Locally Significant Certificates

Information About Locally Significant Certificates

This module explains how to configure the Cisco Catalyst 9800 Series Wireless Controller and Lightweight Access Points (LAPs) to use the Locally Significant Certificate (LSC). If you choose the Public Key Infrastructure (PKI) with LSC, you can generate the LSC on the APs and controllers. You can then use the certificates to mutually authenticate the controllers and the APs.

In Cisco controllers, you can configure the controller to use an LSC. Use an LSC if you want your own PKI to provide better security, have control of your Certificate Authority (CA), and define policies, restrictions, and usages on the generated certificates.

You need to provision the new LSC certificate on the controller and then the Lightweight Access Point (LAP) from the CA Server.

The LAP communicates with the controller using the CAPWAP protocol. Any request to sign the certificate and issue the CA certificates for LAP and controller itself must be initiated from the controller. The LAP does not communicate directly with the CA server. The CA server details must be configured on the controller and must be accessible.

The controller makes use of the Simple Certificate Enrollment Protocol (SCEP) to forward certReqs generated on the devices to the CA and makes use of SCEP again to get the signed certificates from the CA.

The SCEP is a certificate management protocol that the PKI clients and CA servers use to support certificate enrollment and revocation. It is widely used in Cisco and supported by many CA servers. In SCEP, HTTP is used as the transport protocol for the PKI messages. The primary goal of SCEP is the secure issuance of certificates to network devices. SCEP is capable of many operations, but for our release, SCEP is utilized for the following operations:

- CA and Router Advertisement (RA) Public Key Distribution
- Certificate Enrollment

Certificate Provisioning in Controllers

The new LSC certificates, both CA and device certificates, must be installed on the controller.

With the help of SCEP, CA certificates are received from the CA server. During this point, there are no certificates in the controller. After the **get** operation of obtaining the CA certificates, are installed on the controller. The same CA certificates are also pushed to the APs when the APs are provisioned with LSCs.

Note We recommend that you use a new RSA keypair name for the newly configured PKI certificate. If you want to reuse an existing RSA keypair name (that is associated with an old certificate) for a new PKI certificate, do either of the following:

- Do not regenerate a new RSA keypair with an existing RSA keypair name, reuse the existing RSA keypair name. Regenerating a new RSA keypair with an existing RSA keypair name will make all the certificates associated with the existing RSA keypair invalid.
- Manually remove the old PKI certificate configurations first, before reusing the existing RSA keypair name for the new PKI certificate.

Device Certificate Enrollment Operation

For both the LAP and the controller that request a CA-signed certificate, the certRequest is sent as a PKCS#10 message. The certRequest contains the Subject Name, Public Key, and other attributes to be included in the X.509 certificate, and must be digitally signed by the Private Key of the requester. These are then sent to the CA, which transforms the certRequest into an X.509 certificate.

The CA that receives a PKCS#10 certRequest requires additional information to authenticate the requester's identity and verify if the request is unaltered. (Sometimes, PKCS#10 is combined with other approaches, such as PKCS#7 to send and receive the certificate request or response.)

The PKCS#10 is wrapped in a PKCS#7 Signed Data message type. This is supported as part of the SCEP client functionality, while the PKCSReq message is sent to the controller. Upon successful enrollment operation, both the CA and device certificates are available on the controller.

Certificate Provisioning on Lightweight Access Point

In order to provision a new certificate on LAP, while in CAPWAP mode, the LAP must be able to get the new signed X.509 certificate. In order to do this, it sends a certRequest to the controller, which acts as a CA proxy and helps obtain the certRequest signed by the CA for the LAP.

The certReq and the certResponses are sent to the LAP with the LWAPP payloads.

Both the LSC CA and the LAP device certificates are installed in the LAP, and the system reboots automatically. The next time when the system comes up, because it is configured to use LSCs, the AP sends the LSC device certificate to the controller as part of the JOIN Request. As part of the JOIN Response, the controller sends the new device certificate and also validates the inbound LAP certificate with the new CA root certificate.

What to Do Next

To configure, authorize, and manage certificate enrollment with the existing PKI infrastructure for controller and AP, you need to use the LSC provisioning functionality.

