithm
- Step 6** If you selected **AuthPriv** as a **Mode** option, then choose a **Privacy** type from the drop down menu and enter a SNMPv3 privacy password.
The SNMPv3 privacy password is used to generate the secret key used for encryption of messages exchanged with devices that support DES or AES128 encryption.
The following **Privacy** type options are available:
- **DES**—Data Encryption Standard (DES) 56-bit encryption in addition to authentication based on the Cipher Block Chaining (CBC) DES (DES-56) standard.
 - **AES128**—Cipher Block Chaining (CBC) mode AES for encryption.
- Step 7** Click **Save** to save your SNMPv3 configuration values.
The **SNMPv3** configured values will appear in the table below.
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What to Do Next

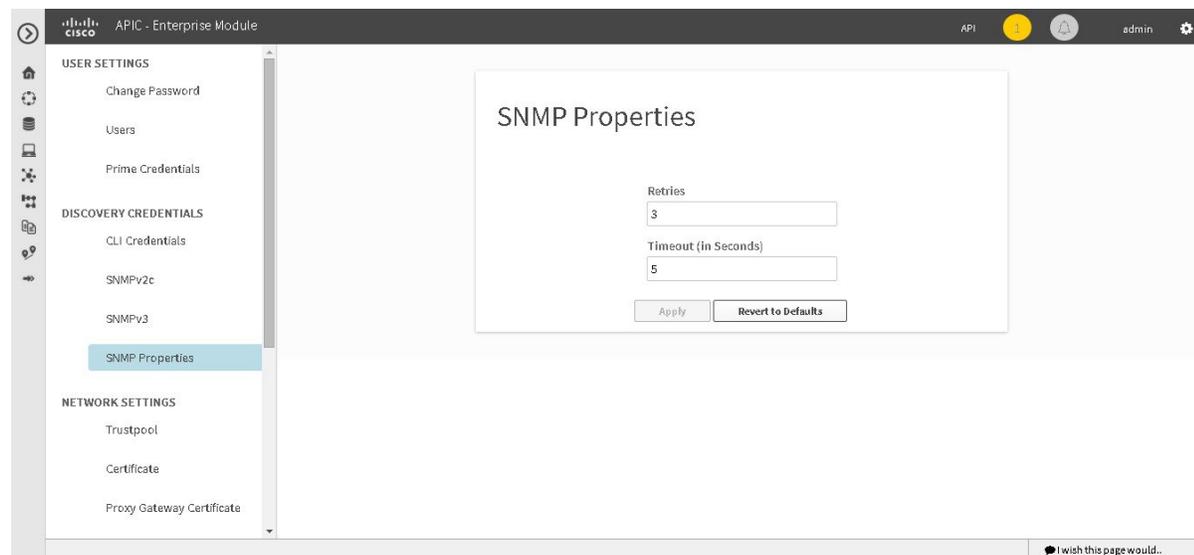
If required for your SNMP configuration, proceed to configure either **SNMPv2c** or **SNMP Properties** using the GUI.

If you are finished with your SNMP configuration, then proceed to import an X.509 certificate and private key into the controller, if necessary for your network configuration.

Configuring SNMP Properties

You configure SNMP properties for device discovery in the **SNMP Properties** window in the Cisco APIC-EM GUI.

Figure 6: Configuring SNMP Properties



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have your network's SNMP information available for this configuration procedure.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

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- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **SNMP Properties** to view the **SNMP Properties** window. Configure the SNMP property settings for discovery in your network.
 - Step 4** In the **SNMP Properties** window, enter a value in the **Retries** field. The value entered in this field is the number of attempts the controller attempts to use SNMP to communicate with your network devices.

- Step 5** In the **SNMP Properties** window, enter a value in the **Timeout** field.
The value entered in this field is the length of time in seconds the controller attempts to use SNMP to communicate with your network devices.
- Step 6** Click **Apply** to save your SNMP configuration values.
You can also click **Revert to Defaults** to revert to the SNMP property default values. The following are the SNMP property default values:
- **Retries**—3
 - **Timeout**—5

What to Do Next

If required for your SNMP configuration, proceed to configure either **SNMPv2c** or **SNMPv3** using the GUI.

If you are finished with your SNMP configuration, then proceed to import an X.509 certificate and private key into the controller, if necessary for your network configuration.

Security

Importing a Certificate

The Cisco APIC-EM supports the import and storing of an X.509 certificate and private key into the controller. After import, the certificate and private key can be used to create a secure and trusted environment between the Cisco APIC-EM, NB API applications, and network devices.

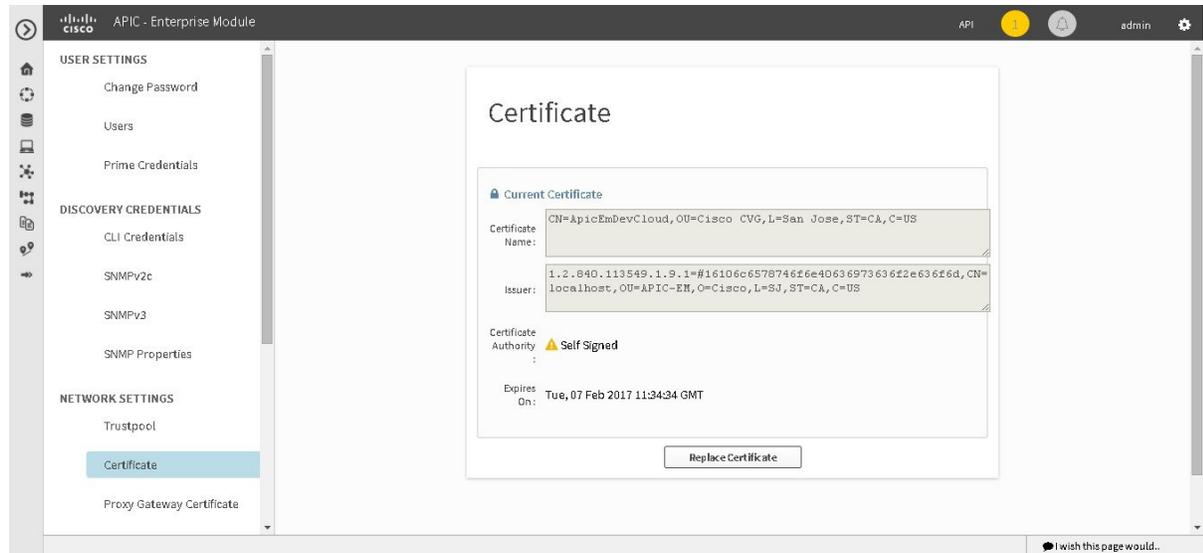
**Note**

If you have a multi-host deployment and you plan to acquire a valid CA-issued certificate for your controller HTTPS server, then use the virtual IP address that you assigned to the multi-hosts as the Common Name for the certificate when you order. If you are using a host name instead, make sure the host name is DNS-resolvable to the virtual IP address of the multi-host deployment.

If you already have a single host Cisco APIC-EM with a previously purchased CA-issued certificate for its external IP address, then it is ideal to use that original physical IP address of the single host as the virtual IP address of the multi-host deployment. This way you can save your investment in the CA-issued certificate and also keep the external client applications, using your Cisco APIC-EM services to continue using the same IP address.

You import a certificate and private key using the **Certificate** window in the Cisco APIC-EM GUI.

Figure 7: Certificate Configuration Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have acquired an X.509 certificate and private key from a well-known certificate authority (CA) for the import.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Settings** link from the drop-down menu.

Step 3 In the **Settings** navigation pane, click **Certificate** to view the **Certificate** window.

Step 4 In the **Certificate** window, view the current certificate data.

When first viewing this window, the current certificate data that is displayed is the controller's self-signed certificate. The self-signed certificate's expiration is set for several years in the future.

Note The **Expiration Date and Time** is displayed as a Greenwich Mean Time (GMT) value. A system notification will appear in the controller's GUI 2 months before the expiration date and time of the certificate.

Additional displayed fields in the **Certificate** window include:

- Certificate Name—The name of the certificate.
- Issuer—The issuer name identifies the entity that has signed and issued the certificate.
- Certificate Authority—Either self-signed or name of the CA.

- Expires On—Expiration date of the certificate.

Step 5 To replace the current certificate, click the **Replace Certificate** button. The following new fields appear:

- **Certificate**—Fields to enter certificate data
- **Private Key**—Fields to enter private key data

Step 6 In the **Certificate** fields, choose the file format type of the certificate:

- **PEM**—Privacy enhanced mail file format
- **PKCS**—Public-key cryptography standard file format

Choose one of the above file types for the certificate that you are importing into the Cisco APIC-EM.

Step 7 If you choose **PEM**, then perform the following tasks:

- For the **Certificate** field, import the **PEM** file by dragging and dropping this file into the **Drag n' Drop a File Here** field.
 - Note** For a PEM file, it must have a valid PEM format extension (.pem, .cert, .crt). The maximum file size for the certificate is 10KB
- For the **Private Key** field, import the private key by dragging and dropping this file into the **Drag n' Drop a File Here** field.
 - Choose the encryption option from the **Encrypted** drop-down menu for the private key.
 - If encryption is chosen, enter the passphrase for the private key in the **Passphrase** field.
 - Note** For the private keys, they must have a valid private key format extension (.pem or .key).

