Configure Radius DTLS on ISE and 9800 WLC

Contents

Introduction

This document describes a method to create the necessary certificates to configure RADIUS DTLS between ISE and the 9800 WLC.

Background

RADIUS DTLS is a secure form of the RADIUS protocol where the RADIUS messages are sent over a data Transport Layer Security (DTLS) Tunnel. To create this tunnel between the authentication server and the authenticator, a set of certificates is needed. This set of certificates require the certain Extended Key Usage (EKU) certificate extensions to be set, specifically, client authentication on the WLC certificate and both server authentication as well as client authentication for the ISE certificate.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- How to configure the 9800 WLC, the Access Point (AP) for basic operation
- How to use the OpenSSL application
- Public Key Infrastructure (PKI) and digital certificates

Components Used

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

- OpenSSL application (version 3.0.2).
- ISE (version 3.1.0.518)
- 9800 WLC (version 17.12.3)

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.

Configure

Overview

The purpose is to create a two-level certificate authority with a Root CA and an Intermediate CA to sign endpoint certificates. Once the certificates are signed, they are imported to the WLC and ISE. Finally, the devices are configured to perform RADIUS DTLS authentication with those certificates.

Note: This document uses Linux specific commands to create and arrange files. The commands are explained so you can perform the same action on other operating systems where OpenSSL is available.

Optional - Create WLC and ISE RADIUS DTLS Device Certificate

The RADIUS DTLS protocol needs to exchange certificates between ISE and WLC to create the DTLS tunnel. If you do not have valid certificates yet, you can create a local CA to generate the certificates, refer to Configure a Multi-level Certificate Authority on OpenSSL to Generate CIsco IOS® XE Compatible Certificates and perform the steps outlined on the document from the start until the end of step **Create Intermediate CA certificate.**

Add Configuration Sections on openssl.cnf File

Open your **openssl.cnf** configuration file and, at the bottom of it, copy and paste the WLC and ISE sections used to generate a valid Certificate Sign Request (CSR).

Both **ISE_device_req_ext** and **WLC_device_req_ext** sections each point to a list of SANs to be included on the CSR:

```
#Section used for CSR generation, it points to the list of subject alternative names to add them to CSR
[ ISE_device_req_ext ]
subjectAltName = @ISE_alt_names

[ WLC_device_req_ext ]
subjectAltName = @WLC_alt_names

#DEFINE HERE SANS/IPs NEEDED for **ISE** device certificates
[ISE_alt_names]
DNS.1   = ISE.example.com
DNS.2   = ISE2.example.com

#DEFINE HERE SANS/IPs NEEDED for **WLC** device certificates
[WLC_alt_names]
DNS.1   = WLC.example.com
DNS.2   = WLC2.example.com
```

As a security measure, the CA overrides any SANs present on a CSR in order to sign it so unauthorized devices cannot receive a valid certificate for a name they are not allowed to use. In order to add the SANs back onto the signed certificate, use the **subjectAltName** parameter to point to the same list SANs as the ones used for CSR generation.

ISE requires both **serverAuth** and **clientAuth** EKUs present on the certificate while the WLC only needs **clientAuth.** They are added to the signed certificate with the **extendedKeyUsage** parameter.

Copy and paste the sections used for certificate sign at the bottom of the **openssl.cnf** file:

```
#This section contains the extensions used for the device certificate sign
[ ISE_cert ]
basicConstraints=CA:FALSE
subjectKeyIdentifier=hash
authorityKeyIdentifier=keyid,issuer:always
#EKU client and server is needed for RADIUS DTLS on ISE
extendedKeyUsage = serverAuth, clientAuth
subjectAltName = @ISE_alt_names

[ WLC_cert ]
basicConstraints=CA:FALSE
subjectKeyIdentifier=hash
authorityKeyIdentifier=keyid,issuer:always
#EKU client is needed for RADIUS DTLS on WLC
extendedKeyUsage = clientAuth
subjectAltName = @WLC_alt_names
```

Create WLC Device Certificate

Create new folder to store WLC certs on the machine which has OpenSSL installed inside the Intermediate CA cert folder called **IntermCA.db.certs.** The new folder is called **WLC**:

```
mkdir ./IntermCA/IntermCA.db.certs/WLC
```

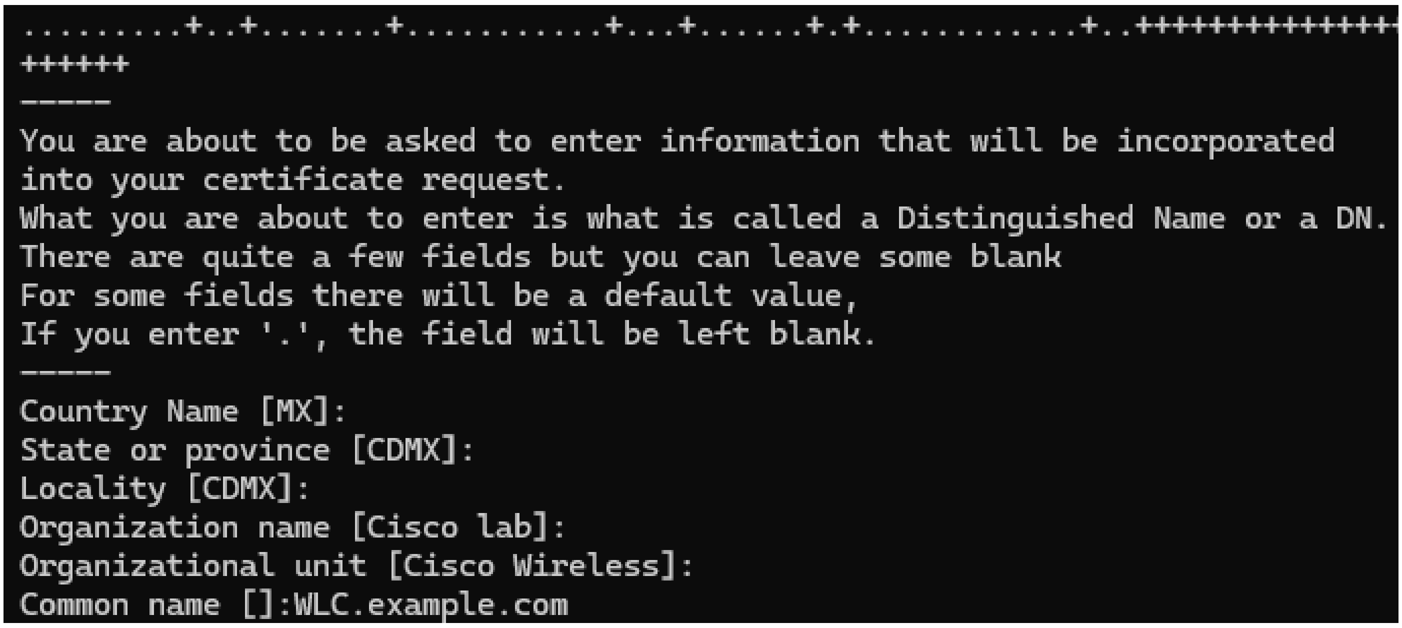
Modify the **DNS** parameters on the **[WLC_alt_names]** section of the **openssl.cnf** file. Change the example names provided for your desired values. These values populate the SANs field of the WLC certificate:

```
[WLC_alt_names]
DNS.1   = WLC.example.com    <-----Change the values after the equals sign
DNS.2   = WLC2.example.com   <-----Change the values after the equals sign
```

Create the WLC private key and WLC CSR with information from section **WLC_device_req_ext** for SANs:

```
openssl req -newkey rsa:4096 -keyout ./IntermCA/IntermCA.db.certs/WLC/WLC.key -nodes -config openssl.cn
```

OpenSSL opens an interactive prompt for you to enter Distinguished Name (DN) details:



```
.........+..+.......+...........+...+......+.+............+..++++++++++++++
++++++
-----
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 [MX]:
State or province [CDMX]:
Locality [CDMX]:
Organization name [Cisco lab]:
Organizational unit [Cisco Wireless]:
Common name []:WLC.example.com
```

WLC Certificate Distinguished Name Interactive Prompt

Caution: The Common Name (CN) you provide on the interactive prompt must be identical to one of the Names on the [WLC_alt_names] section of the openssl.cnf file.

Use the CA named **IntermCA** to sign the WLC CSR named **WLC.csr** with the extensions defined under **[WLC_cert]** and store the signed certificate inside **./IntermCA/IntermCA.db.certs/WLC**. The WLC device certificate is called **WLC.crt**:

```
openssl ca -config openssl.cnf -extensions WLC_cert -name IntermCA -out ./IntermCA/IntermCA.db.certs/WL
```

9800 WLC needs the certificate to be in pfx format to import it. Create new file which contains the chain of CAs who signed the WLC certificate, this is called a certfile:

```
cat ./RootCA/RootCA.crt ./IntermCA/IntermCA.crt > ./IntermCA/IntermCA.db.certs/WLC/certfile.crt
```

To create your .pfx file run one of these commands according to the WLC version.