Restrictions for Locally Significant Certificates

- LSC workflow is different in FIPS+WLANCC mode. CA server must support Enrollment over Secure Transport (EST) protocol and should be capable of issuing EC certificates in FIPS+WLANCC mode.
- Elliptic Curve Digital Signature Algorithm (ECDSA) cipher works only if both AP and controller are having EC certificates, provisioned with LSC.
- EC certificates (LSC-EC) can be provisioned only if CA server supports EST (and not SCEP).
- FIPS + CC security modes is required to be configured in order to provision EC certificate.

Provisioning Locally Significant Certificates

Configuring RSA Key for PKI Trustpoint

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**crypto key generate rsa** [**exportable**] **general-keys modulus** *key_size* **label** *RSA_key* **Example:** `Device(config)# crypto key generate rsa exportable general-keys modulus 2048 label lsc-tp`	Configures RSA key for PKI trustpoint. **exportable** is an optional keyword. You may or may not want to configure an exportable-key. If selected, you can export the key out of the box, if required • *key_size*: Size of the key modulus. The valid range is from 2048 to 4096. • *RSA_key*: RSA key pair label.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring PKI Trustpoint Parameters

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**crypto pki trustpoint** *trustpoint_name* **Example:** `Device(config)# crypto pki trustpoint microsoft-ca`	Creates a new trustpoint for an external CA server. Here, *trustpoint_name* refers to the trustpoint name.
Step 3	**enrollment url** *HTTP_URL* **Example:** `Device(ca-trustpoint)# enrollment url http://CA_server/certsrv/mscep/mscep.dll`	Specifies the URL of the CA on which your router should send certificate requests. **url** *url*: URL of the file system where your router should send certificate requests. An IPv6 address can be added in the URL enclosed in brackets. For example: http://[2001:DB8:1:1::1]:80. For more enrollment method options, see the enrollment url (ca-trustpoint) command page.
Step 4	**subject-name** *subject_name* **Example:** `Device(ca-trustpoint)# subject-name C=IN, ST=KA, L=Bengaluru, O=Cisco, CN=eagle-eye/emailAddress=support@abc.com`	Creates subject name parameters for the trustpoint.
Step 5	**rsakeypair** *RSA_key key_size* **Example:** `Device(ca-trustpoint)# rsakeypair ewlc-tp1`	Maps RSA key with that of the trustpoint. • *RSA_key*: RSA key pair label. • *key_size*: Signature key length. Range is from 360 to 4096.
Step 6	**revocation** {**crl** | **none** | **ocsp**} **Example:** `Device(ca-trustpoint)# revocation none`	Checks revocation.
Step 7	**end** **Example:** `Device(ca-trustpoint)# end`	Returns to privileged EXEC mode.

Authenticating and Enrolling a PKI Trustpoint (GUI)

Procedure

Step 1 Choose **Configuration** > **Security** > **PKI Management**.

Step 2 In the **PKI Management** window, click the **Trustpoints** tab.

Step 3 In the **Add Trustpoint** dialog box, provide the following information:

a) In the **Label** field, enter the RSA key label.
b) In the **Enrollment URL** field, enter the enrollment URL.
c) Check the **Authenticate** check box to authenticate the Public Certificate from the enrollment URL.
d) In the **Subject Name** section, enter the **Country Code**, **State**, **Location**, **Organization**, **Domain Name**, and **Email Address**.
e) Check the **Key Generated** check box to view the available RSA keypairs. Choose an option from the **Available RSA Keypairs** drop-down list.
f) Check the **Enroll Trustpoint** check box.
g) In the **Password** field, enter the password.
h) In the **Re-Enter Password** field, confirm the password.
i) Click **Apply to Device**.

The new trustpoint is added to the trustpoint name list.

Authenticating and Enrolling the PKI Trustpoint with CA Server (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**crypto pki authenticate** *trustpoint_name* **Example:** `Device(config)# crypto pki authenticate microsoft-ca`	Fetches the CA certificate.

Step 3	**yes**
	Example:
	`Device(config)# % Do you accept this certificate? [yes/no]:`
	`yes Trustpoint CA certificate accepted.`	

Step 4	**crypto pki enroll** *trustpoint_name* **Example:**	Enrolls the client certificate.

