Understand and Configure EAP-TLS with a WLC and ISE

Contents

Introduction

This document describes how to set up a Wireless Local Area Network (WLAN) with 802.1X and Extensible Authentication Protocol EAP-TLS.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- 802.1X authentication process
- Certificates

Components Used

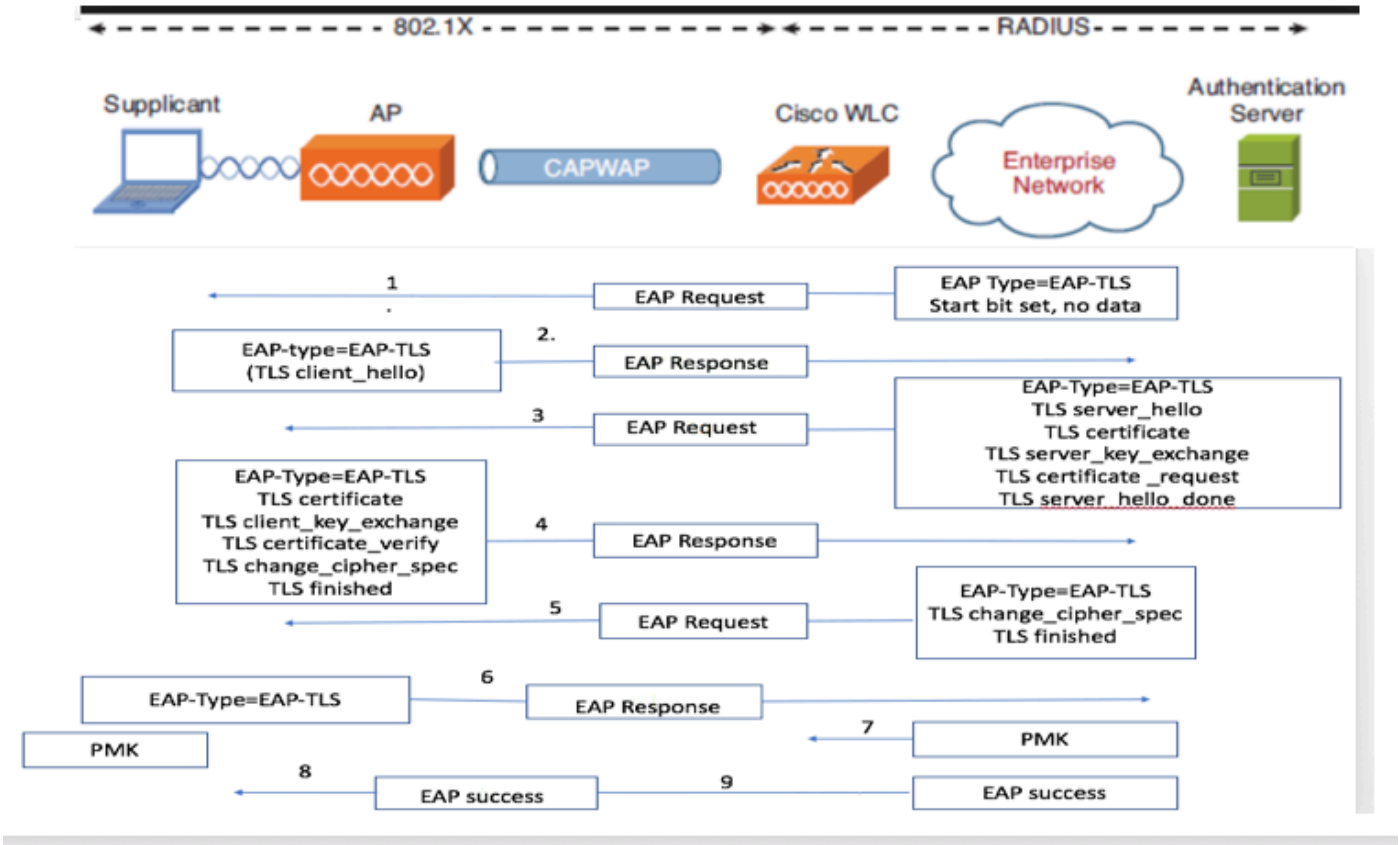
The information in this document is based on these software and hardware versions:

- WLC 3504 version 8.10
- Identity Services Engine (ISE) version 2.7

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

EAP-TLS Flow



Steps in EAP-TLS Flow

1. Wireless Client gets associated with the Access Point (AP). AP does not permit the client to send any data at this point and sends an authentication request.The supplicant then responds with an EAP-Response Identity. The WLC then communicates the user-id information to the Authentication Server. RADIUS server responds back to the client with an EAP-TLS Start Packet. The EAP-TLS conversation starts at this point.
2. The peer sends an EAP-Response back to the authentication server which contains a client_hello handshake message, a cipher that is set for NULL
3. The authentication server responds with an Access-challenge packet that contains:

```
TLS server_hello
handshake message
certificate
server_key_exchange
certificate request
server_hello_done.
```

4. Client responds with a EAP-Response message that contains:

```
Certificate ¬ Server can validate to verify that it is trusted.

client_key_exchange

certificate_verify ¬ Verifies the server is trusted

change_cipher_spec

TLS finished
```

5. After the client authenticates successfully, the RADIUS server responds with an Access-challenge, which contains the change_cipher_spec and handshake finished message.

6. When it receives this, the client verifies the hash in order to authenticate the radius server.

7. A new encryption key is dynamically derived from the secret during the TLS handshake.

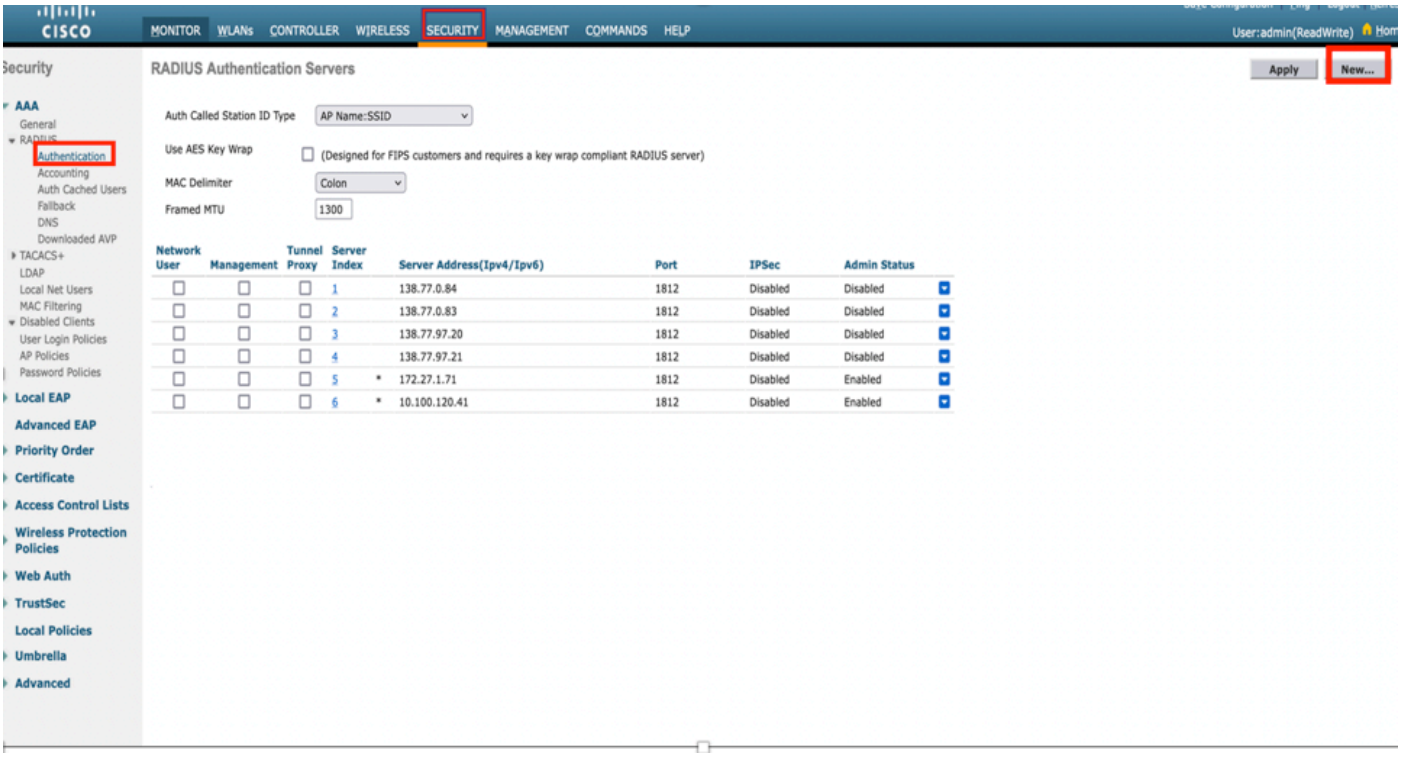
8/9. EAP-Success is finally sent from server to authenticator which then is paased to the supplicant.

At this point, the EAP-TLS enabled wireless client can access the wireless network.

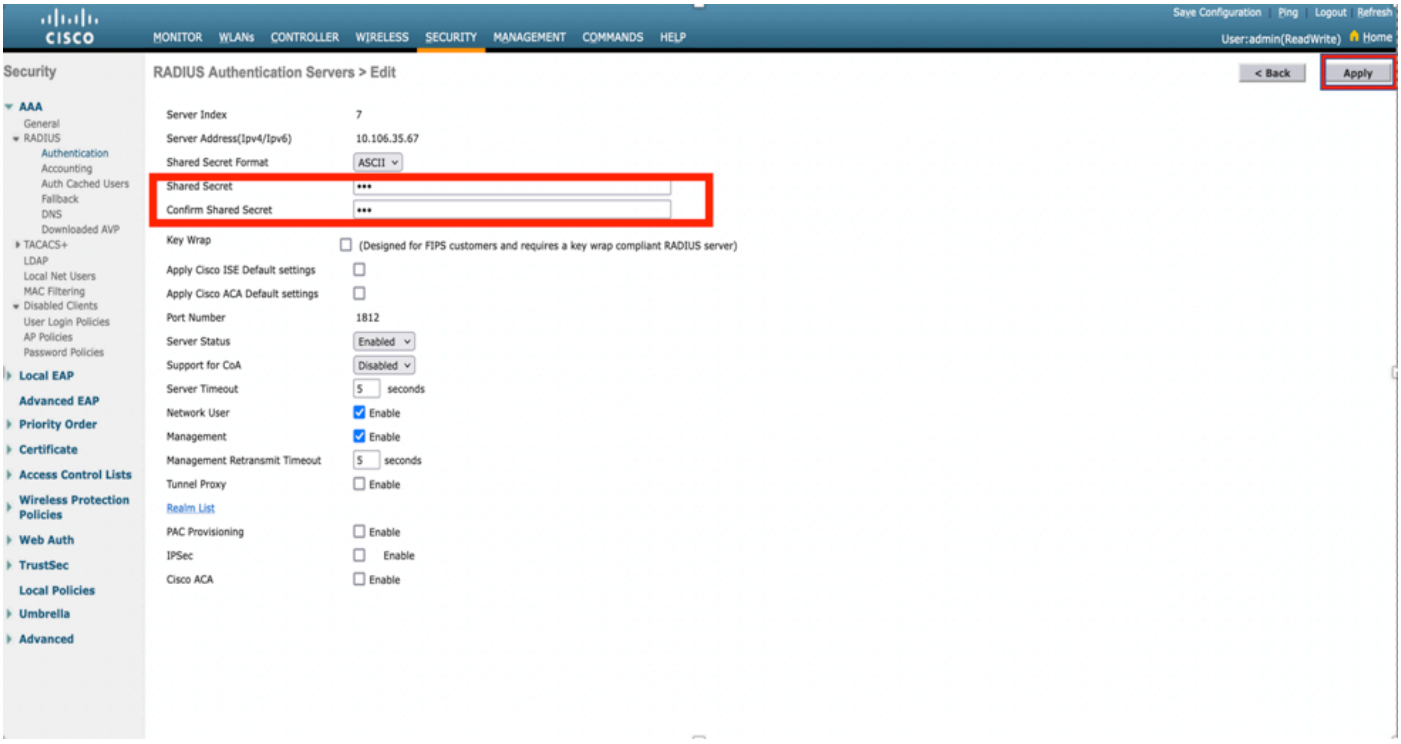
Configure

Cisco Wireless LAN Controller

Step 1. The first step is to configure the RADIUS server on the Cisco WLC. In order to add a RADIUS server, navigate to **Security > RADIUS > Authentication**. Click **New** as shown in the image.



Step 2. Here, you need to enter the IP address and the shared secret <password> that is used in order to validate the WLC on the ISE. Click **Apply** in order to continue as shown in the image.