For versions older than 17.12.1:

```
openssl pkcs12 -export -macalg sha1 -legacy -descert -out ./IntermCA/IntermCA.db.certs/WLC/WLC.pfx -ink
```

For version 17.12.1 or later:

```
openssl pkcs12 -export -out ./IntermCA/IntermCA.db.certs/WLC/WLC.pfx -inkey ./IntermCA/IntermCA.db.cert
```

Create ISE Device Certificate

Create a new folder to store ISE certs on the machine which has OpenSSL installed inside the Intermediate CA cert folder called **IntermCA.db.certs.** The new folder is called **ISE**:

```
mkdir ./IntermCA/IntermCA.db.certs/ISE
```

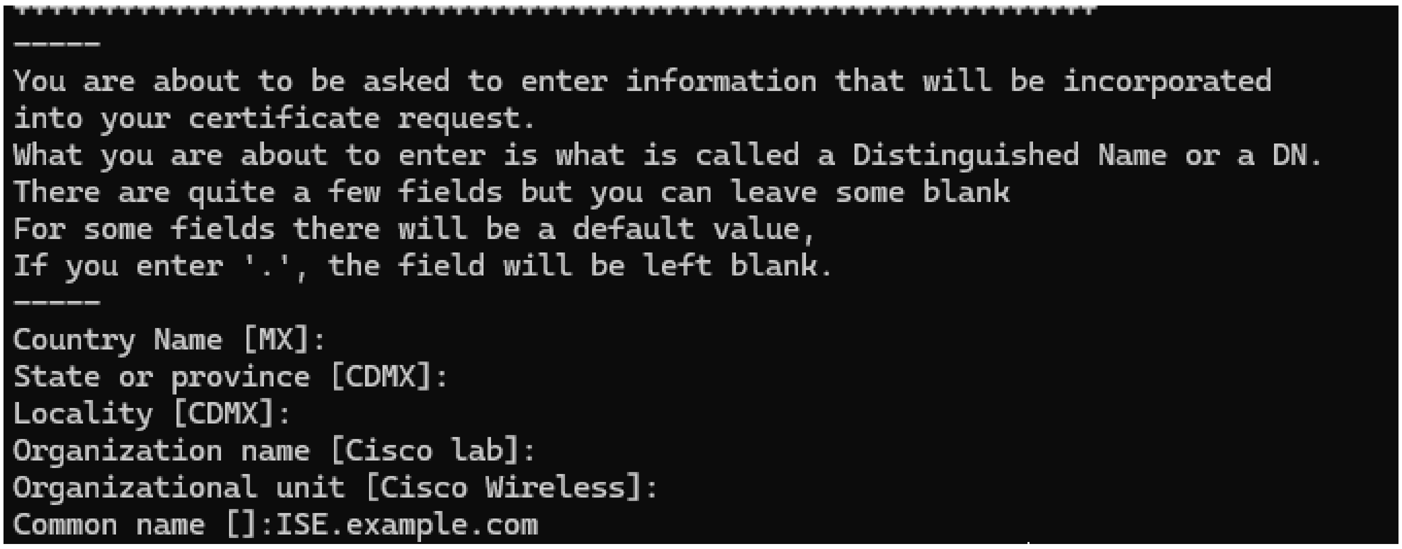
Modify the **DNS** parameters on the **[ISE_alt_names]** section of the **openssl.cnf** file. Change the example names provided for your desired values, these values populate the SANs field of the WLC certificate:

```
[ISE_alt_names]
DNS.1   = ISE.example.com   <-----Change the values after the equals sign
DNS.2   = ISE2.example.com  <-----Change the values after the equals sign
```

Create the ISE private key and ISE CSR with information from section **ISE_device_req_ext** for SANs:

```
openssl req -newkey rsa:2048 -sha256 -keyout ./IntermCA/IntermCA.db.certs/ISE/ISE.key -nodes -config op
```

OpenSSL opens an interactive prompt for you to enter Distinguished Name (DN) details:



```
-----
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 [MX]:
State or province [CDMX]:
Locality [CDMX]:
Organization name [Cisco lab]:
Organizational unit [Cisco Wireless]:
Common name []:ISE.example.com
```

ISE Certificate Distinguished Name Interactive Prompt

Caution: The CN you provide on the interactive prompt must be exactly the same as one of the Names on the [ISE_alt_names] section of the openssl.cnf file.

Use the CA named **IntermCA** to sign the ISE CSR named **ISE.csr** with the extensions defined under **[ISE_cert]** and store the signed certificate inside **./IntermCA/IntermCA.db.certs/WLC**. The ISE device certificate is called **ISE.crt**:

```
openssl ca -config openssl.cnf -extensions ISE_cert -name IntermCA -out ./IntermCA/IntermCA.db.certs/IS
```

Import Certificates to Devices

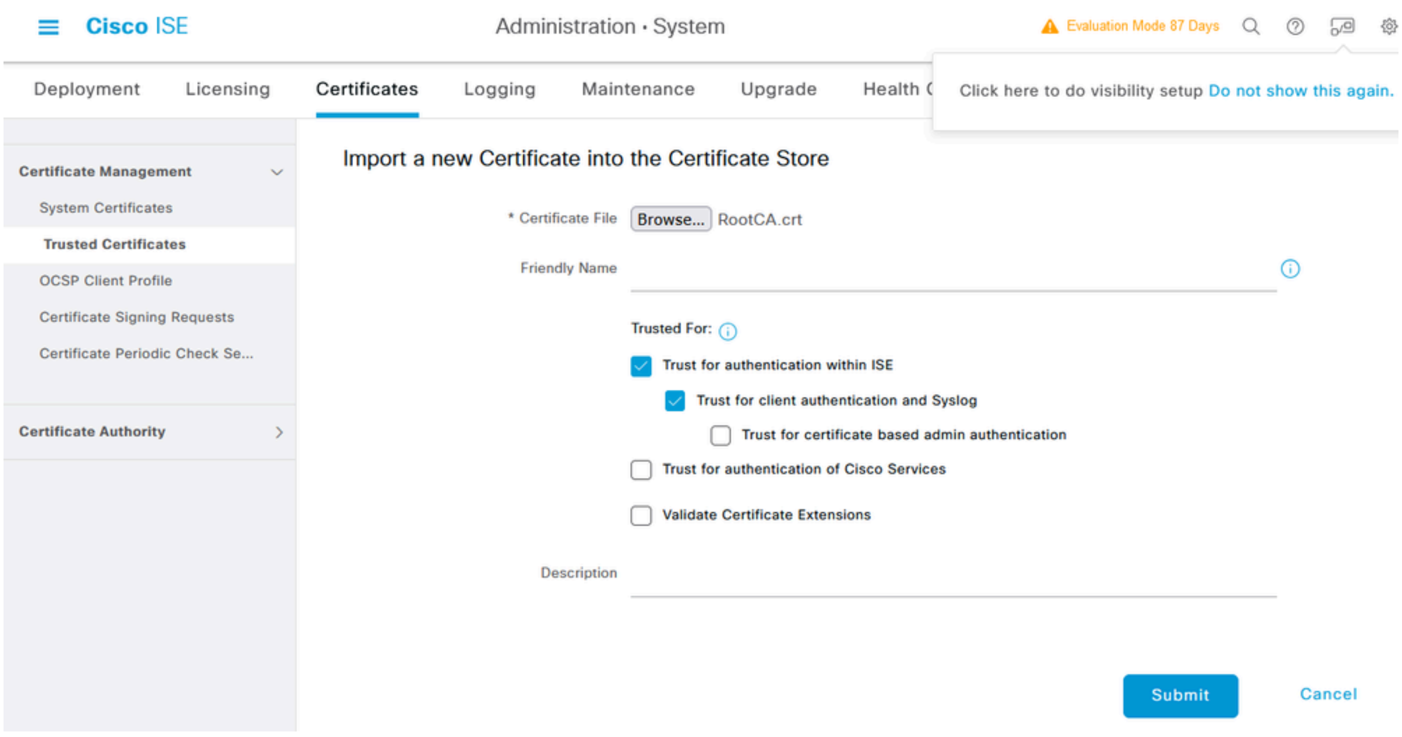
Import Certificates to ISE

1. Import the Root CA certificate from the ISE certificate chain to the trusted certificates store.

2. Navigate to **Administration>System>Certificates>Trusted certificates**.

3. Click on Browse and select the **Root.crt** file.

4. Check the **Trust for authentication within ISE** as well as **Trust for client authentication and Syslog** checkboxes then click **Submit**:



Click here to do visibility setup Do not show this again.

Import a new Certificate into the Certificate Store

* Certificate File: Browse... RootCA.crt

Friendly Name:

Trusted For:

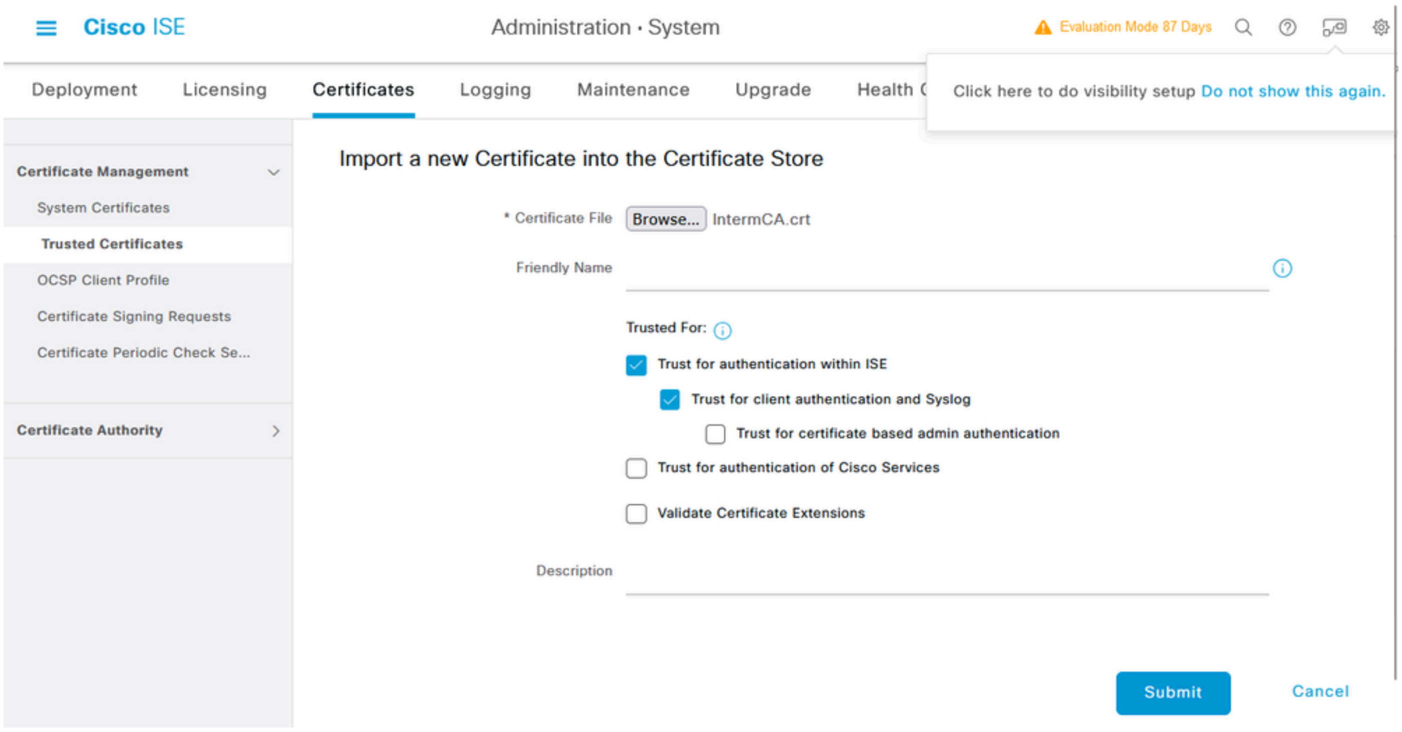
- [x] Trust for authentication within ISE
  - [x] Trust for client authentication and Syslog
    - [ ] Trust for certificate based admin authentication
- [ ] Trust for authentication of Cisco Services
- [ ] Validate Certificate Extensions

Description:

ISE Root CA Certificate Import Dialog

Do the same for the intermediate certificate if it exists.