Step 8 If you choose **PKCS**, then perform the following tasks:

- For the **Certificate** field, import the **PKCS** file by dragging and dropping this file into the **Drag n' Drop a File Here** field.
 - Note** For a PKCS file, it must have a valid PKCS format extension (.pfx, .p12). The maximum file size for the certificate is 10KB
- For the **Certificate** field, enter the passphrase for the certificate using the **Passphrase** field.
 - Note** For PKCS, the imported certificate also requires a passphrase.
- For the **Private Key** field, choose the encryption option for the private key using the drop-down menu.
- For the **Private Key** field, if encryption is chosen, enter the passphrase for the private key in the **Passphrase** field.

Step 9 Click the **Upload/Activate** button.

Step 10 Return to the **Certificate** window to view the updated certificate data.

The information displayed in the **Certificate** window should have changed to reflect the new certificate name, issuer, and certificate authority.

Related Topics

[Cisco APIC-EM Certificate and Private Key Support](#)

[Cisco APIC-EM Certificate Chain Support](#)

Importing a Trustpool Bundle

The Cisco APIC-EM contains a pre-installed Cisco trustpool bundle (Cisco Trusted External Root Bundle). The Cisco APIC-EM also supports the import and storage of an updated trustpool bundle from Cisco. The trustpool bundle is used by supported Cisco networking devices to authenticate the controller and its applications, such as Network PnP upon the presentation of its CA signed certificate, as well as any other third party that presents a valid CA signed certificate.



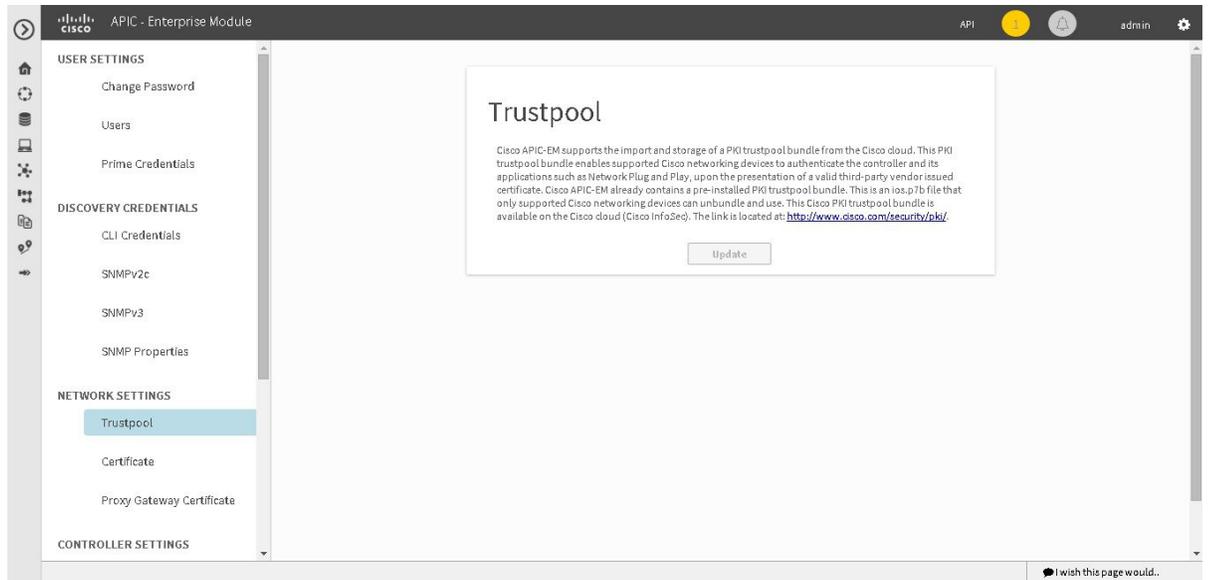
Note

The Cisco trustpool bundle is an ios.p7b file that only supported Cisco devices can unbundle and use. This ios.p7b file contains root certificates of valid certificate authorities including Cisco itself. This Cisco trustpool bundle is available on the Cisco cloud (Cisco InfoSec). The link is located at: <http://www.cisco.com/security/pki/>.

The trustpool bundle provides you with a safe and convenient way to use the same CA to manage all your network device certificates, as well as your controller certificate. The trustpool bundle is used by the controller to validate its own certificate as well as a proxy gateway certificate (if any), to determine whether it is valid CA signed certificate or not. Additionally, the trustpool bundle is available to be uploaded to the Network PnP enabled devices at the beginning of their PnP workflow so that they can trust the controller for subsequent HTTPS-based connections.

You import the Cisco trust bundle using the **Trustpool** window in the Cisco APIC-EM GUI.

Figure 8: Trustpool Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Settings** link from the drop-down menu.

Step 3 In the **Settings** navigation pane, click **Trustpool** to view the **Trustpool** window.

Step 4 In the **Trustpool** window, click the **Update** button.
After clicking this button, the following actions occur:

- The controller checks to see if a new trustpool bundle exists in the Cisco cloud URL location.
- If the trustpool bundle in the Cisco cloud is the same as the installed trustpool bundle on the controller, then the controller does not initiate a new download and install.
- If the trustpool bundle in the Cisco cloud is a new version of the trustpool bundle, then the controller initiates a new download and install of the trustpool bundle.
- After a new trustpool bundle is downloaded and installed on the controller, the controller makes this trustpool bundle available to the supported Cisco devices to download.

Note The **Update** button in the controller's **Trustpool** window will become active when an updated version of ios.p7b file is available and Internet access is present. The **Update** button will remain inactive if there is no Internet access.

Related Topics

[Cisco APIC-EM Trustpool Support](#)

Importing a Proxy Gateway Certificate

In some network configurations, proxy gateways may exist between the Cisco APIC-EM and network devices. Common ports such as 80 and 443 pass through the gateway proxy in the DMZ, and for this reason SSL sessions from the network devices meant for the controller terminate at the proxy gateway. Therefore, these network devices can only communicate with the controller via the proxy gateway. In order for the network devices to establish secure and trusted connections with the controller, or if present, a proxy gateway, then the network devices should have their PKI trust stores appropriately provisioned with the relevant CA root certificates or the server's own certificate under certain circumstances.

Cisco Network Plug and Play

With the Cisco Network Plug and Play (PnP) application, the Cisco APIC-EM responds to HTTPS requests from supported Cisco network devices and permits these devices to download and install an image and desired configuration. Before a device can download such information from the controller, the initial interaction between the controller and device involves the establishment of a trust relationship.

At first interaction with a PnP enabled device, that PnP enabled device is provisioned by the controller with trust information that includes a CA root certificates bundle or at the least the certificate of the CA that issued the server side certificate. Note that in latter case, the CA may or may not be a well known CA.

In certain Cisco Network Plug and Play scenarios, your network configuration may have a proxy gateway present between the controller and PnP enabled devices. For instance in an IWAN deployment a branch router might communicate to the Cisco APIC-EM through a proxy gateway at the DMZ at initial provisioning. Depending on whether there is a proxy gateway present or not, the trust information provided by the controller at the initial transaction with the devices may correspond to the proxy gateway's or to the controller's certificate issuer (if the corresponding server certificates are not valid CA signed). On the other hand, in either proxy or non-proxy cases, if the certificate is a simple self-signed certificate, then that certificate will be downloaded by the device into its trust store.



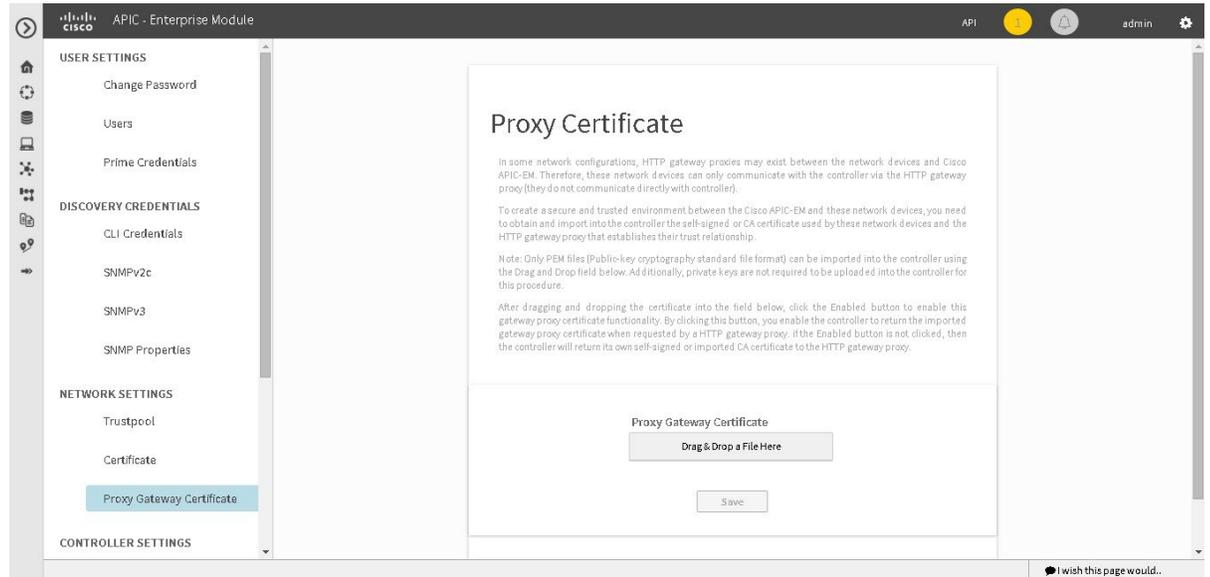
Note Using a self-signed certificate for either the Cisco APIC-EM or the proxy gateway is strongly discouraged. We strongly recommend using a publicly verifiable CA issued certificate to be installed for the controller, as well as the proxy gateway if one is present.