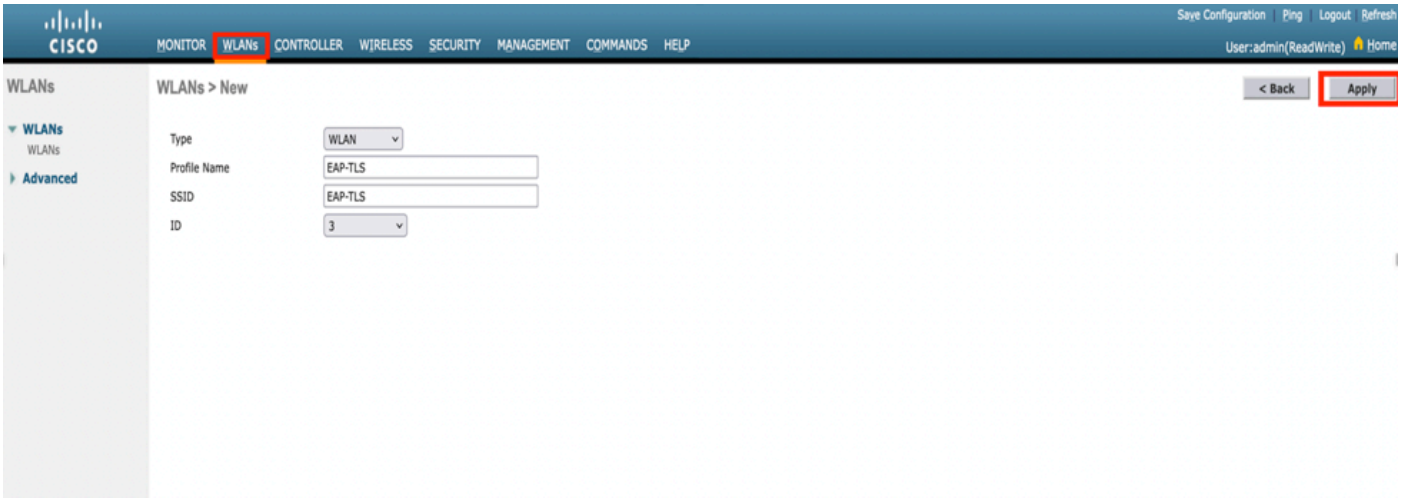


Step 3. Create WLAN for RADIUS Authentication.

Now, you can create a new WLAN and configure it to use WPA-enterprise mode, so it can use RADIUS for authentication.

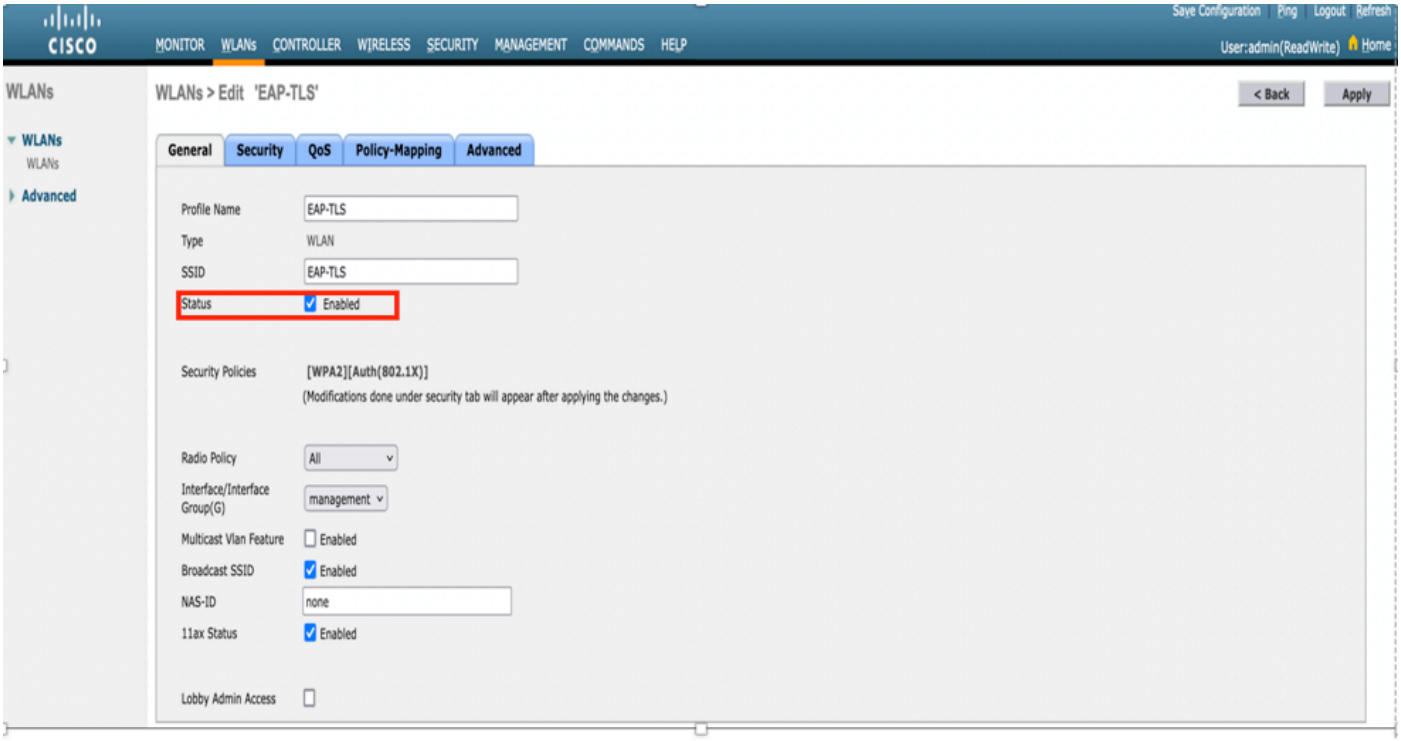
Step 4. Select **WLANs** from the main menu, choose **Create New** and click **Go** as shown in the image.

Step 5. Name the new WLAN **EAP-TLS**. Click **Apply** in order to continue as shown in the image.

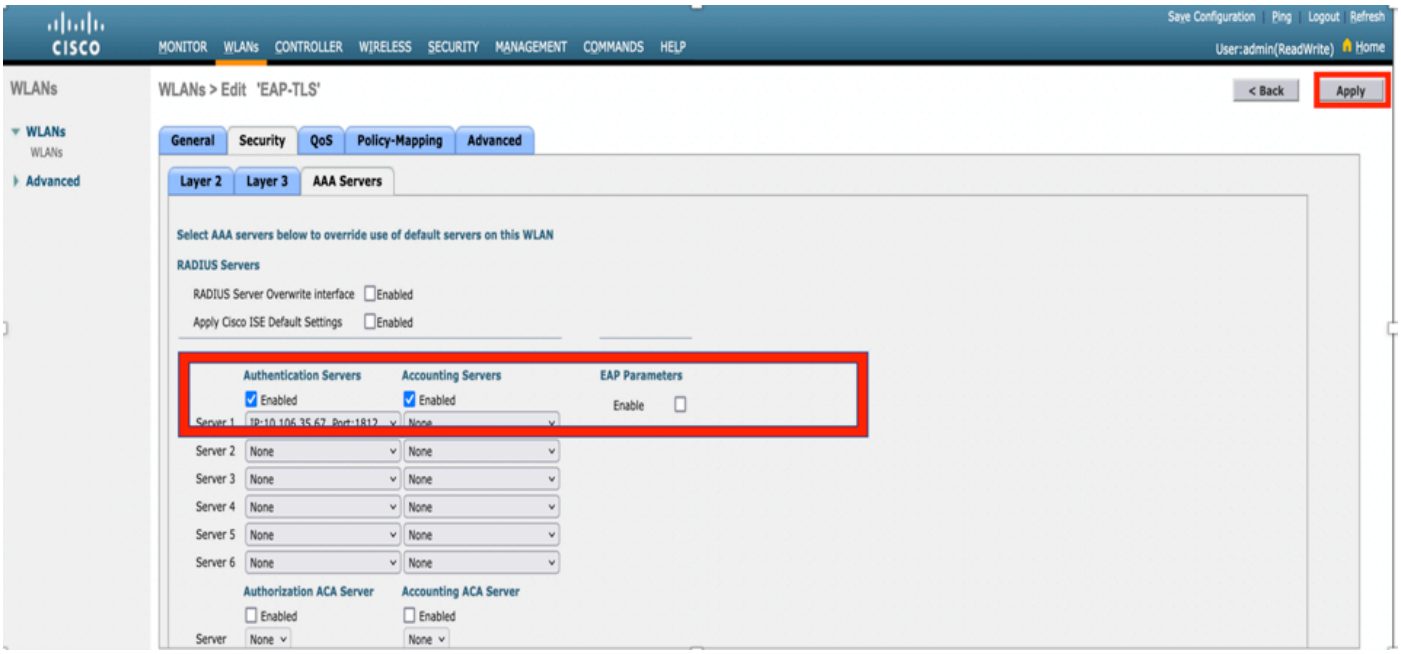


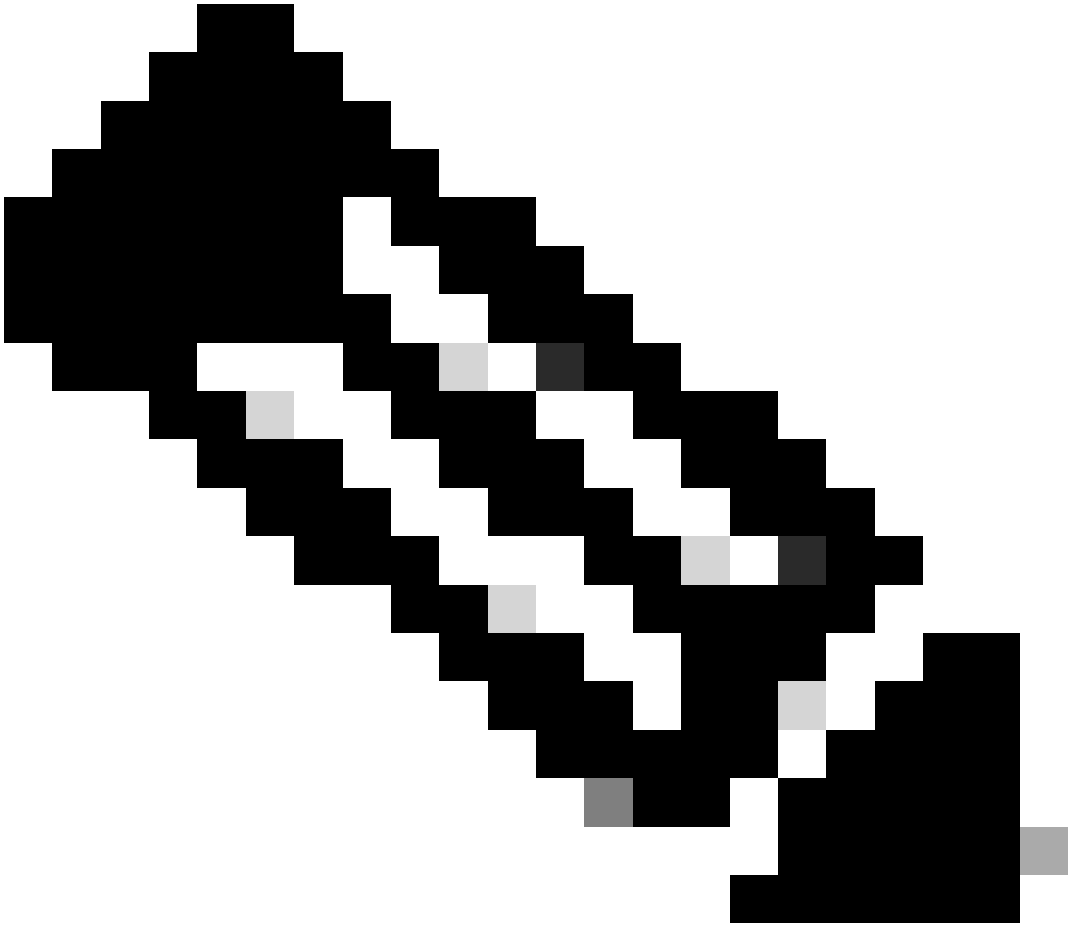
Step 6. Click **General** and ensure that the Status is **Enabled**. The default Security Policies is 802.1X

authentication and WPA2 as shown in the image.



Step 7. Now, navigate to **Security> AAA Servers** tab, select the RADIUS server that you just configured as shown in the image.





Note: It is a good idea to verify that you can reach the RADIUS server from the WLC before you continue. RADIUS uses UDP port 1812 (for authentication), so you need to ensure that this traffic does not get blocked anywhere in the network.

