Application Note

Audio/Video, Desktop Sharing Services on Cisco Unified Communications Manager Release 11.5 and Microsoft Skype for Business Server

Table of Contents

Introduction

This document describes the steps and configurations necessary for integrating Cisco Unified Communications Manager (Cisco UCM) release 11.5, Cisco Expressway-C and E release X8.9 and Microsoft Skype for Business (6.0.9319.0) to interoperate in a single domain. Endpoints are configured on both Cisco UCM and Skype for Business Server. The goal of this integration is to enable end users on Cisco CUCM and Skype for Business to make end to end Audio/Video (AV) calls, ad hoc conference calls and share desktop.

Key Points:

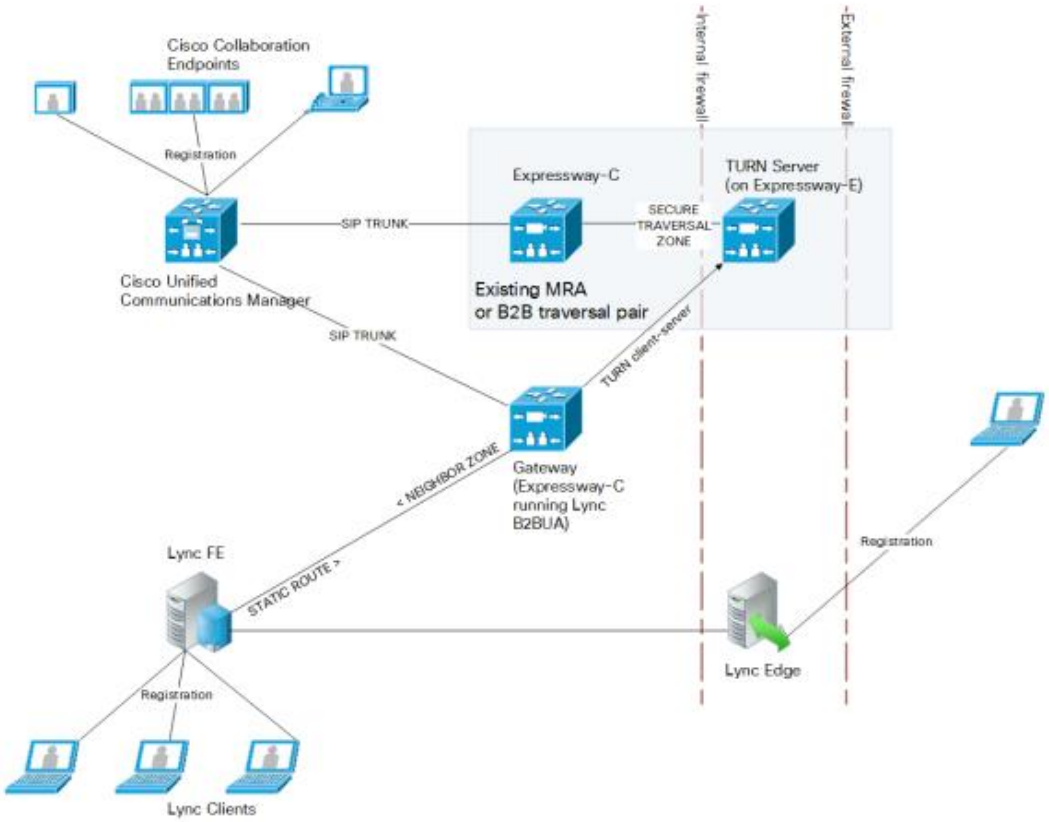
- This testing has been performed with IPv4 using TLS for signaling between Cisco UCM, Microsoft Skype for Business Server, Cisco Expressway-C & Cisco Expressway-E
- Though the solution has been tested with signaling enabled for TLS, it is not mandatory to use TLS and can be deployed with TCP
- Basic Audio/video calls and desktop sharing between Cisco and skype clients works successfully.

The following items were tested:

AV:

- Basic outbound and inbound calling between Skype for Business, Cisco UCM and Jabber users with complete audio and video
- Ad hoc conference
- Desktop Share
- Call hold and resume
- Call transfer
- Call forward
- Call park
- Voicemail deposit/retrieval

Network Topology



System Components

Hardware Requirements

The following hardware was tested

- Cisco UCS-C240-M3S VMWare Host running ESXi 5.5
- Microsoft Windows Server 2012 running Hyper-V
- Cisco End Points DX70, DX80

Software Requirements

The following software was tested:

- Cisco Unified Communications Manager version 11.5.1.11900-26
- Microsoft Skype for Business Server version 6.0.9319.0
- Cisco Expressway-C version X8.9
- Jabber Client for Windows Version 11.6.0 Build 35037
- Skype for Business Android Client (6.0.0.8)

- Skype for Business iOS Client (6.7.0.216)
- Skype for Business Windows Mobile Client (6.3.1558.0)

Features

This section lists supported and unsupported features. Deviance from the configuration presented in this guide is not supported by Cisco. Please see the Limitations section below for more information.

Features Supported:

AV:

- Basic outbound and inbound calling between Skype for Business, Cisco UCM and Jabber users
- Call hold and resume
- Conference

Features Not Supported or Not Tested:

AV:

- Call transfer using Android mobile clients for Skype for Business is not supported

Caveats

These are the known limitations, caveats, or integration issues:

- Basic audio only calls from Cisco users towards iOS clients fail.
- Call transfer from Skype for Business mobile clients to Cisco users are failing.
- Call hold/resume on endpoint fails (call drops) for a call from Skype for Business mobile client to cisco end point and cisco endpoint initiates the hold/resume.
- Call hold on Cisco endpoint fails with one way audio for a call from cisco endpoint to Skype for Business mobile client and cisco end point initiates the hold/resume.
- Call hold on Cisco end point fails with no audio (video is fine) for a video call from cisco endpoint to Skype for Business mobile client and cisco end point initiates the hold/resume.

Infrastructure Configuration

Cisco Certificates

Certificates secure client and server identities. After root certificates are installed, certificates get added to the root trust stores to secure connections between users and hosts, including devices and application users.

For best practices on installing certificates in CUCM, Expressway servers, please refer to the documentations at

CUCM:

http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cucm/admin/11_5_1/CUCM_BK_A09578D7_00_admin-guide-cucm-imp_1151/CUCM_BK_A09578D7_00_admin-guide-for-cucm-1105_chapter_01110.pdf

Expressway:

http://www.cisco.com/c/en/us/support/unified-communications/expressway-series/products-installation-and-configuration-guides-list.html

Note: The below configuration uses TLS with port 5061 between Skype for Business Server and Expressway-C; Expressway-C and Cisco UCM; Cisco UCM and Expressway-C . TLS is not a mandate to configure the supported features, if you are using TCP please use the default TCP port 5060.

Active Directory Root Certificate Configuration

User Configuration

1. In Active Directory, open Active Directory Users and Computers
2. Right click on Users, navigate to New->User
3. Enter the details of users as shown in the screen shot below

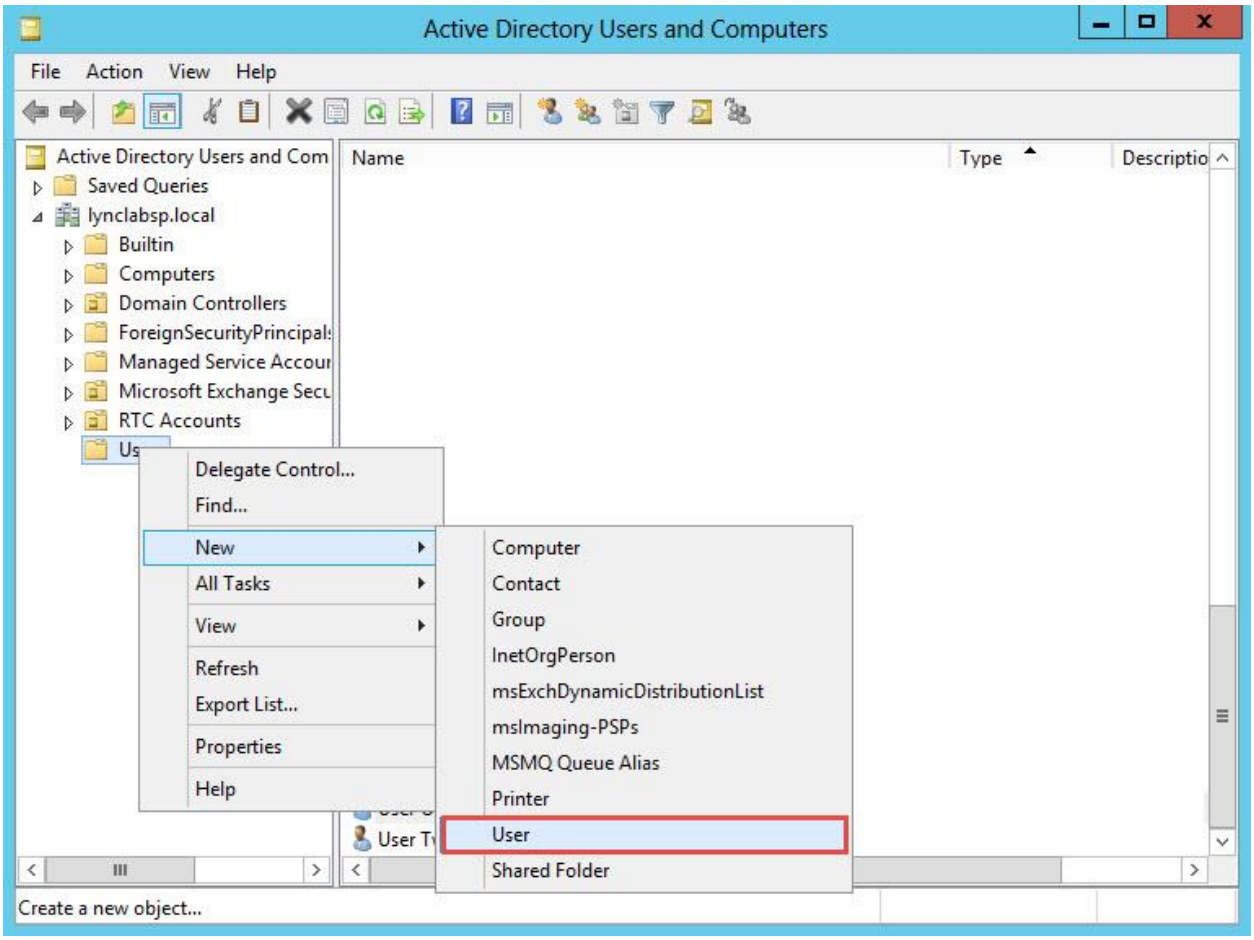


Figure 1: Active Directory Users and Computers

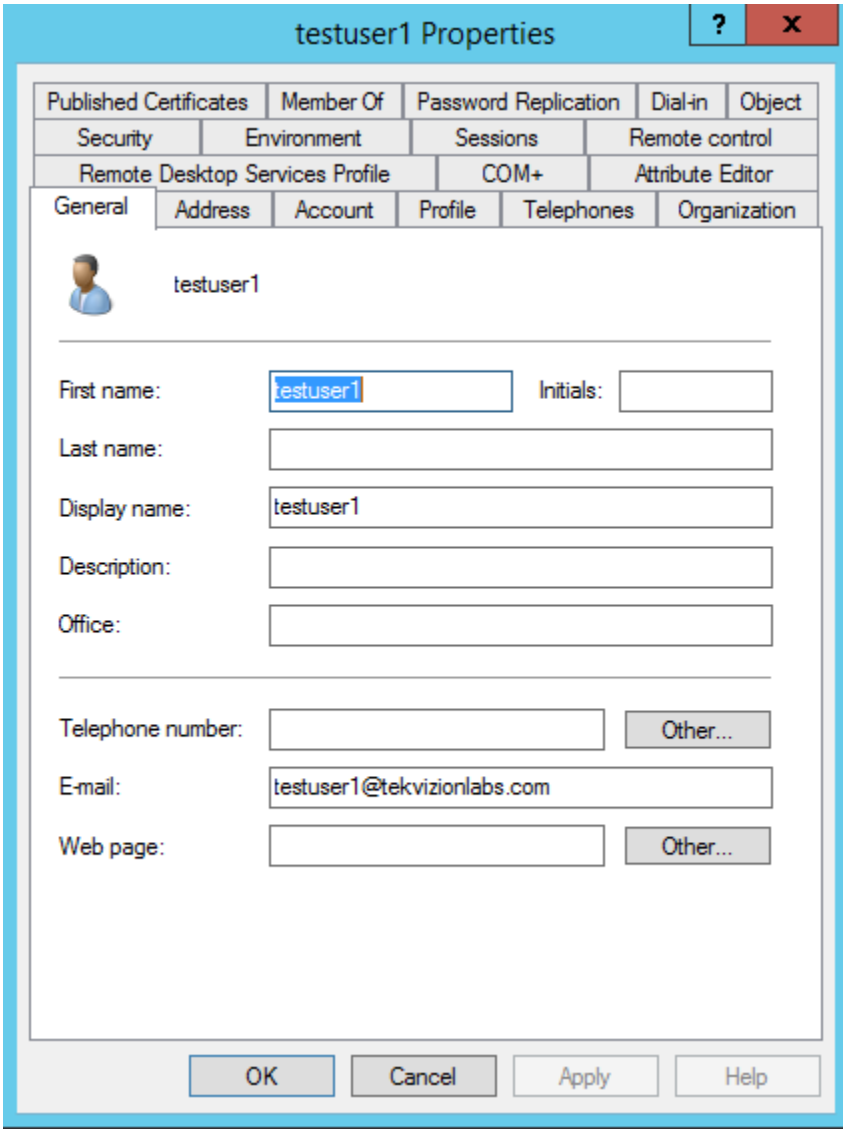


Figure 2: Active Directory User-1

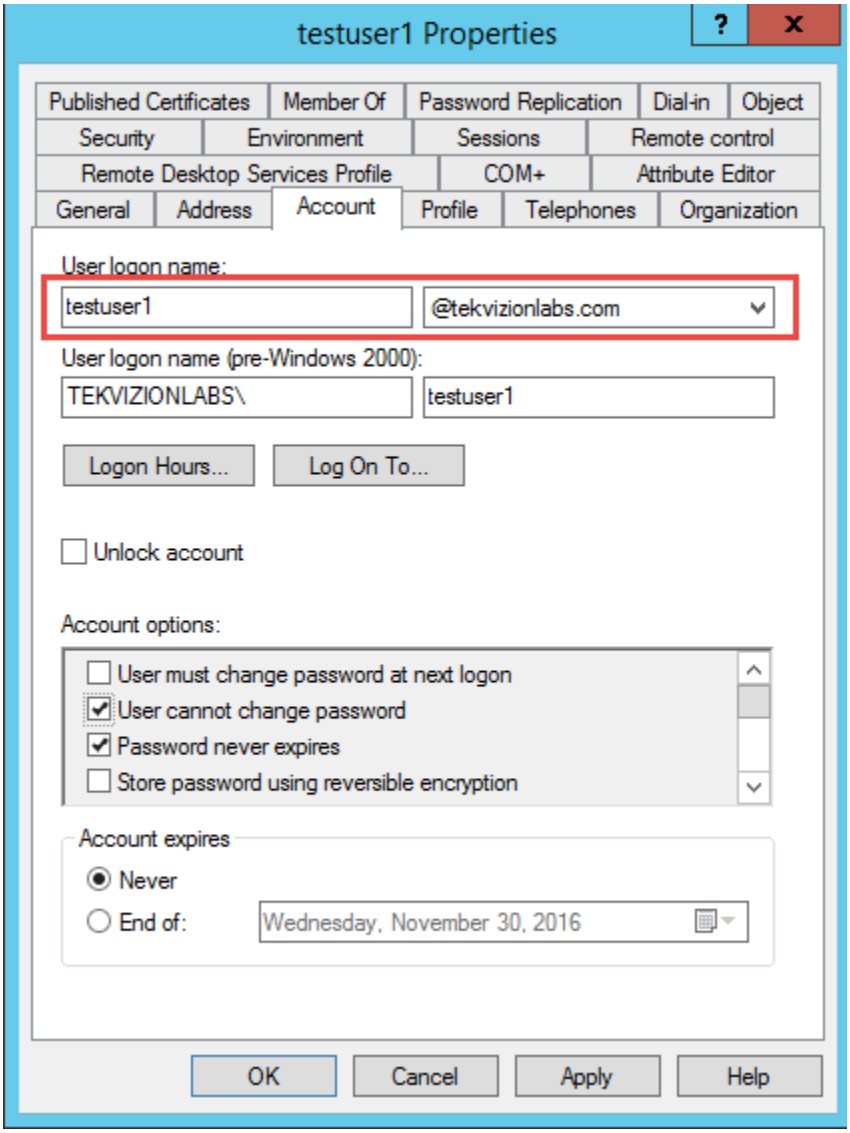


Figure 3: Active Directory User-2

Create a Certificate Template in the Certificate Authority

The default certificate templates are not provisioned with required client and server authentication, and have only server authentication enabled. So, a custom template with both client and server authentication is required. The following captures illustrate the steps required to create a client server authentication certificate template to be used during the certificate generation.