With a valid CA issued certificate for the controller or the proxy gateway (if present), the PnP enabled devices can download the trustpool bundle (ios.p7b) containing all the well known CA root certificates. This permits the devices to establish secure connections to the controller or to the proxy gateway for further provisioning and operation of those devices. If such a certificate is not a valid CA issued or self-signed, then the devices will have to download the issuing CA's or self-signed certificate to proceed further with a secure connection to the controller or a proxy gateway in front of the controller. The Cisco APIC-EM facilitates automatic downloads of the relevant trusted certificates on the devices, depending on the nature of the certificate installed

on it. However; when a proxy gateway is present, it provides a provisioning GUI to facilitate similar pre-provisioning.

In network topologies where there is a proxy gateway present between controller and PnP enabled devices, follow the procedure below to import a proxy gateway certificate into the controller.

Figure 9: Proxy Gateway Certificate Window



Before You Begin

You have successfully deployed the Cisco APIC-EM and it is operational.

In your network, an HTTP proxy gateway exists between the controller and PnP enabled network devices. The PnP enabled network devices will use the proxy gateway's IP address to reach the Cisco APIC-EM controller and its services.

You have the certificate file currently being used by the proxy gateway. The certificate file contents can consist any of the following:

- The proxy gateway's certificate in PEM format, with the certificate being self-signed.
- The proxy gateway's certificate in PEM format, with the certificate being issued by a valid, well-known CA, such as the Comodo Group, Symantec, or DigiCert.
- The proxy gateway's certificate and the issuing CA root certificate.



Note The certificate file is structured in the above order as a chain and in PEM format. This is required if the CA is not a valid, well-known CA. For example, a CA not present in the Cisco ios.p7b trust pool bundle.

- The proxy gateway's certificate and a Sub CA certificate.

**Note**

The certificate file is structured in the above order and as a chain in PEM format. This is required if the issuing Root CA, Sub CA is a well-known valid CA such as the Comodo Group, Symantec, or DigiCert.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

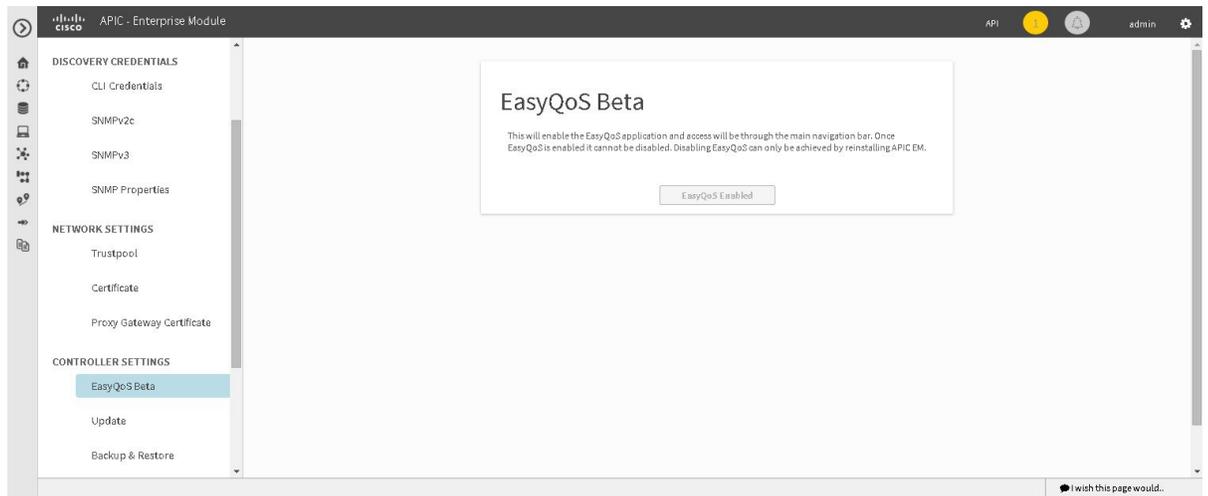
The certificate used by the devices and proxy gateway must be imported into the controller by following this procedure.

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **Proxy Gateway Certificate** to view the **Proxy Certificate** window.
- Step 4** In the **Proxy Gateway Certificate** window, view the current proxy gateway certificate data (if this exists).
Note The **Expiration Date and Time** is displayed as a Greenwich Mean Time (GMT) value. A system notification will appear in the controller's GUI 2 months before the expiration date and time of the certificate.
- Step 5** To add a proxy gateway certificate, drag and drop the self-signed or CA certificate to the **Drag n' Drop a File Here** field.
Note Only PEM files (Public-key cryptography standard file format) can be imported into the controller using this field. Additionally, private keys are neither required nor uploaded into the controller for this procedure.
- Step 6** Click the **Enable** checkbox to enable the proxy gateway certificate functionality.
By clicking on this checkbox, you enable the controller to return the imported proxy gateway certificate when requested by a proxy gateway. If this checkbox is not checked, then the controller will return its own self-signed or imported CA certificate to the proxy gateway.
- Step 7** Click the **Save** button.
- Step 8** Refresh the **Proxy Gateway Certificate** window to view the updated proxy gateway certificate data.
The information displayed in the **Proxy Gateway Certificate** window should have changed to reflect the new certificate name, issuer, and certificate authority.
-

Enabling EasyQoS

You can enable and activate the EasyQoS application on the controller using the **EasyQoS Beta** window in the Cisco APIC-EM GUI.

Figure 10: Enable EasyQoS



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **EasyQoS Beta** to view the **EasyQoS Beta** window.
 - Step 4** Click the **Enable EasyQoS** button to activate EasyQoS on the controller.

Note Once enabled, you can only disable EasyQoS by uninstalling and then reinstalling the controller. Any QoS configurations applied to devices using EasyQoS will remain on those devices.
 - Step 5** Click the **EasyQoS** icon in the main Navigation pane to open the EasyQoS application. For detailed information about EasyQoS, see the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.
-

What to Do Next

Proceed to apply QoS to your network devices using the EasyQoS application.

Updating the Cisco APIC-EM Software

You can update the Cisco APIC-EM to the latest version using the controller's software update procedure. This procedure requires that you perform the following tasks:

- 1 Download the release upgrade pack from the secure Cisco cloud.
- 2 Run a checksum against the release upgrade pack.
- 3 Upload the release upgrade pack to the controller using the GUI.
- 4 Update the controller's software with the release upgrade pack.



Note

In a multi-host cluster, you only need to update a single host. After updating that single host, the other two hosts are automatically updated with the release upgrade pack.

The release upgrade pack is available for download as a tar file that is also compressed, so the release upgrade pack has a .tar.gz extension. The release upgrade pack itself may consist of any or all of the following update files:

- Service files
- Grapevine files
- Linux files

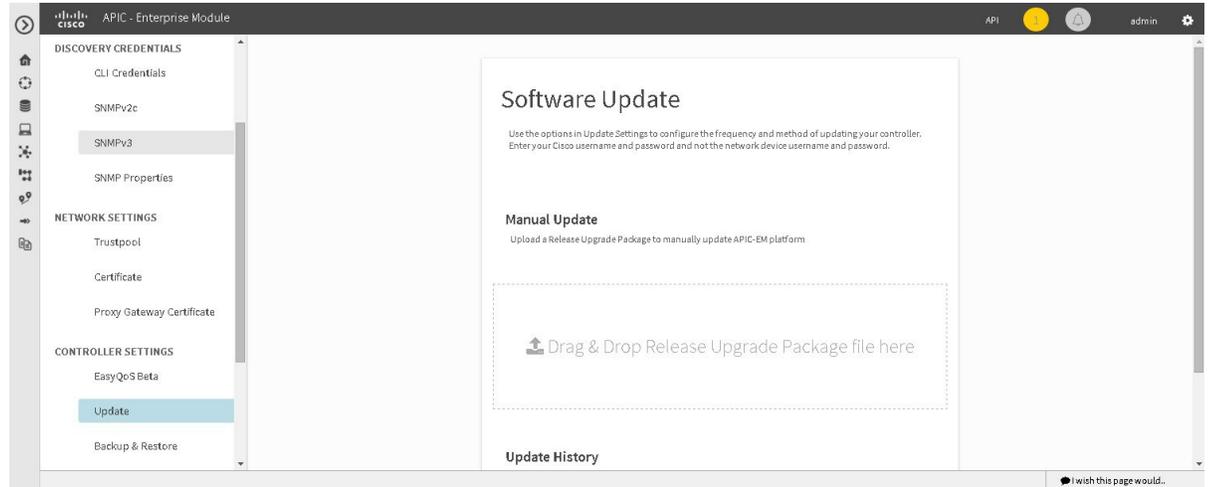


Note

Each release upgrade pack contains an encrypted Cisco signature for security purposes, as well as release version metadata that validates the package.