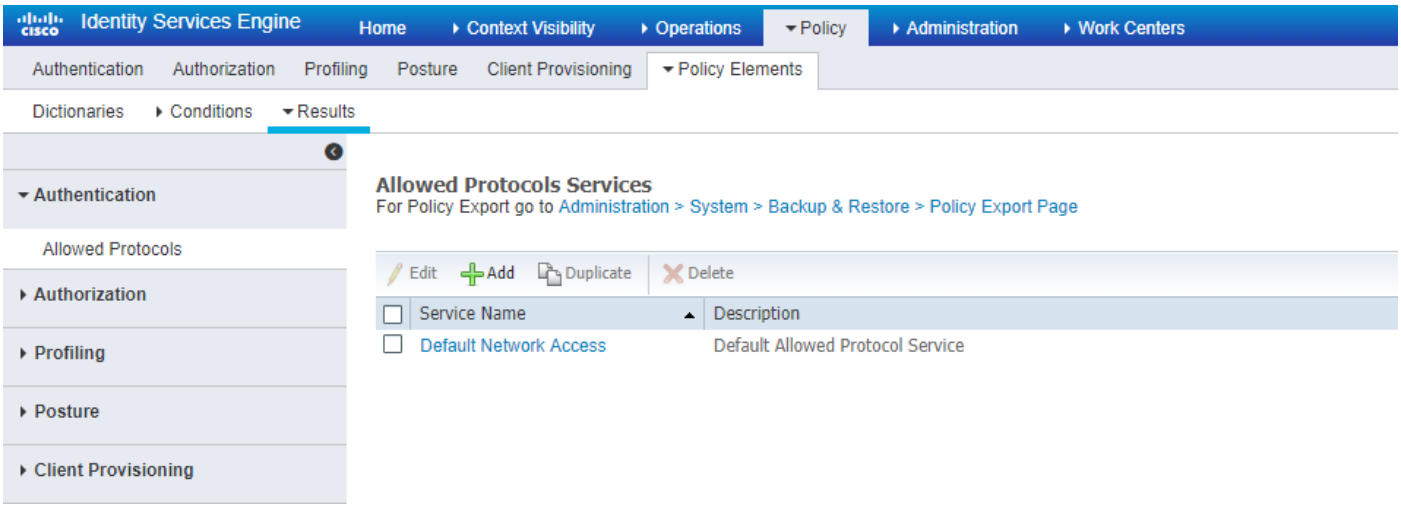
ISE with Cisco WLC

EAP-TLS Settings

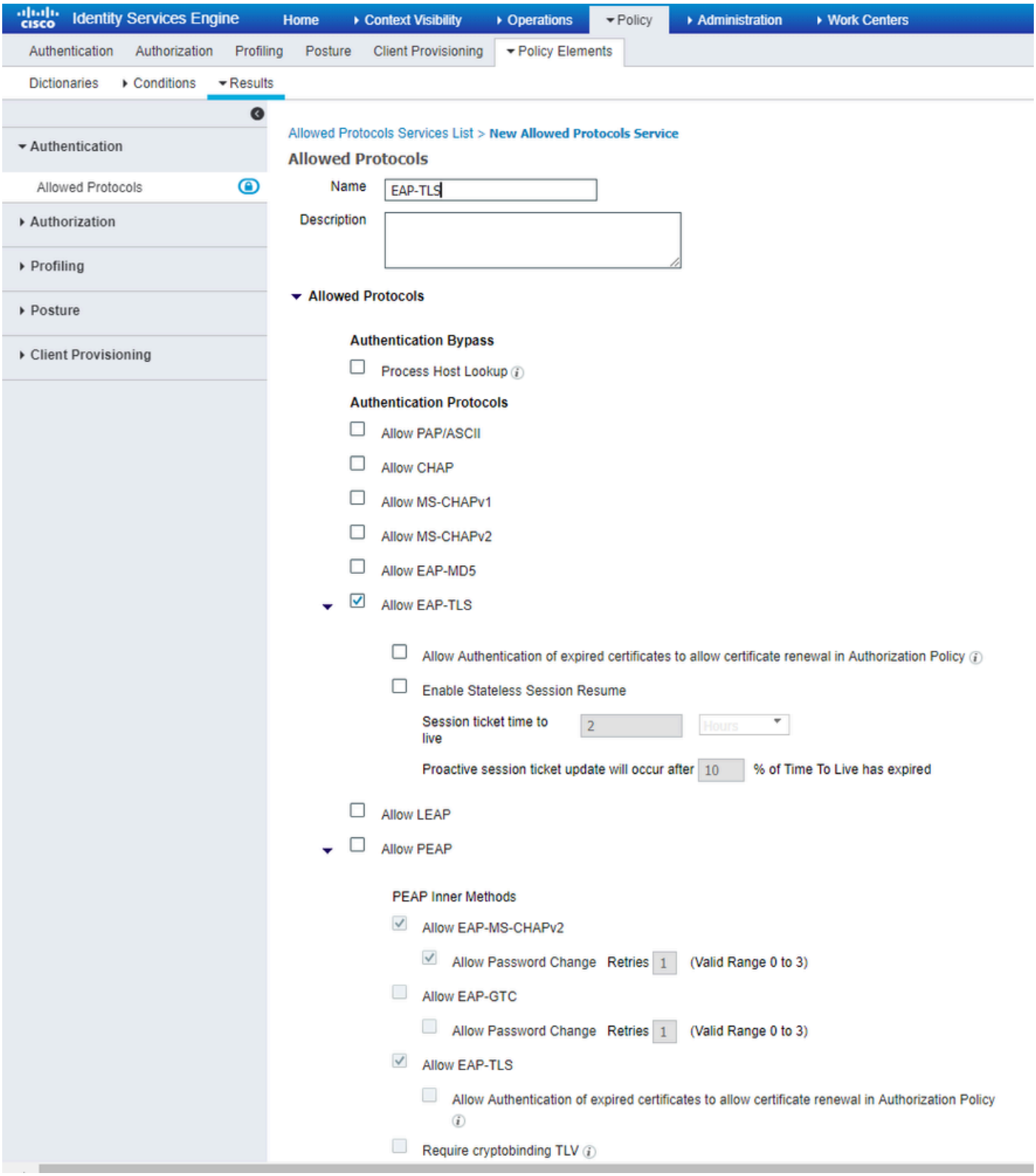
In order to build the policy, you need to create the allowed protocol list to use in our policy. Since a dot1x policy is written, specify the allowed EAP type based on how the policy is configured.

If you use the default, you allow most EAP types for authentication which are not preferred if you need to lock down access to a specific EAP type.

Step 1. Navigate to**Policy > Policy Elements > Results > Authentication > Allowed Protocols**and click**Add** as shown in the image.

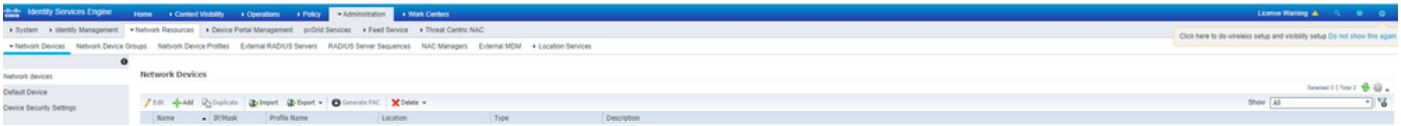


Step 2. On this Allowed Protocol list, you can enter the name for the list. In this case, **Allow EAP-TLS** box is checked and other boxes are unchecked as shown in the image.

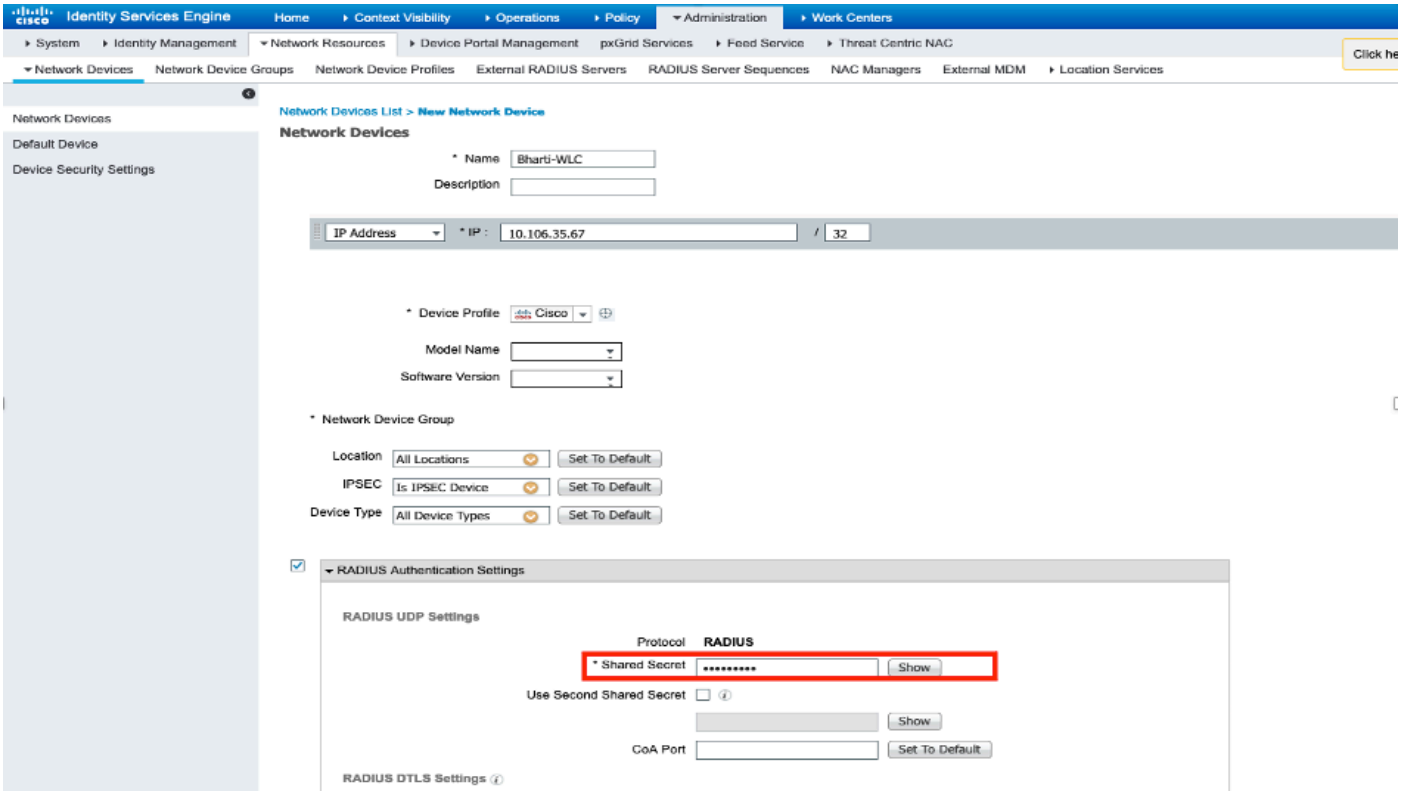


WLC Settings on ISE

Step 1. Open ISE console and navigate to **Administration > Network Resources > Network Devices > Add** as shown in the image.

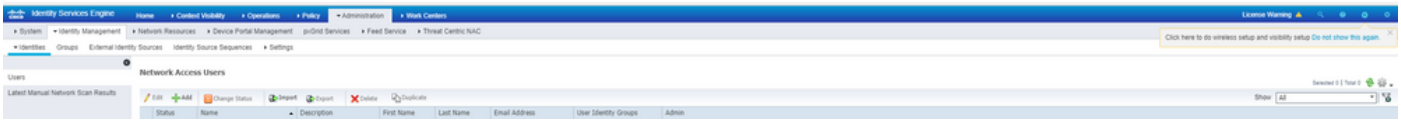


Step 2. Enter the values as shown in the image.

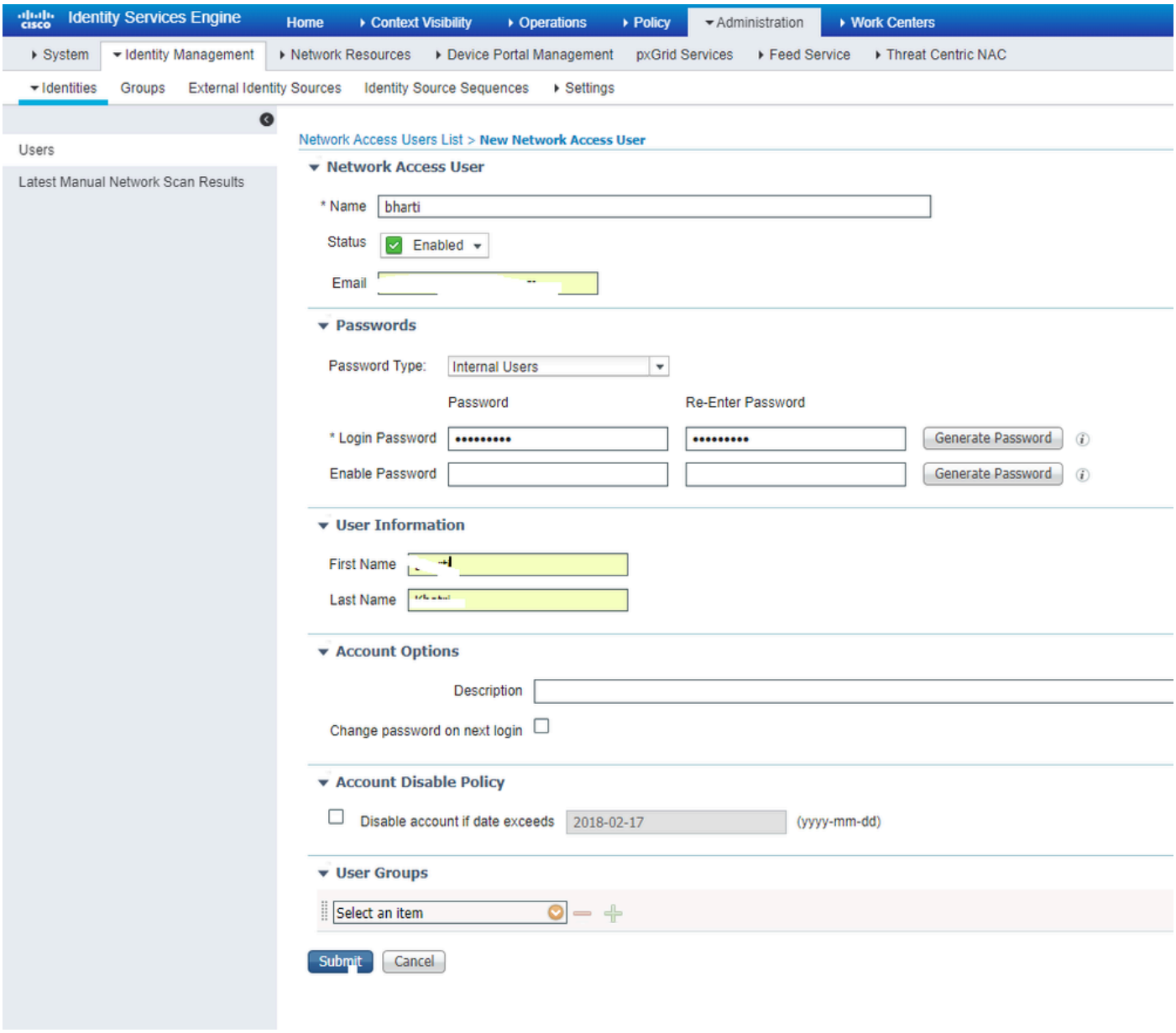


Create New User on ISE

Step 1. Navigate to **Administration > Identity Management > Identities > Users > Add** as shown in the image.