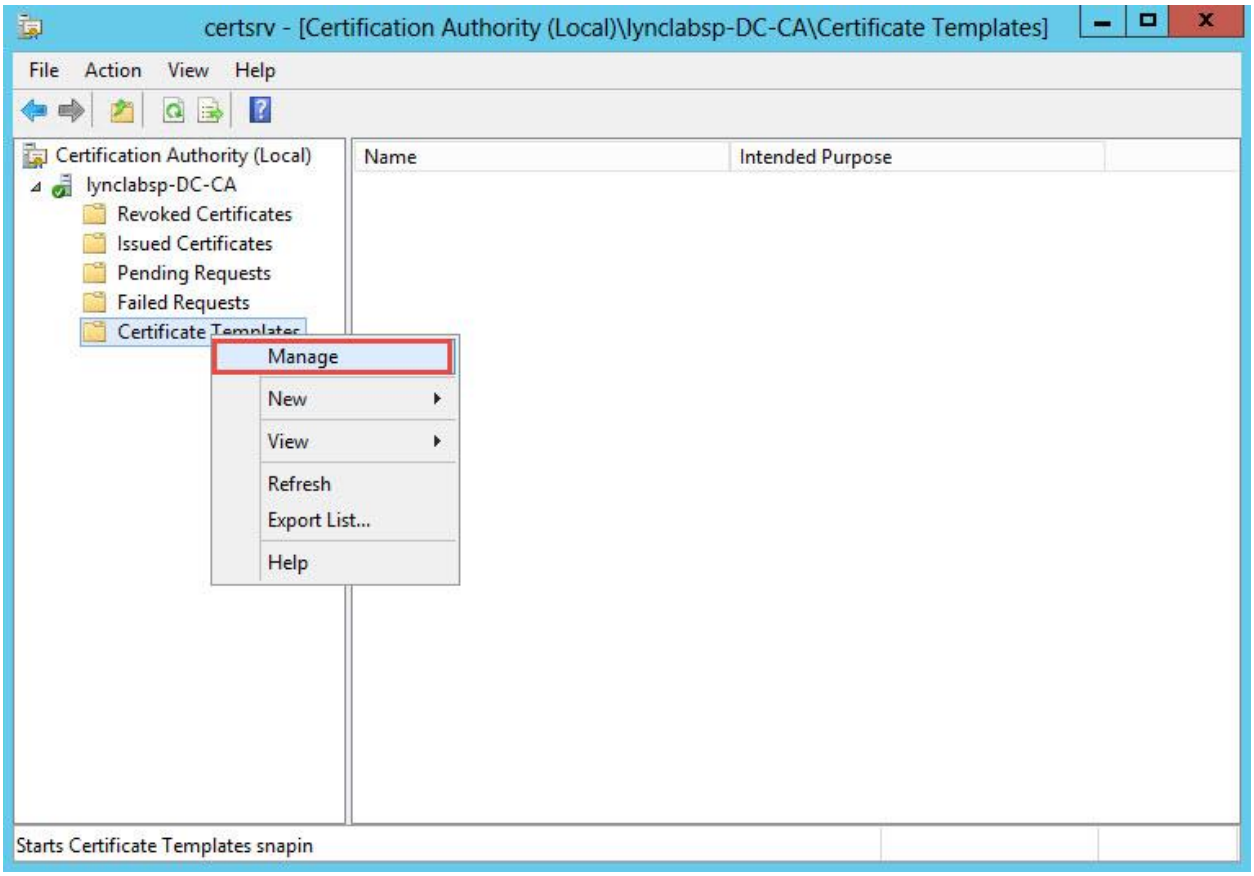


Figure 4: Certificate Authority- Create New Certificate Template-1

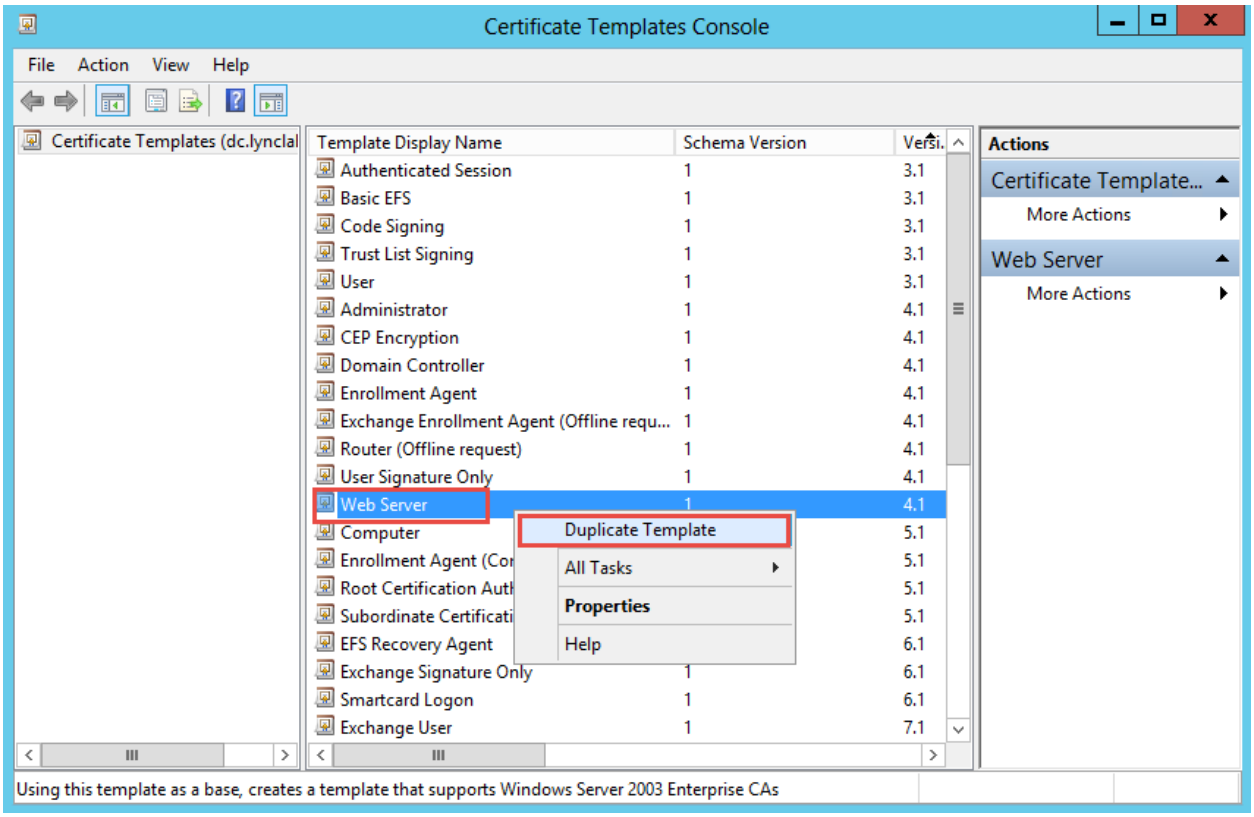


Figure 5: Certificate Authority- Create New Certificate Template-2

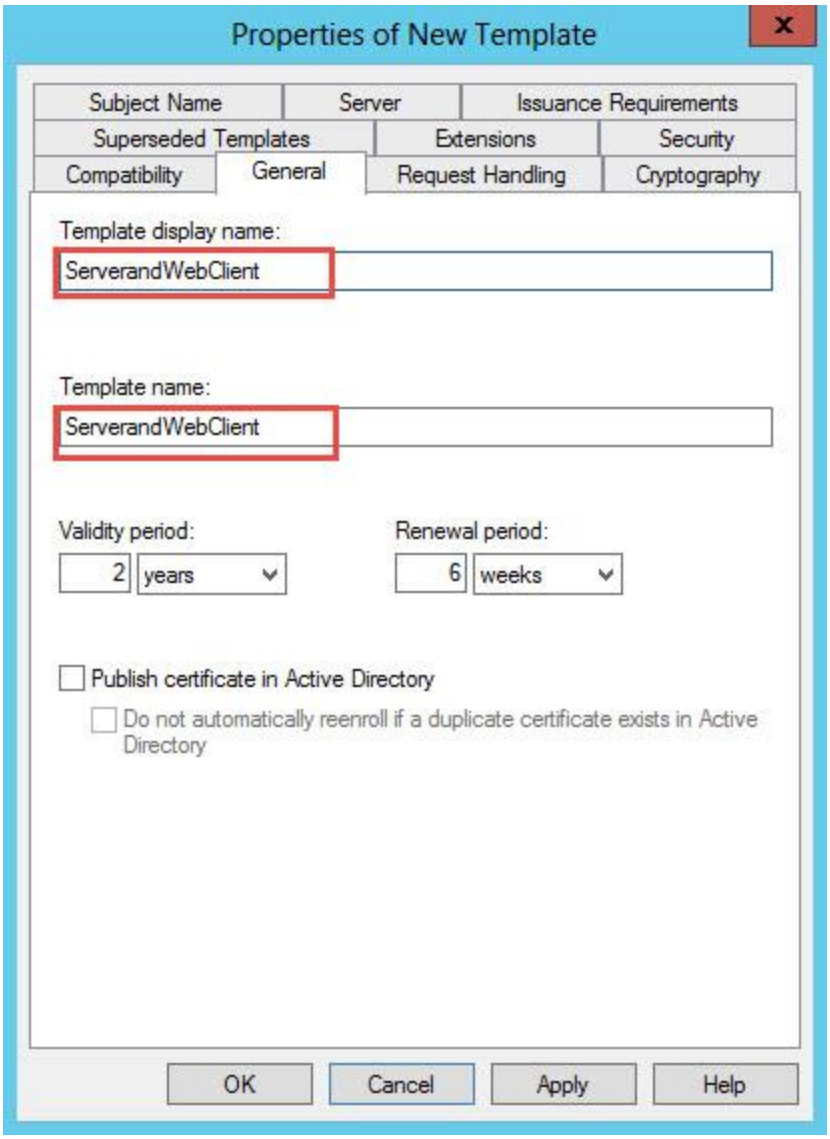


Figure 6: Certificate Authority- Create New Certificate Template-3

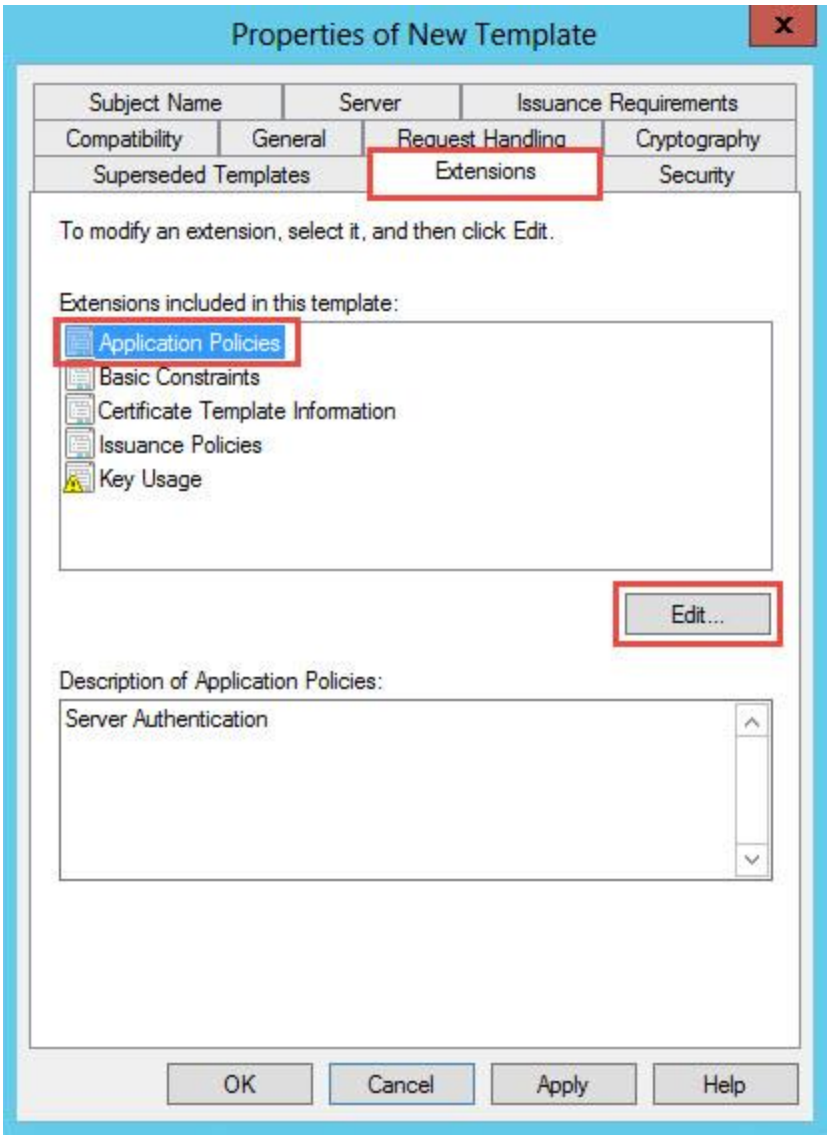


Figure 7: Certificate Authority- Create New Certificate Template-4

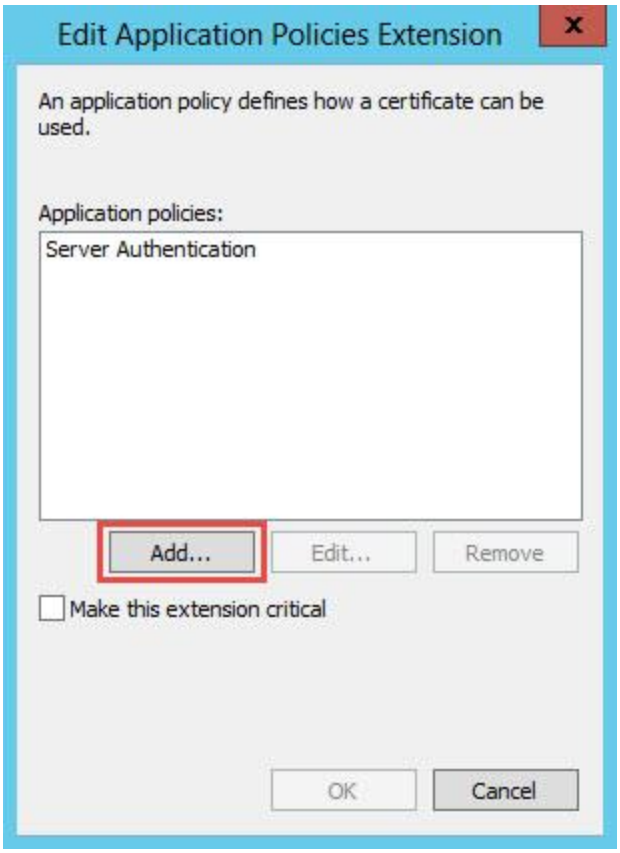


Figure 8: Certificate Authority- Create New Certificate Template-5