You perform the upload and update procedure using the **Software Update** window in the Cisco APIC-EM GUI.

Figure 11: Software Update Window



Note

After a successful upload and software update, you are not permitted to rollback to an earlier Cisco APIC-EM version.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.



Note

When updating or upgrading the Cisco APIC-EM in a virtual machine within a VMware vSphere environment, you must ensure that the time settings on the ESXi host are also synchronized to the NTP server. Failure to ensure synchronization will cause the upgrade to fail.

You must have received notification from Cisco that the Cisco APIC-EM software update is available for you to download from the secure Cisco website.

You can be notified about the availability of a Cisco APIC-EM software update in the following ways:

- Email notification from Cisco support and/or updated release notes.
- System notification through the controller GUI.

**Note**

Notification about available release upgrade packs can be viewed by clicking the **System Notifications** icon on the menu bar.

-
- Step 1** Review the information in the Cisco notification about the Cisco APIC-EM update file and checksum. The Cisco notification specifies the location of the release upgrade pack and verification values for either a Message Digest 5 (MD5) or Secure Hash Algorithm (SHA) 512 bits (SHA512) checksum.
- Note** The Cisco APIC-EM release upgrade pack is a bit file that varies in size based upon the requirements of the specific update. The release upgrade pack can be as large as several Gigabits.
- Step 2** Download the release upgrade pack from the secure Cisco website to your laptop or to a location within your network.
- Step 3** Run a checksum against the release upgrade pack using your own checksum verification tool or utility (either MD5 or SHA512).
- Step 4** Review the displayed checksum verification value from your checksum verification tool or utility. If the output from your checksum verification tool or utility matches the appropriate checksum value in the Cisco notification or from the Cisco secure website, then proceed to the next step. If the output does not match the checksum value, then download the release upgrade pack and perform another checksum. If checksum verification issues persist, contact Cisco support.
- Step 5** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 6** Click the **Settings** link from the drop-down menu.
- Step 7** In the **Settings** navigation pane, click **Software Update** to view the **Software Update** window.
- Step 8** If the release upgrade pack is acceptable to use for updating the controller (checksum value match in step 4), then drag and drop the release upgrade pack from the download location on your laptop or in your network onto the **Manual Update** field in the **Software Update** window.
After dropping the release upgrade pack onto the **Manual Update** field, the upload process begins.
The upload process may take several minutes depending upon the size of the release upgrade pack and your network connection. During the upload process, you can continue to work with the controller. Once the upload process ends and the update process begins, you will not be able to work with the controller.
- Note** If you close the **Software Update** window for any reason, then the upload process stops. To start the upload process again, open the **Software Update** window and drag and drop the release upgrade pack onto the **Manual Update** field again. The upload process starts where it previously stopped. To avoid any interruptions to the upload process while working with the controller, open additional windows in the GUI for any other tasks. Keep the **Software Update** window open during the upload process.
- Step 9** Once the upload process finishes, the update process automatically begins. A message appears in the GUI stating that the update process has started and is in progress.
You should refrain from working with the controller during the update process. During the update process, the controller may shut down and restart. The shut down process may last for several minutes.
- Note** At the beginning of the update process, the controller performs a second verification test on the release upgrade pack. The release upgrade pack itself contains an encrypted security value (signature) that will be decrypted and reviewed by the controller. This second verification test ensures that the release upgrade pack that has been uploaded is from Cisco. The release upgrade pack must pass this second verification test before the update process can continue.
- Step 10** Once the update process finishes, you will receive a success or failure notification.

If the update was successful, you will receive a successful update notification and can then proceed working with the controller. If the update was unsuccessful, you will receive an unsuccessful update notification with suggested remedial actions to take.

Note An unsuccessful update will cause a rollback to the current controller software. For example, if the current version is 1.0.0.1 and an unsuccessful update to version 1.0.0.2 occurs, then the controller rolls back to the current version, 1.0.0.1.

After the update (or attempted update), information about it will also appear in the **Update History** field of the **Software Update** window. The following update data is displayed in this field:

- **Date**—Local date and time of the update
- **User**—Username of the person initiating the update
- **Update Version**—Update path of release upgrade pack version represented with an arrow.
- **Update Status**—Success or failure status of the update.

Note If you place your cursor over (mouseover) a failure status in this field, then additional details about the failure is displayed.

Backing Up and Restoring the Cisco APIC-EM

As with any other system upon which your company or organization relies, you need to ensure that the Cisco APIC-EM is backed up regularly, so that it can be restored in case of hardware or other failure.



Caution

For the IWAN solution application, you must review the *Software Configuration Guide for Cisco IWAN on APIC-EM* before attempting a back up and restore. There is important and detailed information about how these processes work for the IWAN solution application that includes what is backed up, what is not backed up, recommendations, limitations, and caveats.

Information about Backing Up and Restoring the Cisco APIC-EM

The back up and restore procedure for the Cisco APIC-EM can be used for the following purposes:

- To create a single backup file to support disaster recovery on the controller
- To create a single backup file on one controller to restore to a different controller (if required for your network configuration)

When you perform a back up using the controller's GUI, you copy and export the controller's database and files as a single file to a specific location on the controller. When you perform a restore, you copy over the existing database and files on the controller using this single backup file.

**Note**

The Cisco APIC-EM uses PostgreSQL as the preferred database engine for all network data. PostgreSQL is an open source object-relational database system.

The following files and data are copied and restored when performing a back up and restore:

- Cisco APIC-EM database
- Cisco APIC-EM file system and files
- X.509 certificates and trustpools
- Usernames and passwords
- Any user uploaded files (for example, any Network Plug and Play image files)

The database and files are compressed into a single *.backup* file when performing the back up and restore. The maximum size of the *.backup* file is 30GB. This number consists of a permitted 20GB maximum size for a file service back up and a 10GB permitted maximum size for the database back up.

**Note**

The *.backup* file should not be modified by the user.

Only a single back up can be performed at a time. Performing multiple back ups at once are not permitted. Additionally, only a full back up is supported. Other types of back ups (for example, incremental back ups) are not supported.

**Note**

After saving the backup file, you can also download it to another location in your network. You can restore the backup file from its default location in the controller or drag and drop the backup file from its location in your network to restore.

When performing a backup and restore, we recommend the following:

- Perform a back up everyday to maintain a current version of your database and files.
- Perform a back up and restore after making any changes to your configuration. For example, when changing or creating a new policy on a device.
- Only perform a back up and restore during a low impact or maintenance time period.

When a back up is being performed, you will be unable to delete any files that have been uploaded to the file service and any changes you make to any files may not be captured by the back up process. When a restore is being performed, the controller is unavailable.

**Note**

You cannot schedule nor automate a back up and restore at this time. Additionally, once started you cannot manually cancel either the back up or restore process.

Related Topics

[Backing Up the Cisco APIC-EM, on page 30](#)

[Restoring the Cisco APIC-EM, on page 31](#)

Multi-Host Cluster Back Up and Restore

In a multi-host cluster, the database and files are replicated and shared across three hosts. When backing up and restoring in a multi-host cluster, you need to first back up on one of the three hosts in the cluster. You can then use that backup file to restore all three hosts in the cluster. However, you need not perform the restore operation on each of the hosts. You simply restore one of the hosts in the cluster. The controller replicates the restored data to the other hosts automatically.



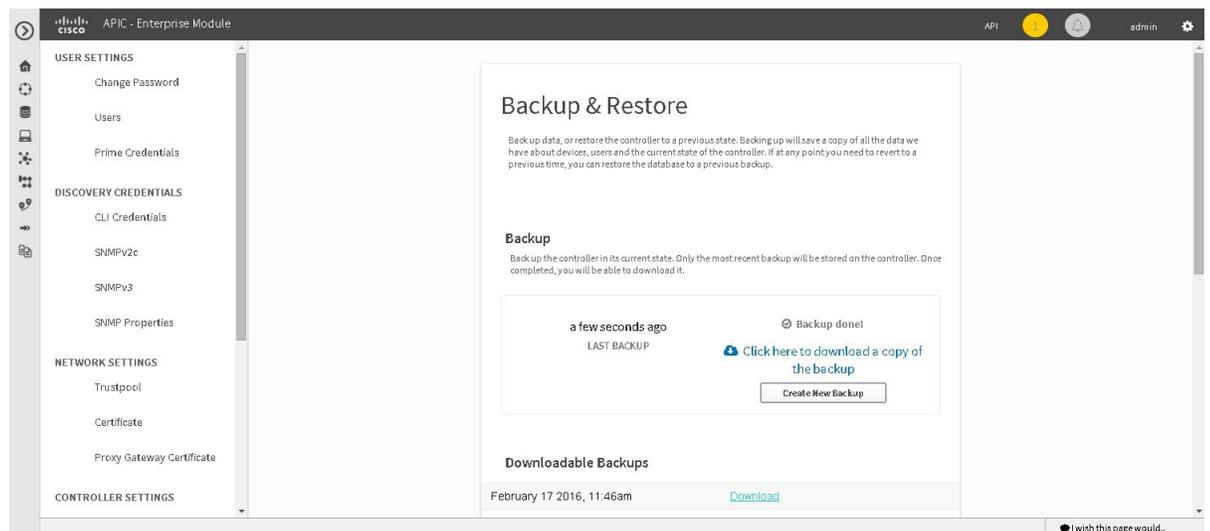
Note

The back up and restore process in a multi-host cluster requires that the Cisco APIC-EM software and version must be the same for all three hosts.