Note: Repeat the steps for any CA certificate which is part of the ISE certificate validation chain. Always start with the Root CA certificate and finish with the lowest Intermediate CA certificate of the chain.



Cisco ISE — Administration · System — Evaluation Mode 87 Days

Deployment | Licensing | Certificates | Logging | Maintenance | Upgrade | Health (

Click here to do visibility setup Do not show this again.

Certificate Management: System Certificates, Trusted Certificates, OCSP Client Profile, Certificate Signing Requests, Certificate Periodic Check Se...

Certificate Authority

Import a new Certificate into the Certificate Store

* Certificate File: Browse... IntermCA.crt

Friendly Name:

Trusted For:

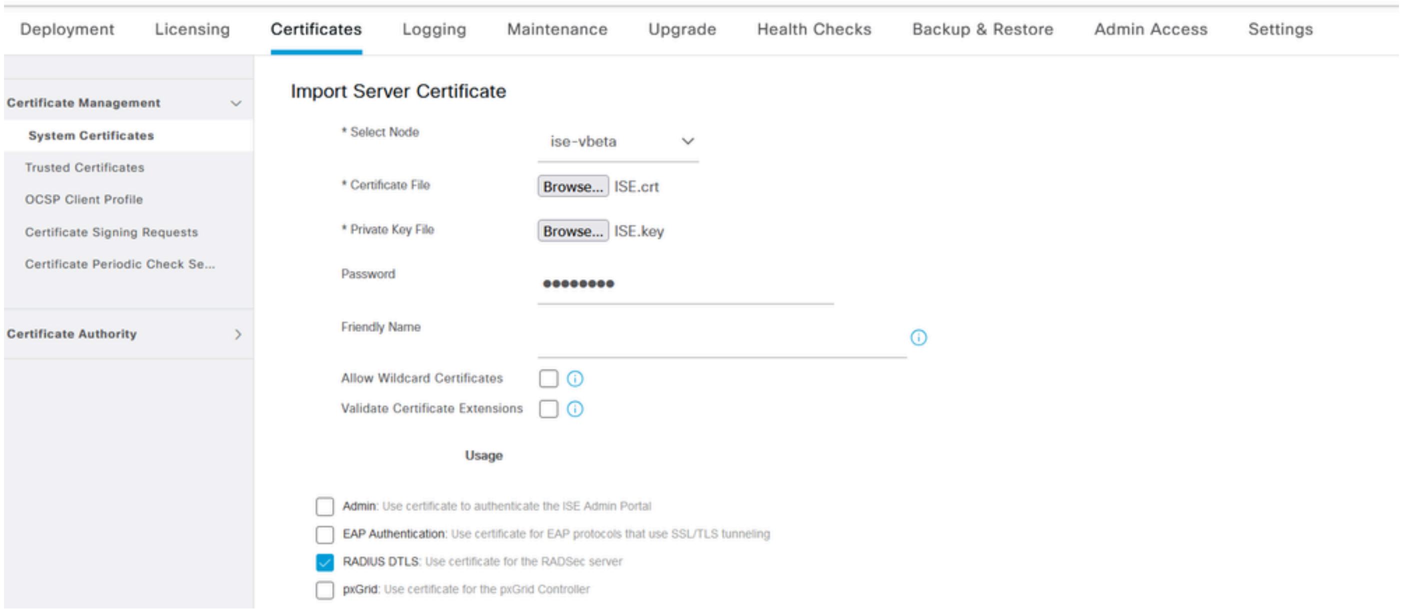
- [✓] Trust for authentication within ISE
  - [✓] Trust for client authentication and Syslog
    - [ ] Trust for certificate based admin authentication
- [ ] Trust for authentication of Cisco Services
- [ ] Validate Certificate Extensions

Description:

Submit | Cancel

ISE Intermediate CA Certificate Import Dialog

Caution: If the ISE certificate and the WLC certificate are issued by different CAs you must import all the CA certificates that belong to the WLC certificate chain as well. ISE does not accept the WLC certificate on the DTLS certificate exchange until you import those CA certificates.



Import Server Certificate

* Select Node	ise-vbeta
* Certificate File	Browse... ISE.crt
* Private Key File	Browse... ISE.key
Password	••••••••
Friendly Name	
Allow Wildcard Certificates	☐
Validate Certificate Extensions	☐

Usage

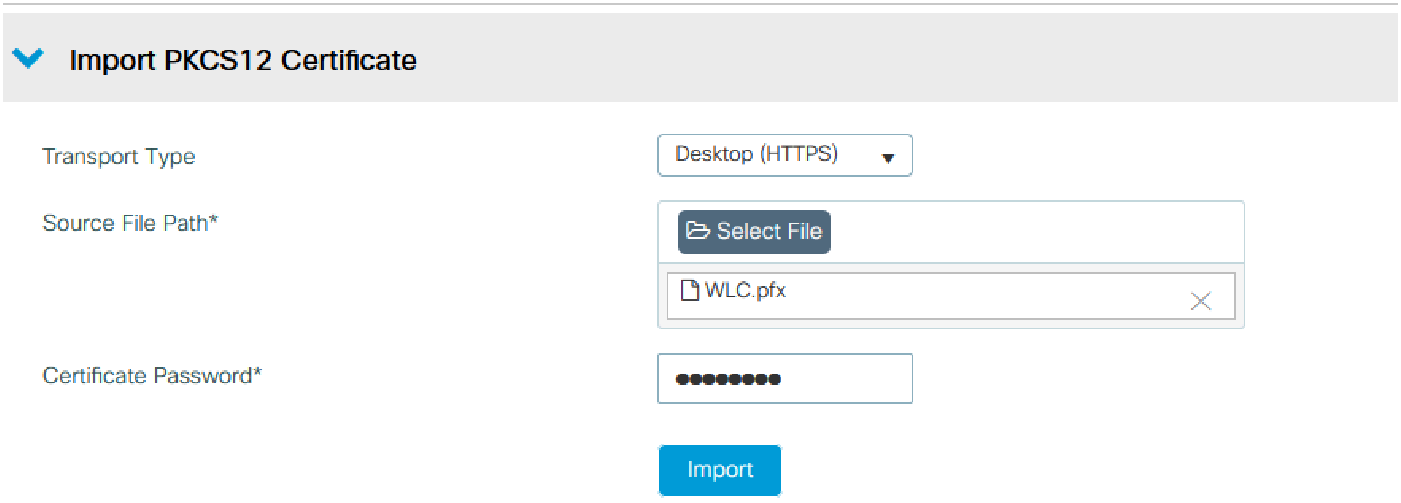
- ☐ Admin: Use certificate to authenticate the ISE Admin Portal
- ☐ EAP Authentication: Use certificate for EAP protocols that use SSL/TLS tunneling
- ✓ RADIUS DTLS: Use certificate for the RADSec server
- ☐ pxGrid: Use certificate for the pxGrid Controller

ISE Device Certificate Import Menu

Tip: You only need to import the ISE device certificate on this step. This certificate is the one ISE exchanges to establish the DTLS tunnel. It is not necessary to import the WLC device certificate and private key as the WLC certificate is verified with the use of the CA certificates imported previously.

Import Certificates to WLC

1. Navigate to **Configuration > Security > PKI Management** on the WLC and go to the **Add Certificate** tab.
2. Click on the **Import PKCS12 Certificate** dropdown and set the transport type as **Desktop (HTTPS)**.
3. Click on the **Select File** button and select the **.pfx** file you prepared earlier.
4. Type the import password and finally click on **Import**.


Import PKCS12 Certificate

Transport Type: Desktop (HTTPS)

Source File Path*: WLC.pfx

Certificate Password*: ●●●●●●●●

WLC Certificate Import Dialog

For detailed information on the import process refer to [Generate and Download CSR Certificates on Catalyst 9800 WLCs.]()

Disable revocation check inside each automatically created trustpoint if the WLC has no Certificate Revocation List that it can check through the network:

```
9800#configure terminal

9800(config)#crypto pki trustpoint WLC.pfx
9800(config)#revocation-check none
9800(config)#exit

9800(config)#crypto pki trustpoint WLC.pfx-rrr1
9800(config)#revocation-check none
9800(config)#exit
```

Note: If you created a Multi-Level CA on OpenSSL with the **Configure Multi-level CA on OpenSSL to Generate Cisco IOS XE Certificates** document, you must disable revocation check as no CRL server is created.

The automated import creates the necessary trustpoints to contain the WLC certificate and its CA certificates.

Tip: If the WLC certificates were issued by the same CA as the ISE certificates, you can use the same trustpoints created automatically form the WLC certificate import. There is no need to import the ISE certificates separately.

If the WLC certificate is issued by a different CA than the ISE certificate you also need to import the ISE CA certificates to the WLC for the WLC to trust the ISE device certificate.
Create a new trustpoint for the Root CA and Import the ISE Root CA:

```
9800(config)#crypto pki trustpoint ISEroot
9800(ca-trustpoint)#revocation-check none
9800(ca-trustpoint)#enrollment terminal
9800(ca-trustpoint)#chain-validation stop
9800(ca-trustpoint)#exit
```

```
9800(config)#crypto pki authenticate ISEroot

Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself

------Paste the ISE root CA-----
```

Import the next intermediate CA certificate on the ISE CA chain, in other words, the CA certificate Issued by the Root CA:

```
hamariomed1(config)#crypto pki trustpoint ISEintermediate
hamariomed1(ca-trustpoint)#revocation-check none
hamariomed1(ca-trustpoint)#chain-validation continue ISErootCA
hamariomed1(ca-trustpoint)#enrollment terminal
hamariomed1(ca-trustpoint)#exit

hamariomed1(config)#crypto pki authenticate ISEintermediate

Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself

------Paste the ISE intermediate CA-------
```

Each additional CA on the chain requires a separate trustpoint. Each trustpoint in the chain must reference the trustpoint which contains the issuer certificate of the certificate you want to import with the command **chain-validation continue <Issuer trustpoint name>**.