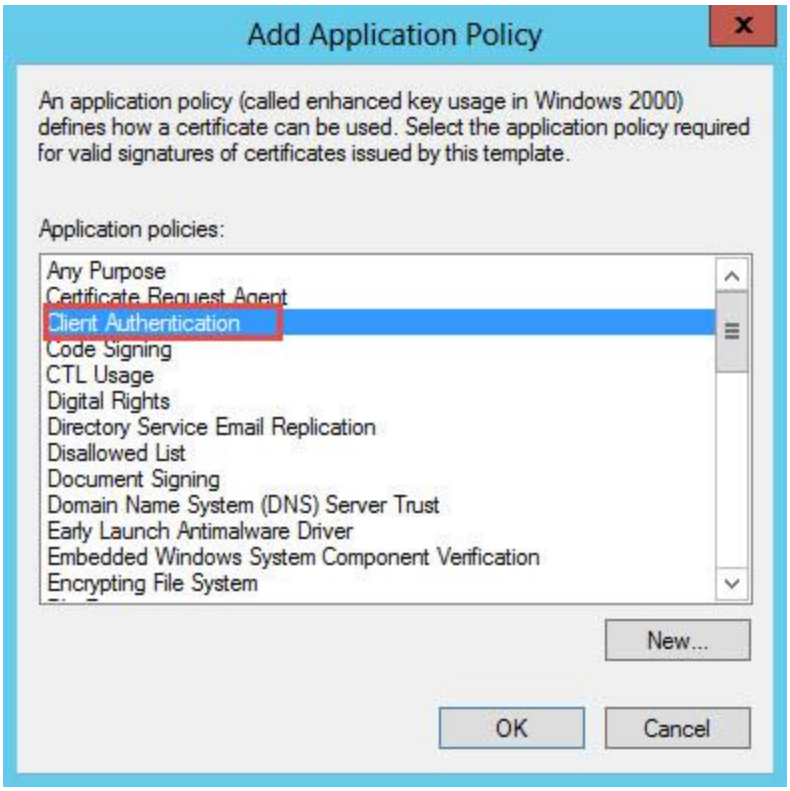


Figure 9: Certificate Authority- Create New Certificate Template-6

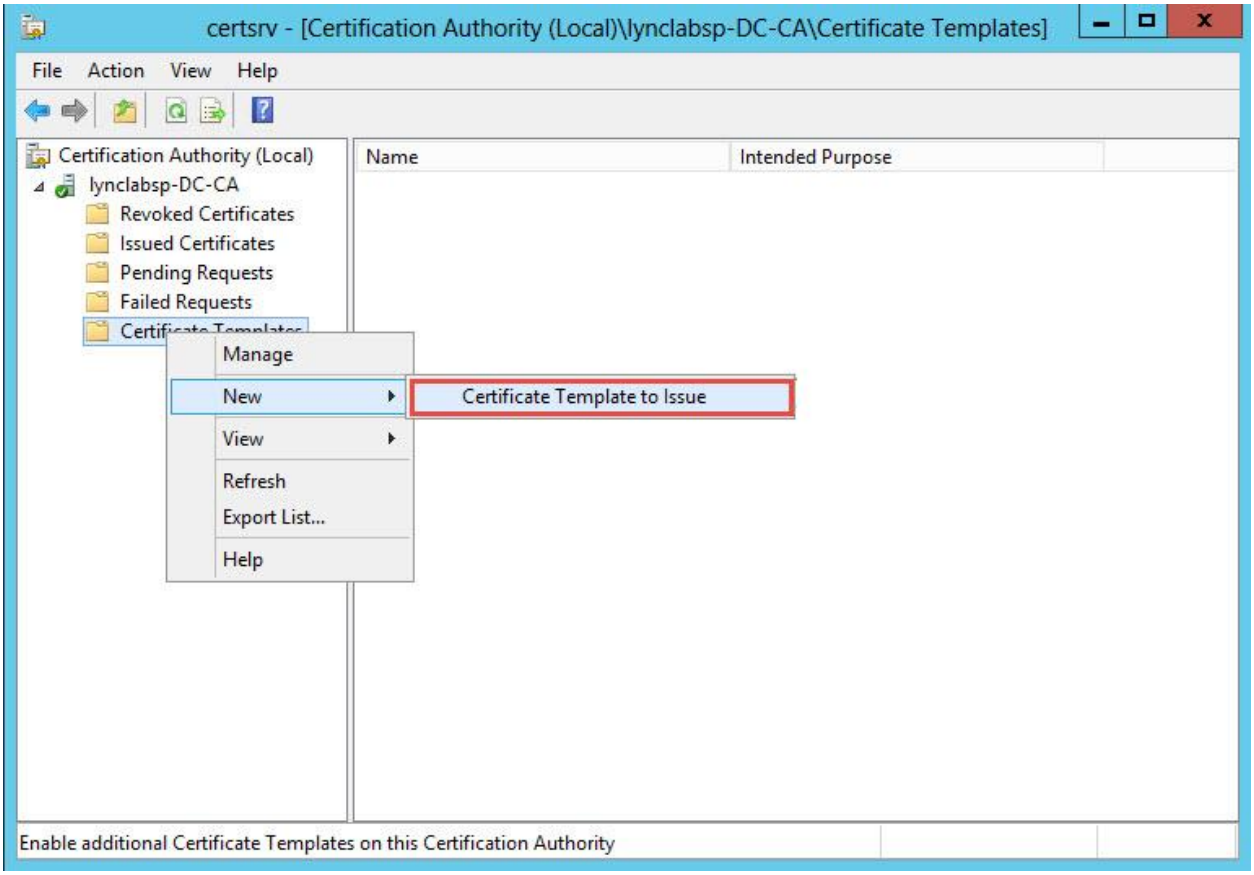


Figure 10: Certificate Authority- Create New Certificate Template-7

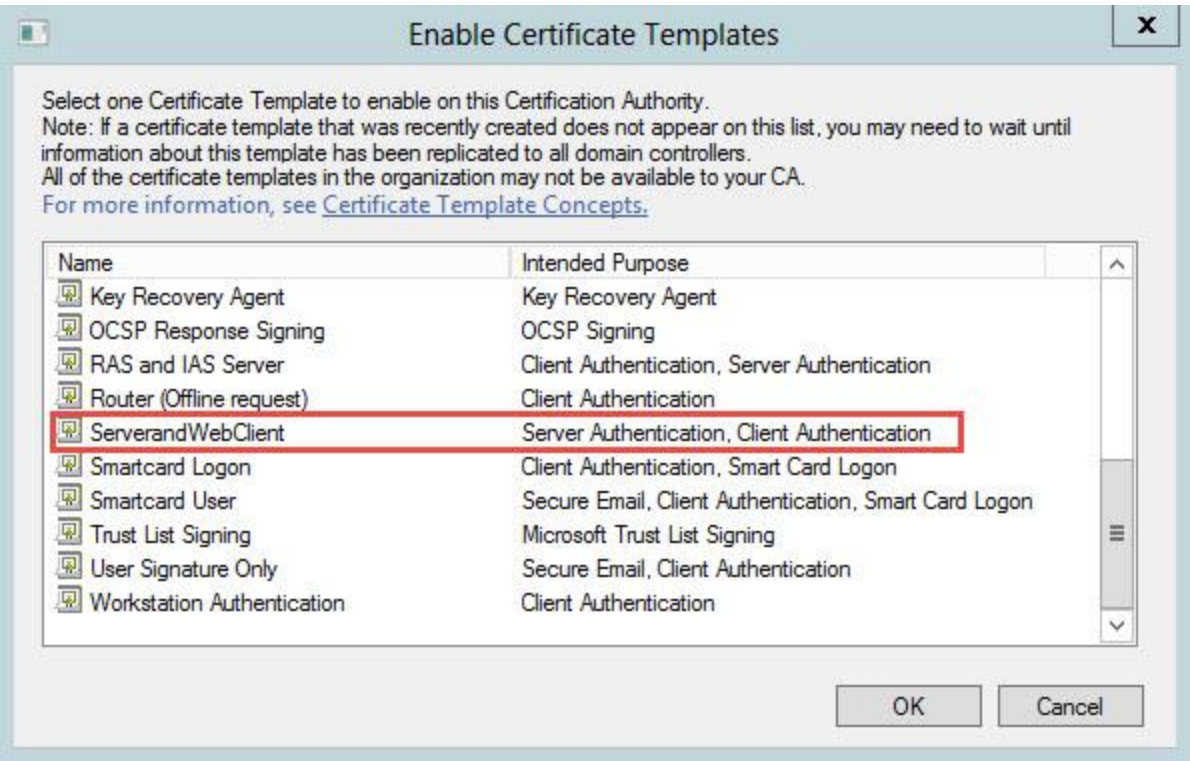


Figure 11: Certificate Authority- Create New Certificate Template-8

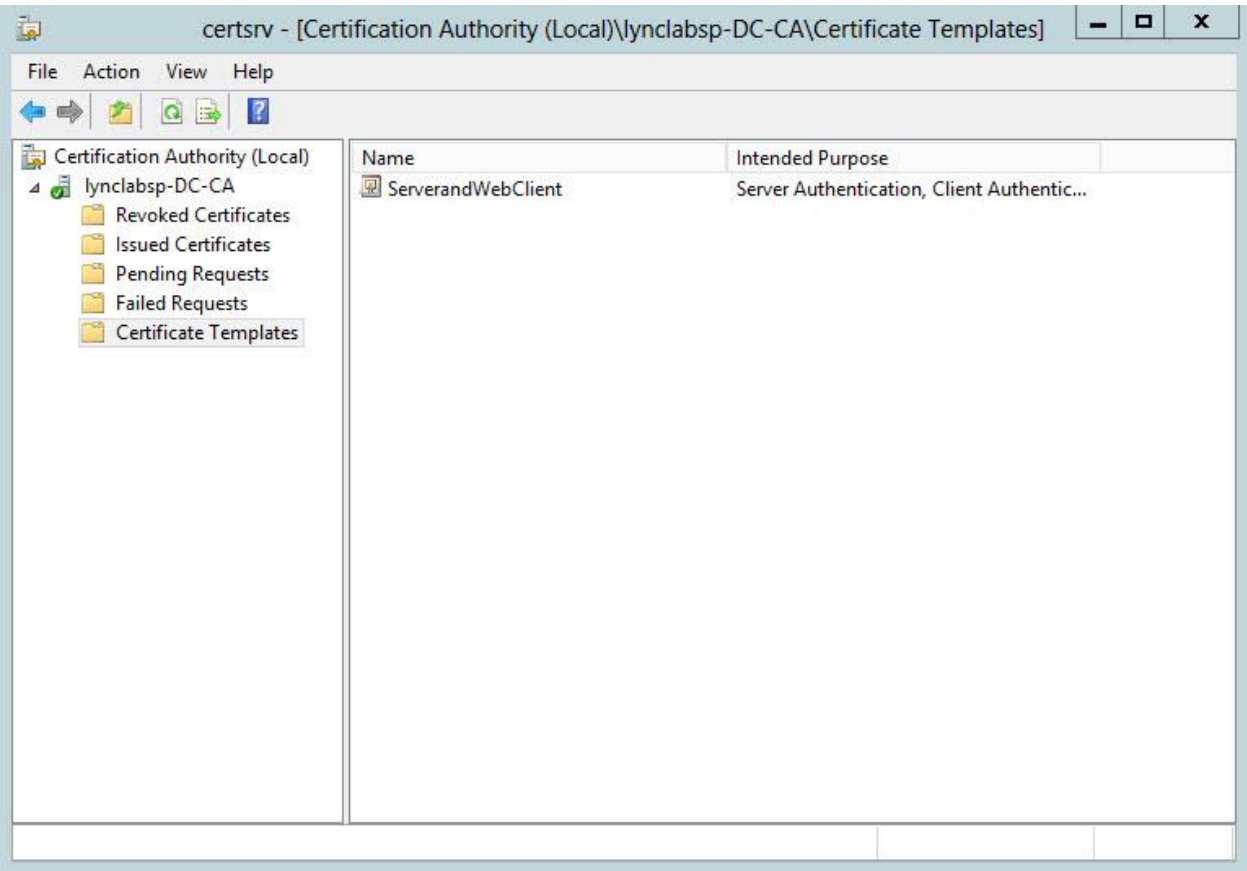


Figure 12: Certificate Authority- Create New Certificate Template-9

Submit a certificate request in the Certificate Authority

Below is the process for creating a certificate request in the Certificate Authority