Backing Up the Cisco APIC-EM

You can back up your controller using the **Backup & Restore** window.

Figure 12: Backup & Restore Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Settings** link from the drop-down menu.

Step 3 In the **Settings** navigation pane, click **Backup & Restore** to view the **Backup & Restore** window.

Step 4 In the **Backup & Restore** window, create a backup file by clicking on the **Create New Backup** button. After clicking the **Create New Backup** button, a **Backup in Progress** window appears in the GUI.

During this process, the Cisco APIC-EM creates a compressed *.backup* file of the controller database and files. This backup file is also given a time and date stamp that is reflected in its file name. The following file naming convention is used: *yyyy-mm-dd-hh-min-seconds* (year-month-day-hour-seconds).

For example:

backup_2015_08_14-08-35-10

Note If necessary, you can rename the backup file instead of using the default time and date stamp naming convention.

This backup file is then saved to a default location within the controller. You will receive a **Backup Done!** notification, once the back up process is finished. Only a single backup file at a time is stored within the controller.

Note If the back up process fails for any reason, there is no impact to the controller and its database. Additionally, you will receive an error message stating the cause of the back up failure. The most common reason for a failed back up is insufficient disk space. If your back up process fails, you should check to ensure that there is sufficient disk space on the controller and attempt another back up.

Step 5 (Optional) Create a copy of the backup file to another location.

After a successful back up, a **Download** link appears in the GUI. Click the link to download and save a copy of the backup file to a location on your laptop or network.

What to Do Next

When necessary and at an appropriate time, proceed to restore the backup file to the Cisco APIC-EM.

Related Topics

[Information about Backing Up and Restoring the Cisco APIC-EM, on page 28](#)

Restoring the Cisco APIC-EM

You can restore your controller using the **Backup & Restore** window.

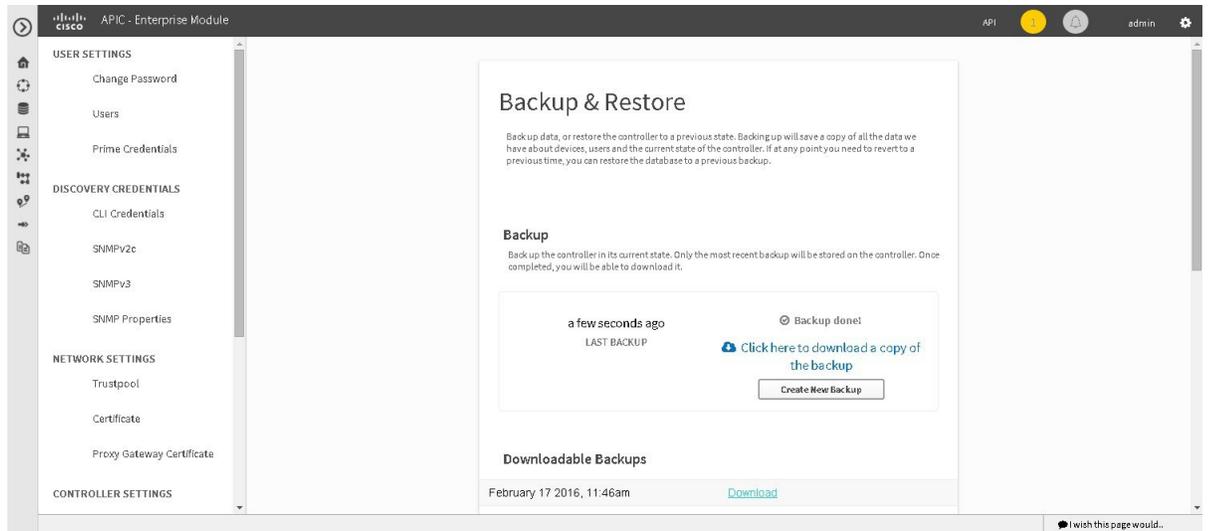
The following restore options are available:

- You can restore from the last know backup file on the controller.
- You can also restore from an archived backup file that was saved and moved to another location on your network.

**Caution**

The Cisco APIC-EM restore process restores the controller's database and files. The restore process does not restore your network state and any changes made by the controller since the last backup, including any new network policies that have been created, any new or updated passwords, or any new or updated certificates/trustpool bundles.

Figure 13: Backup & Restore Window

**Note**

You can only restore a backup from a controller that is the same software version as the controller where the backup was originally taken from.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

You must have successfully performed a back up of the Cisco APIC-EM database and files following the steps in the previous procedure.

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **Backup & Restore** to view the **Backup & Restore** window.
 - Step 4** To restore the backup file, click on the **Restore from last Backup** button.

You can also drag and drop the backup file from its location in your network onto the **Drag and Drop a backup file** field in this window.

During a restore, the backup file copies over the current database.

Note When a restore is in progress, you are not be able to open and access any windows in the GUI.

Step 5 After the restore process completes, log back into the controller's GUI.

If the restore process was successful, you will be logged out of the controller and its GUI. You will need to log back in.

Note The Cisco APIC-EM restore process restores the controller's database and files. The restore process does not restore your network state and any changes made by the controller since the last backup, including any new network policies that have been created, any new or updated passwords, or any new or updated certificates/trustpool bundles.

To check whether the restore process was successful, you can either review the **Backup History** field of the **Backup & Restore** window or access the Grapevine root and to run the **grape backup display** command.

Caution

If the restore process was unsuccessful, you will receive an unsuccessful restore notification. Since the database may be in an inconsistent state, we recommend that you do not use the database and contact technical support for additional actions to take.

Step 6 (Optional) Using a Secure Shell (SSH) client, log into the host (physical or virtual) with the IP address that you specified using the configuration wizard.

Note The IP address to enter for the SSH client is the IP address that you configured for the network adapter. This IP address connects the appliance to the external network.

Step 7 (Optional) When prompted, enter your Linux username ('grapevine') and password for SSH access.

Step 8 (Optional) Enter the **grape backup display** command at the prompt to confirm that the restore process was completed and successful.

```
$ grape backup display
```

Check the command output to ensure that the restore process was completed and successful. Look for the property operation marked "restore" in the command output, with the latest start_time and ensure that the status is marked as a "success".

Step 9 (Optional) Using the Secure Shell (SSH) client, log out of the appliance.

Step 10 Return to the controller's GUI and review the **Backup History** field of the **Backup & Restore** window.

After the restore, information about it appears in the **Backup History** field of the **Backup & Restore** window. The following update data is displayed in this field:

- **Date**—Local date and time of the restore
- **ID**—Controller generated identification number of the backup file
- **Operation**—Type of operation, either backup or restore
- **Update Status**—Success or failure status of the operation.

Note If you place your cursor over (mouseover) a failure status in this field, then additional details about the failure is displayed.

Related Topics

[Information about Backing Up and Restoring the Cisco APIC-EM, on page 28](#)

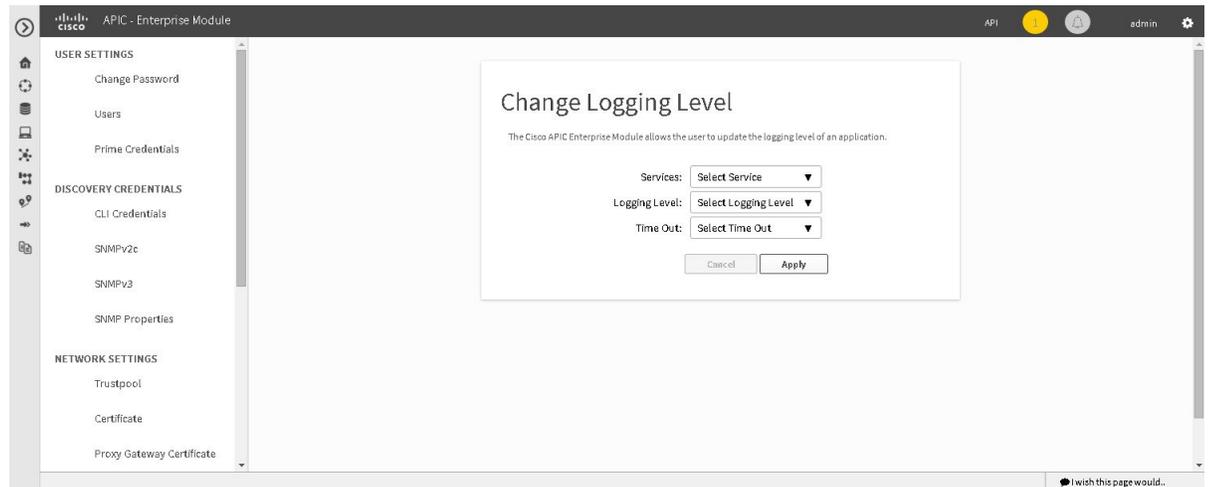
Service Logs

Changing the Logging Level for Services

You can change the logging level for the Cisco APIC-EM services by using the **Changing the Logging Level** window in the Cisco APIC-EM GUI.