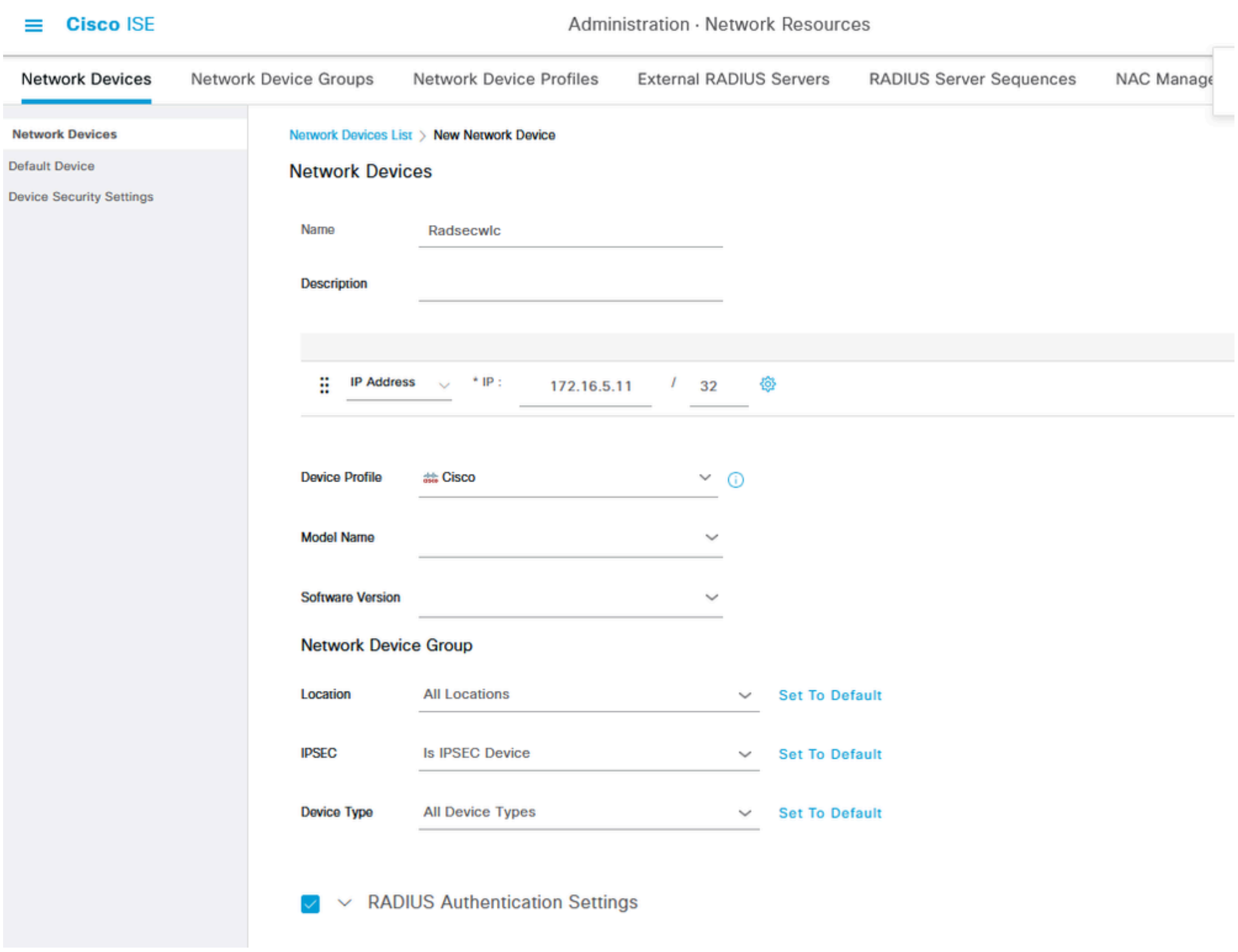
Import as many CA certificates as your CA chain contains. You are finished after you import the issuer CA of the ISE device certificate, take a note of the name of this trustpoint.

You do not need to import the ISE device certificate on the WLC for RADIUS DTLS to work.

Configure RADIUS DTLS

ISE Configuration

Add the WLC as a network device into ISE, to do this, navigate to **Administration>Network Resources>Network devices>Add**
Input the name of the device and the IP of the WLC interface which sources the RADIUS traffic. Typically the Wireless Management Interface IP. Scroll down and check **RADIUS Authentication Settings** as well as **DTLS Required** and click **Submit**:



Cisco ISE — Administration · Network Resources

Network Devices | Network Device Groups | Network Device Profiles | External RADIUS Servers | RADIUS Server Sequences | NAC Manage

Network Devices
Default Device
Device Security Settings

Network Devices List > New Network Device

Network Devices

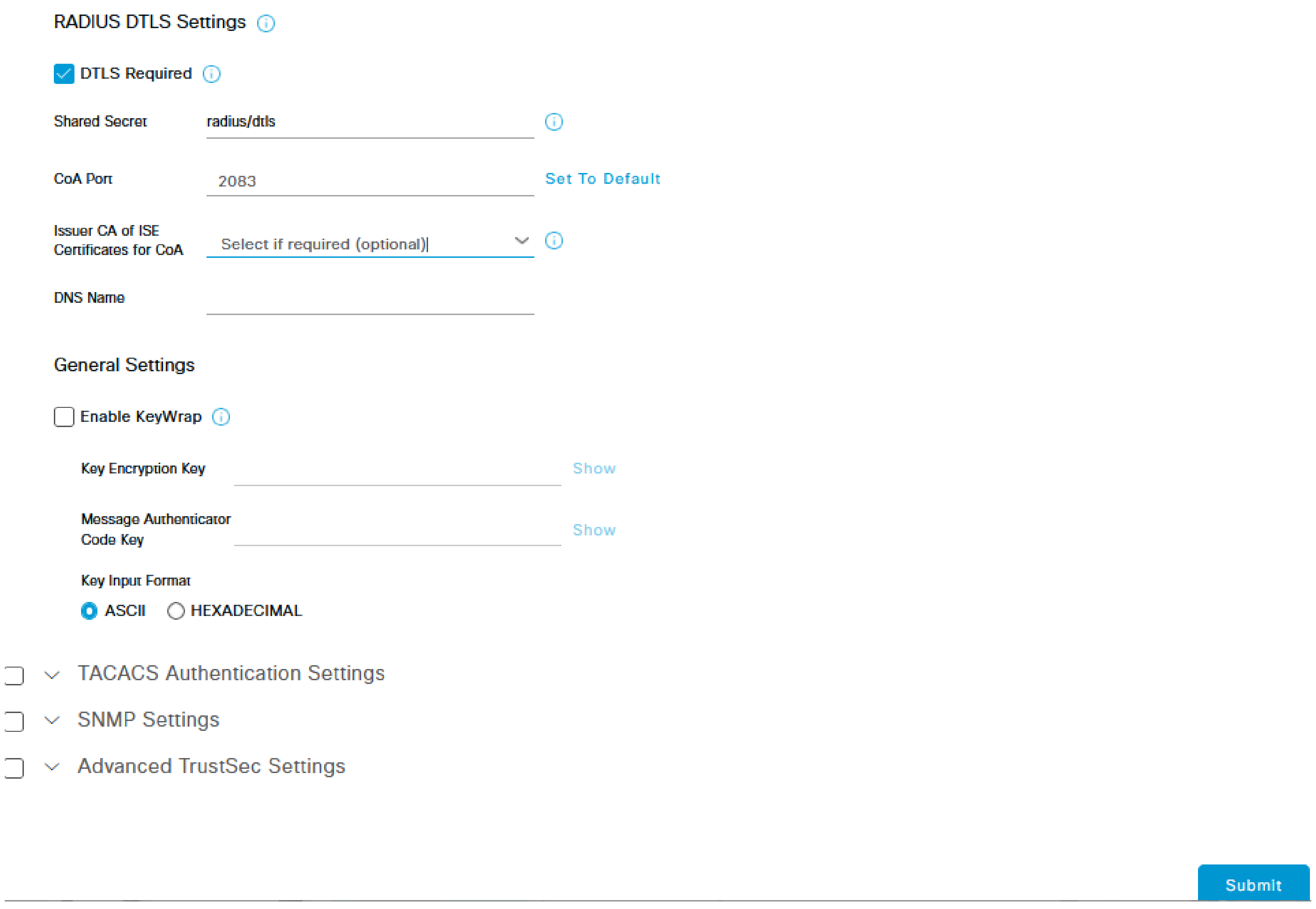
Name	Radsecwlc
Description	
IP Address	* IP : 172.16.5.11 / 32
Device Profile	Cisco
Model Name	
Software Version	

Network Device Group

Location	All Locations	Set To Default
IPSEC	Is IPSEC Device	Set To Default
Device Type	All Device Types	Set To Default

✓ RADIUS Authentication Settings

New Network Device Configuration


RADIUS DTLS Settings

[✓] DTLS Required

Shared Secret: radius/dtls

CoA Port: 2083 Set To Default

Issuer CA of ISE Certificates for CoA: Select if required (optional)

DNS Name:

General Settings

[ ] Enable KeyWrap

Key Encryption Key: Show

Message Authenticator Code Key: Show

Key Input Format
[✓ ASCII] HEXADECIMAL

TACACS Authentication Settings

SNMP Settings

Advanced TrustSec Settings

Submit

Radius DTLS Settings for the Network Device on ISE

WLC Configuration

Define a new Radius server along with the ISE IP address and default port for Radius DTLS. This configuration is available on the CLI only:

```
9800#configure terminal
9800(config)#radius server ISE
9800(config-radius-server)#address ipv4 <ISE Policy Service Node ip>
9800(config-radius-server)#dtls port 2083
```

Radius DTLS must use the shared secret **radius/dtls**, the 9800 WLC ignores any configured key other than this one:

```
9800(config-radius-server)#key radius/dtls
```

Use the dtls trustpoint client <trustpoint> command to configure the trustpoint which contains the WLC device certificate to exchange for the DTLS tunnel.
Use the dtls trustpoint server <trustpoint> command to configure the trustpoint which contains the issuer CA for the

ISE device certificate.

