Managing Certificates

Loading an Externally Generated SSL Certificate

This section describes how to load an externally generated SSL certificate.

Information About Externally Generated SSL Certificates

You can use a TFTP server to download an externally generated SSL certificate to the controller. Follow these guidelines for using TFTP:

- If you load the certificate through the service port, the TFTP server must be on the same subnet as the controller because the service port is not routable, or you must create static routes on the controller. Also, if you load the certificate through the distribution system network port, the TFTP server can be on any subnet.
- A third-party TFTP server cannot run on the same PC as the Cisco Prime Infrastructure because the Prime Infrastructure built-in TFTP server and the third-party TFTP server require the same communication port.

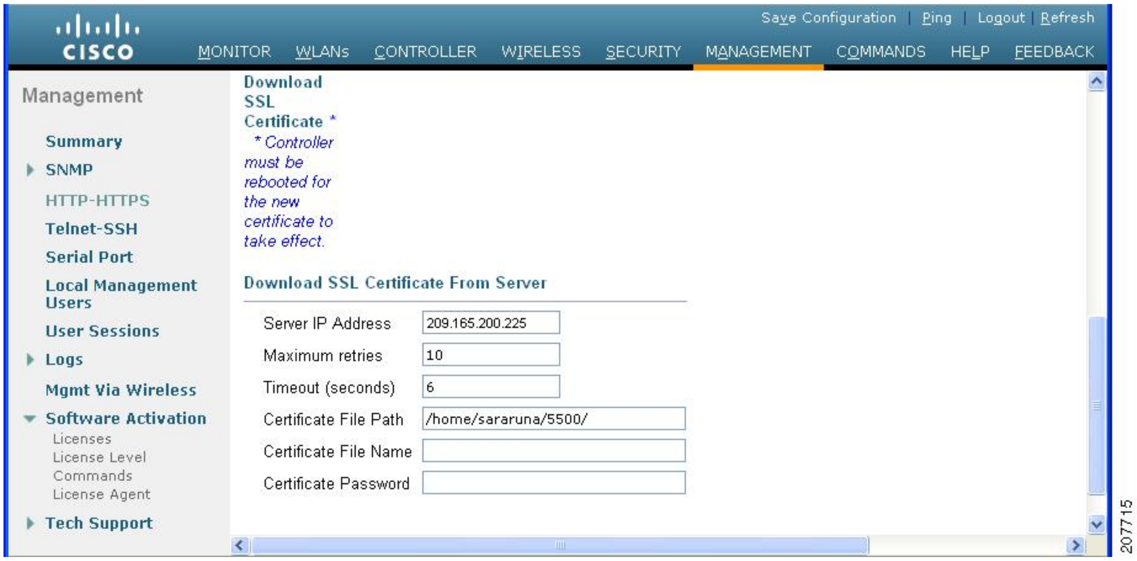
Note Chained certificates are supported for web authentication only and not for the management certificate.

Note Every HTTPS certificate contains an embedded RSA key. The length of the key can vary from 512 bits, which is relatively insecure, to thousands of bits, which is very secure. When you obtain a new certificate from a Certificate Authority, make sure that the RSA key embedded in the certificate is at least 768 bits long.

Loading an SSL Certificate (GUI)

Step 1 On the HTTP Configuration page, select the **Download SSL Certificate** check box.

Figure 1: HTTP Configuration Page



Download SSL Certificate *

* Controller must be rebooted for the new certificate to take effect.

Download SSL Certificate From Server

Server IP Address: 209.165.200.225
Maximum retries: 10
Timeout (seconds): 6
Certificate File Path: /home/sararuna/5500/
Certificate File Name:
Certificate Password:

Step 2 In the **Server IP Address** text box, enter the IP address of the TFTP server.

Step 3 In the **Maximum Retries** text box, enter the maximum number of times that the TFTP server attempts to download the certificate.

Step 4 In the **Timeout** text box, enter the amount of time (in seconds) that the TFTP server attempts to download the certificate.

Step 5 In the **Certificate File Path** text box, enter the directory path of the certificate.

Step 6 In the **Certificate File Name** text box, enter the name of the certificate (webadmincert_name.pem).

Step 7 (Optional) In the **Certificate Password** text box, enter a password to encrypt the certificate.