1. Navigate to https://<IP_Address_of_CA>/certsrv

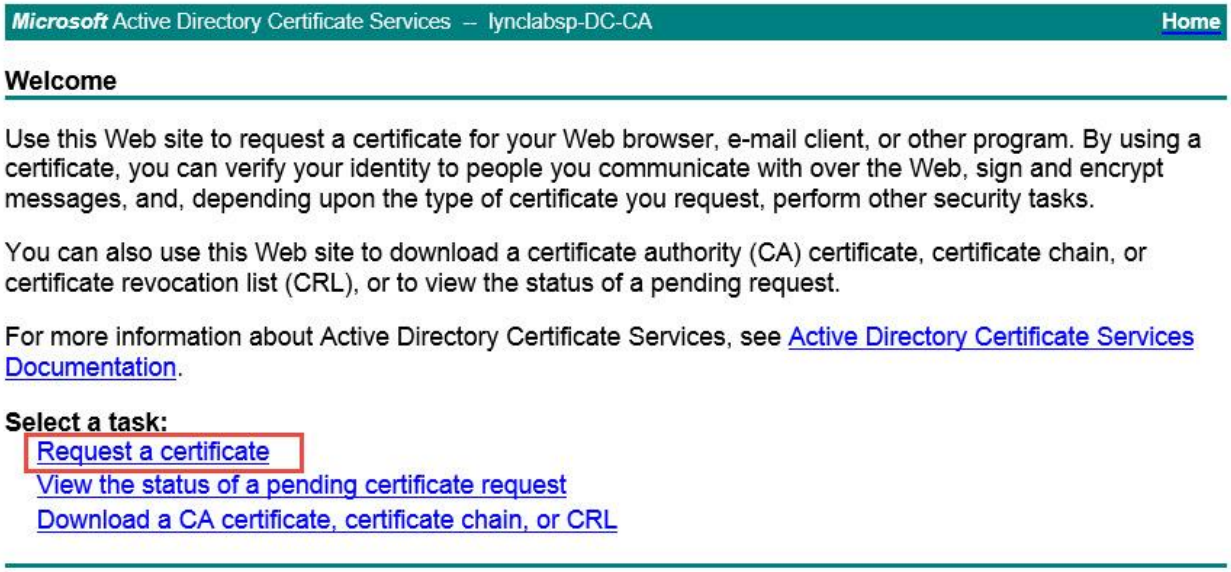


Figure 13: Certificate Authority-Certificate Request-1

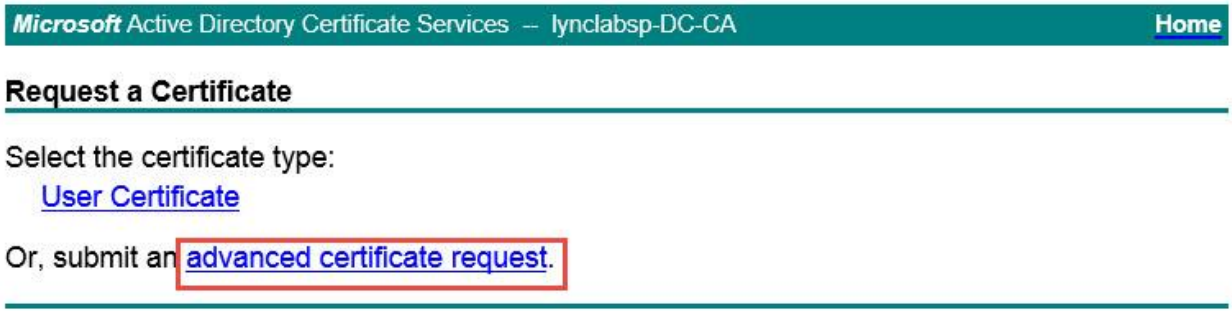


Figure 14: Certificate Authority-Certificate Request-2

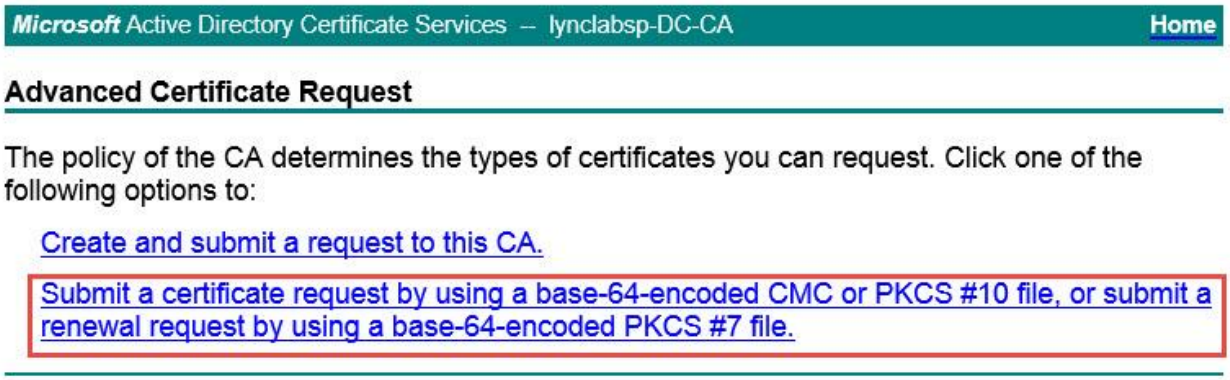


Figure 15: Certificate Authority-Certificate Request-3

2. Copy the Generated CSR in to the text field shown below
3. Select the Certificate Template 'ServerandWebClient', this is the template we have created in [Create a Certificate Template in the Certificate Authority]
4. Click submit and download the certificate

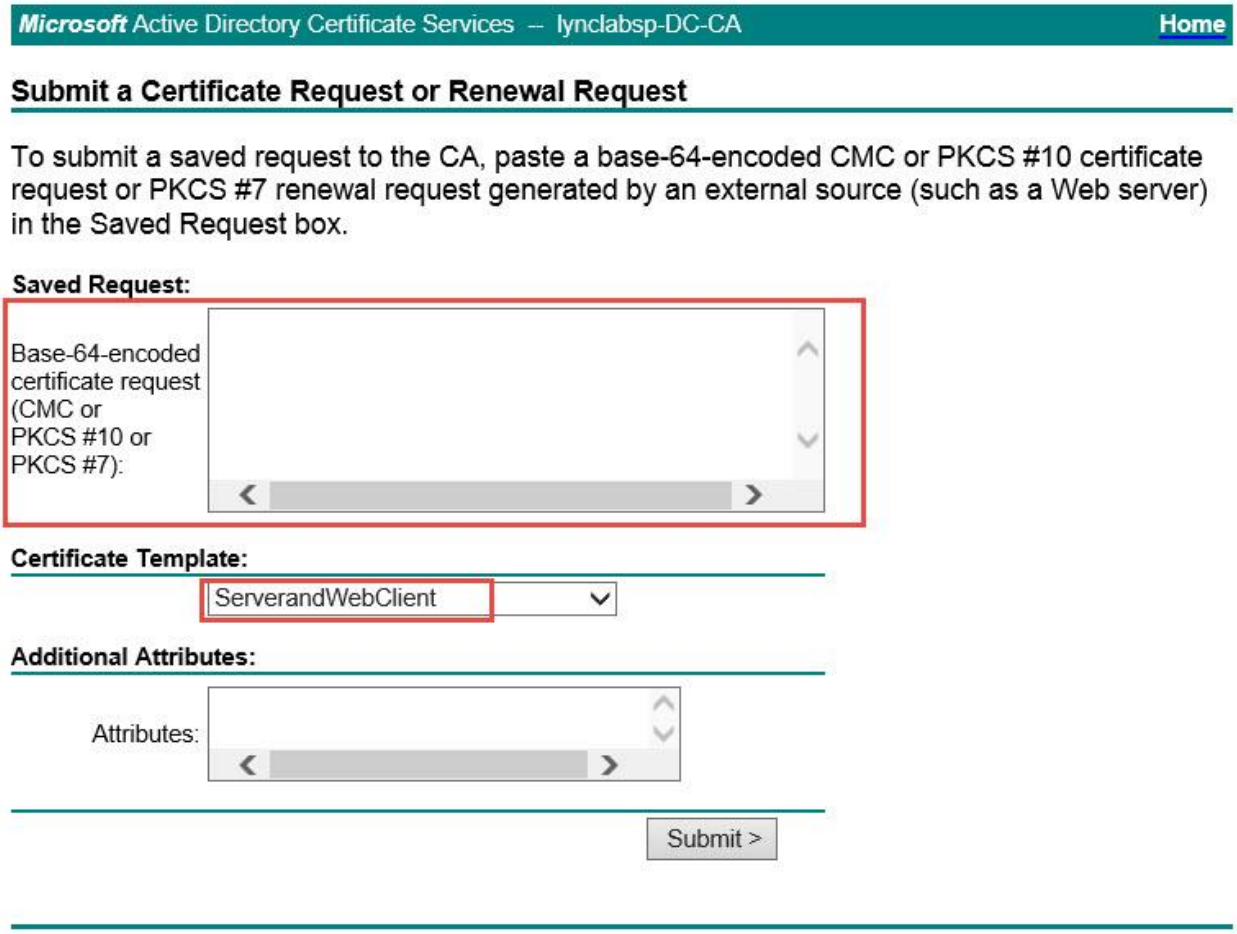


Figure 16: Certificate Authority-Certificate Request-4

Download a root certificate from CA

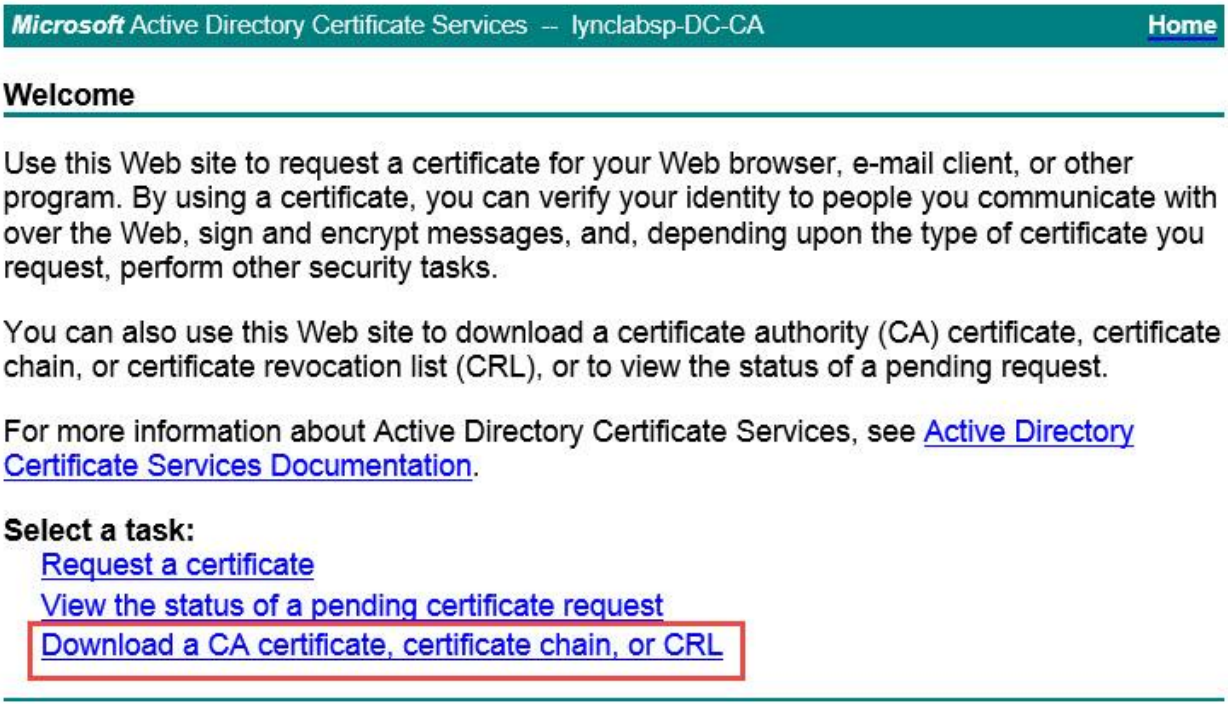


Figure 17: Certificate Authority-Download CA certificate-1

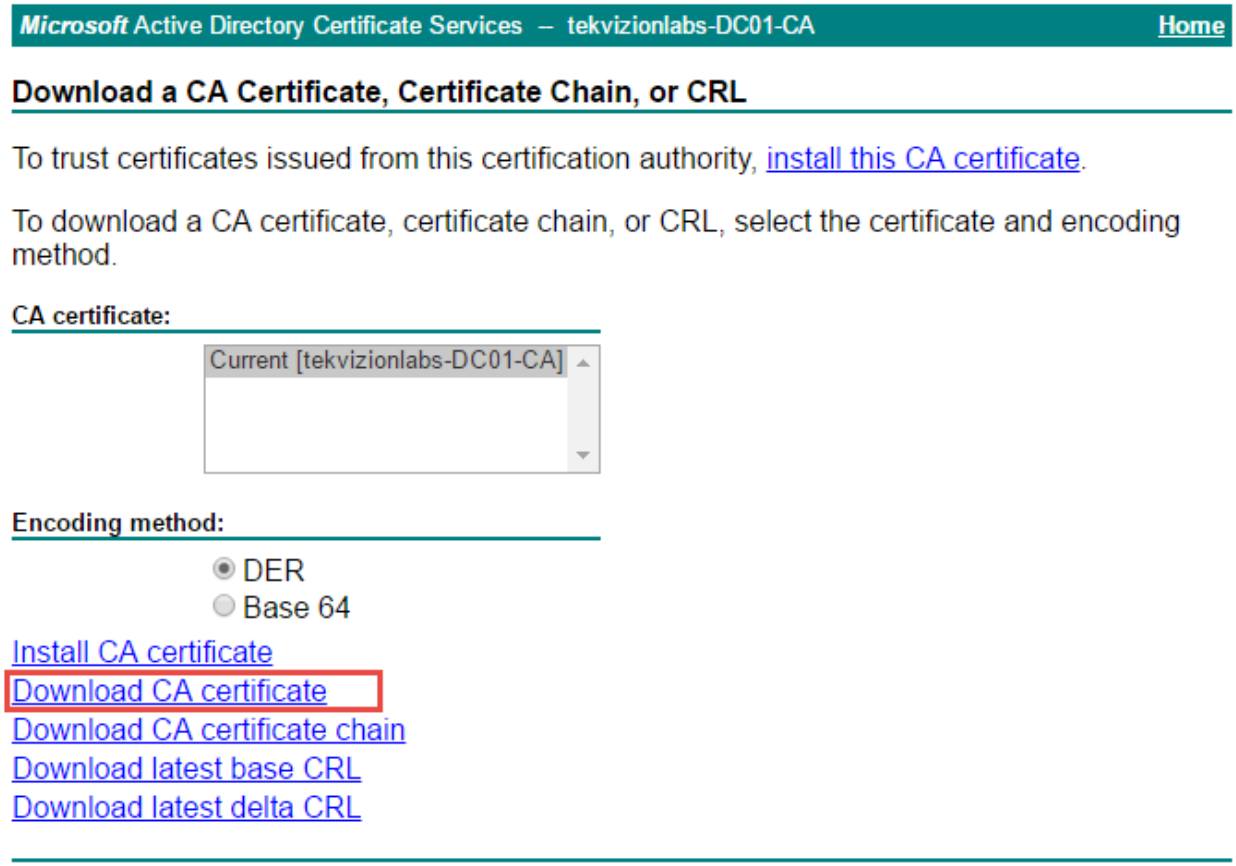


Figure 18: Certificate Authority-Download CA certificate-2

Cisco UCM Configuration

Loading certificates on Cisco UCM

Navigation: Cisco Unified OS Administration/Security->Certificate Management

Cisco UCM should trust Expressway-C

Cisco UCM Server Certificate

Cisco UCM by default has a self-signed certificate installed. This should be replaced with a certificate generated from a trusted certificate authority.