	Command or Action	Purpose

	`Device(config)# crypto pki enroll microsoft-ca`
	`%`
	`% Start certificate enrollment ..`
	`% Create a challenge password. You will need to verbally`
	`provide this password to the CA Administrator in order to`
	`revoke your certificate. For security reasons your password`
	`will not be saved in the configuration.`
	`Please make a note of it.`	

Step 5	**password** **Example:** `Device(config)# abcd123`	Enters a challenge password to the CA server.
Step 6	**password** **Example:** `Device(config)# abcd123`	Re-enters a challenge password to the CA server.

Step 7	**yes**
	Example:
	`Device(config)# % Include the router serial number`
	`in the subject name? [yes/no]: yes`	

Step 8	**no**
	Example:
	`Device(config)# % Include an IP address`
	`in the subject name? [no]: no`	

Step 9	**yes**
	Example:
	`Device(config)#`
	`Request certificate from CA? [yes/no]: yes`
	`% Certificate request sent to Certificate Authority`
	`% The 'show crypto pki certificate verbose`
	`client' command will show the fingerprint.`	

Step 10	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring AP Join Attempts with LSC Certificate (GUI)

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Access Points**.

Step 2 In the **All Access Points** window, click the LSC Provision name.

Step 3 From the **Status** drop-down list, choose a status to enable LSC.

Step 4 From the **Trustpoint Name** drop-down list, choose the trustpoint.

Step 5 In the **Number of Join Attempts** field, enter the number of retry attempts that will be permitted.

Step 6 Click **Apply**.

Configuring AP Join Attempts with LSC Certificate (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**ap lsc-provision join-attempt** *number_of_attempts* **Example:** `Device(config)# ap lsc-provision join-attempt 10`	Specifies the maximum number of AP join failure attempts with the newly provisioned LSC certificate. When the number of AP joins exceed the specified limit, AP joins back with the Manufacturer Installed Certificate (MIC).
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Subject-Name Parameters in LSC Certificate

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**ap lsc-provision subject-name-parameter country** *country-str* **state** *state-str* **city** *city-str* **domain** *domain-str* **org** *org-str* **email-address** *email-addr-str* **Example:** `Device(config)# ap lsc-provision subject-name-parameter country India state Karnataka city Bangalore domain domain1 org Right email-address adc@gfe.com`	Specifies the attributes to be included in the subject-name parameter of the certificate request generated by an AP.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring Key Size for LSC Certificate

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**ap lsc-provision key-size** { **2048** | **3072** | **4096}**} **Example:** `Device(config)# ap lsc-provision key-size 2048`	Specifies the size of keys to be generated for the LSC on AP.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Trustpoint for LSC Provisioning on an Access Point

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**ap lsc-provision trustpoint** *tp-name* **Example:** `Device(config)# ap lsc-provision trustpoint microsoft-ca`	Specifies the trustpoint with which the LCS is provisioned to an AP. *tp-name*: The trustpoint name.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring an AP LSC Provision List (GUI)

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Access Points**.

Step 2 In the **All Access Points** window, click the corresponding LSC Provision name.

Step 3 From the **Status** drop-down list, choose a status to enable LSC.

Step 4 From the **Trustpoint Name** drop-down list, choose a trustpoint.

Step 5 In the **Number of Join Attempts** field, enter the number of retry attempts that are allowed.

Step 6 From the **Key Size** drop-down list, choose a key.

Step 7 In the **Edit AP Join Profile** window, click the **CAPWAP** tab.

Step 8 In the **Add APs to LSC Provision List** section, click **Select File** to upload the CSV file that contains AP details.

Step 9 Click **Upload File**.

Step 10 In the **AP MAC Address** field, enter the AP MAC address. and add them. (The APs added to the provision list are displayed in the **APs in provision List** .)

Step 11 In the **Subject Name Parameters** section, enter the following details:

- **Country**
- **State**
- **City**
- **Organization**
- **Department**
- **Email Address**

Step 12 Click **Apply**.

Configuring an AP LSC Provision List (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**ap lsc-provision mac-address** *mac-addr* **Example:** `Device(config)# ap lsc-provision mac-address 001b.3400.02f0`	Adds the AP to the LSC provision list. **Note** You can provision a list of APs using the **ap lsc-provision provision-list** command. (Or) You can provision all the APs using the **ap lsc-provision** command.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring LSC Provisioning for all the APs (GUI)

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Access Points**.