Step 8 Click **Apply**.

Step 9 Click **Save Configuration**.

Step 10 Choose **Commands** > **Reboot** > **Reboot** > **Save and Reboot** to reboot the controller for your changes to take effect,

Loading an SSL Certificate (CLI)

Step 1 Use a password to encrypt the HTTPS certificate in a .PEM-encoded file. The PEM-encoded file is called a web administration certificate file (`webadmincert_name.pem`).

Step 2 Move the `webadmincert_name.pem` file to the default directory on your TFTP server.

Step 3 To view the current download settings, enter this command and answer **n** to the prompt:
transfer download start

Information similar to the following appears:

```
Mode........................................... TFTP
Data Type...................................... Admin Cert
TFTP Server IP................................. xxx.xxx.xxx.xxx
TFTP Path...................................... <directory path>
TFTP Filename..................................
Are you sure you want to start? (y/n) n
Transfer Canceled
```

Step 4 Use these commands to change the download settings:
transfer download mode *tftp*

transfer download datatype *webauthcert*

transfer download serverip *TFTP_server IP_address*

transfer download path *absolute_TFTP_server_path_to_the_update_file*

transfer download filename *webadmincert_name.pem*

Step 5 To set the password for the .PEM file so that the operating system can decrypt the web administration SSL key and certificate, enter this command:
transfer download certpassword *private_key_password*

Step 6 To confirm the current download settings and start the certificate and key download, enter this command and answer **y** to the prompt:
transfer download start

Information similar to the following appears:

```
Mode........................................... TFTP
Data Type...................................... Site Cert
TFTP Server IP................................. xxx.xxx.xxx.xxx
TFTP Path...................................... directory path
TFTP Filename.................................. webadmincert_name
Are you sure you want to start? (y/n) y
TFTP Webadmin cert transfer starting.
Certificate installed.
Please restart the switch (reset system) to use the new certificate.
```

Step 7 To save the SSL certificate, key, and secure web password to NVRAM so that your changes are retained across reboots, enter this command:

save config

Step 8 To reboot the controller, enter this command:
reset system

Downloading Device Certificates

Each wireless device (controller, access point, and client) has its own device certificate. For example, the controller is shipped with a Cisco-installed device certificate. This certificate is used by EAP-FAST (when not using PACs), EAP-TLS, PEAP-GTC, and PEAP-MSCHAPv2 to authenticate wireless clients during local EAP authentication. However, if you want to use your own vendor-specific device certificate, it must be downloaded to the controller.

Note For more information about configuring local EAP, see the Configuring Local EAP section.

Follow the instructions in this section to download a vendor-specific device certificate to the controller through the GUI or CLI. However, before you begin, make sure you have a TFTP or FTP server available for the certificate download. Follow these guidelines when setting up a TFTP or FTP server:

- If you are downloading through the service port, the TFTP or FTP server must be on the same subnet as the service port because the service port is not routable, or you must create static routes on the controller.
- If you are downloading through the distribution system network port, the TFTP or FTP server can be on the same or a different subnet because the distribution system port is routable.
- A third-party TFTP or FTP server cannot run on the same computer as Cisco Prime Infrastructure because the Prime Infrastructure built-in TFTP or FTP server and the third-party TFTP or FTP server require the same communication port.

Note All certificates downloaded to the controller must be in PEM format.

Note Clients using Microsoft Windows 10 with default (zero-touch config) supplicant fail to connect to Cisco WLC when there is no CA certificate to validate the server certificate. This is because the supplicant does not pop up a window to accept the server certificate and silently rejects the 802.1X authentication. Therefore, we recommend that you do either of the following:

- Manually install a third-party CA certificate on the AAA server, which the clients using Microsoft Windows 10 can trust.
- Use any other supplicant, such as Cisco AnyConnect, which pops up a window to trust or not trust the server certificate. If you accept the trust certificate, then the client is authenticated.

Downloading Device Certificates (GUI)

Step 1 Copy the device certificate to the default directory on your server.

Step 2 Choose **Commands** > **Download File** to open the Download File to Controller page.

Step 3 From the File Type drop-down list, choose **Vendor Device Certificate**.

Step 4 In the Certificate Password text box, enter the password that was used to protect the certificate.