Generate a CSR

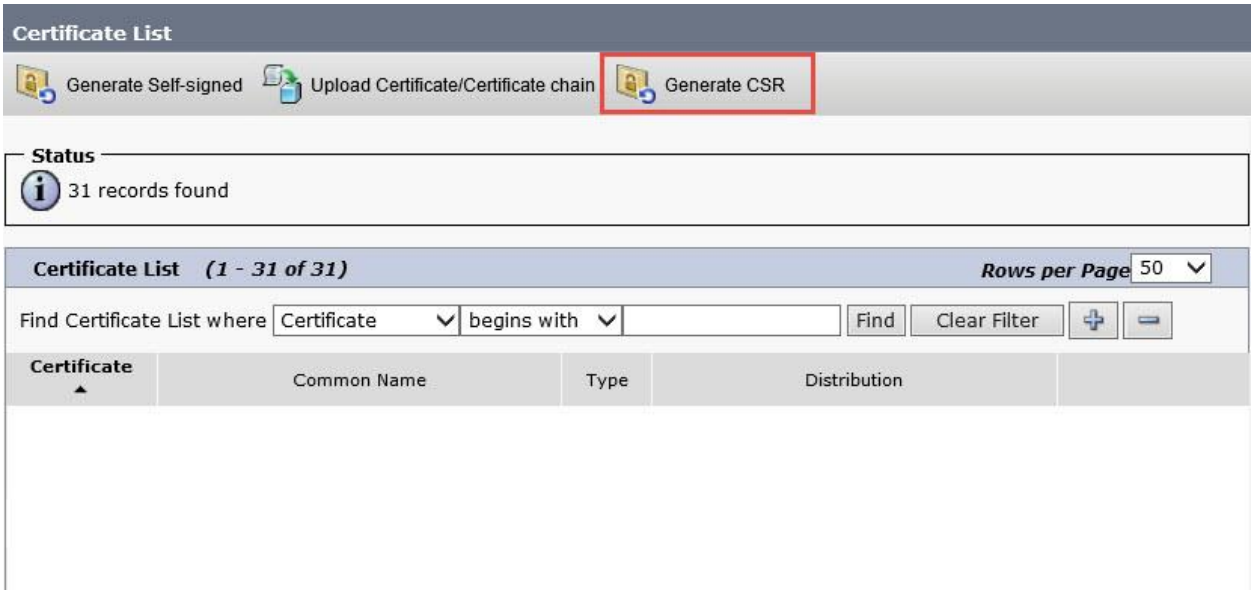


Figure 19: Cisco UCM Generate CSR-1

1. Set **Certificate Purpose:** CallManager
2. Set **Distribution:** This will be the node to which you are generating a certificate
3. Set **Common Name:** This will be the node to which you are generating a certificate
4. Set **Parent Domain:** This will be the domain of the UCM node

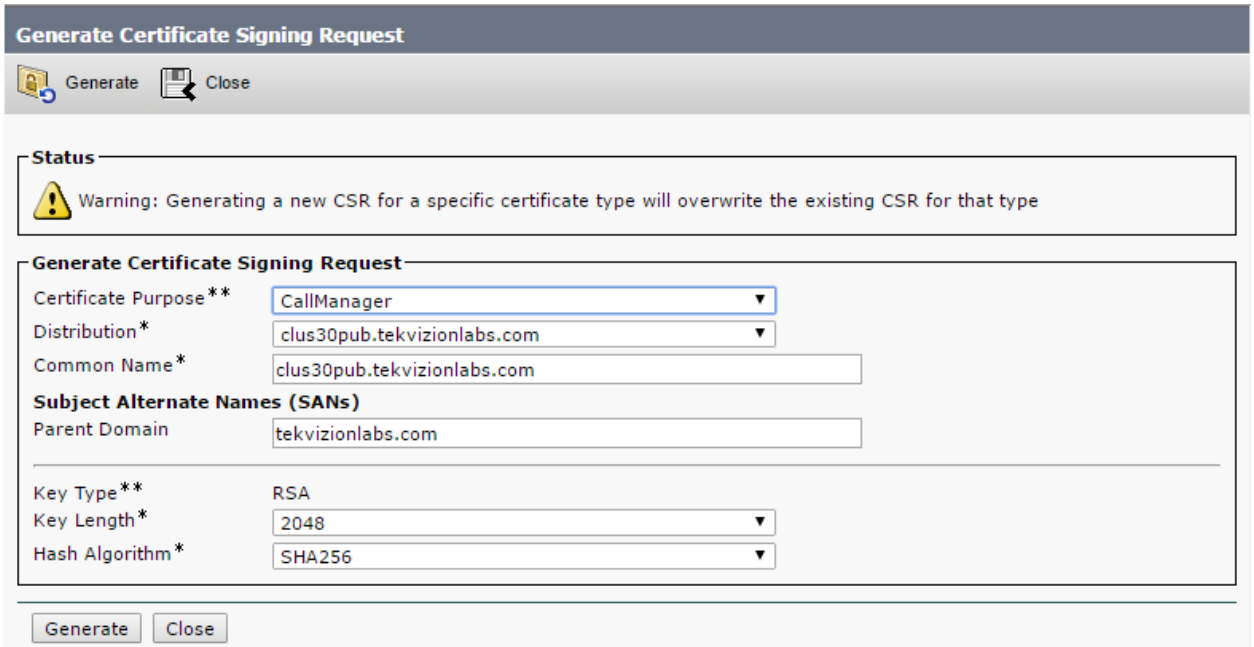


Figure 20: Cisco UCM Generate CSR-2

Once the CSR is created, open the CSR, copy the content of the CSR and follow the steps shown in Submit a certificate request in the Certificate Authority for creating a certificate request and downloading the certificate

Upload root certificate to Cisco UCM

Follow the instructions in Download a root certificate from CA to download the root certificate authority that issued the Expressway-C certificate

1. Click Upload Certificate/Certificate Chain
2. Select **Certificate Purpose:** Call Manager-trust

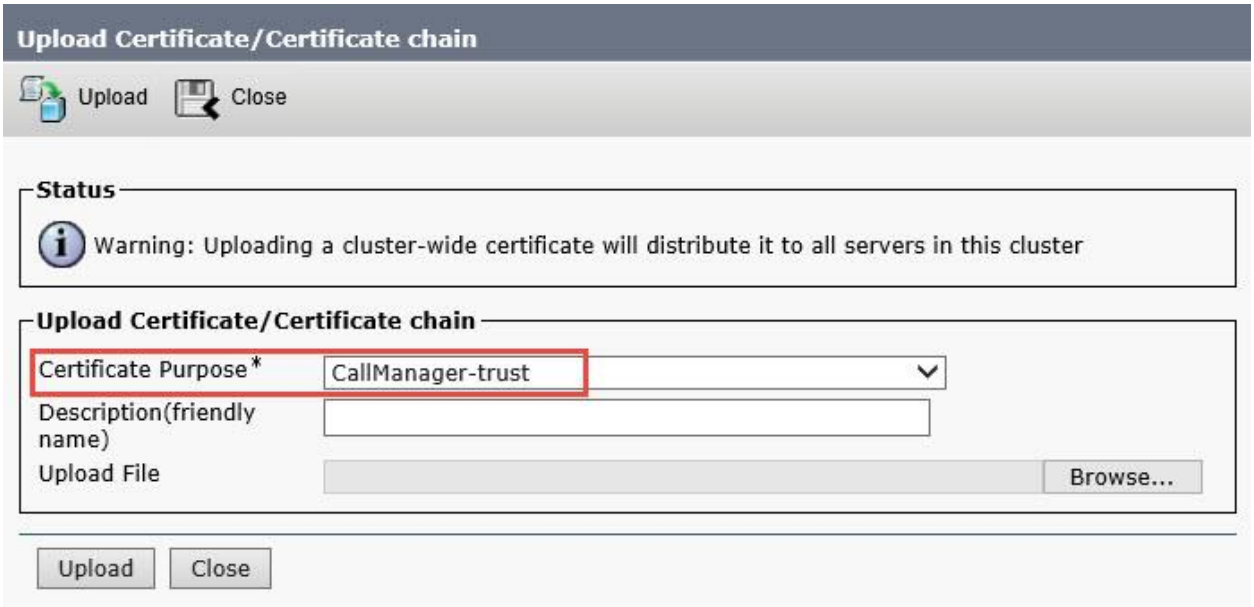


Figure 21: Cisco UCM Upload root certificate to Call Manager-trust

After upload is done, click on the certificate you uploaded and it should look similar to the one below.