Step 2. Enter the information as shown in the image.

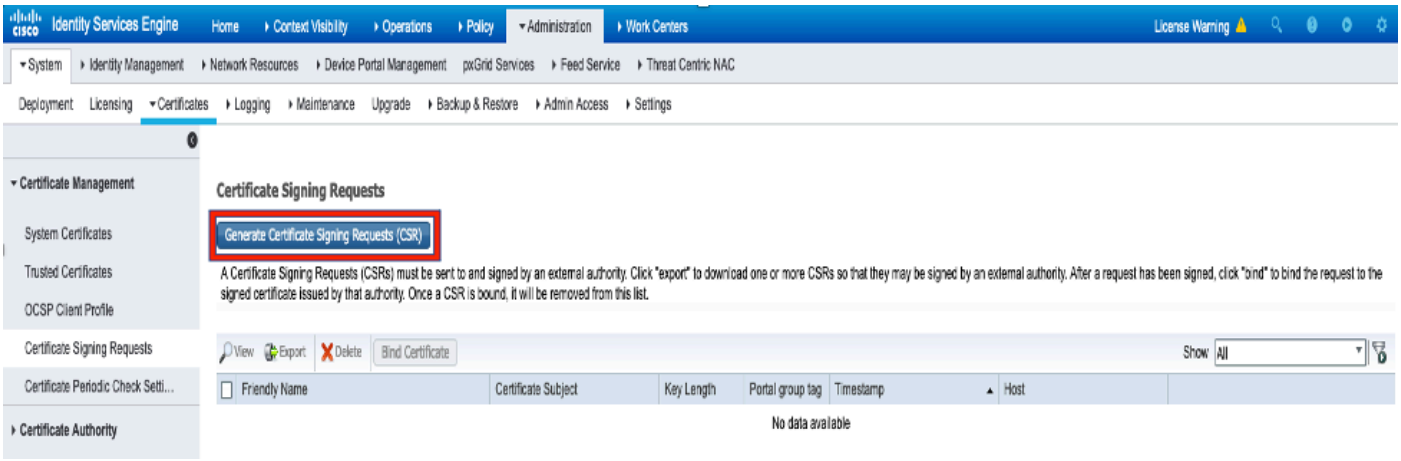


Trust Certificate on ISE

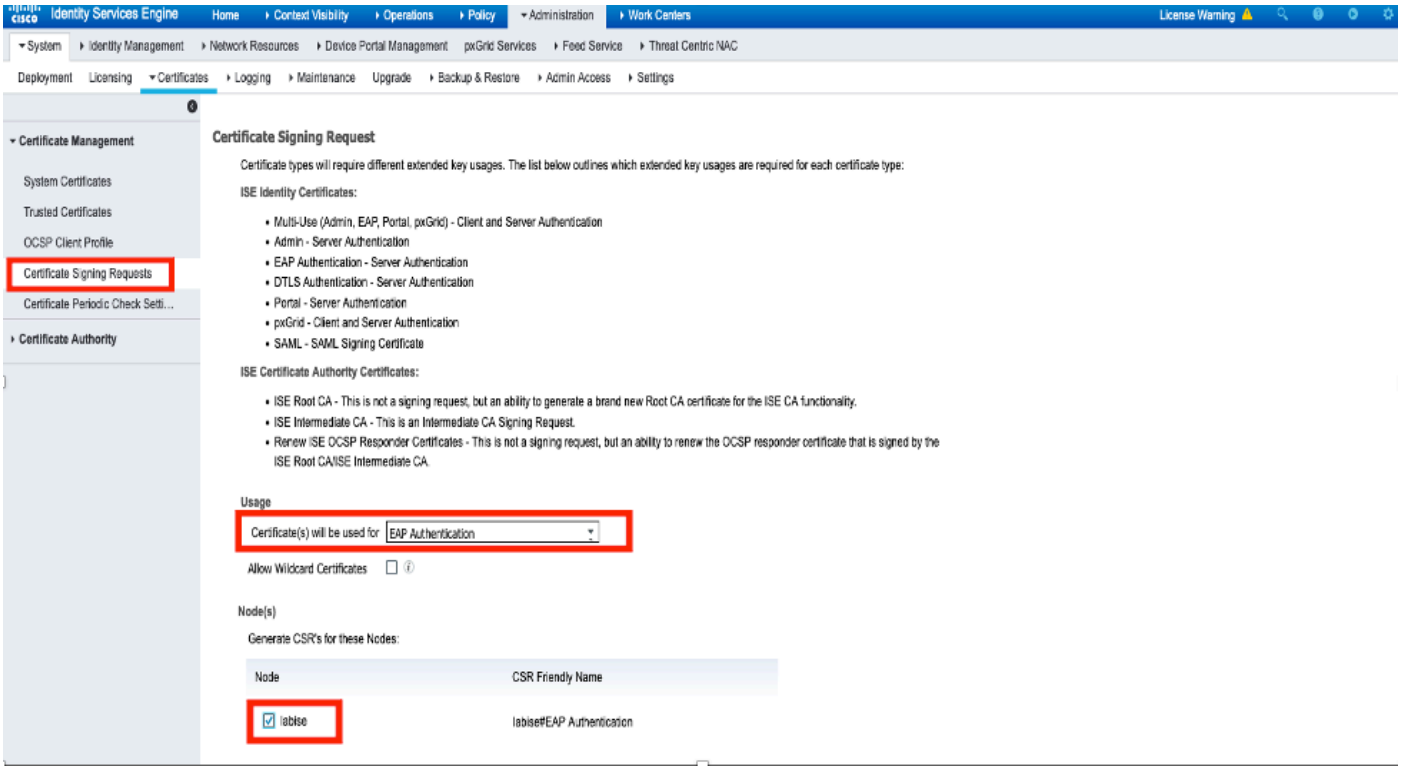
Step 1. Navigate to **Administration > System > Certificates > Certificate Management > Trusted certificates**.

Click **Import** in order to import a certificate to ISE. Once you add a WLC and create a user on ISE, you need to do the most important part of EAP-TLS that is to trust the certificate on ISE. For that we need to generate CSR.

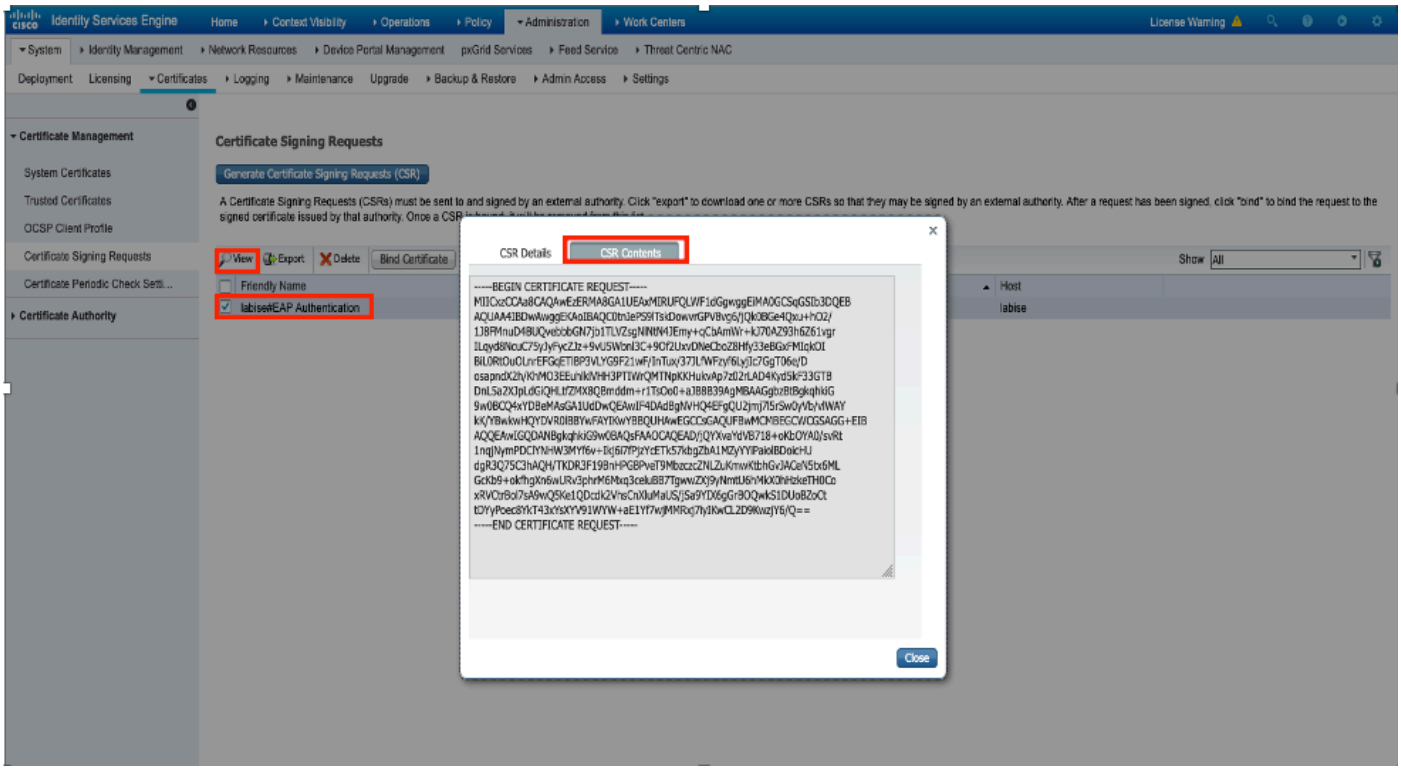
Step 2. Navigate to **Administrauon > Certificates > Certificate Signing Requests > Generate Certificate Signing Requests (CSR)** as shown in the image.



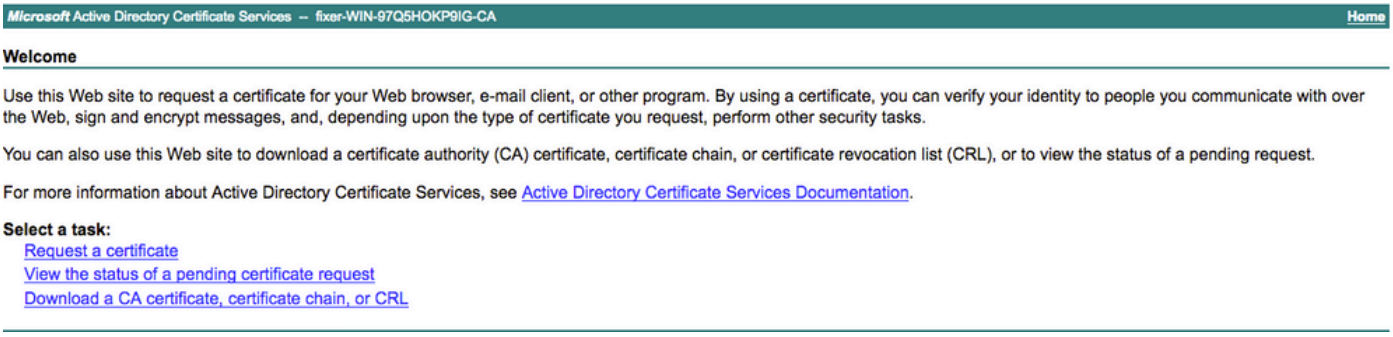
Step 3. In order to generate CSR, navigate to **Usage** and from the **Certificate(s) are used for** drop down options select **EAP Authentication** as shown in the image.