Step 5 From the Transfer Mode drop-down list, choose from the following options:

- **TFTP**
- **FTP**
- **SFTP** (available in 7.4 and later releases)

Step 6 In the IP Address text box, enter the IP address of the server.
If you are using a TFTP server, the default values of 10 retries and 6 seconds for the Maximum Retries and Timeout text boxes should work correctly without any adjustment. However, you can change these values.

Step 7 Enter the maximum number of times that the TFTP server attempts to download the certificate in the Maximum Retries text box and the amount of time (in seconds) that the TFTP server attempts to download the certificate in the Timeout text box.

Step 8 In the File Path text box, enter the directory path of the certificate.

Step 9 In the File Name text box, enter the name of the certificate.

Step 10 If you are using an FTP server, follow these steps:

a) In the Server Login Username text box, enter the username to log into the FTP server.
b) In the Server Login Password text box, enter the password to log into the FTP server.
c) In the Server Port Number text box, enter the port number on the FTP server through which the download occurs. The default value is 21.

Step 11 Click **Download** to download the device certificate to the controller. A message appears indicating the status of the download.

Step 12 After the download is complete, choose **Commands** > **Reboot** > **Reboot**.

Step 13 If prompted to save your changes, click **Save and Reboot**.

Step 14 Click **OK** to confirm your decision to reboot the controller.

Downloading Device Certificates (CLI)

Step 1 Log onto the controller CLI.

Step 2 Specify the transfer mode used to download the config file by entering this command:
transfer download mode {**tftp** | **ftp** | **sftp**}

Step 3 Specify the type of the file to be downloaded by entering this command:
transfer download datatype eapdevcert

Step 4 Specify the certificate's private key by entering this command:
transfer download certpassword *password*

Step 5 Specify the IP address of the TFTP or FTP server by entering this command:
transfer download serverip *server-ip-address*

Step 6 Specify the name of the config file to be downloaded by entering this command:
transfer download path *server-path-to-file*

Step 7 Specify the directory path of the config file by entering this command:
transfer download filename *filename.pem*

Step 8 If you are using a TFTP server, enter these commands:

- **transfer download tftpMaxRetries retries**
- **transfer download tftpPktTimeout timeout**

Note The default values of 10 retries and a 6-second timeout should work correctly without any adjustment. However, you can change these values. To do so, enter the maximum number of times that the TFTP server attempts to download the software for the *retries* parameter and the amount of time (in seconds) that the TFTP server attempts to download the software for the *timeout* parameter.

Step 9 If you are using an FTP server, enter these commands:

- **transfer download username** *username*
- **transfer download password** *password*
- **transfer download port** *port*

Note The default value for the port parameter is 21.

Step 10 View the updated settings by entering the **transfer download start** command. Answer y when prompted to confirm the current settings and start the download process.

Step 11 Reboot the controller by entering this command:
reset system

Uploading Device Certificates

Uploading Device Certificates (GUI)

Step 1 Choose **Commands** > **Upload File** to open the Upload File from Controller page.

Step 2 From the File Type drop-down list, choose **IPSec Device Certificate**.

Step 3 From the Transfer Mode drop-down list, choose from the following options:

- **TFTP**
- **FTP**
- **SFTP**

Step 4 In the IP Address text box, enter the IP address of the server.

Step 5 In the File Path text box, enter the directory path of the certificate.

Step 6 In the File Name text box, enter the name of the certificate.

Step 7 If you are using an FTP server, follow these steps:

a) In the Server Login Username text box, enter the username to log on to the FTP server.
b) In the Server Login Password text box, enter the password to log on to the FTP server.
c) In the Server Port Number text box, enter the port number on the FTP server through which the download occurs. The default value is 21. For SFTP, the default value is 22.

Step 8 Click **Upload** to upload the CA certificate from the controller. A message appears indicating the status of the upload.

Step 9 After the upload is complete, choose **Commands** > **Reboot** > **Reboot**.

Step 10 If prompted to save your changes, click **Save and Reboot**.

Step 11 Click **OK** to confirm your decision to reboot the controller.

Uploading Device Certificates (CLI)

Step 1 Log on to the controller CLI.

