



Locally Significant Certificates

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Information About Locally Significant Certificates (LSC)

This module explains how to configure the Cisco Embedded Wireless Controller on Catalyst Access Points 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 embedded wireless controllers. You can then use the certificates to mutually authenticate the embedded wireless controller and the APs.

In Cisco embedded wireless controllers, you can configure the embedded wireless 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 embedded wireless controller and then the Lightweight Access Point (LAP) from the CA Server.

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

The embedded wireless 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.

Preventing the Expiry of Manufacturing Installed Certificate

To prevent manufacturing installed certificate (MIC) expiry failures, ensure that you configure a policy, as shown here:

- Create a certificate map and add the rules:

```
configure terminal
crypto pki certificate map map1 1
issuer-name co Cisco Manufacturing CA
```



Note You can add multiple rules and filters under the same map. The rule mentioned in the example above specifies that any certificate whose issuer-name contains *Cisco Manufacturing CA* (case insensitive) is selected under this map.

- Use the certificate map under the trustpool policy:

```
configure terminal
crypto pki trustpool policy
match certificate map1 allow expired-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.



Note The LSC is supported on the controller and all Cisco Aironet access points.

LSC workflow is different in FIPS+WLANCC mode. CA server must support EST protocol and should be capable of issuing EC certificates in FIPS+WLANCC mode.

Also, the LSC is enabled on the controller (GUI and CLI).

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.

Provisioning Locally Significant Certificates

Configuring RSA Key for PKI Trustpoint

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# <code>configure terminal</code>	Enters global configuration mode.
Step 2	crypto key generate rsa [exportable] general-keys modulus <i>key_size</i> label <i>RSA_key</i> Example: Device(config)# <code>crypto key generate rsa</code> <code>exportable general-keys modulus 2048</code> <code>label ewlc-tp1</code>	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 <ul style="list-style-type: none">• 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)# <code>end</code>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration mode.

Configuring PKI Trustpoint Parameters

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# <code>configure terminal</code>	Enters global configuration mode.
Step 2	crypto pki trustpoint <i>trustpoint_name</i> Example: Device(config)# <code>crypto pki trustpoint microsoft-ca</code>	Creates a new trustpoint for an external CA server. Here, <i>trustpoint_name</i> refers to the trustpoint name.
Step 3	enrollment url <i>HTTP_URL</i> Example: Device(ca-trustpoint)# <code>enrollment url http://CA_server/certsrv/mscep/mscep.dll</code>	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: <code>http://[2001:DB8:1:1::1]:80</code> . For more enrollment method options, see the enrollment url (ca-trustpoint) command page.
Step 4	subject-name <i>subject_name</i> Example: Device(ca-trustpoint)# <code>subject-name C=IN, ST=KA, L=Bengaluru, O=Cisco, CN=eagle-eye/emailAddress=support@abc.com</code>	Creates subject name parameters for the trustpoint.
Step 5	rsakeypair <i>RSA_key key_size</i> Example: Device(ca-trustpoint)# <code>rsakeypair ewlc-tp1</code>	Maps RSA key with that of the trustpoint. <ul style="list-style-type: none"> • <i>RSA_key</i>: RSA key pair label. • <i>key_size</i>: Signature key length. Range is from 360 to 4096.
Step 6	revocation {crl none ocsf} Example: Device(ca-trustpoint)# <code>revocation none</code>	Checks revocation.
Step 7	end Example: Device(ca-trustpoint)# <code>end</code>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration 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:
- In the **Label** field, enter the RSA key label.
 - In the **Enrollment URL** field, enter the enrollment URL.
 - Check the **Authenticate** check box to authenticate the Public Certificate from the enrollment URL.
 - In the **Subject Name** section, enter the **Country Code, State, Location, Organisation, Domain Name, and Email Address**.
 - Check the **Key Generated** check box to view the available RSA keypairs. Choose an option from the **Available RSA Keypairs** drop-down list.
 - Check the **Enroll Trustpoint** check box.
 - In the **Password** field, enter the password.
 - In the **Re-Enter Password** field, confirm the password.
 - 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
	<pre>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.</pre>	
Step 5	<p>password</p> <p>Example:</p> <pre>Device(config)# abcd123</pre>	Enters a challenge password to the CA server.