A logging level determines the amount of data that is captured to the log files. Each logging level is cumulative, that is, each level contains all the data generated by the specified level and any higher levels. For example, setting the logging level to **Info** also captures **Warn** and **Error** logs.

Figure 14: Service Logging Level Window



The default logging level for services in the controller is informational (**Info**). You can change the logging level with the GUI to set it to debug or trace to capture more information.

**Caution**

Any logs collected at the **Debug** level or higher should be handled with restricted access.

**Note**

The log files are created and stored in a centralized location on your controller. From this location, the controller can query and display them in the GUI. The total compressed size of the log files is 2GB. If log files created are in excess of 2GB, then the pre-existing log files are overwritten with the newer log files.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **Changing the Logging Level** to view the **Changing Logging Level** window. The **Logging Level** table appears with the following fields:
- **Services**
 - **Logging Level**
 - **Timeout**
- Step 4** In the **Changing Logging Level** window, choose a service from the **Services** field to adjust its logging level.
- Note** The **Services** field displays any services that are currently configured and running on the controller.
- Step 5** In the **Changing Logging Level** window, choose the new logging level for the service from the **Logging Level** field. The following logging levels are supported on the controller:
- **Trace**—Trace messages
 - **Debug**—Debugging messages
 - **Info**—Normal but significant condition messages
 - **Warn**—Warning condition messages
 - **Error**—Error condition messages
- Step 6** In the **Changing Logging Level** window, choose the time period for the logging level from the **Timeout** field for the logging level adjustment.
You configure logging level time periods in increments of 15 minutes up to an unlimited time period.
- Step 7** Review your selection and click the **Apply** button.
To cancel your selection click the **Cancel** button.
The logging level for the specified service is set.
-

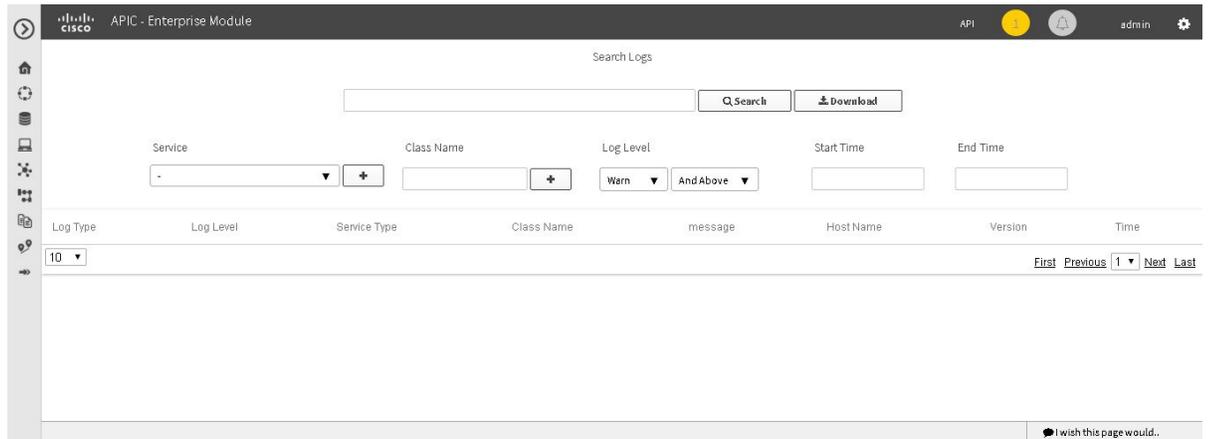
Related Topics

[Services](#)

Searching the Service Logs

You can search various controller service logs using the **Search Logs** window in the Cisco APIC-EM GUI.

Figure 15: Search Logs



The following log files are reviewed during a search:

- Linux logs
- Grapevine logs
- Grapevine service logs
- Database logs

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, "Managing Users and Roles," in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Logs** link from the drop-down menu.

The **Search Logs** window appears. In the **Search Logs** window, you can search the controller service logs by performing the following tasks:

- Search service logs by entering text in the **Search** field.
- Search service logs by configuring the GUI drop-down fields and menus.

- Search service logs by both entering search text and by using the GUI drop-down fields and menus as filters to that text.

Note There are no mandatory fields in the GUI that must have a value entered to conduct a search. You do not have to configure any specific field to run a search.

Step 3

(Optional) Enter a string value in the **Search Logs** field at the top of the **Search Log** window and click the **Search** button.

The log search results are displayed at the bottom of the **Search Logs** window in a table. You can view the following information from the search:

- **Log Level**—Log level (Error, Warn, Trace, Debug, Info)
- **Service Type**—Type of service (also including Grapevine and Linux services)
- **Class Name**—Java class that executed the request.
- **Message**—Actual detail of message that was sent to the log file. For example, "File not found" or "Resource xxx not found".
- **Host Name**—Grapevine host name that generated the request.
- **Version**—Version of the service.
- **Time**—Time message was sent to the log file.

Below the table are numerical filters. Adjust these filters to limit the number of logs displayed in the table (10, 25, 50, 100) or to view groups of a logs at a time (First, Previous, Next, Last, or 1-3).

Step 4

(Optional) In the **Search Logs** window, choose a service from the **Services** drop-down menu for the search and click the plus sign (+).

You can add several different services to your search, by choosing from the drop-down menu and then clicking the plus sign(+).

Note The **Services** drop-down menu displays any services that are currently configured and running on the controller.

Step 5

(Optional) In the **Search Log** window, type in a Java class in the **Class Name** field and click the plus sign (+).

You can add several different Java classes to your search, by choosing from the drop-down menu and then clicking the plus sign(+).

Step 6

(Optional) In the **Search Logs** window, choose a logging level from the **Log Level** drop-down menu.

The following logging levels are supported:

- **Trace**—Trace messages
- **Debug**—Debugging messages
- **Info**—Normal but significant condition messages
- **Warn**—Warning condition messages
- **Error**—Error condition messages

Step 7

(Optional) Adjust the logging level by choosing an appropriate condition in the second **Log Level** drop-down menu.

The following logging level adjustments are supported:

- **And Below**—Search for the specified logging level and any other logging level that has a lower level. For example, a **Trace** has a lower logging level than a **Warn**.
- **Only**—Search only for the specified logging level. Ignore any other logging levels in the results.
- **And Above**—Search for the specified logging level and any other logging level with a higher level. For example, a **Warn** has a higher logging level than a **Debug**.

Step 8 (Optional) In the **Search Logs** window, enter a start time for the logs in the **Start Time** field for the search or use the calendar icon.

If entering a date and time directly, use the following formats:

- Hour: Minutes, AM or PM
- MM/DD/YYYY

Step 9 (Optional) In the **Search Logs** window, enter an end time for the logs in the **End Time** field for the search or use the calendar icon.

If entering a date and time directly, use the following formats:

- Hour: Minutes, AM or PM
- MM/DD/YYYY

Step 10 Review your log search settings and then click the **Search** button.

The log search results are displayed at the bottom of the **Search Log** window in a table.

Below the table are numerical filters. Adjust these filters to limit the number of logs displayed in the table (10, 25, 50, 100) or to view groups of a logs at a time (First, Previous, Next, Last, or 1-3).

What to Do Next

Proceed with any additional service log searches.

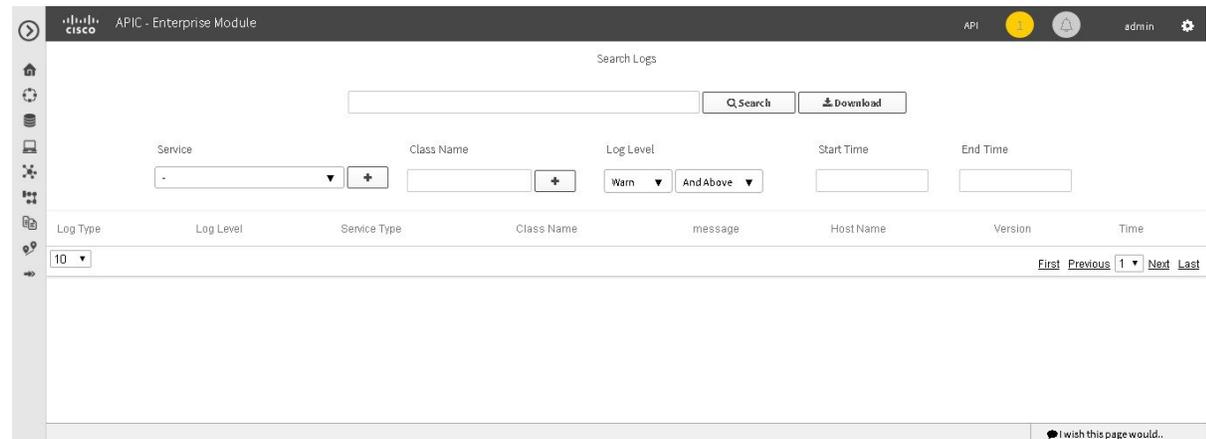
Related Topics

[Services](#)

Downloading the Service Logs

You can download various controller service logs using the **Search Logs** window in the Cisco APIC-EM GUI.