Step 2 Specify the type of the file to be uploaded by entering this command:
transfer upload datatype ipsecdevcert

Step 3 Specify the transfer mode used to upload the file by entering this command:
transfer upload mode {**tftp** | **ftp** | **sftp**}

Step 4 Specify the IP address of the TFTP or FTP server by entering this command:
transfer upload serverip *server-ip-address*

Step 5 Specify the directory path of the file by entering this command:

transfer upload path *server-path-to-file*

Step 6 Specify the name of the file to be uploaded by entering this command:
transfer upload filename *filename*

Step 7 If you are using an FTP server, enter these commands:

- **transfer upload username** *username*
- **transfer upload password** *password*
- **transfer upload port** *port*

Note The default value for the port parameter for is 21. For SFTP, the default value is 22.

Step 8 View the updated settings by entering the **transfer upload start** command. Answer y when prompted to confirm the current settings and start the upload process.

Step 9 Reboot the controller by entering the **reset system** command.

Downloading CA Certificates

Controllers and access points have a Certificate Authority (CA) certificate that is used to sign and validate device certificates. The controller is shipped with a Cisco-installed CA certificate. This certificate may be used by EAP-FAST (when not using PACs), EAP-TLS, PEAP-GTC, and PEAP-MSCHAPv2 to authenticate wireless clients during local EAP authentication. However, if you want to use your own vendor-specific CA certificate, it must be downloaded to the controller.

Note For more information about configuring local EAP, see the Configuring Local EAP section.

Follow the instructions in this section to download CA certificates to the controller through the GUI or CLI. However, before you begin, make sure that you have a TFTP or FTP server available for the certificate download. Follow these guidelines when setting up a TFTP or FTP server:

- If you are downloading through the service port, the TFTP or FTP server must be on the same subnet as the service port because the service port is not routable, or you must create static routes on the controller.
- If you are downloading through the distribution system network port, the TFTP or FTP server can be on the same or a different subnet because the distribution system port is routable.
- A third-party TFTP or FTP server cannot run on the same computer as Cisco Prime Infrastructure because the Prime Infrastructure built-in TFTP or FTP server and the third-party TFTP or FTP server require the same communication port.

Note All certificates downloaded to the controller must be in PEM format.

Download CA Certificates (GUI)

Step 1 Copy the CA certificate to the default directory on your server.

Step 2 Choose **Commands** > **Download File** to open the Download File to Controller page.

Step 3 From the File Type drop-down list, choose **Vendor CA Certificate**.

Step 4 From the Transfer Mode drop-down list, choose from the following options:

- **TFTP**
- **FTP**
- **SFTP** (available in 7.4 and later releases)

Step 5 In the IP Address text box, enter the IP address of the server.
If you are using a TFTP server, the default values of 10 retries and 6 seconds for the Maximum Retries and Timeout text boxes should work correctly without any adjustment. However, you can change these values.

Step 6 Enter the maximum number of times that the TFTP server attempts to download the certificate in the Maximum Retries text box and the amount of time (in seconds) that the TFTP server attempts to download the certificate in the Timeout text box.

Step 7 In the File Path text box, enter the directory path of the certificate.

Step 8 In the File Name text box, enter the name of the certificate.

Step 9 If you are using an FTP server, follow these steps:

a) In the Server Login Username text box, enter the username to log on to the FTP server.
b) In the Server Login Password text box, enter the password to log on to the FTP server.
c) In the Server Port Number text box, enter the port number on the FTP server through which the download occurs. The default value is 21.

Step 10 Click **Download** to download the CA certificate to the controller. A message appears indicating the status of the download.

Step 11 After the download is complete, choose **Commands** > **Reboot** > **Reboot**.

Step 12 If prompted to save your changes, click **Save and Reboot**.

Step 13 Click **OK** to confirm your decision to reboot the controller.

Downloading CA Certificates (CLI)

Step 1 Log on to the controller CLI.

Step 2 Specify the transfer mode used to download the config file by entering this command:
transfer download mode {**tftp** | **ftp** | **sftp**}

Step 3 Specify the type of the file to be downloaded by entering this command:

transfer download datatype eapdevcert

Step 4 Specify the IP address of the TFTP or FTP server by entering this command:
transfer download serverip *server-ip-address*

Step 5 Specify the directory path of the config file by entering this command:
transfer download path *server-path-to-file*

Step 6 Specify the name of the config file to be downloaded by entering this command:
transfer download filename *filename*

Step 7 If you are using a TFTP server, enter these commands:

- **transfer download tftpMaxRetries** *retries*
- **transfer download tftpPktTimeout** *timeout*

Note The default values of 10 retries and a 6-second timeout should work correctly without any adjustment. However, you can change these values. To do so, enter the maximum number of times that the TFTP server attempts to download the software for the *retries* parameter and the amount of time (in seconds) that the TFTP server attempts to download the software for the *timeout* parameter.