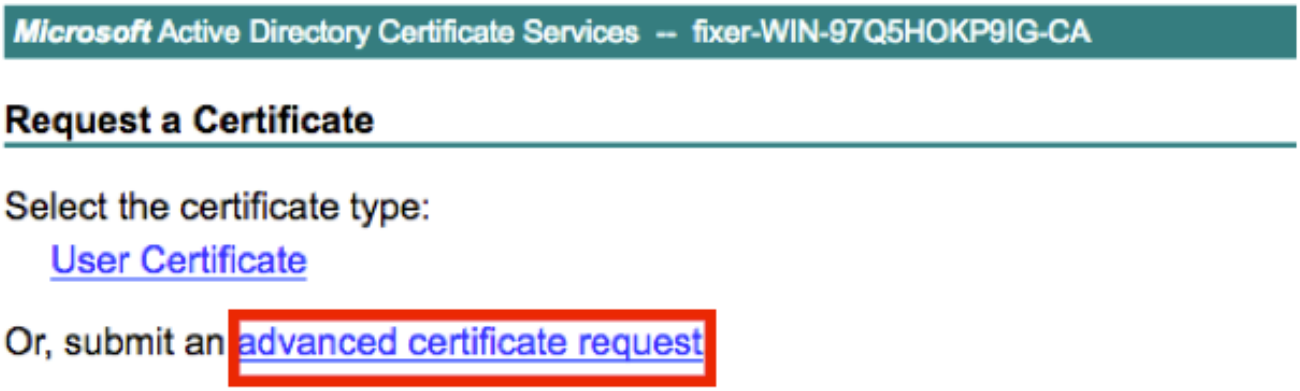
Step 4. The CSR generated on ISE can be viewed. Click **View** as shown in the image.



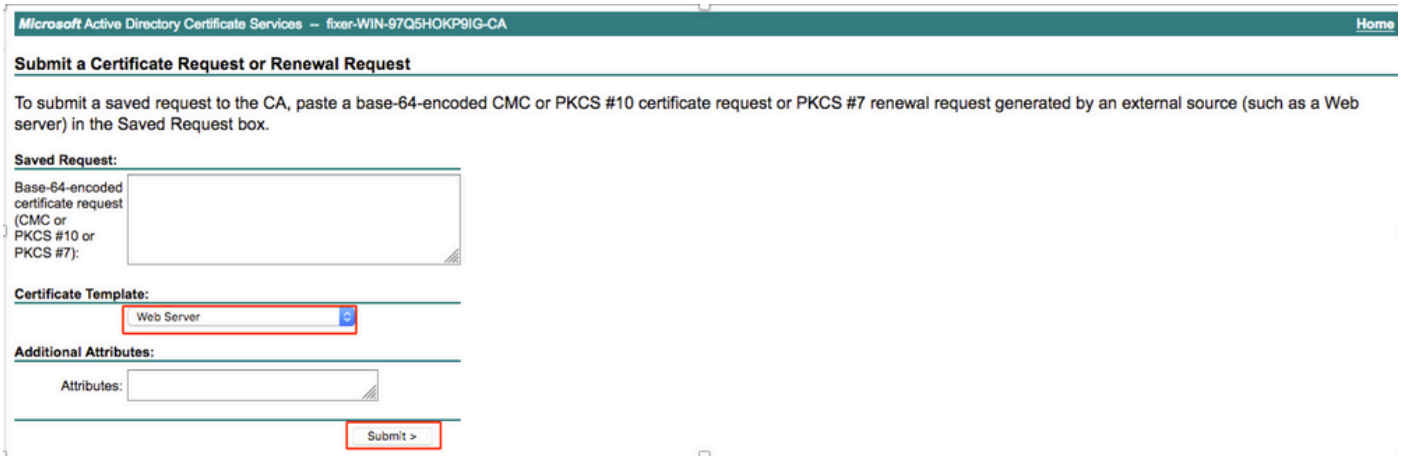
Step 5. Once CSR is generated, browse for CA server and click **Request a certificate** as shown in the image:



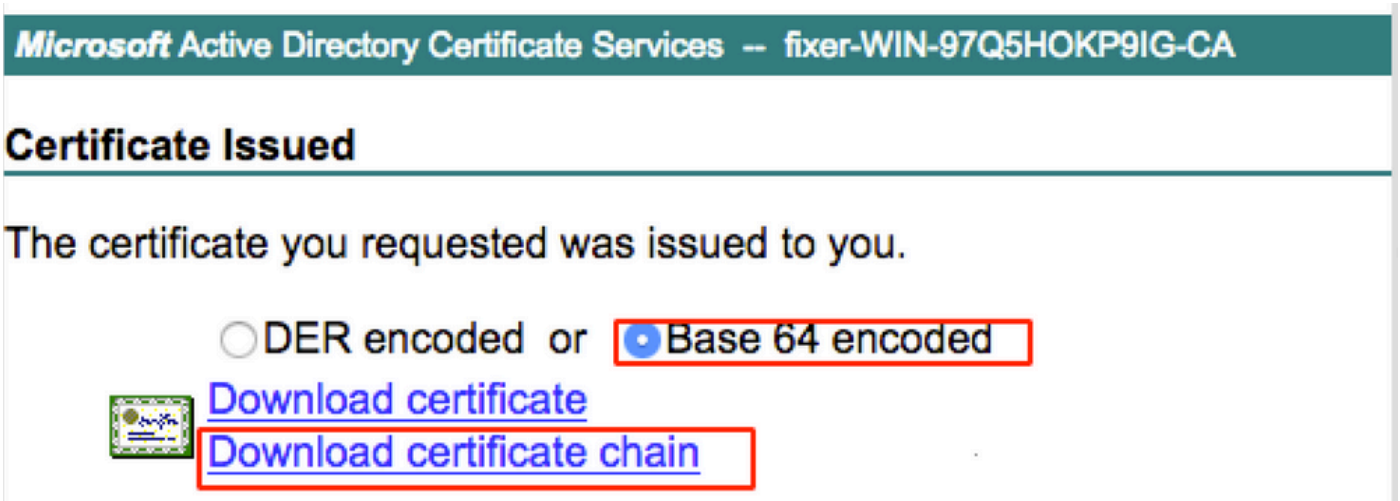
Step 6. Once you request a certificate, you get options for **User Certificate** and **advanced certificate request**, click **advanced certificate request** as shown in the image.



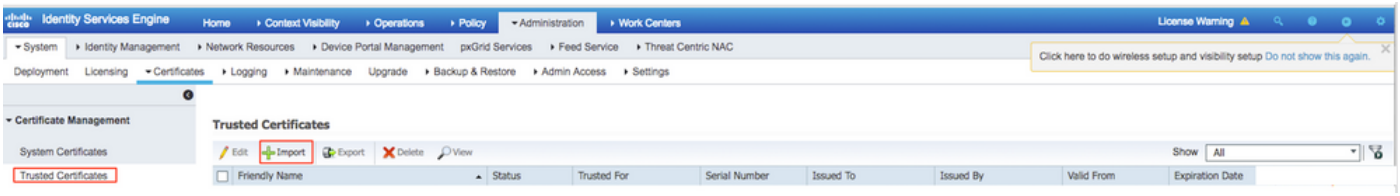
Step 7. Paste the CSR generated in **Base-64 encoded certificate request**. From the **Certificate Template:** drop down option, choose **Web Server** and click **Submit** as shown in the image.

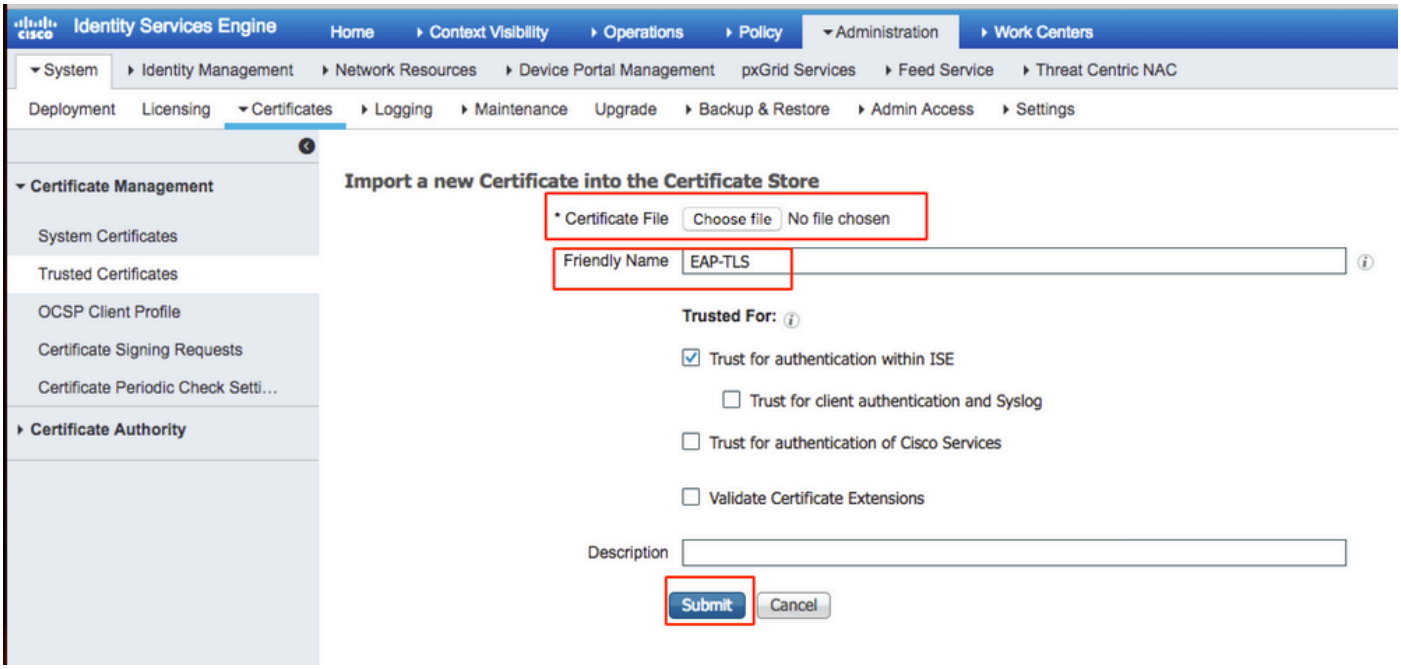


Step 8. Once you click **Submit**, you get the option to select the type of certificate, select **Base-64 encoded** and click **Download certificate chain** as shown in the image.

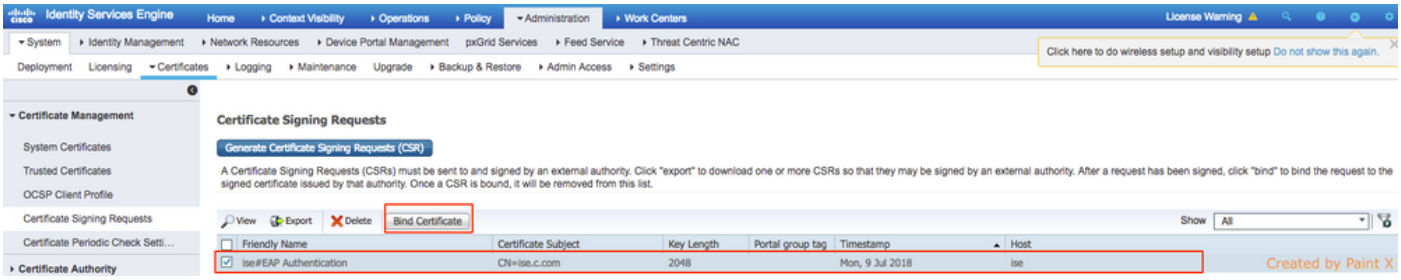


Step 9. The certificate download is completed for the ISE server. You can extract the certificate, the certificate contains two certificates, one root certificate and other intermediate. The root certificate can be imported under **Administration > Certifictes > Trusted certificates > Import** as shown in the images.