Figure 16: Downloading Logs



The following log files are reviewed during a search and download:

- Linux logs
- Grapevine logs
- Grapevine service logs
- Database logs

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have either administrator (ROLE_ADMIN) or policy administrator (ROLE_POLICY_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, "Managing Users and Roles," in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

Step 1 In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.

Step 2 Click the **Logs** link from the drop-down menu.

The **Search Logs** window appears. In the **Search Logs** window, you can download the controller service logs by performing the following tasks:

- Download service logs by entering a string value.
- Download service logs by configuring the GUI drop-down menus and fields.

- Download service logs by both entering a string value and by configuring the GUI drop-down menus and fields as filters to that string value.

Step 3 (Optional) Enter a string value in the **Search Logs** field at the top of the **Search Logs** window and click the **Download** button.

The log download results are displayed at the bottom of the **Search Logs** window.

Step 4 (Optional) In the **Search Log** window, choose a service from the **Services** drop-down menu for the download and click the plus sign (+).

You can add several different services to your download, by choosing from the drop-down menu and then clicking the plus sign(+).

Note The **Services** drop-down menu displays any services that are currently configured and running on the controller.

Step 5 (Optional) In the **Search Log** window, choose a Java class from the **Class** drop-down menu for the download and click the plus sign (+).

You can add several different Java classes to your download, by choosing from the drop-down menu and then clicking the plus sign(+).

Step 6 (Optional) In the **Search Logs** window, choose a logging level from the **Log Level** drop-down menu.

The following logging levels are supported:

- **Trace**—Trace messages
- **Debug**—Debugging messages
- **Info**—Normal but significant condition messages
- **Warn**—Warning condition messages
- **Error**—Error condition messages

Step 7 (Optional) Adjust the logging level by choosing an appropriate condition in the second **Log Level** drop-down menu.

The following logging level adjustments are supported:

- **And Below**—Search for the specified logging level and any other logging level that has a lower level. For example, a **Trace** has a lower logging level than a **Warn**.
- **Only**—Search only for the specified logging level. Ignore any other logging levels in the results.
- **And Above**—Search for the specified logging level and any other logging level with a higher level. For example, a **Warn** has a higher logging level than a **Debug**.

Step 8 (Optional) In the **Search Logs** window, enter a start time for the logs in the **Start Time** field for the download or use the calendar icon.

If entering a date and time directly, use the following formats:

- Hour: Minutes, AM or PM
- MM/DD/YYYY

Step 9 (Optional) In the **Search Logs** window, enter an end time for the logs in the **End Time** field for the download or use the calendar icon.

If entering a date and time directly, use the following formats:

- Hour: Minutes, AM or PM
- MM/DD/YYYY

Step 10 Review your log search settings and then click the **Download** button. The log download results are displayed at the bottom right of the **Search Log** window as a page icon displaying the number of logs using the following format: `Search Results (5).log`.

Step 11 Click on the icon for the log download results. A new window opens that displays the log download data. This data is organized using the following parameters:

- **Timestamp**—Time message was sent to the log file
- **Service type**—Service
- **Class**—Java class that executed the request.
- **Log level**—Log level
- **Message**—Actual detail of message that was sent to the log file. For example, "File not found" or "Resource xxx not found".
- **Version Number**—Version of the service.

What to Do Next

Proceed with any additional service log downloads.

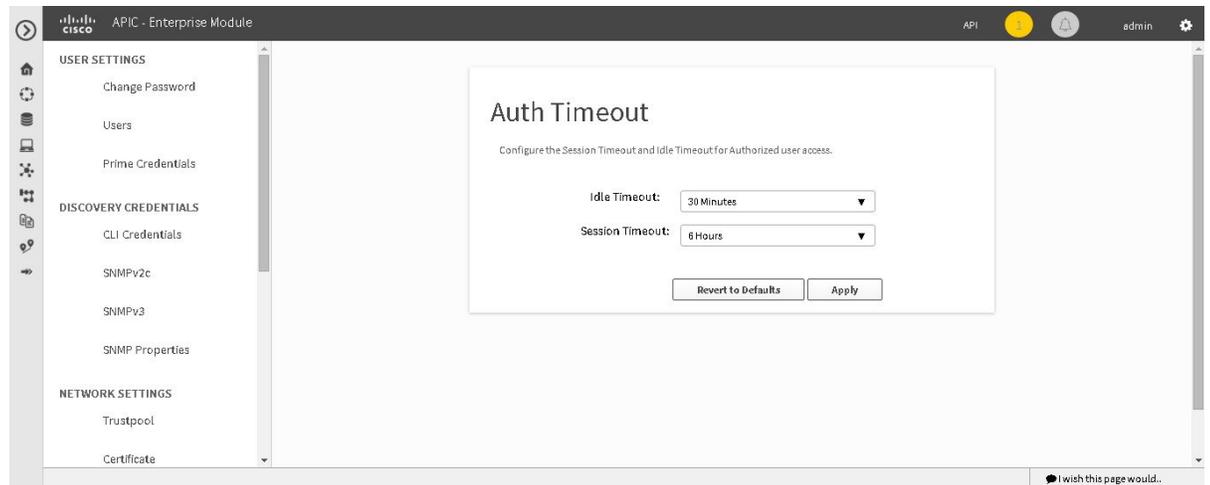
Related Topics

[Services](#)

Configuring the Authentication Timeout

You can configure authentication timeouts that require the user to log back into the controller with their credentials (username and password) using the **Authentication Timeout** window in the Cisco APIC-EM GUI.

Figure 17: Authentication Timeout Window



The following authentication timeout values can be configured:

- Idle timeout—Time interval that you can configure before the controller requires re-authentication (logging back in with appropriate credentials) due to Cisco APIC-EM inactivity. Idle timeouts are API-based, meaning that idle timeout is the time the controller is idle between API usages and not GUI mouse clicks or drags.
- Session timeout—Time interval that you can configure before the controller requires re-authentication (logging back in with appropriate credentials). This is a forced re-authentication.



Note

Approximately 2-3 minutes before your session is about to idle timeout, a pop-up warning appears in the GUI stating that your session is about to idle timeout and asking if you wish to continue with the current session. Click **Cancel** to ignore the warning and idle timeout of the session within approximately 2-3 minutes. Click **OK** to continue the session for another 30 minutes.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*

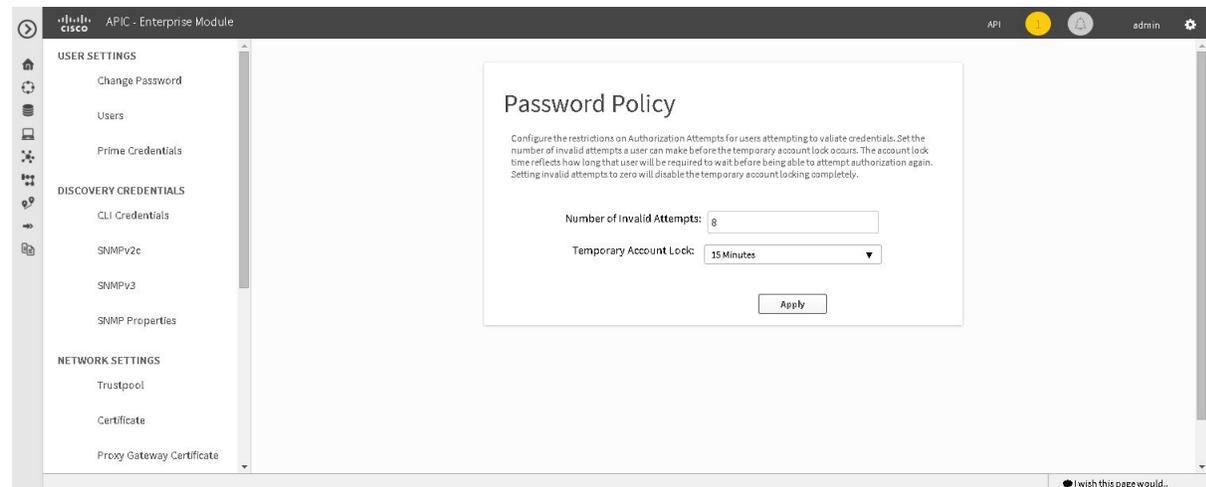
-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **Authentication Timeout** to view the **Authentication Timeout** window.
- Step 4** (Optional) Configure the idle timeout value using the **Idle Timeout** drop-down menu.
You can configure the idle timeout value in increments of 5 minutes, up to an hour. The default value is 30 minutes.
- Step 5** (Optional) Configure the session timeout value using the **Session Timeout** drop-down menu.
You can configure the session timeout value in increments of 30 minutes, up to 24 hours. The default value is six hours.
- Step 6** Click the **Apply** button to apply your configuration to the controller.
To restore the authentication timeout defaults to the controller, click the **Revert to Defaults** button.
-

Configuring Password Policies

As an administrator, you can control the number of consecutive, invalid user login attempts to the Cisco APIC-EM. Once a user crosses the threshold set by you as administrator, the user's account is locked and access is refused. Additionally, as an administrator, you can also configure the length of time that the user account is locked. The user account will remain locked until the configured time period expires.