Step 8 If you are using an FTP server, enter these commands:

- **transfer download username** *username*
- **transfer download password** *password*
- **transfer download port** *port*

Note The default value for the port parameter is 21.

Step 9 View the updated settings by entering the **transfer download start** command. Answer y when prompted to confirm the current settings and start the download process.

Step 10 Reboot the controller by entering the **reset system** command.

Uploading CA Certificates

Uploading CA Certificates (GUI)

Step 1 Choose **Commands** > **Upload File** to open the Upload File from Controller page.

Step 2 From the File Type drop-down list, choose **IPSec CA Certificate**.

Step 3 From the Transfer Mode drop-down list, choose from the following options:

- **TFTP**
- **FTP**

- **SFTP**

Step 4 In the IP Address text box, enter the IP address of the server.

Step 5 In the File Path text box, enter the directory path of the certificate.

Step 6 In the File Name text box, enter the name of the certificate.

Step 7 If you are using an FTP server, follow these steps:

a) In the Server Login Username text box, enter the username to log on to the FTP server.
b) In the Server Login Password text box, enter the password to log on to the FTP server.
c) In the Server Port Number text box, enter the port number on the FTP server through which the download occurs. The default value is 21. For SFTP, the default value is 22.

Step 8 Click **Upload** to upload the CA certificate from the controller. A message appears indicating the status of the upload.

Step 9 After the upload is complete, choose **Commands** > **Reboot** > **Reboot**.

Step 10 If prompted to save your changes, click **Save and Reboot**.

Step 11 Click **OK** to confirm your decision to reboot the controller.

Uploading CA Certificates (CLI)

Step 1 Log on to the controller CLI.

Step 2 Specify the type of the file to be uploaded by entering this command:
transfer upload datatype ipseccacert

Step 3 Specify the transfer mode used to upload the file by entering this command:
transfer upload mode {**tftp** | **ftp** | **sftp**}

Step 4 Specify the IP address of the TFTP or FTP server by entering this command:
transfer upload serverip *server-ip-address*

Step 5 Specify the directory path of the file by entering this command:
transfer upload path *server-path-to-file*

Step 6 Specify the name of the file to be uploaded by entering this command:
transfer upload filename *filename*

Step 7 If you are using an FTP server, enter these commands:

- **transfer upload username** *username*
- **transfer upload password** *password*
- **transfer upload port** *port*

Note The default value for the port parameter is 21. For SFTP, the default value is 22.

Step 8 View the updated settings by entering the **transfer upload start** command. Answer y when prompted to confirm the current settings and start the upload process.

Step 9 Reboot the controller by entering the **reset system** command.

Generating a Certificate Signing Request

Step 1 Install and open the OpenSSL application.

Step 2 Enter the command:

```
OpenSSL> req -new -newkey rsa:1024 -nodes -keyout mykey.pem -out myreq.pem
```

Controllers support a maximum key size of 2048 bits.

Note You must provide the correct Common Name. Ensure that the host name that is used to create the certificate (Common Name) matches the Domain Name System (DNS) host name entry for the virtual interface IP on the controller. This name should exist in the DNS as well. Also, after you make the change to the VIP interface, you must reboot the system in order for this change to take effect.

After you issue the command, you are prompted to enter information such as country name, state, city, and so on.