Both the client and server trustpoint names are the same only if the WLC and ISE certificates are issued by the same CA:

```
9800(config-radius-server)#dtls trustpoint client WLC.pfx
9800(config-radius-server)#dtls trustpoint server WLC.pfx
```

Configure the WLC to check for one of the Subject Alternative Names (SANs) that is present on the ISE certificate. This configuration **must match exactly one of the SANs** present in the SANs field of the certificate.

The 9800 WLC **does not perform a regular expression-based match** for the SAN field. This means, for example, that the command dtls match-server-identity hostname *.example.com for a wildcard certificate which has *.example.com on its SAN field is correct but the same command for a certificate which contains www.example.com on the SAN field is not.

The WLC does not check this name against any name server:

```
9800(config-radius-server)#dtls match-server-identity hostname ISE.example.com
9800(config-radius-server)#exit
```

Create a new server group to use the new Radius DTLS for authentication:

```
9800(config)#aaa group server radius Radsec
9800(config-sg-radius)#server name ISE
9800(config-sg-radius)#exit
```

From this point onwards you can use this server group as you use any other server group on the WLC. Refer to Configure 802.1X Authentication on Catalyst 9800 Wireless Controller Series to use this server for wireless client authentication.

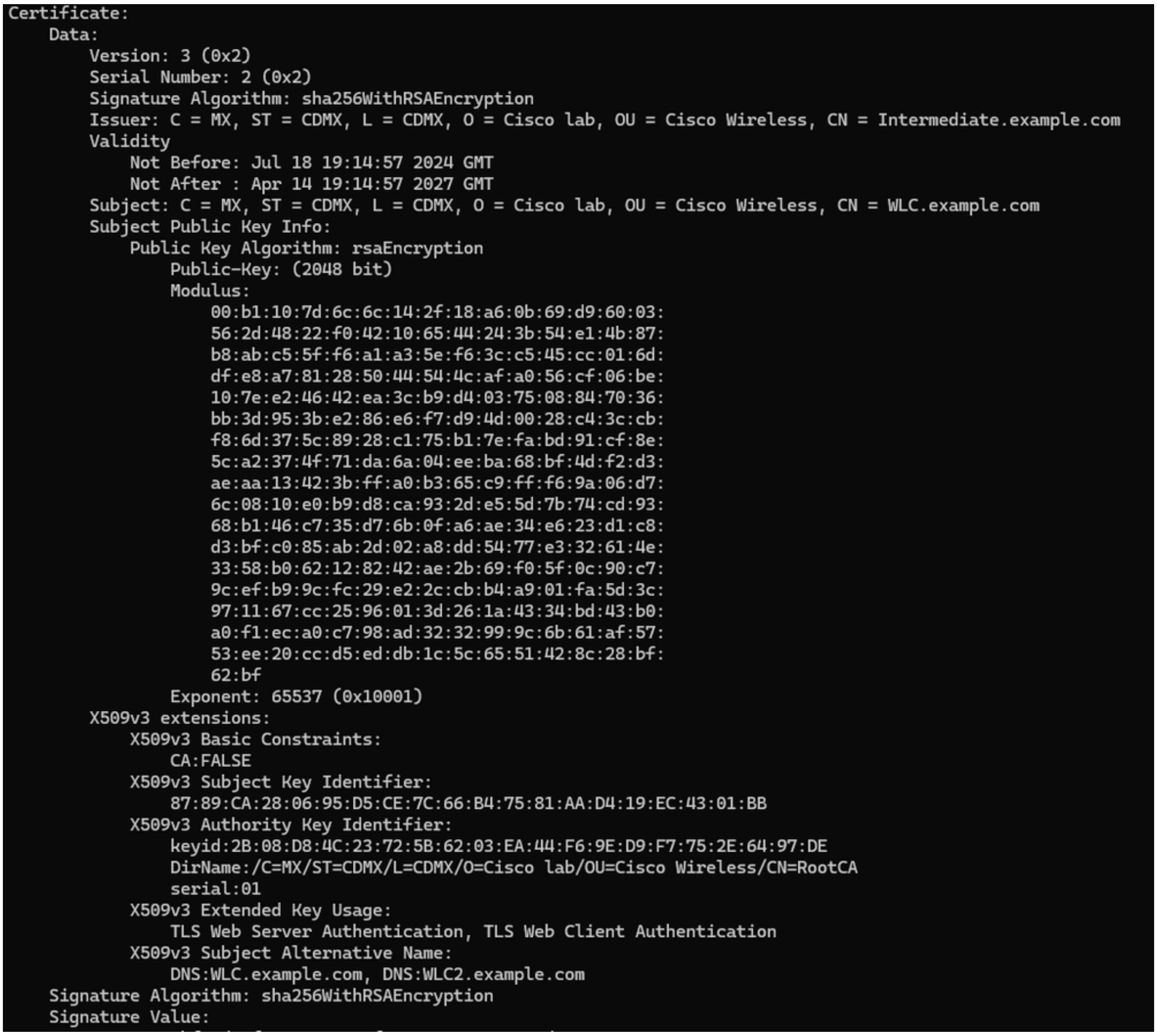
Verify

Verify Certificate Information

To verify the certificate information for the created certificates, on the Linux terminal run the command:

```
openssl x509 -in <path to cert> -text -noout
```

It shows the full certificate information. This is useful to determine the issuer CA of a given certificate or if the certificates contain the required EKUs and SANs:



```
Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number: 2 (0x2)
        Signature Algorithm: sha256WithRSAEncryption
        Issuer: C = MX, ST = CDMX, L = CDMX, O = Cisco lab, OU = Cisco Wireless, CN = Intermediate.example.com
        Validity
            Not Before: Jul 18 19:14:57 2024 GMT
            Not After : Apr 14 19:14:57 2027 GMT
        Subject: C = MX, ST = CDMX, L = CDMX, O = Cisco lab, OU = Cisco Wireless, CN = WLC.example.com
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
                Public-Key: (2048 bit)
                Modulus:
                    00:b1:10:7d:6c:6c:14:2f:18:a6:0b:69:d9:60:03:
                    56:2d:48:22:f0:42:10:65:44:24:3b:54:e1:4b:87:
                    b8:ab:c5:5f:f6:a1:a3:5e:f6:3c:c5:45:cc:01:6d:
                    df:e8:a7:81:28:50:44:54:4c:af:a0:56:cf:06:be:
                    10:7e:e2:46:42:ea:3c:b9:d4:03:75:08:84:70:36:
                    bb:3d:95:3b:e2:86:e6:f7:d9:4d:00:28:c4:3c:cb:
                    f8:6d:37:5c:89:28:c1:75:b1:7e:fa:bd:91:cf:8e:
                    5c:a2:37:4f:71:da:6a:04:ee:ba:68:bf:4d:f2:d3:
                    ae:aa:13:42:3b:ff:a0:b3:65:c9:ff:f6:9a:06:d7:
                    6c:08:10:e0:b9:d8:ca:93:2d:e5:5d:7b:74:cd:93:
                    68:b1:46:c7:35:d7:6b:0f:a6:ae:34:e6:23:d1:c8:
                    d3:bf:c0:85:ab:2d:02:a8:dd:54:77:e3:32:61:4e:
                    33:58:b0:62:12:82:42:ae:2b:69:f0:5f:0c:90:c7:
                    9c:ef:b9:9c:fc:29:e2:2c:cb:b4:a9:01:fa:5d:3c:
                    97:11:67:cc:25:96:01:3d:26:1a:43:34:bd:43:b0:
                    a0:f1:ec:a0:c7:98:ad:32:32:99:9c:6b:61:af:57:
                    53:ee:20:cc:d5:ed:db:1c:5c:65:51:42:8c:28:bf:
                    62:bf
                Exponent: 65537 (0x10001)
        X509v3 extensions:
            X509v3 Basic Constraints:
                CA:FALSE
            X509v3 Subject Key Identifier:
                87:89:CA:28:06:95:D5:CE:7C:66:B4:75:81:AA:D4:19:EC:43:01:BB
            X509v3 Authority Key Identifier:
                keyid:2B:08:D8:4C:23:72:5B:62:03:EA:44:F6:9E:D9:F7:75:2E:64:97:DE
                DirName:/C=MX/ST=CDMX/L=CDMX/O=Cisco lab/OU=Cisco Wireless/CN=RootCA
                serial:01
            X509v3 Extended Key Usage:
                TLS Web Server Authentication, TLS Web Client Authentication
            X509v3 Subject Alternative Name:
                DNS:WLC.example.com, DNS:WLC2.example.com
    Signature Algorithm: sha256WithRSAEncryption
    Signature Value:
```

Cisco IOS XE Device Certificate Information as Shown by OpenSSL

Perform Test Authentication

From the WLC you can test the Radius DTLS functionality with command test aaa group <radis dtls group> <username> <userpassword > new-code

```
9800#test aaa group Radsec testuser Cisco123 new-code
User successfully authenticated

USER ATTRIBUTES

username             0   "testuser"
```

Note: An access reject output on the test command means the WLC received an Access-Reject RADIUS message in which case RADIUS DTLS is working. However it can also indicate of a failure to establish the DTLS tunnel. The test command does not differentiate both scenarios, see the troubleshooting section to identify if there is an issue.