You configure these controller access parameters for the Cisco APIC-EM using the **Password Policy** window.

Figure 18: Password Policy Window



The following password policy functionality is supported:

- As an administrator, you can set the number of consecutive, invalid user login attempts to the controller. These consecutive, invalid user login attempts can be set from 0 to 10 attempts, with 8 attempts being the default value. Setting invalid attempts to 0 will disable the feature of locking a user with invalid password attempts.
- As an administrator, you can set the length of time a user account is locked. Permitted lock time intervals for a user account range from 1-3600 seconds, with 900 seconds being the default value.
- When a user account is locked due to the number of consecutive, invalid login attempts, entering correct credentials will still result in a login failure until the expiration of the configured lock out time period.
- An administrator can unlock the user account at any time.

We recommend that you create at least two administrator accounts for your deployment. With two administrator accounts, if one account is locked for whatever reason then the other account can be used to unlock that locked account.



Note For information about how to unlock a user account, see the Chapter 4, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

- A locked user account is unlocked when the configured lock out time period expires.
- A user account can never be permanently locked, but to deny access permanently, an administrator can delete the account.

Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **Password Policy** to view the **Password Policy** window.
 - Step 4** (Optional) Configure the number of permitted consecutive, invalid password attempts by choosing from the **Number of Invalid Attempts** drop-down menu.
 - Step 5** (Optional) Configure the time interval for locking a user account by choosing from the **Temporary Account Lock** drop-down menu.
 - Step 6** Click the **Apply** button to apply your configuration to the controller.
-

Related Topics

[Password Requirements](#)

Telemetry Collection

The Cisco APIC-EM uses telemetry to collect information about the user experience with the controller. This information is collected for the following reasons:

- To proactively identify any issues with the controller
- To better understand the controller features that are most frequently used
- To improve and enhance the overall user experience

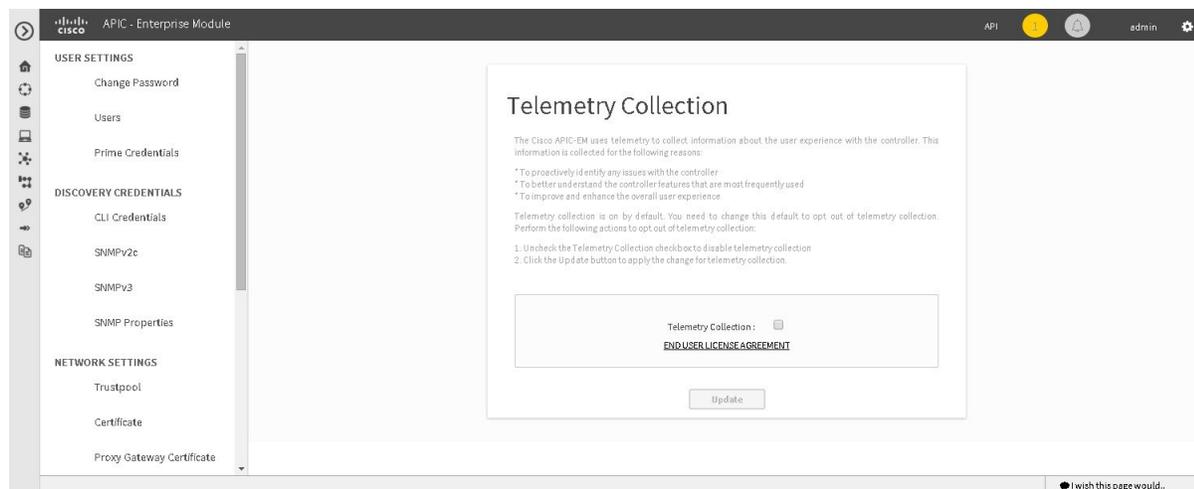
You are able to view the some of the collected telemetry data using the following methods:

- View the logs using the Cisco APIC-EM GUI—For information about this method, see *Searching the Services Logs* in Chapter 5, Configuring the Cisco APIC-EM Settings.
- View the logs using the Grapevine console— For information about this method, see *Troubleshooting Services* in Chapter 6, Troubleshooting the Cisco APIC-EM.

Telemetry is enabled with a telemetry service that collects data from the many other controller services. The telemetry service supports Data Access Service (DAS). The telemetry service uploads data to the Cisco Clean Access Agent (CAA) infrastructure on the Cisco cloud using HTTPS.

Telemetry collection is on by default. If you wish to opt out of telemetry collection, then perform the steps in the following procedure.

Figure 19: Telemetry Collection Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

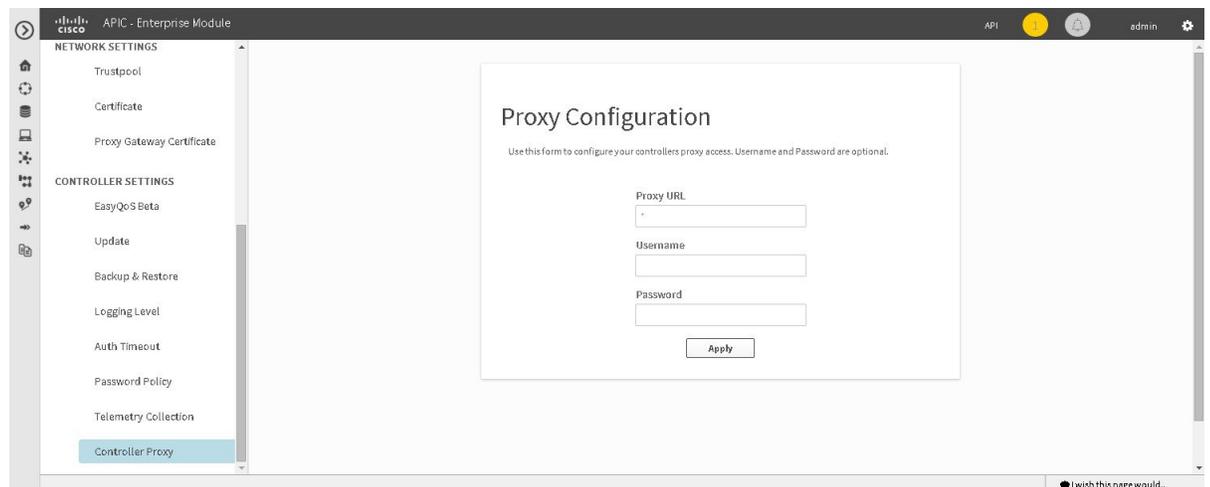
-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
- Step 2** Click the **Settings** link from the drop-down menu.
- Step 3** In the **Settings** navigation pane, click **Telemetry Collection** to view the **Telemetry Collection** window. When accessing the **Telemetry Collection** window for the first time, the GUI displays a blue box with a check that indicates that telemetry collection is enabled.
- Step 4** (Optional) Click the **End User License Agreement** to review the agreement for telemetry collection.
- Step 5** (Optional) Uncheck the **Telemetry Collection** blue box to disable telemetry collection.
- Step 6** (Optional) Click the **Update** button to apply the change for telemetry collection.
-

Configuring the Proxy

If the Cisco APIC-EM is unable to communicate directly with the telemetry server in the Cisco cloud, then a message will appear in the controller GUI (for an admin user) requesting that you configure access to the proxy. This message will contain a direct link to the **Proxy Configuration** window where you can configure this access. To configure access, enter the appropriate settings for the proxy server that exists between the controller and the telemetry server.

You configure these settings using the **Proxy Configuration** window in the Cisco APIC-EM GUI.

Figure 20: Proxy Configuration Window



Before You Begin

You must have successfully deployed the Cisco APIC-EM and it must be operational.

You must have administrator (ROLE_ADMIN) permissions to perform this procedure.

For information about the user permissions required to perform tasks using the Cisco APIC-EM, see the chapter, *Managing Users and Roles* in the *Cisco Application Policy Infrastructure Controller Enterprise Module Configuration Guide*.

-
- Step 1** In the **Home** window, click either **admin** or the **Settings** icon (gear) at the top right corner of the screen.
 - Step 2** Click the **Settings** link from the drop-down menu.
 - Step 3** In the **Settings** navigation pane, click **Controller Proxy** to view the **Proxy Configuration** window.
 - Step 4** Enter the proxy server's URL address.
 - Step 5** (Optional) If the proxy server requires authentication, then enter the username for access to the proxy server.
 - Step 6** (Optional) If the proxy server requires authentication, then enter the password that is required for access to the proxy server.
 - Step 7** Click the **Apply** button to apply your proxy configuration settings to the controller.
-