Information similar to the following appears:

```
OpenSSL> req -new -newkey rsa:1024 -nodes -keyout mykey.pem -out myreq.pem
Loading 'screen' into random state - done
Generating a 1024 bit RSA private key
................................................................++++++
...................................................++++++
writing new private key to 'mykey.pem'
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:CA
Locality Name (eg, city) []:San Jose
Organization Name (eg, company) [Internet Widgits Pty Ltd]:ABC
Organizational Unit Name (eg, section) []:CDE
Common Name (eg, YOUR name) []:XYZ.ABC
Email Address []:Test@abc.com


Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:Test123
An optional company name []:
OpenSSL>
```

After you provide all the required details two files are generated:

- A new private key that includes the name *mykey.pem*

- A CSR that includes the name *myreq.pem*

Step 3 Copy and paste the Certificate Signing Request (CSR) information into any CA enrollment tool. After you submit the CSR to a third party CA, the third party CA digitally signs the certificate and sends back the signed certificate chain through e-mail. In case of chained certificates, you receive the entire chain of certificates from the CA. If you only have one intermediate certificate similar to the example above, you will receive the following three certificates from the CA:

- Root certificate.pem
- Intermediate certificate.pem
- Device certificate.pem

Note Ensure that the certificate is Apache-compatible with SHA1 encryption.

Step 4 Once you have all the three certificates, copy and paste into another file the contents of each .pem file in this order:

```
------BEGIN CERTIFICATE------
*Device cert*
------END CERTIFICATE------
------BEGIN CERTIFICATE------
*Intermediate CA cert *
------END CERTIFICATE--------
------BEGIN CERTIFICATE------
*Root CA cert *
------END CERTIFICATE------
```

Step 5 Save the file as *All-certs.pem*.

Step 6 Combine the All-certs.pem certificate with the private key that you generated along with the CSR (the private key of the device certificate, which is mykey.pem in this example), and save the file as final.pem.

Step 7 Create the All-certs.pem and final.pem files by entering these commands:

```
openssl> pkcs12 -export -in All-certs.pem -inkey mykey.pem
       -out All-certs.p12 -clcerts -passin pass:check123
       -passout pass:check123

openssl> pkcs12 -in All-certs.p12 -out final.pem
       -passin pass:check123 -passout pass:check123
```

final.pem is the file that we need to download to the controller.

Note You must enter a password for the parameters **-passin** and **-passout**. The password that is configured for the **-passout** parameter must match the certpassword parameter that is configured on the controller. In the above example, the password that is configured for both the **-passin** and **-passout** parameters is check123.

What to Do Next

Download the final.pem file to the controller either using CLI or GUI.

Downloading Third-Party Certificate (GUI)

Step 1 Copy the device certificate final.pem to the default directory on your TFTP server.

Step 2 Choose **Security** > **Web Auth** > **Certificate** to open the Web Authentication Certificate page.

Step 3 Check the **Download SSL Certificate** check box to view the Download SSL Certificate From Server parameters.

Step 4 In the **Server IP Address** text box, enter the IP address of the TFTP server.

Step 5 In the **File Path** text box, enter the directory path of the certificate.

Step 6 In the **File Name** text box, enter the name of the certificate.

Step 7 In the **Certificate Password** text box, enter the password to protect the certificate.

Step 8 Click **Apply**.

Step 9 After the download is complete, choose **Commands** > **Reboot** and click **Save and Reboot**.

Step 10 Click **OK** in order to confirm your decision to reboot the controller.

Downloading Third-Party Certificate (CLI)

Step 1 Move the *final.pem* file to the default directory on your TFTP server. Change the download settings by entering the following commands:

```
(Cisco Controller) > transfer download mode tftp
(Cisco Controller) > transfer download datatype webauthcert
(Cisco Controller) > transfer download serverip <TFTP server IP address>
(Cisco Controller) > transfer download path <absolute TFTP server path to the update file>
(Cisco Controller) > transfer download filename final.pem
```

Step 2 Enter the password for the .pem file so that the operating system can decrypt the SSL key and certificate.

```
(Cisco Controller) > transfer download certpassword password
```

Note Ensure that the value for *certpassword* is the same as the **-passout** parameter when you generate a CSR.

Step 3 Start the certificate and key download by entering the this command:
transfer download start

Example:

```
(Cisco Controller) > transfer download start

Mode........................................... TFTP
Data Type...................................... Site Cert
TFTP Server IP................................. 10.77.244.196
TFTP Packet Timeout............................ 6
TFTP Max Retries............................... 10
TFTP Path......................................./
TFTP Filename................................... final.pem

This may take some time.
Are you sure you want to start? (y/N) y

TFTP EAP Dev cert transfer starting.

Certificate installed.
Reboot the switch to use new certificate.
```

Step 4 Reboot the controller.