Troubleshoot

To review the cause of a failed authentication you can enable these commands before performing a test authentication.

```
9800#debug radius
9800#debug radius radsec
9800#terminal monitor
```

This is the output of a successful authentication with debugs enabled:

```
9800#test aaa group Radsec testuser Cisco123 new-code
User successfully authenticated

USER ATTRIBUTES

username             0   "testuser"
9800#
Jul 18 21:24:38.301: %PARSER-5-HIDDEN: Warning!!! ' test platform-aaa group server-group Radsec user-nam
Jul 18 21:24:38.313: RADIUS/ENCODE(00000000):Orig. component type = Invalid
Jul 18 21:24:38.313: RADIUS/ENCODE(00000000): dropping service type, "radius-server attribute 6 on-for-
Jul 18 21:24:38.313: RADIUS(00000000): Config NAS IP: 0.0.0.0
Jul 18 21:24:38.313: vrfid: [65535]  ipv6 tableid : [0]
Jul 18 21:24:38.313: idb is NULL
Jul 18 21:24:38.313: RADIUS(00000000): Config NAS IPv6: ::
Jul 18 21:24:38.313: RADIUS(00000000): sending
Jul 18 21:24:38.313: RADIUS/DECODE(00000000): There is no General DB. Want server details may not be sp
Jul 18 21:24:38.313: RADSEC: DTLS default secret
Jul 18 21:24:38.313: RADIUS/ENCODE: Best Local IP-Address 172.16.5.11 for Radius-Server 172.16.18.123
Jul 18 21:24:38.313: RADSEC: DTLS default secret
Jul 18 21:24:38.313: RADIUS(00000000): Send Access-Request to 172.16.18.123:2083 id 53808/10, len 54
RADIUS:  authenticator C3 4E 34 0A 91 EF 42 53 - 7E C8 BB 50 F3 98 B3 14
Jul 18 21:24:38.313: RADIUS:  User-Password       [2]   18  *
Jul 18 21:24:38.313: RADIUS:  User-Name           [1]   10  "testuser"
Jul 18 21:24:38.313: RADIUS:  NAS-IP-Address      [4]   6   172.16.5.11
Jul 18 21:24:38.313: RADIUS_RADSEC_ENQ_WAIT_Q: Success Server(172.16.18.123)/Id(10)
Jul 18 21:24:38.313: RADIUS_RADSEC_CLIENT_PROCESS: Got DATA SEND MSG
Jul 18 21:24:38.313: RADIUS_RADSEC_SOCK_SET:  0 Success
Jul 18 21:24:38.313: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 18 21:24:38.313: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 18 21:24:38.313: RADIUS_RADSEC_HASH_KEY_ADD_CTX: add [radius_radsec ctx(0x7522CE91BAC0)] succeedd f
Jul 18 21:24:38.313: RADIUS_RADSEC_GET_SOURCE_ADDR: Success
Jul 18 21:24:38.313: RADIUS_RADSEC_GET_SOCK_ADDR: Success
Jul 18 21:24:38.313: RADIUS_RADSEC_SET_LOCAL_SOCK: Success
Jul 18 21:24:38.313: RADIUS_RADSEC_SOCK_SET: Success
Jul 18 21:24:38.314: RADIUS_RADSEC_BIND_SOCKET: Success
Jul 18 21:24:38.314: RADIUS_RADSEC_CONN_SET_LPORT: Success
Jul 18 21:24:38.314: RADIUS_RADSEC_CONN_SET_SERVER_PORT: Success
Jul 18 21:24:38.314: RADIUS_RADSEC_CLIENT_HS_START: local port = 54509
Jul 18 21:24:38.314: RADIUS_RADSEC_SOCKET_CONNECT: Success
Jul 18 21:24:38.315: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got radsec_data
Jul 18 21:24:38.315: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got valid rctx, with server_handle B0000019
Jul 18 21:24:38.316: RADIUS_RADSEC_CLIENT_HS_START: TLS handshake in progress...(172.16.18.123/2083)
Jul 18 21:24:38.316: RADIUS_RADSEC_START_CONN_TIMER: Started (172.16.18.123/2083) for 5 secs
Jul 18 21:24:38.316: RADIUS_RADSEC_CONN_STATE_UPDATE: Success - State = 2
Jul 18 21:24:38.318: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.318: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 18 21:24:38.318: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 18 21:24:38.318: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 18 21:24:38.318: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for 
Jul 18 21:24:38.318: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 18 21:24:38.318: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 18 21:24:38.318: RADIUS_RADSEC_START_CONN_TIMER: Started (172.16.18.123/2083) for 5 secs
Jul 18 21:24:38.318: RADIUS_RADSEC_HS_CONTINUE: TLS handshake in progress...(172.16.18.123/2083)
Jul 18 21:24:38.318: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Success
Jul 18 21:24:38.318: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.327: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.327: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 18 21:24:38.327: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 18 21:24:38.327: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 18 21:24:38.327: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for 
Jul 18 21:24:38.327: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 18 21:24:38.327: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 18 21:24:38.391: RADIUS_RADSEC_START_CONN_TIMER: Started (172.16.18.123/2083) for 5 secs
Jul 18 21:24:38.391: RADIUS_RADSEC_HS_CONTINUE: TLS handshake in progress...(172.16.18.123/2083)
Jul 18 21:24:38.391: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Success
Jul 18 21:24:38.391: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.397: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.397: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 18 21:24:38.397: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 18 21:24:38.397: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 18 21:24:38.397: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for
Jul 18 21:24:38.397: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 18 21:24:38.397: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 18 21:24:38.397: RADIUS_RADSEC_HS_CONTINUE: TLS handshake success!(172.16.18.123/2083) <-------- TL
Jul 18 21:24:38.397: RADIUS_RADSEC_CONN_STATE_UPDATE: Success - State = 3
Jul 18 21:24:38.397: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got radsec_data
Jul 18 21:24:38.397: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got valid rctx, with server_handle B0000019
Jul 18 21:24:38.397: RADIUS-RADSEC-HS-SUCCESS: Negotiated Cipher is ECDHE-RSA-AES256-GCM-SHA384
Jul 18 21:24:38.397: RADIUS_RADSEC_START_DATA_SEND: RADSEC HS Done, Start data send (172.16.18.123/2083
Jul 18 21:24:38.397: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Success Server(172.16.18.123)/Id(10)
Jul 18 21:24:38.397: RADIUS_RADSEC_MSG_SEND: RADSEC Write SUCCESS(id=10)
Jul 18 21:24:38.397: RADIUS(00000000): Started 5 sec timeout
Jul 18 21:24:38.397: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Empty Server(172.16.18.123)/Id(-1)
Jul 18 21:24:38.397: RADIUS_RADSEC_START_DATA_SEND: no more data available
Jul 18 21:24:38.397: RADIUS_RADSEC_IDLE_TIMER: Started (172.16.18.123/2083)
Jul 18 21:24:38.397: RADIUS-RADSEC-HS-SUCCESS: Success
Jul 18 21:24:38.397: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Success
Jul 18 21:24:38.397: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.453: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 18 21:24:38.453: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 18 21:24:38.453: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 18 21:24:38.453: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 18 21:24:38.453: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for
Jul 18 21:24:38.453: RADIUS_RADSEC_MSG_RECV: RADSEC Bytes read= 20, Err= 0
Jul 18 21:24:38.453: RADIUS_RADSEC_SOCK_READ_EVENT_HANDLE: Radius length is 113
Jul 18 21:24:38.453: RADIUS_RADSEC_SOCK_READ_EVENT_HANDLE: Going to read rest 93 bytes
Jul 18 21:24:38.453: RADIUS_RADSEC_MSG_RECV: RADSEC Bytes read= 93, Err= 0
Jul 18 21:24:38.453: RADIUS_RADSEC_SOCK_READ_EVENT_HANDLE: linktype = 7 - src port = 2083 - dest port =
Jul 18 21:24:38.453: RADIUS: Received from id 54509/10 172.16.18.123:2083, Access-Accept, len 113 <----
RADIUS:  authenticator 4E CE 96 63 41 4B 43 04 - C7 A2 B5 05 C2 78 A7 0D
Jul 18 21:24:38.453: RADIUS:  User-Name           [1]   10  "testuser"
Jul 18 21:24:38.453: RADIUS:  Class               [25]  83
RADIUS:   43 41 43 53 3A 61 63 31 30 31 32 37 62 64 38 74  [CACS:ac10127bd8t]
RADIUS:   47 58 50 47 4E 63 6C 57 76 2F 39 67 44 66 51 67  [GXPGNclWv/9gDfQg]
RADIUS:   63 4A 76 6C 35 47 72 33 71 71 47 36 4C 66 35 59  [cJvl5Gr3qqG6Lf5Y]
RADIUS:   52 42 2F 7A 57 55 39 59 3A 69 73 65 2D 76 62 65  [RB/zWU9Y:ise-vbe]
RADIUS:   74 61 6E 63 6F 2F 35 31 30 34 33 39 38 32 36 2F  [tanco/510439826/]
RADIUS:   39                 [ 9]
Jul 18 21:24:38.453: RADSEC: DTLS default secret
Jul 18 21:24:38.453: RADIUS/DECODE(00000000): There is no General DB. Reply server details may not be r
Jul 18 21:24:38.453: RADIUS(00000000): Received from id 54509/10
```