Step 2 In the **Access Points** window, expand the **LSC Provision** section.

Step 3 Set **Status** to **Enabled** state.

Note If you set **Status** to **Provision List**, LSC provisioning will be configured only for APs that are a part of the provision list.

Step 4 From the **Trustpoint Name** drop-down list, choose the appropriate trustpoint for all APs.

Step 5 In the **Number of Join Attempts** field, enter the number of retry attempts that the APs can make to join the controller.

Step 6 From the **Key Size** drop-down list, choose the appropriate key size of the certificate:

- **2048**
- **3072**
- **4096**

Step 7 In the **Add APs to LSC Provision List** section, click **Select File** to upload the CSV file that contains the AP details.

Step 8 Click **Upload File**.

Step 9 In the **AP MAC Address** field, enter the AP MAC address. (The APs that are added to the provision list are displayed in the **APs in Provision List** section.)

Step 10 In the **Subject Name Parameters** section, enter the following details:

a. **Country**

b. **State**

c. **City**

d. **Organization**

e. **Department**

f. **Email Address**

Step 11 Click **Apply**.

Configuring LSC Provisioning for All APs (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**ap lsc-provision** **Example:** `Device(config)# ap lsc-provision`	Enables LSC provisioning for all APs. By default, LSC provisioning is disabled for all APs.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Configuring LSC Provisioning for the APs in the Provision List

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**ap lsc-provision provision-list** **Example:** `Device(config)# ap lsc-provision provision-list`	Enables LSC provisioning for a set of APs configured in the provision list.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Verifying LSC Configuration

To view the details of the wireless management trustpoint, use the following command:

```
Device# show wireless management trustpoint

Trustpoint  Name : microsoft-ca
Certificate Info : Available
Certificate Type : LSC
Certificate Hash : 9e5623adba5307facf778e6ea2f5082877ea4beb
 Private key Info : Available
```

To view the LSC provision-related configuration details for an AP, use the following command:

```
Device# show ap lsc-provision summary

AP LSC-provisioning : Disabled
Trustpoint used for LSC-provisioning : microsoft-ca
LSC Revert Count in AP reboots : 10

AP LSC Parameters :
Country : IN
State : KA
City : BLR
Orgn : ABC
Dept : ABC
Email : support@abc.com
Key Size : 2048

AP LSC-provision List : Enabled
Total number of APs in provision list: 3

Mac Address
-----------
0038.df24.5fd0
2c5a.0f22.d4ca
e4c7.22cd.b74f
```

Configuring Management Trustpoint to LSC (GUI)

Procedure

Step 1 Choose **Administration** > **Management** > **HTTP/HTTPS**.

Step 2 In the **HTTP Trust Point Configuration** section, set **Enable Trust Point** to the **Enabled** state.

Step 3 From the **Trust Points** drop-down list, choose the appropriate trustpoint.

Step 4 Save the configuration.

Configuring Management Trustpoint to LSC (CLI)

After LSC provisioning, the APs will automatically reboot and join at the LSC mode after bootup. Similarly, if you remove the AP LSC provisioning, the APs reboot and join at non-LSC mode.

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**wireless management trustpoint** *trustpoint_name* **Example:** `Device(config)# wireless management trustpoint microsoft-ca`	Configures the management trustpoint to LSC.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Controller Self-Signed Certificate for Wireless AP Join

Use Cases

Use Case-1

Cisco Catalyst 9800-CL platform does not contain manufacturer installed SUDI certificates. You will need to configure Self-Signed Certificates on your controller.

Use Case-2

APs running on earlier versions and having Manufacturer Installed Certificate (MIC) issued by a SHA1 Cisco Trusted CA cannot join the controller with SHA2 SUDI certificate. During CAPWAP join process, the AP displays a bad certificate error and tears down the DTLS handshake.

Workaround: To upgrade APs, configure controller Self-Signed certificates. Once done, you can delete the Self-Signed certificates and revert back to the SUDI certificate.

Note This workaround does not apply to the Embedded Wireless Controller running Catalyst 9k switches. But applies to other hardware appliance controllers, such as Cisco Catalyst 9800-40, Cisco Catalyst 9800-80, and Cisco Catalyst 9800-L.