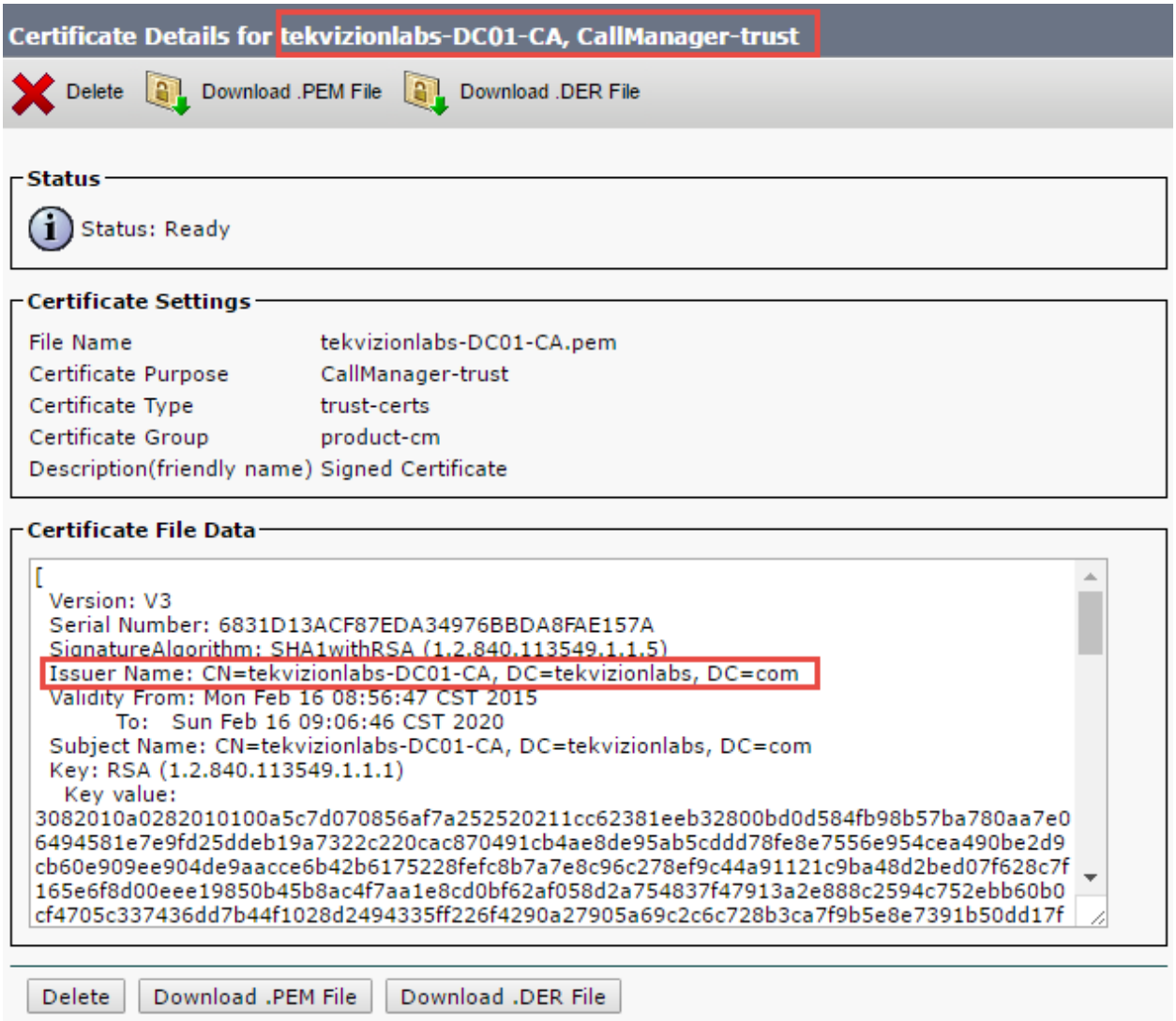


Figure 22: Cisco UCM root certificate example

In similar, upload the root certificate to tomcat-trust

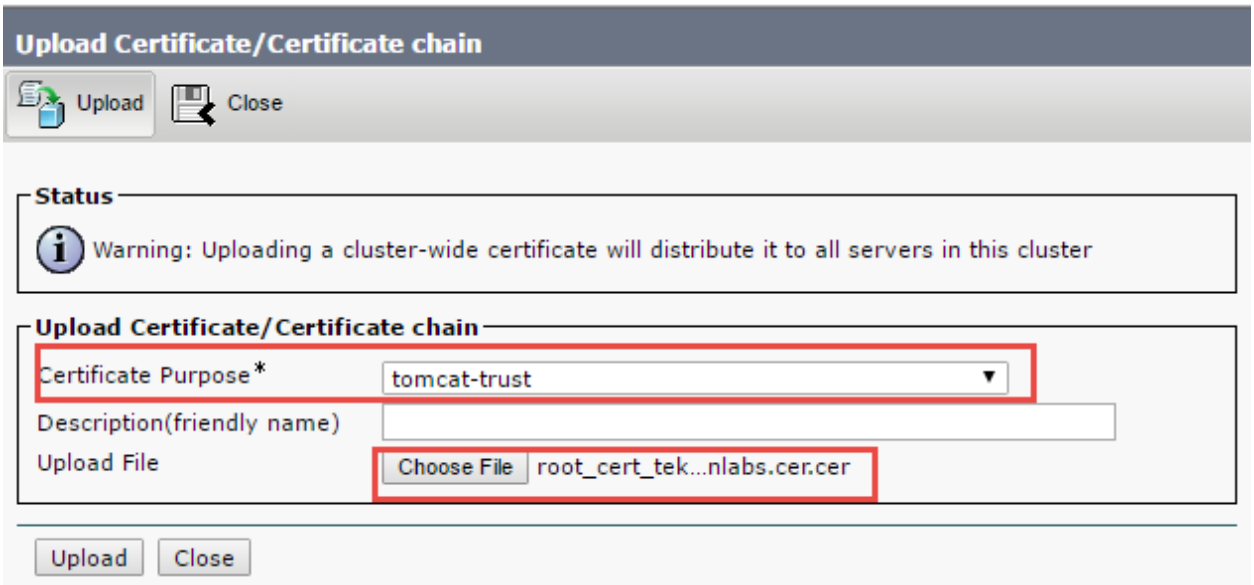


Figure 23: Cisco UCM Upload root certificate to tomcat-trust

Upload Server Certificate

5. After the certificate download is complete click on '**Upload Certificate/Certificate chain**'

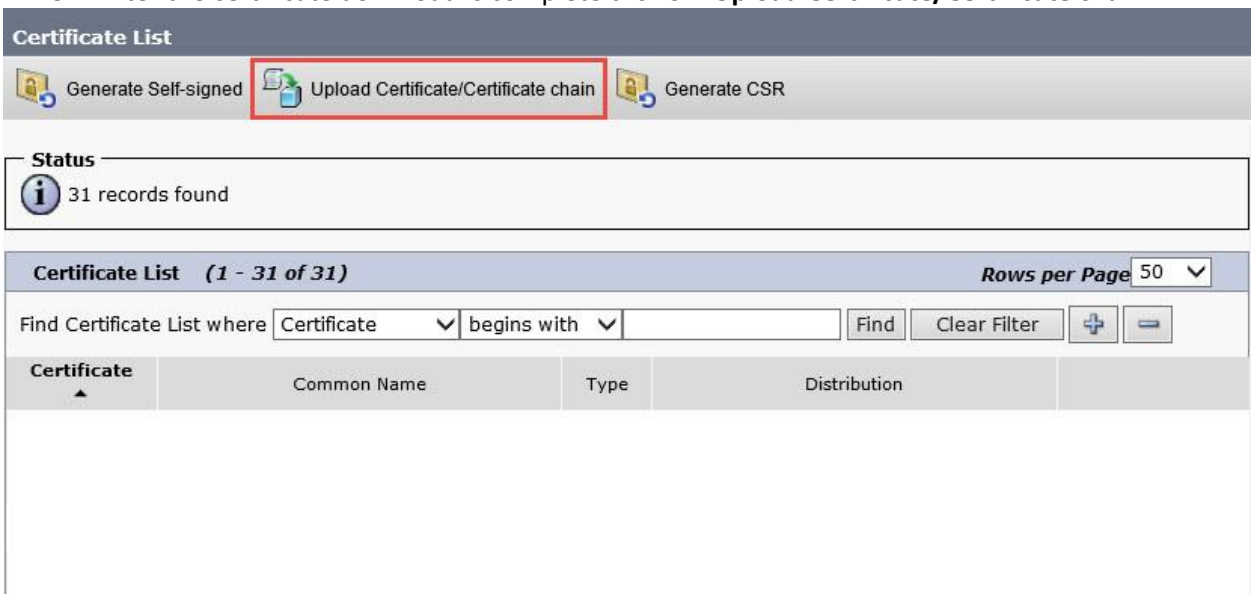


Figure 24: Cisco UCM Upload Server Certificate to CallManager-Trust-1

6. Set **Certificate Purpose:** Call Manager
7. Browse and upload the file

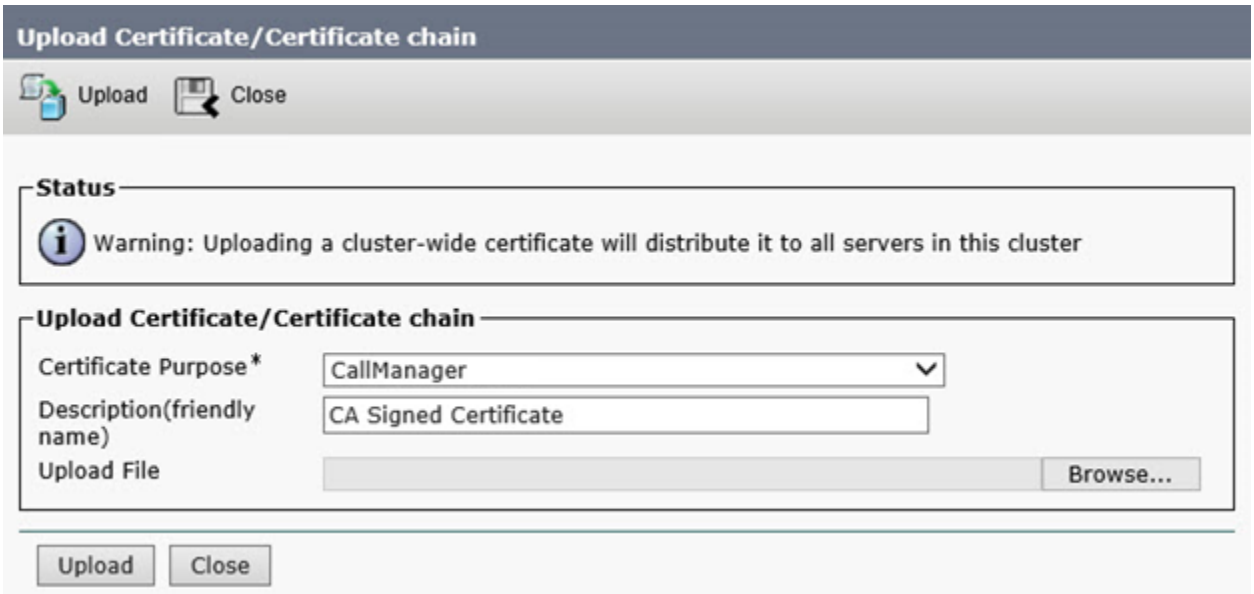
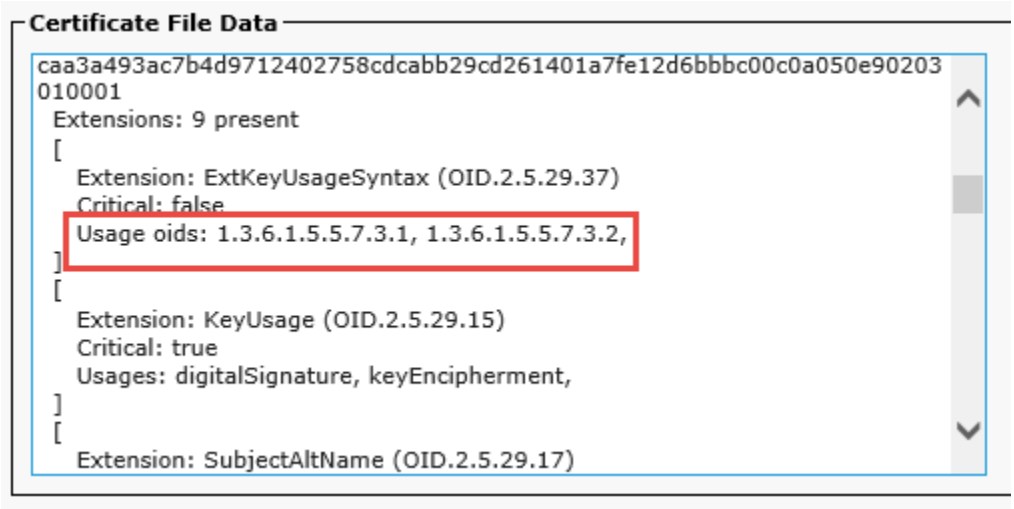


Figure 25: Cisco UCM Upload Server Certificate to CallManager-2

Look for the following oids in the certificate file Data to confirm that the certificate has both client and server authentication



Upload tomcat Certificate

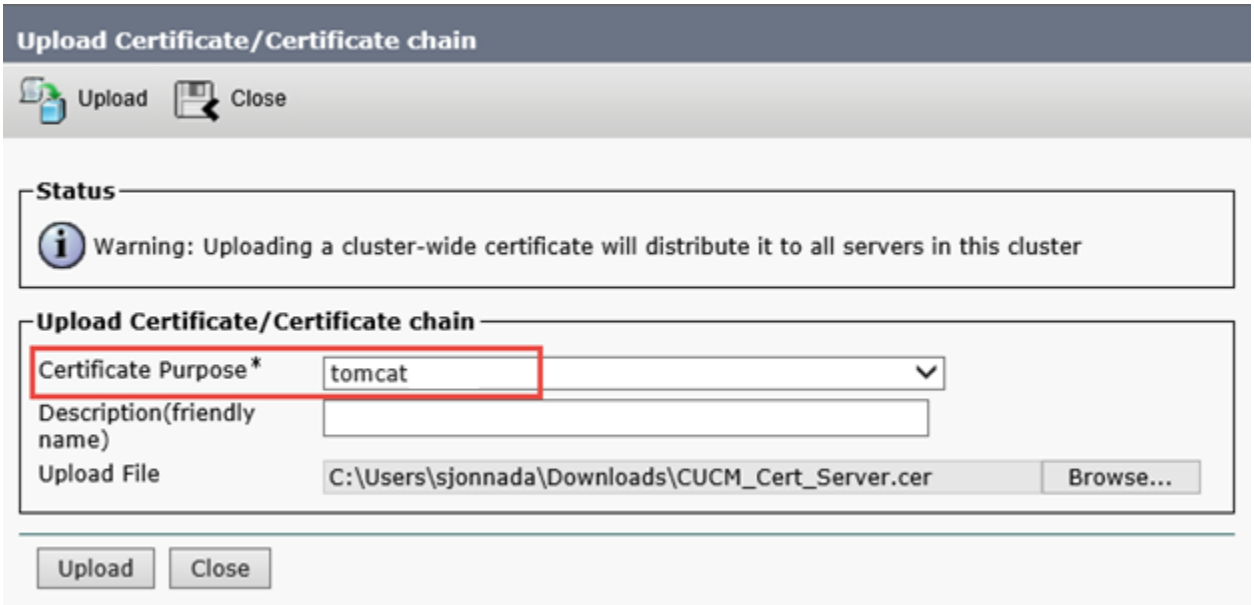
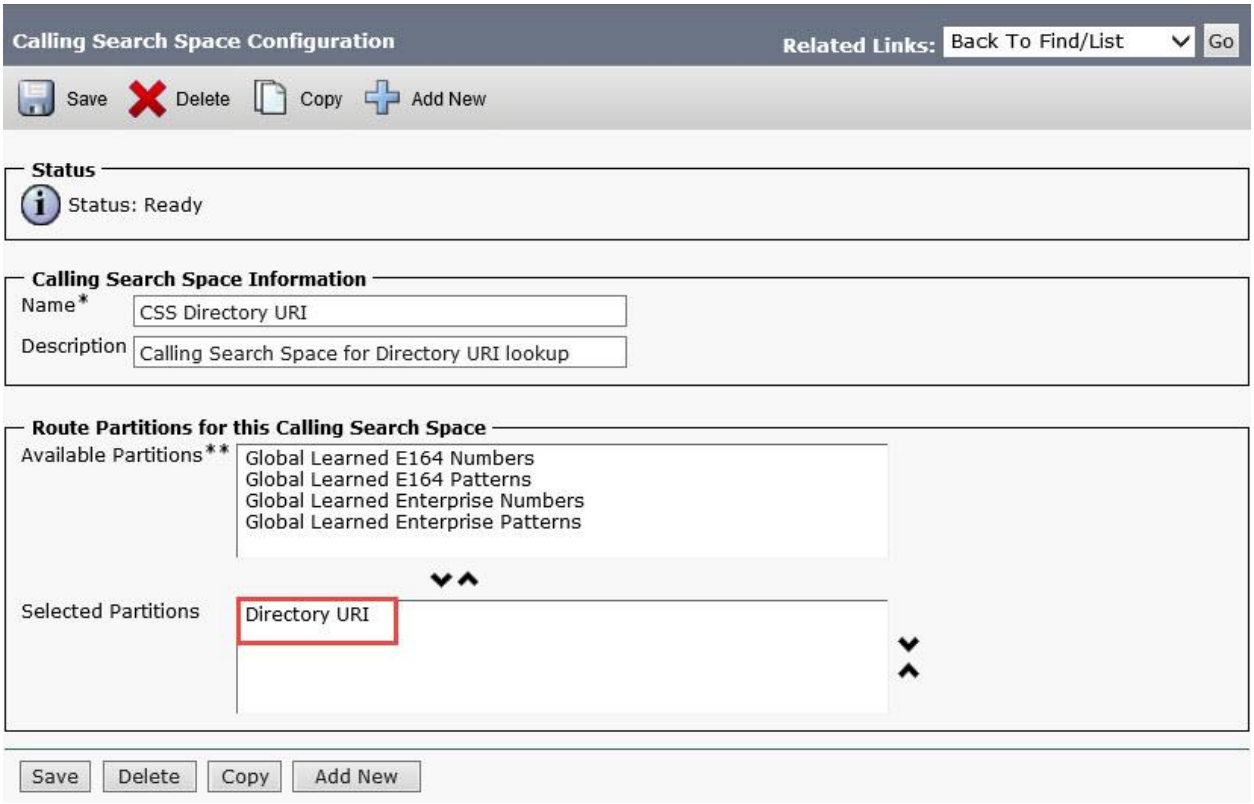


Figure 26: Cisco UCM Upload Server Certificate to tomcat-trust

Calling Search Space

Navigation: Call Routing->Class of Control->Calling Search Space



SIP Trunk Security Profile Configuration for Expressway-C

Navigation: System -> Security -> SIP Trunk Security Profile

1. Set **Name**: Enter a name for the security profile.
   When you save the new profile, the name displays in the SIP Trunk Security Profile drop-down list box in the Trunk Configuration window.
2. Set **Description**: Enter a description relevant to your security profile
3. Set **Device Security Mode:** Encrypted
4. Set **Incoming Transport Type:** TLS
5. Set **Outgoing Transport Type:** TLS
6. Set **X.509 Subject Name:** Enter the subject name of the X.509 certificate for the SIP trunk device, which is the subject name of Expressway-C here.
7. Set **Incoming Port:** 5061
8. Confirm **Accept unsolicited notification**: is checked
   If you want Cisco Unified Communications Manager to accept incoming non-INVITE, unsolicited notification messages that come via the SIP trunk, check this check box.
9. Confirm **Accept replaces header**: is checked
   If you want Cisco Unified Communications Manager to accept new SIP dialogs, which have replaced existing SIP dialogs, check this check box

SIP Trunk Security Profile Configuration

Save Delete Copy Reset Apply Config Add New

Status

Status: Ready

SIP Trunk Security Profile Information

Name* Expressway Secure SIP Trunk Profile

Description Expressway Secure SIP Trunk Profile

Device Security Mode Encrypted

Incoming Transport Type* TLS

Outgoing Transport Type TLS

Enable Digest Authentication

Nonce Validity Time (mins)* 600

X.509 Subject Name expressc2.tekvizionlabs.com

Incoming Port* 5061

Enable Application level authorization

Accept presence subscription

Accept out-of-dialog refer**

Accept unsolicited notification

Accept replaces header

Transmit security status

Allow charging header

SIP V.150 Outbound SDP Offer Filtering* Use Default Filter

Save Delete Copy Reset Apply Config Add New

Figure 27: Cisco UCM Security Profile for Expressway-C Trunk

Trunk to Expressway-C Gateway

To configure Expressway-C, please refer to section [Expressway-C Configuration]

Navigation: Device -> Trunk

Device Information

1. Set **Trunk Type**: SIP Trunk
2. Set **Device Protocol**: SIP
3. Set **Trunk Service Type**: None
4. Set **Device Name**: Enter a name for the trunk
5. Set **Description:** Enter a description relevant to your trunk
6. Set **Device Pool**: Select the Device Pool you configured under System -> Device Pool
   For trunks, device pools specify a list of Cisco Unified Communications Managers that the trunk uses to distribute the call load dynamically
7. Set Media Resource Group List: Select the Media Resource Group List you configured under Media Resources -> Media Resource Group List
8. Confirm **SRTP Allowed:** is checked
9. Set **Consider Traffic on This Trunk Secure**: When using both SRTP and TLS
10. Set **Calling Search Space:** CSS Directory URI

SIP Information

11. Set the **Destination Address**: Enter the FQDN of the Expressway-C to which you are establishing a trunk.
12. Set **SIP trunk Security Profile**: Select the security profile you created under System -> Security -> SIP Security Profile
13. Set **SIP Profile**: Select the SIP Profile you created under Device -> Device Settings -> SIP Profile
14. Set **Normalization Script:** Select the existing normalization script vcs-interop

Trunk Configuration Related Links: Back To Find/List G

Save Delete Reset Add New

SIP Trunk Status

Service Status: Full Service

Duration: Time In Full Service: 15 days 0 hour 7 minutes

Device Information

Product:	SIP Trunk
Device Protocol:	SIP
Trunk Service Type	None(Default)
Device Name*	ExpressC
Description	Trunk to Expressway C
Device Pool*	DP_Richardson
Common Device Configuration	< None >
Call Classification*	OnNet
Media Resource Group List	MRGL_Richardson
Location*	Hub_None
AAR Group	< None >
Tunneled Protocol*	None
QSIG Variant*	No Changes
ASN.1 ROSE OID Encoding*	No Changes
Packet Capture Mode*	None
Packet Capture Duration	0

- [ ] Media Termination Point Required
- [x] Retry Video Call as Audio
- [ ] Path Replacement Support
- [ ] Transmit UTF-8 for Calling Party Name
- [ ] Transmit UTF-8 Names in QSIG APDU
- [ ] Unattended Port
- [x] SRTP Allowed - When this flag is checked, Encrypted TLS needs to be configured in the network to provide end to end security. Failure to do so will expose keys and other information.