Unknown CA Reported by WLC

When the WLC cannot validate certificates provided by ISE, it fails to create the DTLS tunnel and authentications fail.
This is a sample of the debug messages presented when this is the case:

```
9800#test aaa group Radsec testuser Cisco123 new-code
```

```
Jul 19 00:59:09.695: %PARSER-5-HIDDEN: Warning!!! ' test platform-aaa group server-group Radsec user-nam
Jul 19 00:59:09.706: RADIUS/ENCODE(00000000):Orig. component type = Invalid
Jul 19 00:59:09.707: RADIUS/ENCODE(00000000): dropping service type, "radius-server attribute 6 on-for-l
Jul 19 00:59:09.707: RADIUS(00000000): Config NAS IP: 0.0.0.0
Jul 19 00:59:09.707: vrfid: [65535]  ipv6 tableid : [0]
Jul 19 00:59:09.707: idb is NULL
Jul 19 00:59:09.707: RADIUS(00000000): Config NAS IPv6: ::
Jul 19 00:59:09.707: RADIUS(00000000): sending
Jul 19 00:59:09.707: RADIUS/DECODE(00000000): There is no General DB. Want server details may not be sp
Jul 19 00:59:09.707: RADSEC: DTLS default secret
Jul 19 00:59:09.707: RADIUS/ENCODE: Best Local IP-Address 172.16.5.11 for Radius-Server 172.16.18.123
Jul 19 00:59:09.707: RADSEC: DTLS default secret
Jul 19 00:59:09.707: RADIUS(00000000): Send Access-Request to 172.16.18.123:2083 id 52764/13, len 54
RADIUS:  authenticator E8 09 1D B0 72 50 17 E6 - B4 27 F6 E3 18 25 16 64
Jul 19 00:59:09.707: RADIUS:  User-Password       [2]   18  *
Jul 19 00:59:09.707: RADIUS:  User-Name           [1]   10  "testuser"
Jul 19 00:59:09.707: RADIUS:  NAS-IP-Address      [4]   6   172.16.5.11
Jul 19 00:59:09.707: RADIUS_RADSEC_ENQ_WAIT_Q: Success Server(172.16.18.123)/Id(13)
Jul 19 00:59:09.707: RADIUS_RADSEC_CLIENT_PROCESS: Got DATA SEND MSG
Jul 19 00:59:09.707: RADIUS_RADSEC_SOCK_SET:  0 Success
Jul 19 00:59:09.707: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 19 00:59:09.707: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 19 00:59:09.707: RADIUS_RADSEC_HASH_KEY_ADD_CTX: add [radius_radsec ctx(0x7522CE91BAC0)] succeedd f
Jul 19 00:59:09.707: RADIUS_RADSEC_GET_SOURCE_ADDR: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_GET_SOCK_ADDR: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_SET_LOCAL_SOCK: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_SOCK_SET: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_BIND_SOCKET: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_CONN_SET_LPORT: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_CONN_SET_SERVER_PORT: Success
Jul 19 00:59:09.707: RADIUS_RADSEC_CLIENT_HS_START: local port = 49556
Jul 19 00:59:09.707: RADIUS_RADSEC_SOCKET_CONNECT: Success
Jul 19 00:59:09.709: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got radsec_data
Jul 19 00:59:09.709: RADIUS_RADSEC_UPDATE_SVR_REF_CNT: Got valid rctx, with server_handle B0000019
Jul 19 00:59:09.709: RADIUS_RADSEC_CLIENT_HS_START: TLS handshake in progress...(172.16.18.123/2083)
Jul 19 00:59:09.709: RADIUS_RADSEC_START_CONN_TIMER: Started (172.16.18.123/2083) for 5 secsUser reject

uwu-9800#
Jul 19 00:59:09.709: RADIUS_RADSEC_CONN_STATE_UPDATE: Success - State = 2
Jul 19 00:59:09.711: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 19 00:59:09.711: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 19 00:59:09.711: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 19 00:59:09.711: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 19 00:59:09.711: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for 
Jul 19 00:59:09.711: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 19 00:59:09.711: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 19 00:59:09.711: RADIUS_RADSEC_START_CONN_TIMER: Started (172.16.18.123/2083) for 5 secs
Jul 19 00:59:09.711: RADIUS_RADSEC_HS_CONTINUE: TLS handshake in progress...(172.16.18.123/2083)
Jul 19 00:59:09.711: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Success
Jul 19 00:59:09.713: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 19 00:59:09.720: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 19 00:59:09.720: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 19 00:59:09.720: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 19 00:59:09.720: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 19 00:59:09.720: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x7522CE91BAC0:0) get for 
Jul 19 00:59:09.720: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 19 00:59:09.720: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 19 00:59:09.722: RADIUS_RADSEC_HS_CONTINUE: TLS handshake failed!
Jul 19 00:59:09.722: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Success Server(172.16.18.123)/Id(13)
Jul 19 00:59:09.722: RADIUS_RADSEC_FAILOVER_HANDLER:Failng-over to new server = 0x0
Jul 19 00:59:09.722: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Empty Server(172.16.18.123)/Id(-1)
Jul 19 00:59:09.722: RADIUS_RADSEC_FAILOVER_HANDLER: no more data available
Jul 19 00:59:09.722: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 19 00:59:09.722: RADIUS_RADSEC_CONN_CLOSE: Cleaned up timers for Radius RADSEC ctx
Jul 19 00:59:09.722: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 19 00:59:09.722: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 19 00:59:09.722: RADIUS_RADSEC_HASH_KEY_DEL_CTX: remove [radius_radsec  ctx(0x7522CE91BAC0)] succee
Jul 19 00:59:09.722: RADIUS_RADSEC_CONN_CLOSE: Hash table entry removed for RADSEC sock ctx
Jul 19 00:59:09.723: RADIUS_RADSEC_CONN_CLOSE: Success
Jul 19 00:59:09.723: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Failed to complete TLS handshake <----------D
Jul 19 00:59:09.723: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 19 00:59:09.723: RADIUS_RADSEC_CONN_CLOSE: Cleaned up timers for Radius RADSEC ctx
Jul 19 00:59:09.723: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(-1) generated for sock(-1)
Jul 19 00:59:09.723: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(-1) generated for sock(-1)
uwu-9800#
Jul 19 00:59:09.723: RADIUS_RADSEC_HASH_KEY_DEL_CTX: remove [radius_radsec  ctx(0x7522CE91BAC0)] succee
Jul 19 00:59:09.723: RADIUS_RADSEC_CONN_CLOSE: Hash table entry removed for RADSEC sock ctx
Jul 19 00:59:09.723: RADIUS_RADSEC_CONN_CLOSE: Success
Jul 19 00:59:09.723: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Error
Jul 19 00:59:09.723: RADIUS_RADSEC_PROCESS_SOCK_EVENT: failed to hanlde radsec hs event
Jul 19 00:59:09.723: RADIUS/DECODE: No response from radius-server; parse response; FAIL
Jul 19 00:59:09.723: RADIUS/DECODE: Case error(no response/ bad packet/ op decode);parse response; FAIL
Jul 19 00:59:09.723: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
Jul 19 00:59:10.718: %RADSEC_AUDIT_MESSAGE-3-FIPS_AUDIT_FCS_RADSEC_SERVER_CERTIFICATE_VALIDATION_FAILUR
Jul 19 00:59:10.718: %RADSEC_AUDIT_MESSAGE-3-FIPS_AUDIT_FCS_RADSEC_SERVER_IDENTITY_CHECK_FAILURE: Chass
Jul 19 00:59:10.718: %RADSEC_AUDIT_MESSAGE-6-FIPS_AUDIT_FCS_DTLSC_DTLS_SESSION_CLOSED: Chassis 1 R0/0:
```

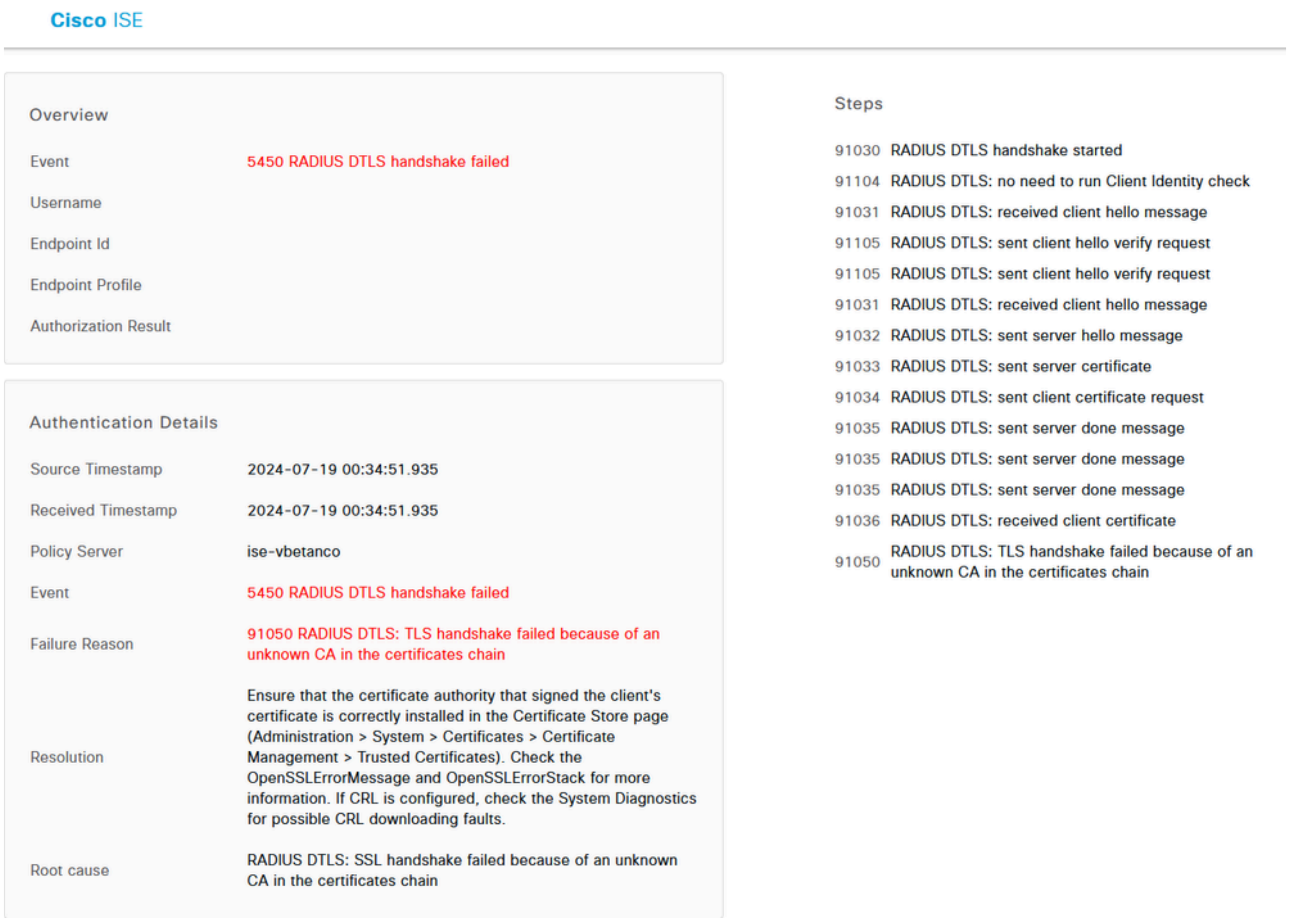
To correct it, ensure the identity configured on the WLC exactly matches one of the SANs included on the ISE certificate:

```
9800(config)#radius server <server name>
9800(config)#dtls match-server-identity hostname <SAN>
```

Make sure that the CA certificate chain is correctly imported on the controller and that the **dtls trustpoint server <trustpoint>** configuration uses the Issuer CA trustpoint.

Unknown CA Reported by ISE

When ISE cannot validate certificates provided by the WLC, it fails to create the DTLS tunnel and authentications fail. This shows up as an error in the RADIUS Live Logs. Navigate to **Operations>Radius>Live logs** to verify.