Note Certificate used in DTLS connections (AP and mobility) must use RSA key of size equal or more than 2048 bits. Otherwise, the APs and mobility connections will fail after reload. Run the **show crypto pki certificate verbose _tp-name_** command to display the key size of the device certificate.

Prerequisites

- Ensure that the VLAN interface is up and it's IP is reachable.
- Ensure that the **ip http server** is enabled. For more information, see Enabling HTTP Server.
- Set the **clock calendar-valid** command appropriately. For more information, see #unique_1270.
- Check if the PKI CA server is already configured or not. If configured, you will need to delete the existing CA server configuration.

Note The **show crypto pki server** command output should not display anything.

Configuring Clock Calendar (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**clock calendar-valid** **Example:** `Device(config)# clock calendar-valid`	Enables clock calendar.
Step 3	**exit** **Example:** `Device(config)# exit`	Exits configuration mode.

Enabling HTTP Server (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**ip http server** **Example:** `Device(config)# ip http server`	Enables the HTTP server on your IP or IPv6 system, including a Cisco web browser user interface. By default, the HTTP server uses the standard port 80.
Step 3	**ip http secure-server** **Example:** `Device(config)# ip http secure-server`	Enables the HTTP server on your IP or IPv6 system, including a Cisco web browser user interface. By default, the HTTP server uses the standard port 80.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits configuration mode.

Configuring CA Server (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**crypto key generate rsa general-keys modulus** *size_of_key_module* **label** *keypair_name* **Example:** `Device(config)# crypto key generate rsa general-keys modulus 2048 label WLC_CA`	Configures a certificate for the controller. When you generate RSA keys, you are prompted to enter a modulus length. A longer modulus length might be more secure, but it takes longer to generate and to use. **Note** The recommended key-pair name is *WLC_CA* and key modulus is *2048* bits.
Step 3	**crypto pki server** *certificate_server_name* **Example:** `Device(config)# crypto pki server WLC_CA`	Enables IOS certificate server. **Note** The *certificate_server_name* must be the same name as the *keypair_name*.
Step 4	**issuer-name** **Example:** `Device(config)# issuer-name O=Cisco Virtual Wireless LAN Controller, CN=CA-vWLC`	Configures X.509 distinguished name for the issuer CA certificate. **Note** You need to configure the same **issuer-name** as suggested for AP join.
Step 5	**grant auto** **Example:** `Device(config)# grant auto`	Grants certificate requests automatically.
Step 6	**hash sha256** **Example:** `Device(config)# hash sha256`	(Optional) Specifies the hash function for the signature used in the granted certificates.
Step 7	**lifetime ca-certificate** *time-interval* **Example:** `Device(config)# lifetime ca-certificate 3650`	(Optional) Specifies the lifetime in days of a CA certificate.
Step 8	**lifetime certificate** *time-interval* **Example:**	(Optional) Specifies the lifetime in days of a granted certificate.

	Command or Action	Purpose
	`Device(config)# lifetime certificate 3650`	
Step 9	**database archive pkcs12 password** *password* **Example:** `Device(config)# database archive pkcs12 password 0 cisco123`	Sets the CA key and CA certificate archive format and password to encrypt the file.
Step 10	**no shutdown** **Example:** `Device(config)# no shutdown`	Enables the certificate server. **Note** Issue this command only after you have completely configured your certificate server.
Step 11	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Trustpoint (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**crypto key generate rsa exportable general-keys modulus** *size-of-the-key-modulus* **label** *label* **Example:** `Device(config)# crypto key generate rsa exportable general-keys modulus 2048 label ewlc-tp1`	When you generate RSA keys, you are prompted to enter a modulus length. A longer modulus length might be more secure, but it takes longer to generate and to use.
Step 3	**crypto pki trustpoint** *trustpoint_name* **Example:** `Device(config)# crypto pki trustpoint ewlc-tp1`	Creates a new trust point for an external CA server. Here, *trustpoint_name* refers to the trustpoint name. **Note** Ensure that same names are used for key-pair (*label*) and *trustpoint_name*.
Step 4	**rsakeypair** *RSA_key key_size* **Example:**	Maps RSA key with that of the trustpoint. • RSA_key—Refers to the RSA key pair label.