Consider Traffic on This Trunk Secure*	When using both sRTP and TLS
Route Class Signaling Enabled*	Default
Use Trusted Relay Point*	Default

- [x] PSTN Access
- [x] Run On All Active Unified CM Nodes

Figure 28: Cisco UCM Trunk to Expressway-C-1

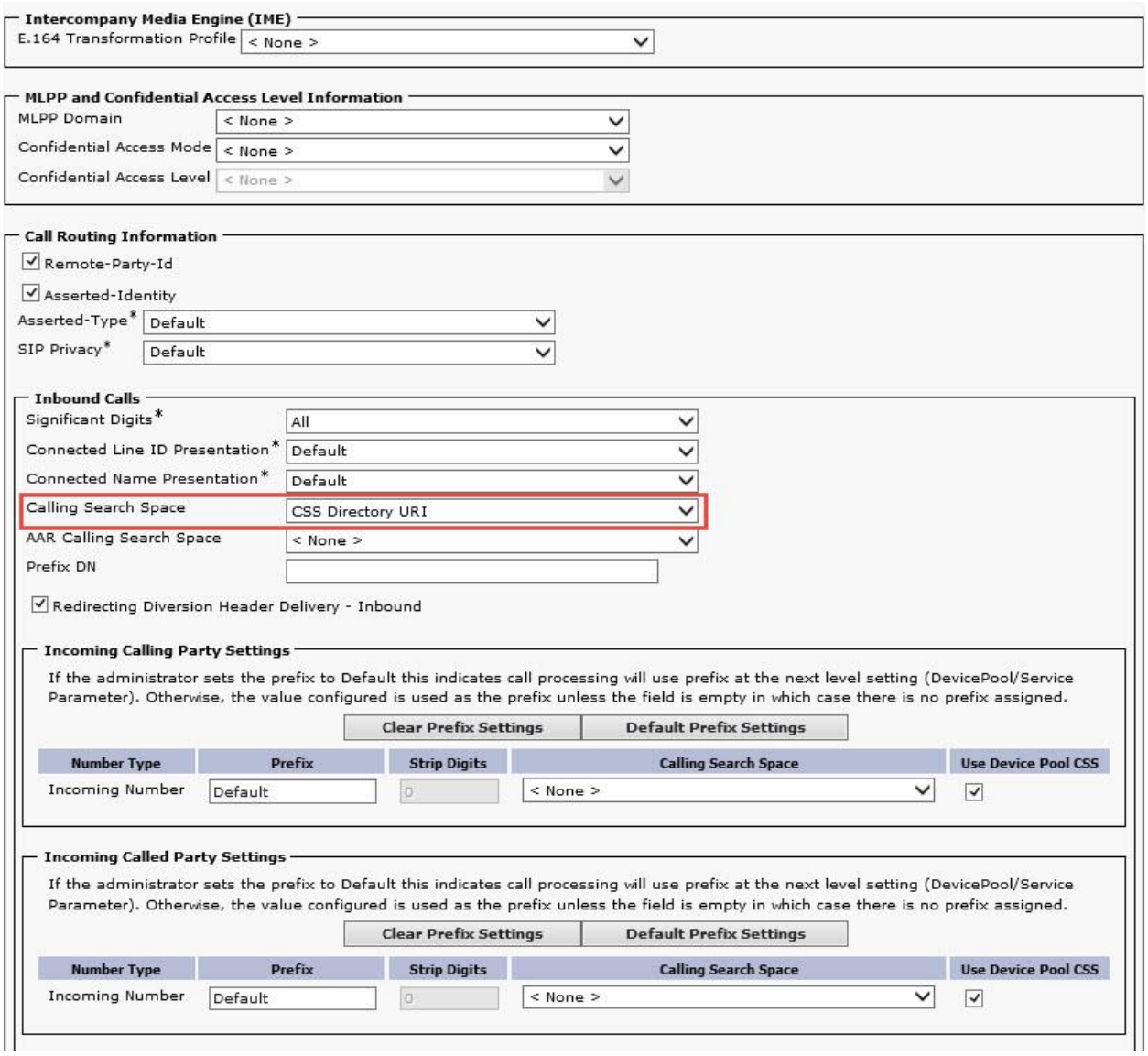


Figure 29: Cisco UCM Trunk to Expressway-C-2

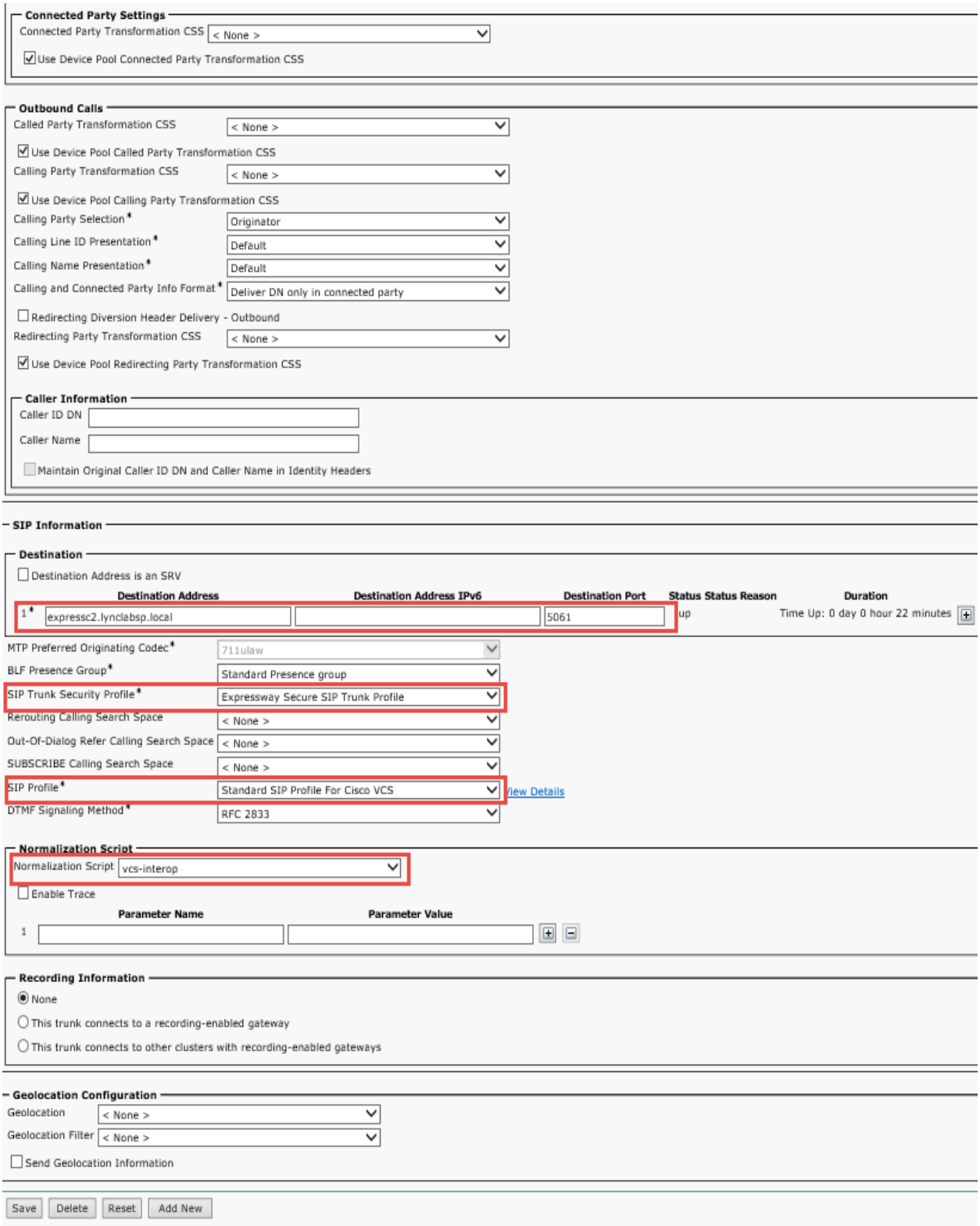


Figure 30: Cisco UCM Trunk to Expressway-C-3

Trunk to Expressway-C for MRA with Expressway-E

To configure Expressway-C, please refer to section Expressway-C Configuration

Navigation: Device -> Trunk

Device Information

1. Set **Trunk Type**: SIP Trunk
2. Set **Device Protocol**: SIP
3. Set **Trunk Service Type**: None
4. Set **Device Name**: Enter a name for the trunk
5. Set **Description:** Enter a description relevant to your trunk
6. Set **Device Pool**: Select the Device Pool you configured under System -> Device Pool
   For trunks, device pools specify a list of Cisco Unified Communications Managers that the trunk uses to distribute the call load dynamically
7. Set Media Resource Group List: Select the Media Resource Group List you configured under Media Resources -> Media Resource Group List
8. Confirm **SRTP Allowed:** is checked
9. Set **Consider Traffic on This Trunk Secure**: When using both SRTP and TLS
10. Set **Calling Search Space:** CSS Directory URI **SIP Information**
11. Set the **Destination Address**: Enter the FQDN of the Expressway-C to which you are establishing a trunk.
12. Set **SIP trunk Security Profile**: Select the security profile you created under System -> Security -> SIP Security Profile
13. Set **SIP Profile**: Select the SIP Profile you created under Device -> Device Settings -> SIP Profile
14. Set **Normalization Script:** Select the existing normalization script vcs-interop