Cisco ISE

Overview

Event	5450 RADIUS DTLS handshake failed
Username	
Endpoint Id	
Endpoint Profile	
Authorization Result	

Authentication Details

Source Timestamp	2024-07-19 00:34:51.935
Received Timestamp	2024-07-19 00:34:51.935
Policy Server	ise-vbetanco
Event	5450 RADIUS DTLS handshake failed
Failure Reason	91050 RADIUS DTLS: TLS handshake failed because of an unknown CA in the certificates chain
Resolution	Ensure that the certificate authority that signed the client's certificate is correctly installed in the Certificate Store page (Administration > System > Certificates > Certificate Management > Trusted Certificates). Check the OpenSSLErrorMessage and OpenSSLErrorStack for more information. If CRL is configured, check the System Diagnostics for possible CRL downloading faults.
Root cause	RADIUS DTLS: SSL handshake failed because of an unknown CA in the certificates chain

Steps

91030	RADIUS DTLS handshake started
91104	RADIUS DTLS: no need to run Client Identity check
91031	RADIUS DTLS: received client hello message
91105	RADIUS DTLS: sent client hello verify request
91105	RADIUS DTLS: sent client hello verify request
91031	RADIUS DTLS: received client hello message
91032	RADIUS DTLS: sent server hello message
91033	RADIUS DTLS: sent server certificate
91034	RADIUS DTLS: sent client certificate request
91035	RADIUS DTLS: sent server done message
91035	RADIUS DTLS: sent server done message
91035	RADIUS DTLS: sent server done message
91036	RADIUS DTLS: received client certificate
91050	RADIUS DTLS: TLS handshake failed because of an unknown CA in the certificates chain

ISE Live Log Reports DTLS Handshake Failure due to Unknown CA

To correct it, ensure both Intermediate and Root Certificates, select the **Trust for client authentication and Syslog** checkboxes under **Administration>System>Certificates>Trusted certificates**.

Revocation Check is in Place

When the certificates are imported to the WLC, the newly created trustpoints have revocation check enabled. This makes the WLC try to search for a Certificate Revocation List which is not available or reachable and fails the certificate verification.
Ensure the each trustpoint in the verification path for the certificates contains the command revocation-check none .

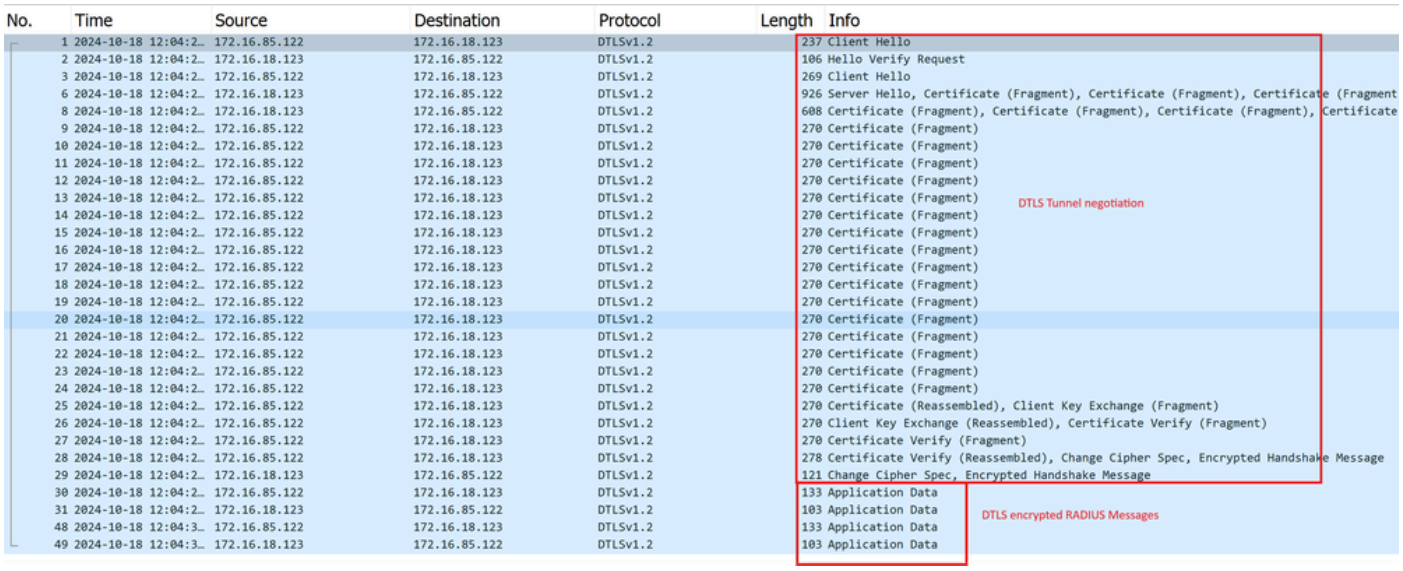
```
Jul 17 21:50:39.064: RADIUS_RADSEC_HASH_KEY_MATCH: hashkey1(0) matches hashkey2(0) TRUE
Jul 17 21:50:39.064: RADIUS_RADSEC_HASH_KEY_GET_CTX: radius radsec  sock_ctx(0x780FB0715978:0) get for 
Jul 17 21:50:39.064: RADIUS_RADSEC_PROCESS_SOCK_EVENT: Handle socket event for TLS handshake(172.16.18.
Jul 17 21:50:39.064: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 17 21:50:39.068: %PKI-3-CRL_FETCH_FAIL: CRL fetch for trustpoint WLC1.pfx failed
                      Reason : Enrollment URL not configured. <------ WLC tries to perform revocation c
Jul 17 21:50:39.070: RADIUS_RADSEC_HS_CONTINUE: TLS handshake failed!
Jul 17 21:50:39.070: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Success Server(172.16.18.123)/Id(2)
Jul 17 21:50:39.070: RADIUS_RADSEC_FAILOVER_HANDLER:Failng-over to new server = 0x0
Jul 17 21:50:39.070: RADIUS_RADSEC_UNQUEUE_WAIT_Q: Empty Server(172.16.18.123)/Id(-1)
Jul 17 21:50:39.070: RADIUS_RADSEC_FAILOVER_HANDLER: no more data available
Jul 17 21:50:39.070: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Cleaned up timers for Radius RADSEC ctx
Jul 17 21:50:39.070: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(0) generated for sock(0)
Jul 17 21:50:39.070: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(0) generated for sock(0)
Jul 17 21:50:39.070: RADIUS_RADSEC_HASH_KEY_DEL_CTX: remove [radius_radsec  ctx(0x780FB0715978)] succee
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Hash table entry removed for RADSEC sock ctx
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Success
Jul 17 21:50:39.070: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Failed to complete TLS handshake
Jul 17 21:50:39.070: RADIUS_RADSEC_STOP_TIMER: Stopped (172.16.18.123/2083)
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Cleaned up timers for Radius RADSEC ctx
Jul 17 21:50:39.070: RADIUS_RADSEC_GENERATE_HASHKEY: hash key(-1) generated for sock(-1)
Jul 17 21:50:39.070: RADIUS_RADSEC_GENERATE_HASHBUCKET: hash bucket(-1) generated for sock(-1)
Jul 17 21:50:39.070: RADIUS_RADSEC_HASH_KEY_DEL_CTX: remove [radius_radsec  ctx(0x780FB0715978)] succee
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Hash table entry removed for RADSEC sock ctx
Jul 17 21:50:39.070: RADIUS_RADSEC_CONN_CLOSE: Success
Jul 17 21:50:39.070: RADIUS_RADSEC_SOCK_TLS_EVENT_HANDLE: Error
Jul 17 21:50:39.070: RADIUS_RADSEC_PROCESS_SOCK_EVENT: failed to hanlde radsec hs event
Jul 17 21:50:39.070: RADIUS_RADSEC_CLIENT_PROCESS: Got Socket Event
```

Troubleshoot DTLS Tunnel Establishment on Packet Capture

The 9800 WLC offers the **Embedded Packet Capture** (EPC) feature which allows you to capture the all the sent and received traffic for a given interface. ISE offers a similar feature called **TCP dump** to monitor incoming and outgoing traffic. When used at the same time, they allow you to analyze the DTLS session establishment traffic from the perspective of both devices.

Please refer to the Cisco Identity Services Engine Administrator Guide for detailed steps to configure TCP dump on ISE. Also refer to the Troubleshoot Catalyst 9800 Wireless LAN Controllers for information to configure the EPC feature on the WLC.

This is an example of a successful DTLS tunnel establishment.



No.	Time	Source	Destination	Protocol	Length	Info
1	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	237	Client Hello
2	2024-10-18 12:04:2…	172.16.18.123	172.16.85.122	DTLSv1.2	106	Hello Verify Request
3	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	269	Client Hello
6	2024-10-18 12:04:2…	172.16.18.123	172.16.85.122	DTLSv1.2	926	Server Hello, Certificate (Fragment), Certificate (Fragment), Certificate (Fragment
8	2024-10-18 12:04:2…	172.16.18.123	172.16.85.122	DTLSv1.2	608	Certificate (Fragment), Certificate (Fragment), Certificate (Fragment), Certificate
9	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
10	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
11	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
12	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
13	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
14	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
15	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
16	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
17	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
18	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
19	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
20	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
21	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
22	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
23	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
24	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Fragment)
25	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate (Reassembled), Client Key Exchange (Fragment)
26	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Client Key Exchange (Reassembled), Certificate Verify (Fragment)
27	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	270	Certificate Verify (Fragment)
28	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	278	Certificate Verify (Reassembled), Change Cipher Spec, Encrypted Handshake Message
29	2024-10-18 12:04:2…	172.16.18.123	172.16.85.122	DTLSv1.2	121	Change Cipher Spec, Encrypted Handshake Message
30	2024-10-18 12:04:2…	172.16.85.122	172.16.18.123	DTLSv1.2	133	Application Data
31	2024-10-18 12:04:2…	172.16.18.123	172.16.85.122	DTLSv1.2	103	Application Data
48	2024-10-18 12:04:3…	172.16.85.122	172.16.18.123	DTLSv1.2	133	Application Data
49	2024-10-18 12:04:3…	172.16.18.123	172.16.85.122	DTLSv1.2	103	Application Data

Packet Capture of a RADIUS DTLS Tunnel Negotiation and Encrypted Messages

Packet captures show how the DTLS tunnel establishment happens. If there is an issue with the negotiation, from lost traffic between devices or DTLS encrypted alert packets, the packet capture helps you identify the problem.