	Command or Action	Purpose
	`Device(ca-trustpoint)# rsakeypair ewlc-tp1`	• key_size—Refers to the signature key length. The value ranges from 360 to 4096.
Step 5	**subject-name** *subject_name* **Example:** `Device(ca-trustpoint)# subject-name O=Cisco Virtual Wireless LAN Controller, CN=DEVICE-vWLC`	Creates subject name parameters for the trustpoint.
Step 6	**revocation-check none** **Example:** `Device(ca-trustpoint)# revocation-check none`	Checks revocation.
Step 7	**hash sha256** **Example:** `Device(ca-trustpoint)# hash sha256`	Specifies the hash algorithm.
Step 8	**serial-number** **Example:** `Device(ca-trustpoint)# serial-number`	Specifies the serial number.
Step 9	**eku request server-auth client-auth** **Example:** `Device(ca-trustpoint)# eku request server-auth client-auth`	(Optional) Sets certificate key-usage purpose.
Step 10	**password** *password* **Example:** `Device(config)# password 0 cisco123`	Enables password.
Step 11	**enrollment url** *url* **Example:** `Device(config)# enrollment url http://<management-IPv4>:80`	Enrolls the URL. **Note** Replace the dummy IP with management VLAN interface IP of the controller where CA server is configured.
Step 12	**exit** **Example:** `Device(config)# exit`	Exits the configuration.

Authenticating and Enrolling the PKI TrustPoint with CA Server (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 2	**crypto pki authenticate** *trustpoint_name*
	Example:
	`Device(config)# crypto pki authenticate ewlc-tp1`
	`Certificate has the following attributes:`
	`Fingerprint MD5: 64C5FC9A C581D827 C25FC3CF 1A7F42AC`
	`Fingerprint SHA1: 6FAFF812 7C552783 6A8FB566 52D95849 CC2FC050`
	`% Do you accept this certificate? [yes/no]: yes`
	`Trustpoint CA certificate accepted.`
		Fetches the CA certificate.

Step 3	**crypto pki enroll** *trustpoint_name*
	Example:
	`Device(config)# crypto pki enroll ewlc-tp1`
	`Enter following answers for UI interaction:`
	`% Include an IP address in the subject name? [no]: no`
	`Request certificate from CA? [yes/no]: yes`
		Enrolls for client certificate.

Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Tagging Wireless Management TrustPoint Name (CLI)

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 2	**wireless management trustpoint** *trustpoint_name*	Tags the wireless management trustpoint name.

	Command or Action	Purpose
	Example: `Device(config)# wireless management trustpoint ewlc-tp1`	
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Verifying Controller Certificates for Wireless AP Join

To view the CA server details, use the following command:

```
Device# show crypto pki server
Certificate Server WLC_CA:
Status: enabled
State: enabled
Server's configuration is locked (enter "shut" to unlock it)
Issuer name: O=Cisco Virtual Wireless LAN Controller, CN=CA-vWLC
CA cert fingerprint: 79A3DBD5 59A7E384 73ABD152 C133F4E2
Granting mode is: auto
Last certificate issued serial number (hex): 1
CA certificate expiration timer: 12:04:00 UTC Mar 8 2029
CRL NextUpdate timer: 18:04:00 UTC Mar 11 2019
Current primary storage dir: nvram:
Database Level: Minimum - no cert data written to storage
```

To view the trustpoint details, use the following command:

```
Device# show crypto pki trustpoint ewlc-tp1 status
Trustpoint ewlc-tp1:
...
State:
Keys generated ..... Yes (General Purpose, exportable)
Issuing CA authenticated ..... Yes
Certificate request(s) ..... Yes
```

To view the wireless management trustpoint details, use the following command:

```
Device# do show wireless management trustpoint
Trustpoint Name : ewlc-tp1
Certificate Info : Available
Certificate Type : SSC
Certificate Hash : 4a5d777c5b2071c17faef376febc08398702184e
Private key Info : Available
FIPS suitability : Not Applicable
```

To view the HTTP server status, use the following command:

```
Device# show ip http server status | include server status
HTTP server status: Enabled
HTTP secure server status: Enabled
```