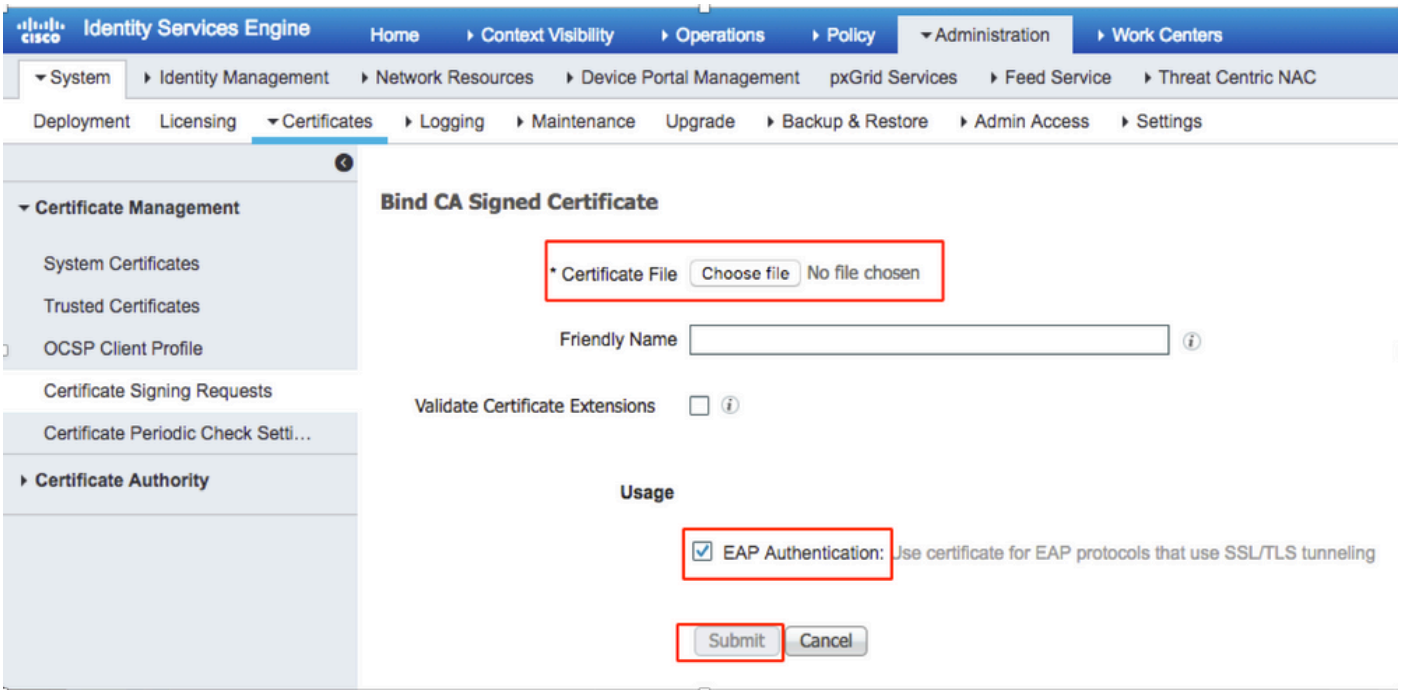




Step 10. Once you click **Submit**, the certificate is added to the trusted certificate list. Also, the intermediate certificate is needed in order to bind with CSR as shown in the image.

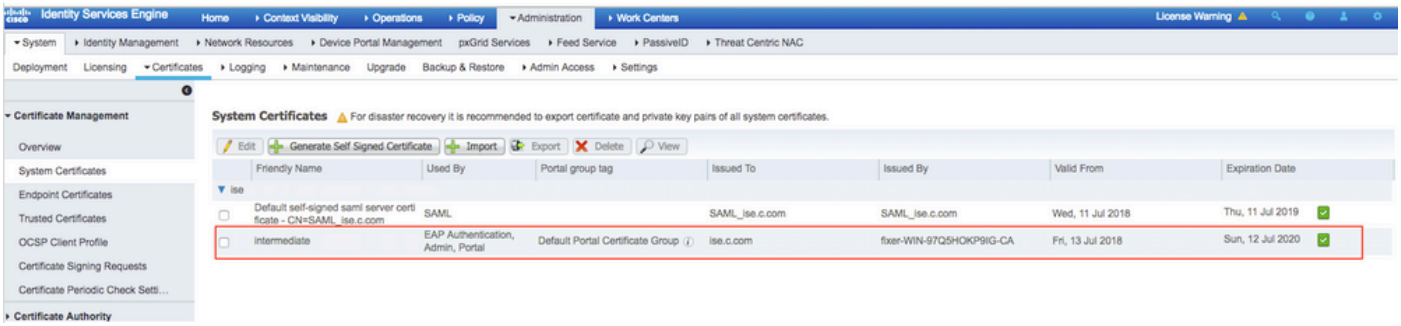


Step 11. Once you click **Bind certificate**, there is an option to choose the certificate file saved in your desktop. Browse to the intermediate certificate and click **Submit** as shown in the image.



Step 12. In order to view the certificate, navigate to **Administration > Certificates > System Certificates**

as shown in the image.



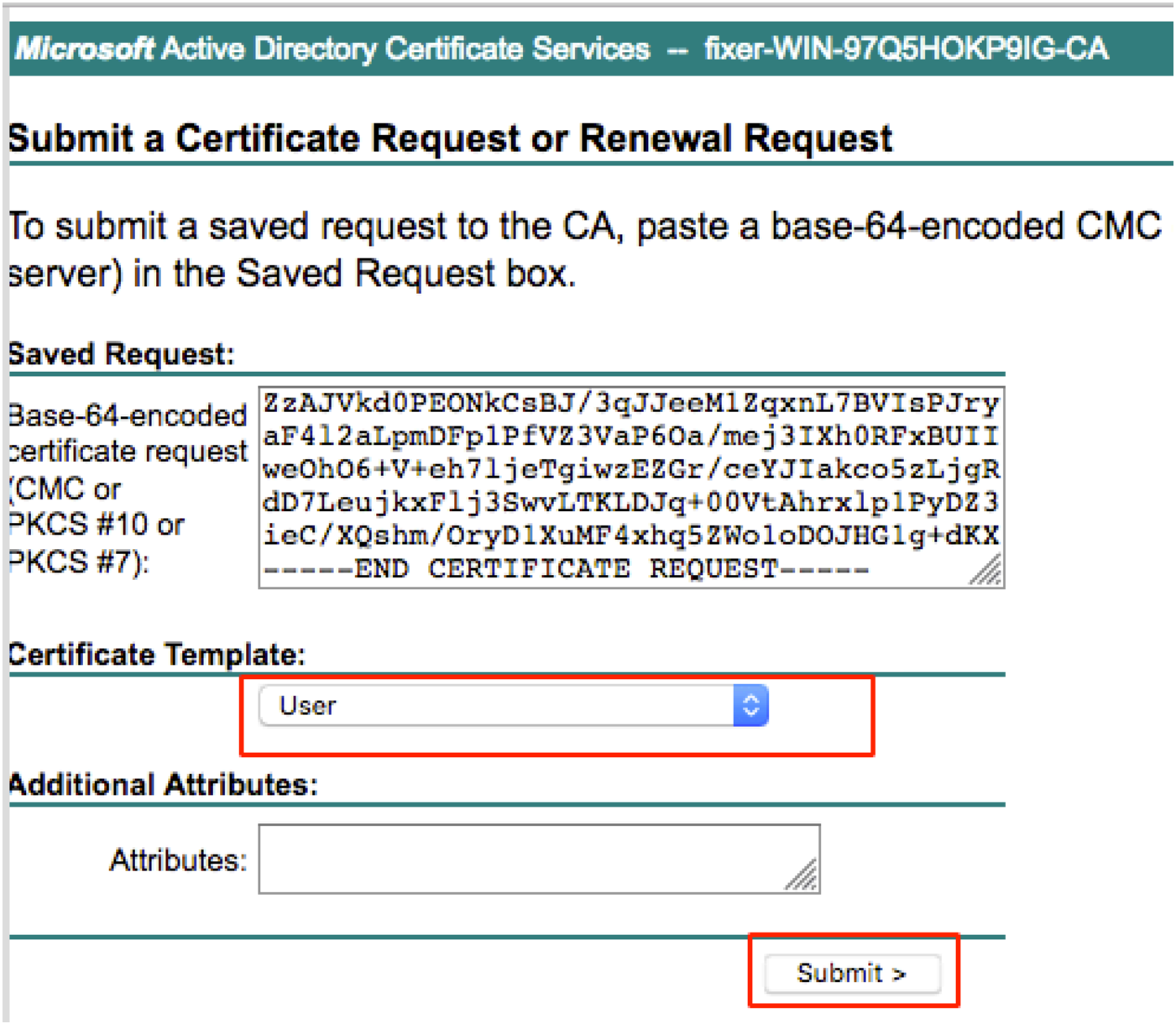
Client for EAP-TLS

Download User Certificate on Client Machine (Windows Desktop)

Step 1. In order to authenticate a wireless user through EAP-TLS, you have to generate a client certificate. Connect your Windows computer to the network so that you can access the server. Open a web browser and enter this address: https://sever ip addr/certsrv---

Step 2. Note that the CA must be the same with which the certificate was downloaded for ISE.

For this, you need to browse for the same CA server that you used to download the certificate for server. On the same CA, click **Request a certificate** as previously done, however, this time you need to select **User** as the Certificate Template as shown in the image.



Step 3. Then, click **download certificate chain** as was done previously for server.

Once you get the certificates, use these steps in order to import the certificate on windows laptop:

Step 4. In order to import the certificate, you need to access it from the Microsoft Management Console (MMC).

1. In order to open the MMC navigate to **Start > Run > MMC**.
2. Navigate to **File > Add / Remove Snap In**
3. Double Click **Certificates**.
4. Select**Computer Account**.
5. Select **Local Computer > Finish**
6. Click **OK** in order to exit the Snap-In window.
7. Click **[+]** next to **Certificates > Personal > Certificates**.
8. Right click on **Certificates** and select **All Tasks> Import**.
9. Click **Next**.
10. Click **Browse**.
11. Select the **.cer**, **.crt**, **or .pfx** you would like to import.
12. Click **Open**.
13. Click **Next**.

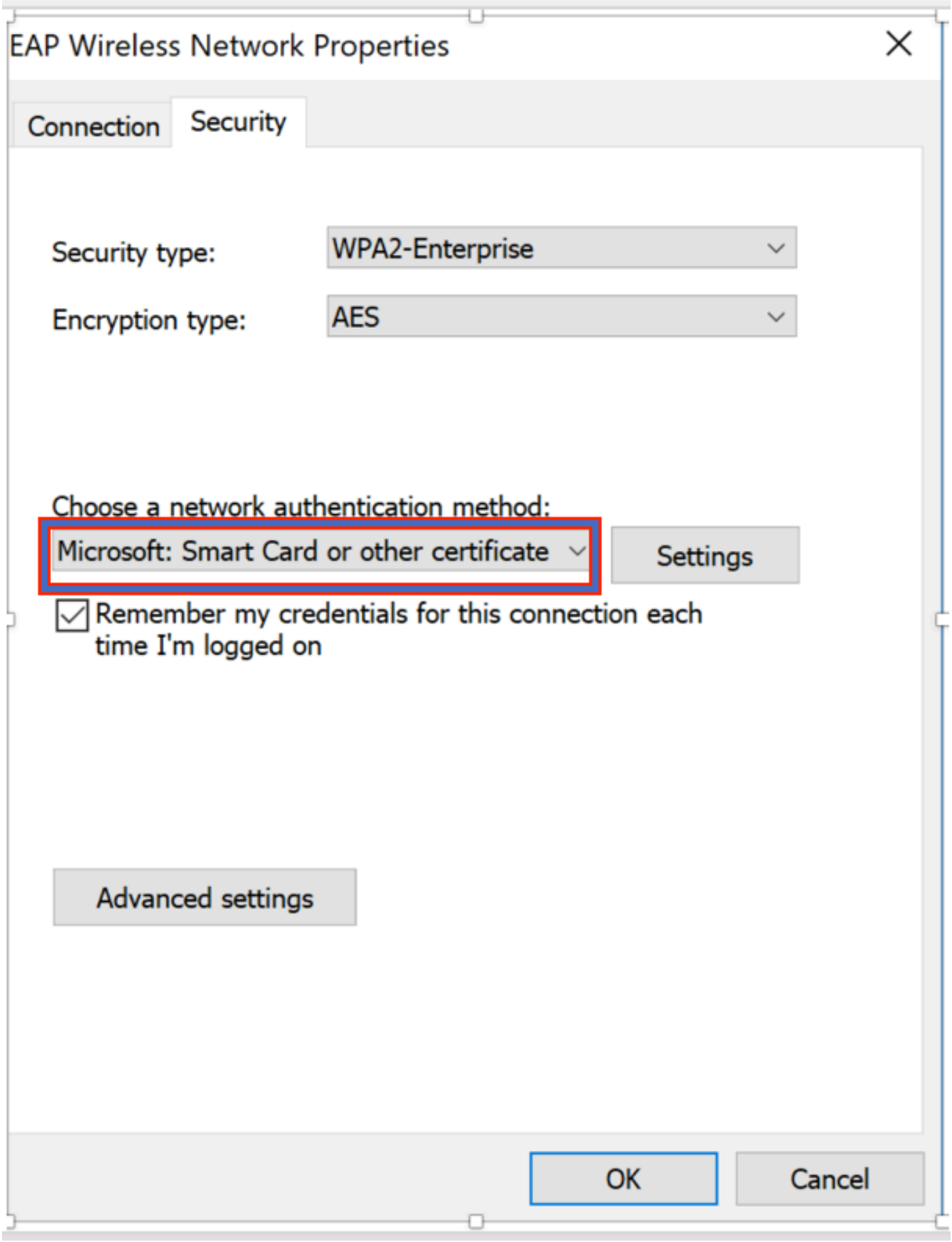
14. Select **Automatically select the certificate store based on the type of certificate**.
15. Click **Finish & OK**

Once import of certificate is done, you need to configure your wireless client (windows desktop, in this example) for EAP-TLS.