Step 6	<p>password</p> <p>Example:</p> <pre>Device(config)# abcd123</pre>	Re-enters a challenge password to the CA server.
Step 7	<p>yes</p> <p>Example:</p> <pre>Device(config)# % Include the router serial number in the subject name? [yes/no]: yes</pre>	
Step 8	<p>no</p> <p>Example:</p> <pre>Device(config)# % Include an IP address in the subject name? [no]: no</pre>	
Step 9	<p>yes</p> <p>Example:</p> <pre>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.</pre>	
Step 10	<p>end</p> <p>Example:</p> <pre>Device(config)# end</pre>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration 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# <code>configure terminal</code>	Enters global configuration mode.
Step 2	ap lsc-provision join-attempt <i>number_of_attempts</i> Example: Device(config)# <code>ap lsc-provision</code> <code>join-attempt 10</code>	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)# <code>end</code>	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# <code>configure terminal</code>	Enters global configuration mode.

	Command or Action	Purpose
Step 2	<p>ap lsc-provision subject-name-parameter country <i>country-str</i> state <i>state-str</i> city <i>city-str</i> domain <i>domain-str</i> org <i>org-str</i> email-address <i>email-addr-str</i></p> <p>Example:</p> <pre>Device(config)# ap lsc-provision subject-name-parameter country India state Karnataka city Bangalore domain domain1 org Right email-address adc@gfe.com</pre>	Specifies the attributes to be included in the subject-name parameter of the certificate request generated by an AP.
Step 3	<p>end</p> <p>Example:</p> <pre>Device(config)# end</pre>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration mode.

Configuring Key Size for LSC Certificate

Procedure

	Command or Action	Purpose
Step 1	<p>configure terminal</p> <p>Example:</p> <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 2	<p>ap lsc-provision key-size { 2048 3072 4096 }</p> <p>Example:</p> <pre>Device(config)# ap lsc-provision key-size 2048</pre>	Specifies the size of keys to be generated for the LSC on AP.
Step 3	<p>end</p> <p>Example:</p> <pre>Device(config)# end</pre>	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	<p>configure terminal</p> <p>Example:</p> <pre>Device# configure terminal</pre>	Enters global configuration mode.

	Command or Action	Purpose
Step 2	ap lsc-provision trustpoint <i>tp-name</i> Example: Device(config)# ap lsc-provision trustpoint microsoft-ca	Specifies the trustpoint with which the LCS is provisioned to an AP. <i>tp-name</i> : The trustpoint name.
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 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**
 - **Organisation**
 - **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# <code>configure terminal</code>	Enters global configuration mode.
Step 2	[no] ap lsc-provision mac-address mac-addr Example: Device(config)# <code>no ap lsc-provision mac-address 001b.3400.02f0</code>	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)# <code>end</code>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration 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 embedded wireless 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:
- Country**
 - State**
 - City**
 - Organization**
 - Department**
 - Email Address**
- Step 11** Click **Apply**.

Configuring LSC Provisioning for All APs (CLI)

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# <code>configure terminal</code>	Enters global configuration mode.
Step 2	[no] ap lsc-provision Example: Device(config)# <code>no ap lsc-provision</code>	Enables LSC provisioning for all APs. By default, LSC provisioning is disabled for all APs.
Step 3	end Example: Device(config)# <code>end</code>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration mode.

Configuring LSC Provisioning for the APs in the Provision List

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# <code>configure terminal</code>	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.

In EWC, the internal APs will not automatically reboot. You should manually reboot the internal AP to make it work in LSC and non-LSC mode.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# <code>configure terminal</code>	Enters global configuration mode.
Step 2	wireless management trustpoint <i>trustpoint_name</i> Example: Device(config)# <code>wireless management trustpoint microsoft-ca</code>	Configures the management trustpoint to LSC. The internal AP will not able to join before a reload, so follow the steps given below to reload the internal AP.
Step 3	write memory Example: Device(config)# <code>write memory</code>	Saves the configuration.
Step 4	wireless ewc-ap ap reload Example: Device(config)# <code>write memory</code>	Reloads the internal AP. This will also reload the controller on the AP.
Step 5	end Example: Device(config)# <code>end</code>	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration mode.