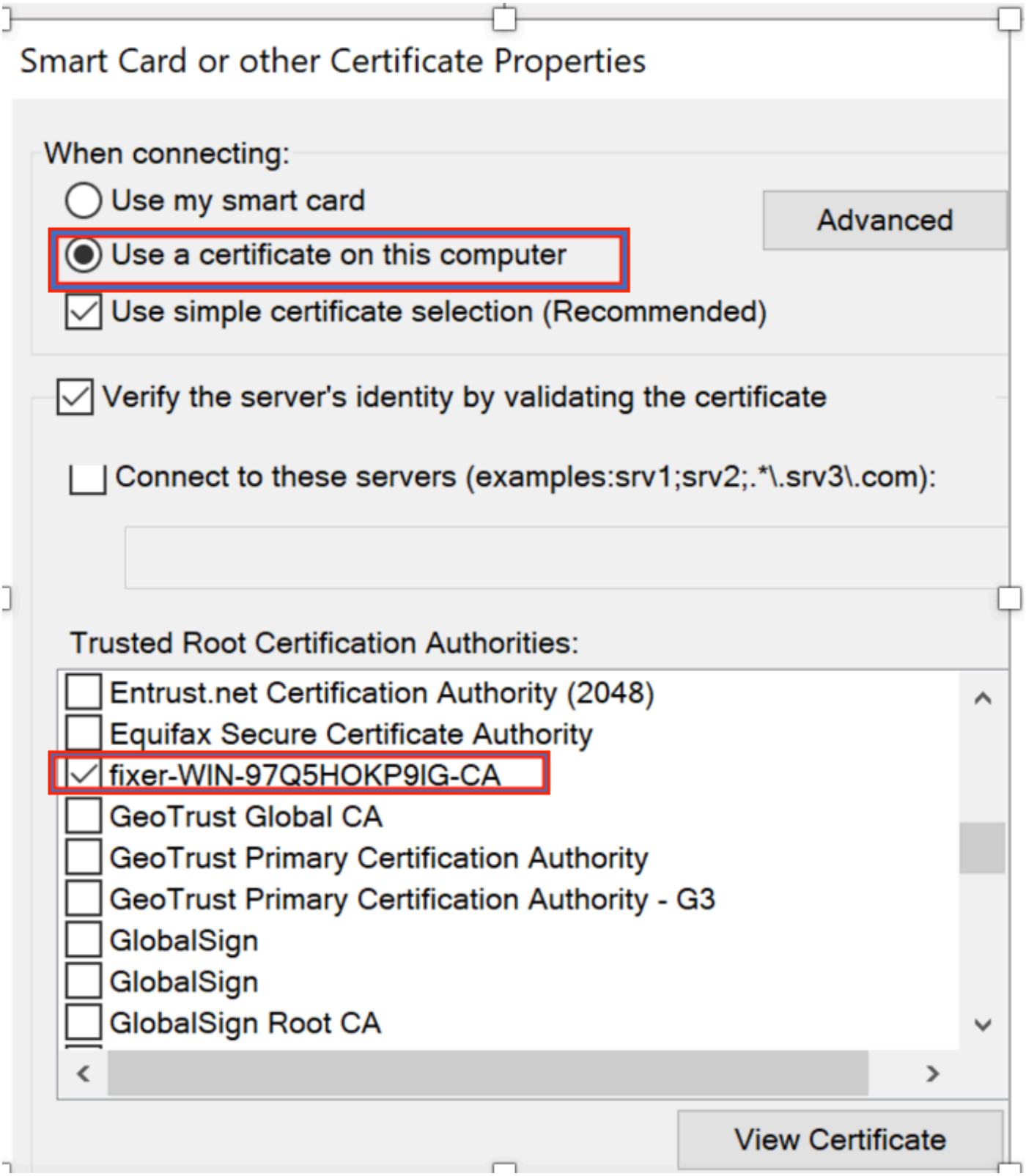
Wireless Profile for EAP-TLS

Step 1. Change the wireless profile that was created earlier for Protected Extensible Authentication Protocol (PEAP) in order to use the EAP-TLS instead. Click **EAP wireless profile**.

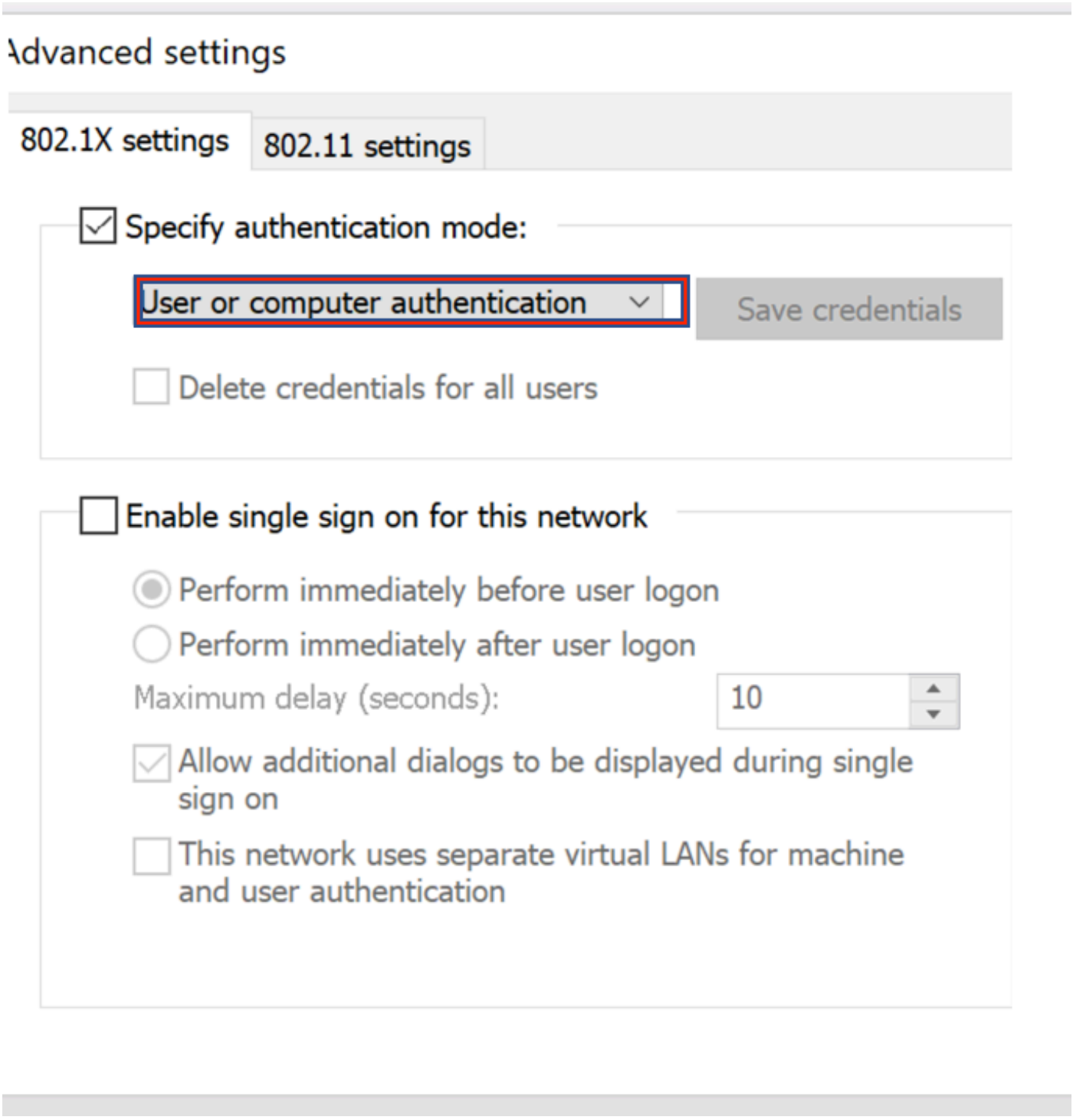
Step 2. Select **Microsoft: Smart Card or other certificate** and click **OK** shown in the image.



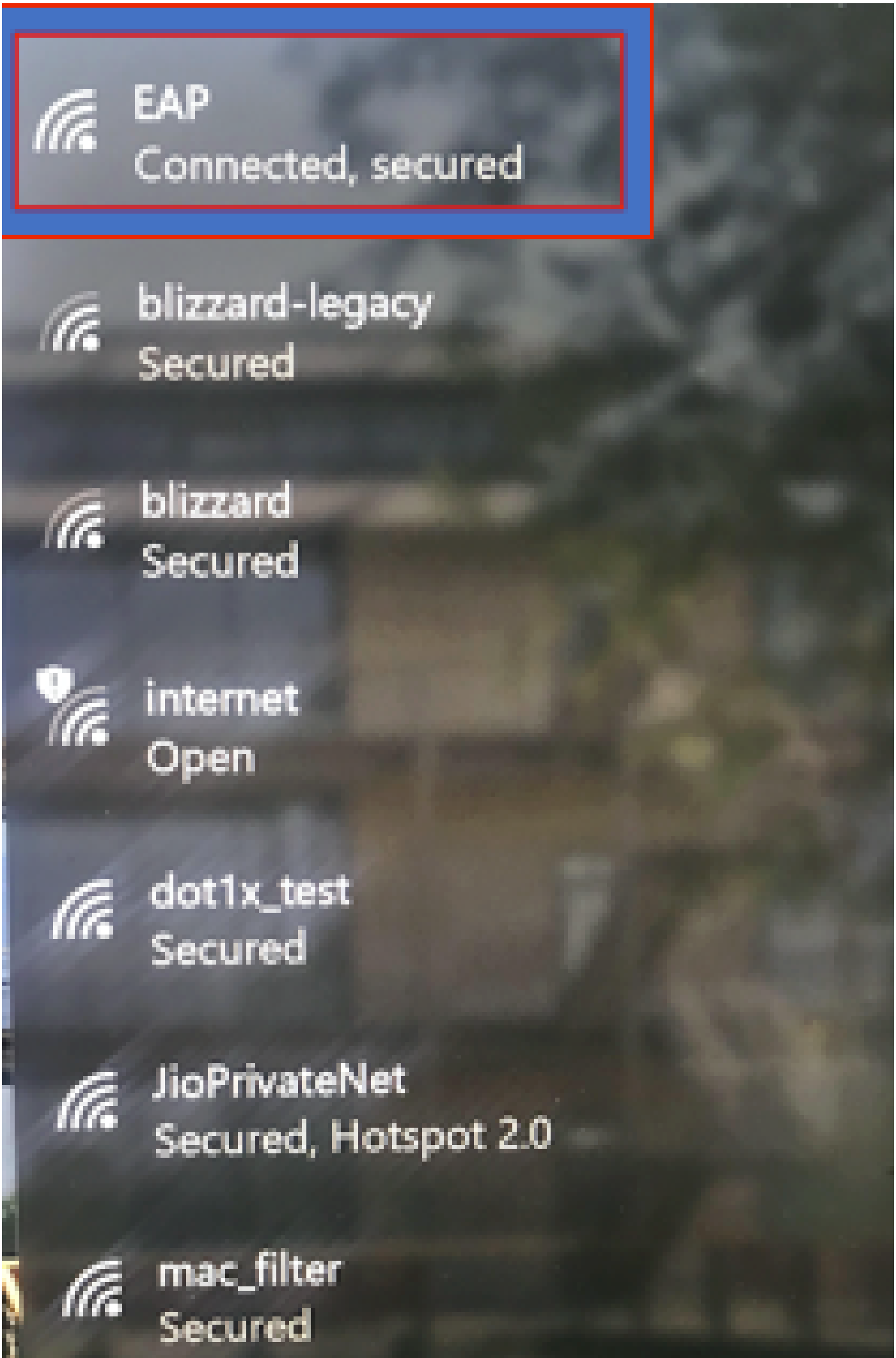
Step 3. Click **settings** and select the root certificate issued from CA server as shown in the image.



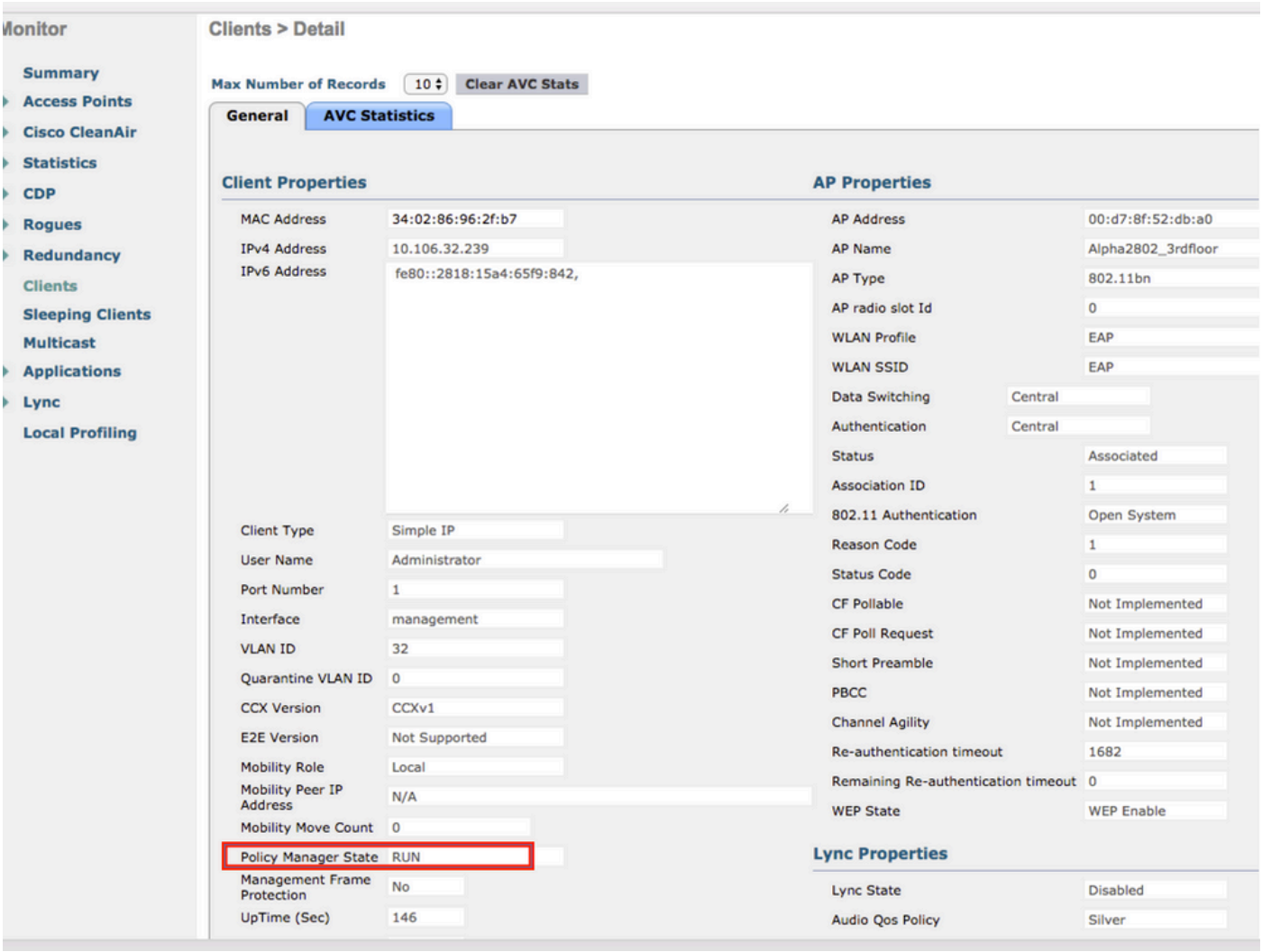
Step 4. Click **Advanced Settings** and select **User** or **computer authentication** from the 802.1x settings tab as shown in the image.



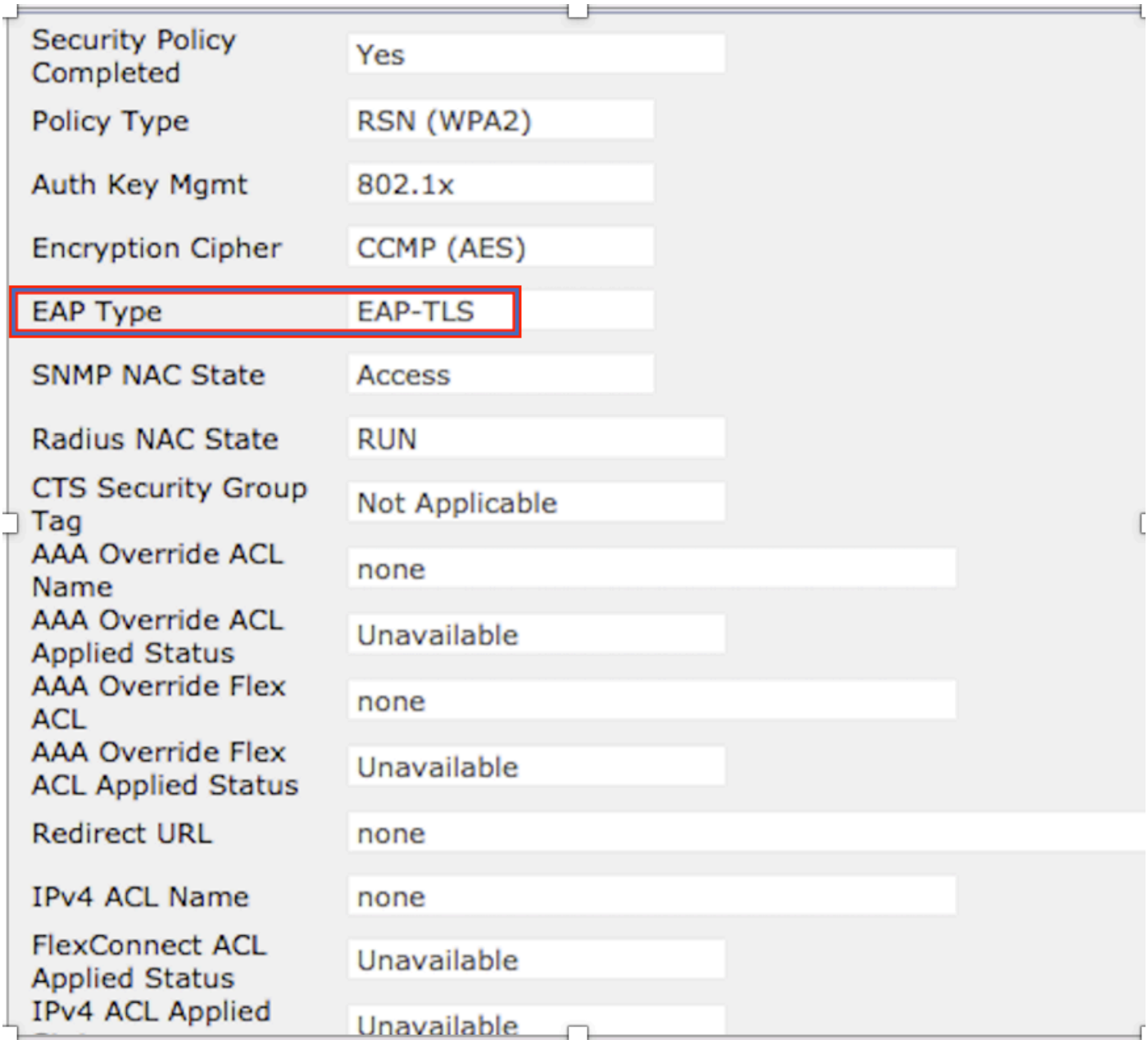
Step 5. Now, try to connect again to the wireless network, select the correct profile (EAP, in this example) and **Connect**. You are connected to the wireless network as shown in the image.


EAP
Connected, secured
blizzard-legacy
Secured
blizzard
Secured
internet
Open
dot1x_test
Secured
JioPrivateNet
Secured, Hotspot 2.0
mac_filter
Secured

. This means that the client has completed authentication, obtained IP address and is ready to pass the traffic shown in the image.



Step 2. Also verify the correct EAP method on WLC in the client details page as shown in the image.

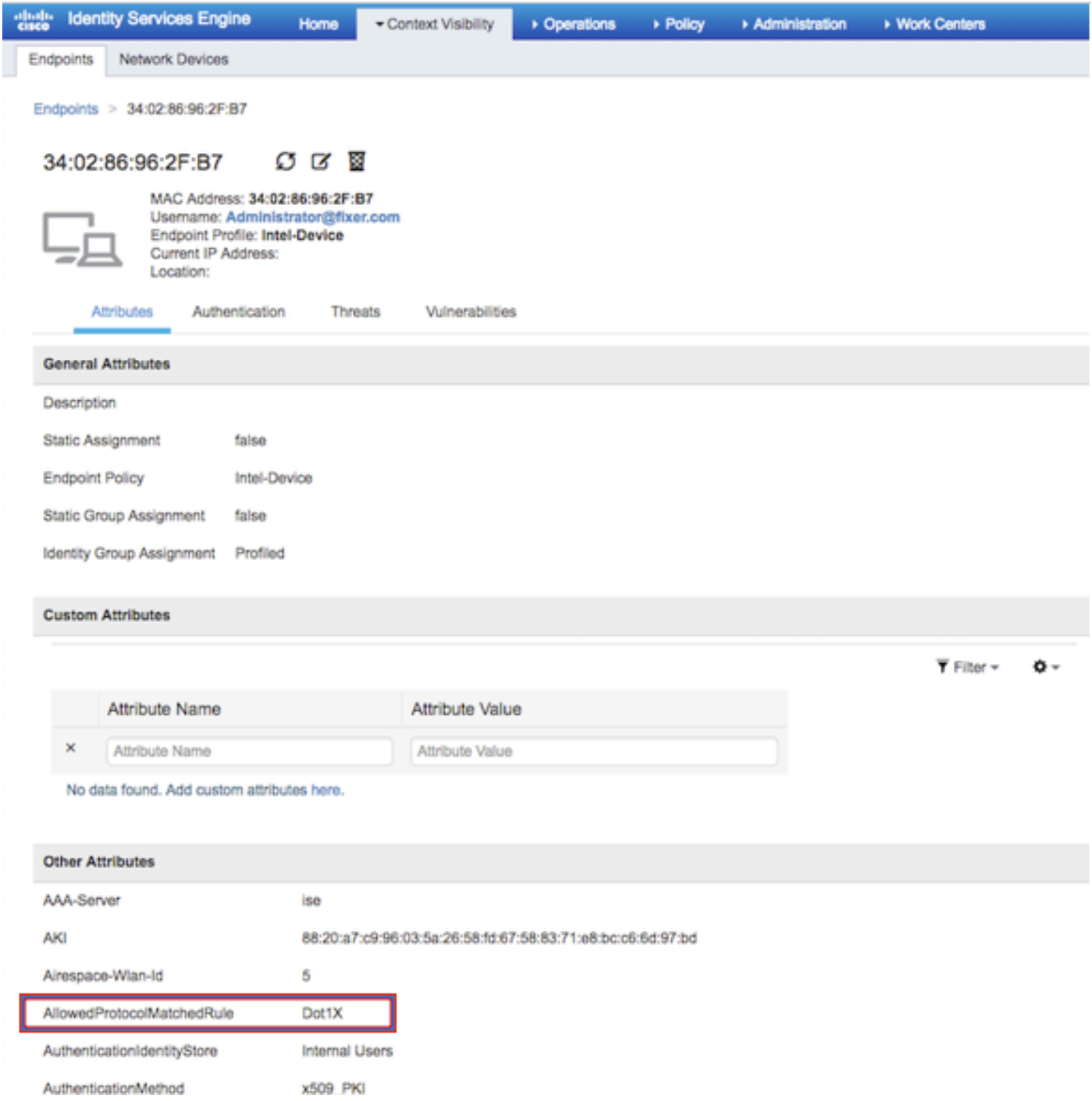


Step 3. Here are the client details from CLI of the controller (output clipped):

```
(Cisco Controller-Standby) >show client detail 34:02:86:96:2f:b7
Client MAC Address.............................. 34:02:86:96:2f:b7
Client Username ................................ Administrator
AP MAC Address.................................. 00:d7:8f:52:db:a0
AP Name......................................... Alpha2802_3rdfloor
AP radio slot Id................................ 0
Client State.................................... Associated
Wireless LAN Id................................. 5
Wireless LAN Network Name (SSID)................ EAP
Wireless LAN Profile Name....................... EAP
Hotspot (802.11u)............................... Not Supported
BSSID........................................... 00:d7:8f:52:db:a4
Connected For .................................. 48 secs
Channel......................................... 1
IP Address...................................... 10.106.32.239
Gateway Address................................. 10.106.32.1
Netmask......................................... 255.255.255.0
```

```
Policy Manager State..............................  RUN
Policy Type.......................................  WPA2
Authentication Key Management.....................  802.1x
Encryption Cipher.................................  CCMP-128 (AES)
Protected Management Frame .......................  No
Management Frame Protection.......................  No
EAP Type..........................................  EAP-TLS
```

Step 4. On ISE, navigate to **Context Visbility > End Points > Attributes** as shown in the images.



Location	Location#All Locations
MACAddress	34:02:86:96:2F:B7
MatchedPolicy	Intel-Device
MessageCode	5200
NAS-IP-Address	10.106.32.223
NAS-Identifier	HA_Pri
NAS-Port	1
NAS-Port-Type	Wireless - IEEE 802.11
Network Device Profile	Cisco
NetworkDeviceGroups	Location#All Locations, Device Type#All Device Types
NetworkDeviceName	HA_Pri
NetworkDeviceProfileId	403ea8fc-7a27-41c3-80bb-27964031a08d
NetworkDeviceProfileName	Cisco
OUI	Intel Corporate
OpenSSLErrorMessage	SSL alert: code=0x230=560 \; source=local \; type=fatal \; message="Unknown CA - error unable to get issuer certificate locally"
OpenSSLErrorStack	140160653813504:error:140890B2:SSL routines:SSL3_GET_CLIENT_CERTIFICATE:no certificate returned:s3_srvr.c:3370:
PolicyVersion	0
PostureApplicable	Yes
PostureAssessmentStatus	NotApplicable
RadiusFlowType	Wireless802_1x
RadiusPacketType	AccessRequest
SSID	00-d7-8f-52-db-a0:EAP
SelectedAccessService	Default Network Access
SelectedAuthenticationIdentityStores	EAPTLS
SelectedAuthorizationProfiles	PermitAccess
Serial Number	10 29 41 78 00 00 00 00 00 11

Troubleshoot

There is currently no specific information available to troubleshoot for this configuration.