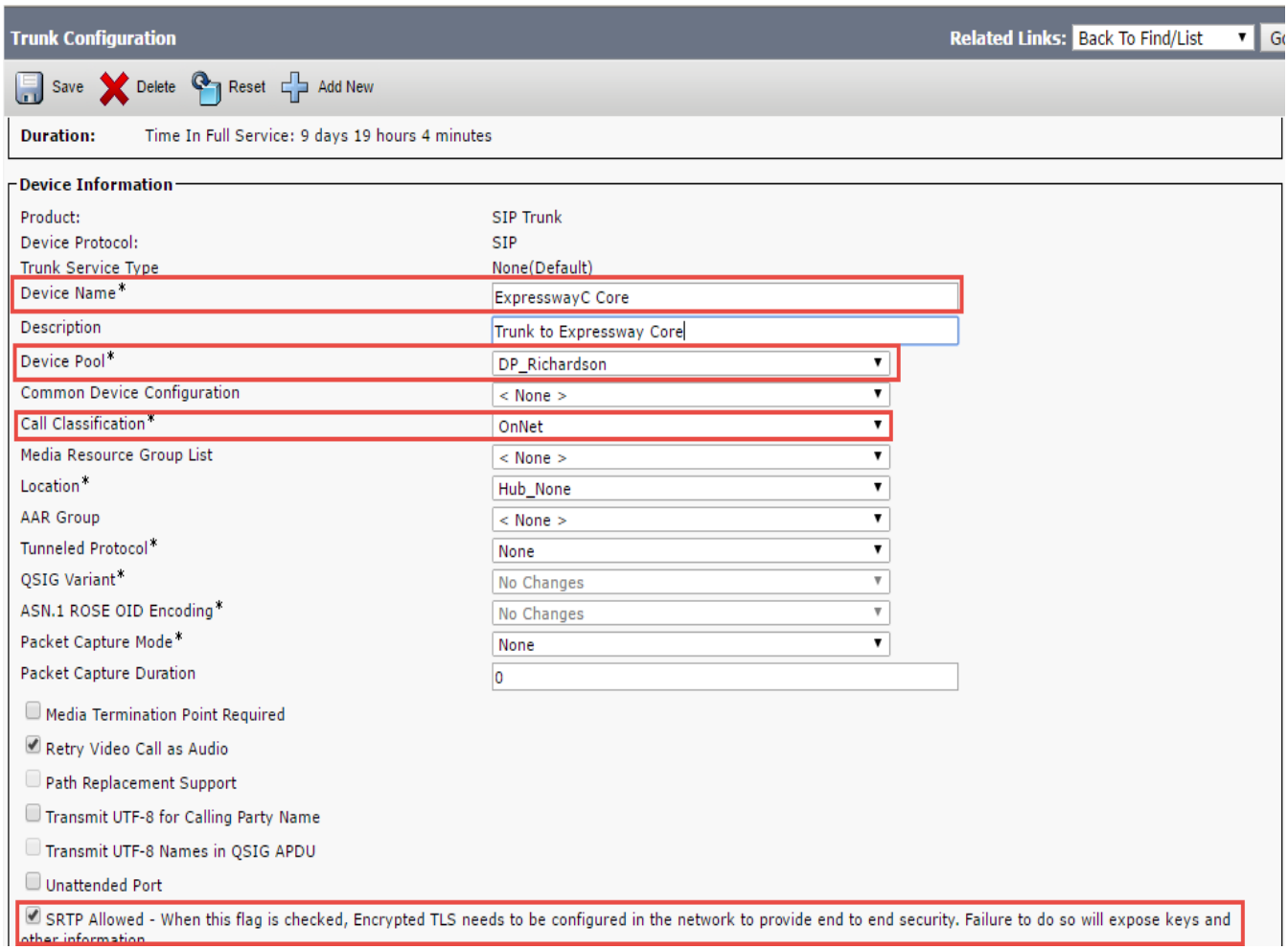


Figure 31: UCM Trunk to Expressway-C for MRA1

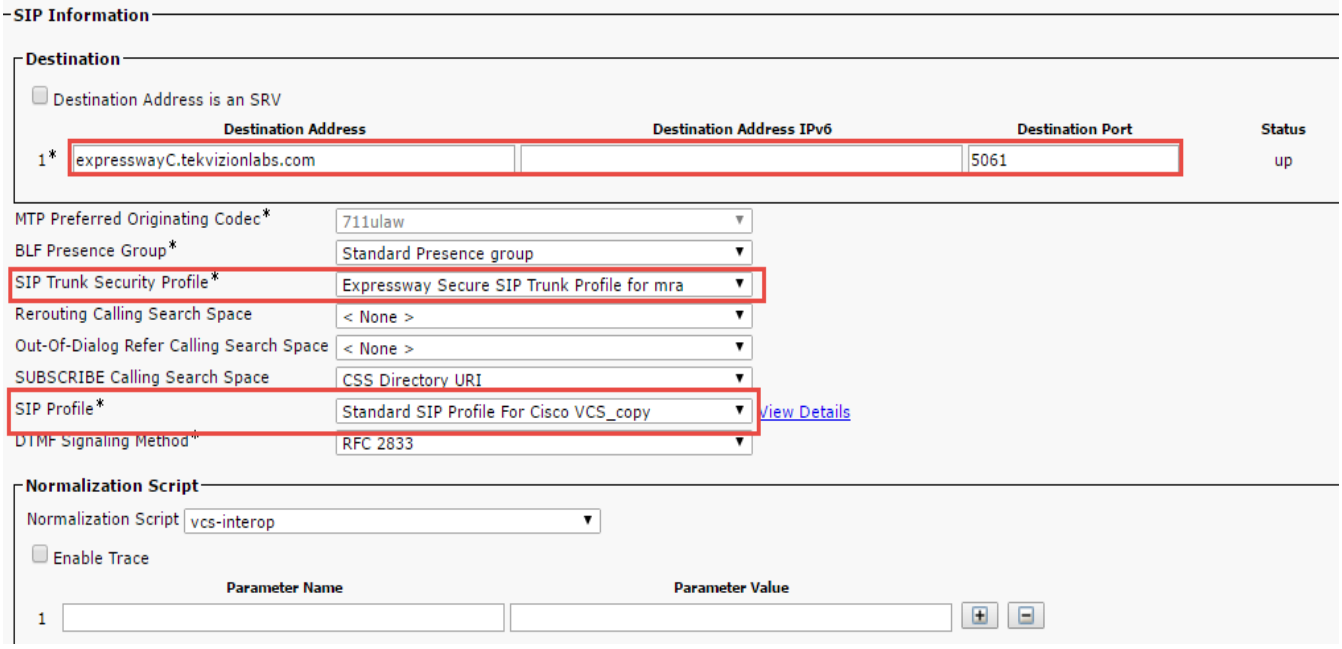


Figure 32: UCM Trunk to Expressway-C for MRA2

Trunk to IM and Presence Server

Navigation: Device -> Trunk

Device Information

1. Set **Trunk Type**: SIP Trunk
2. Set **Device Protocol**: SIP
3. Set **Trunk Service Type**: None
4. Set **Device Name**: Enter a name for the trunk
5. Set **Description:** Enter a description relevant to your trunk
6. Set **Device Pool**: Default
   For trunks, device pools specify a list of Cisco Unified Communications Managers that the trunk uses to distribute the call load dynamically

SIP Information

7. Set the **Destination Address**: Enter the FQDN of the Cisco IM&P Server to which you are establishing a trunk.
8. Set **SIP trunk Security Profile**: Non-Secure SIP Trunk Profile
9. Set **SIP Profile**: Select the SIP Profile you created under Device -> Device Settings -> SIP Profile

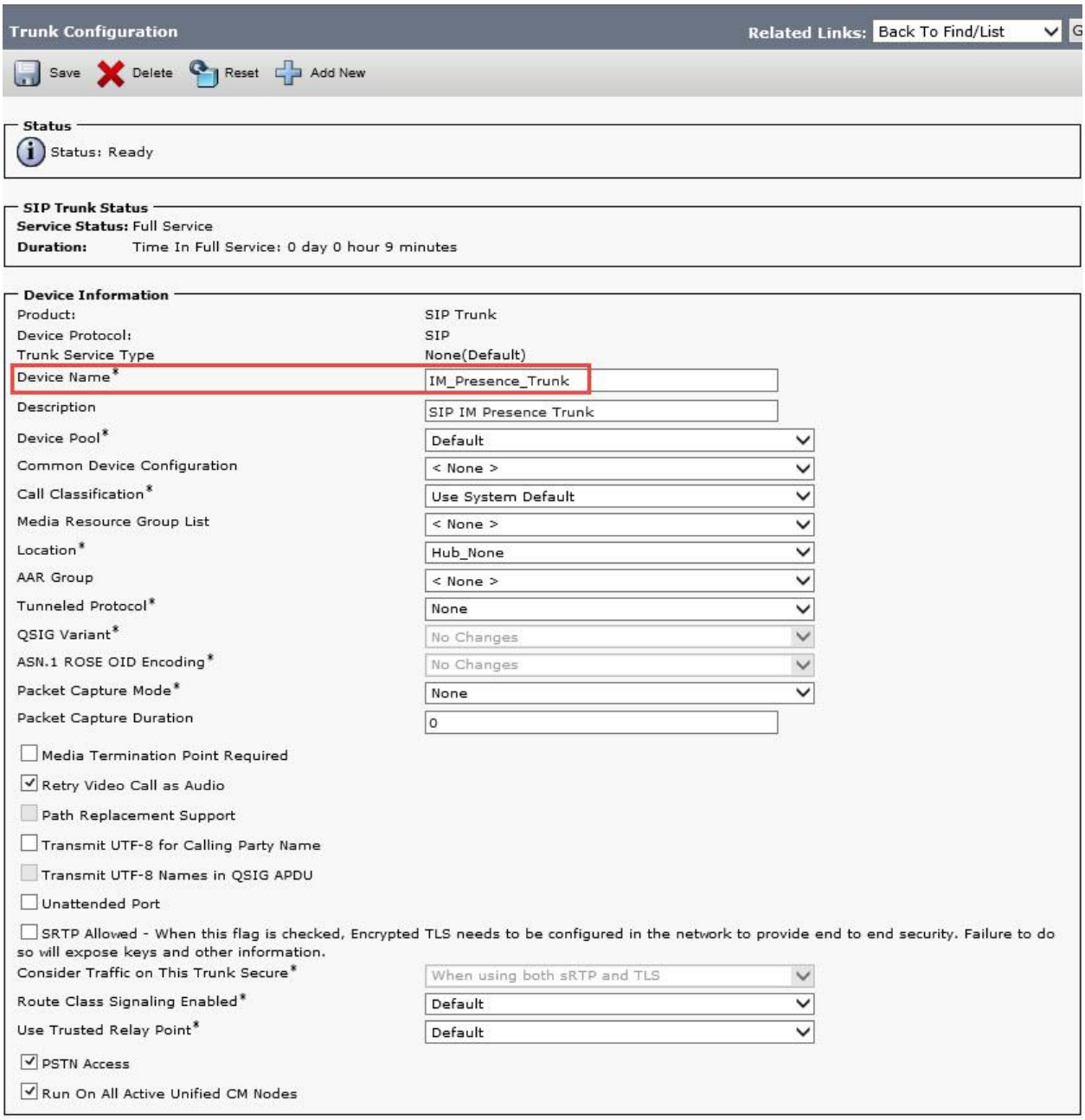


Figure 33: Cisco UCM Trunk to IM&P-1

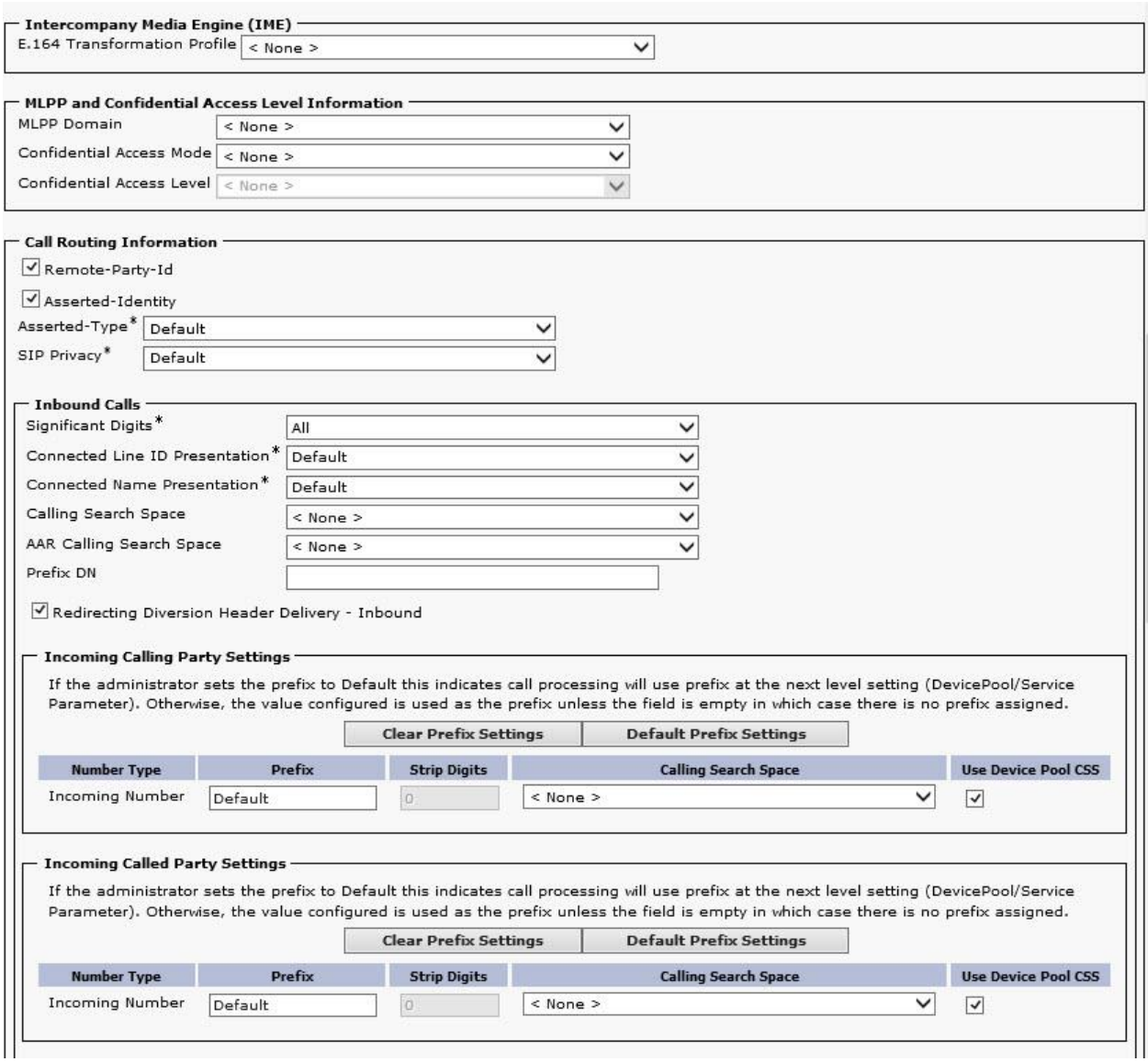


Figure 34: Cisco UCM Trunk to IM&P-2

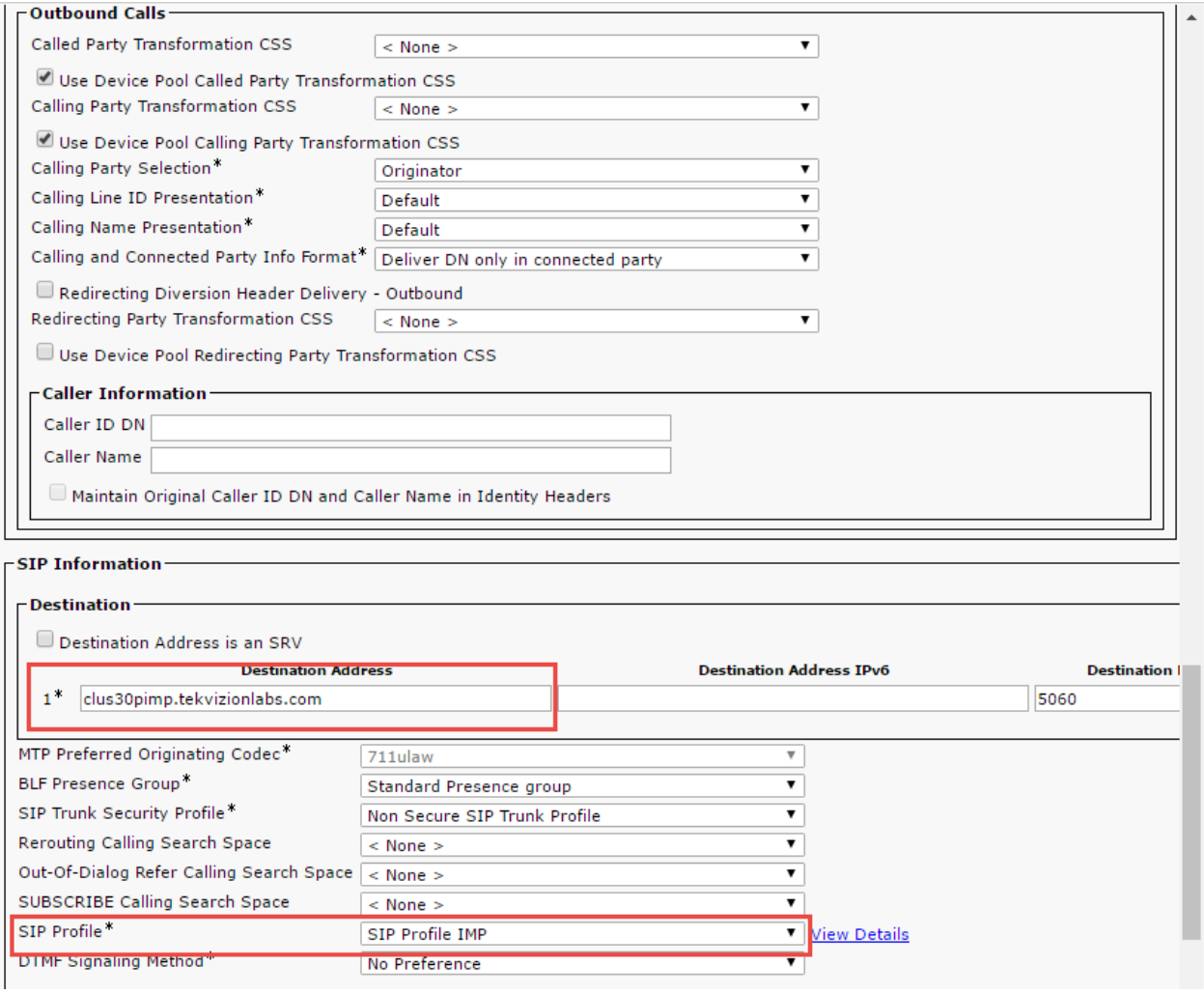


Figure 35: Cisco UCM Trunk to IM&P-3

SIP Route Pattern

Navigation: Call Routing -> SIP Route Pattern

1. Set **IPv4 Pattern**: Enter the Domain name of the deployment
2. Set **Description**: Enter the description of the SIP Route Pattern
3. Set **SIP Trunk**: From the drop-down list select your trunk to Expressway-C

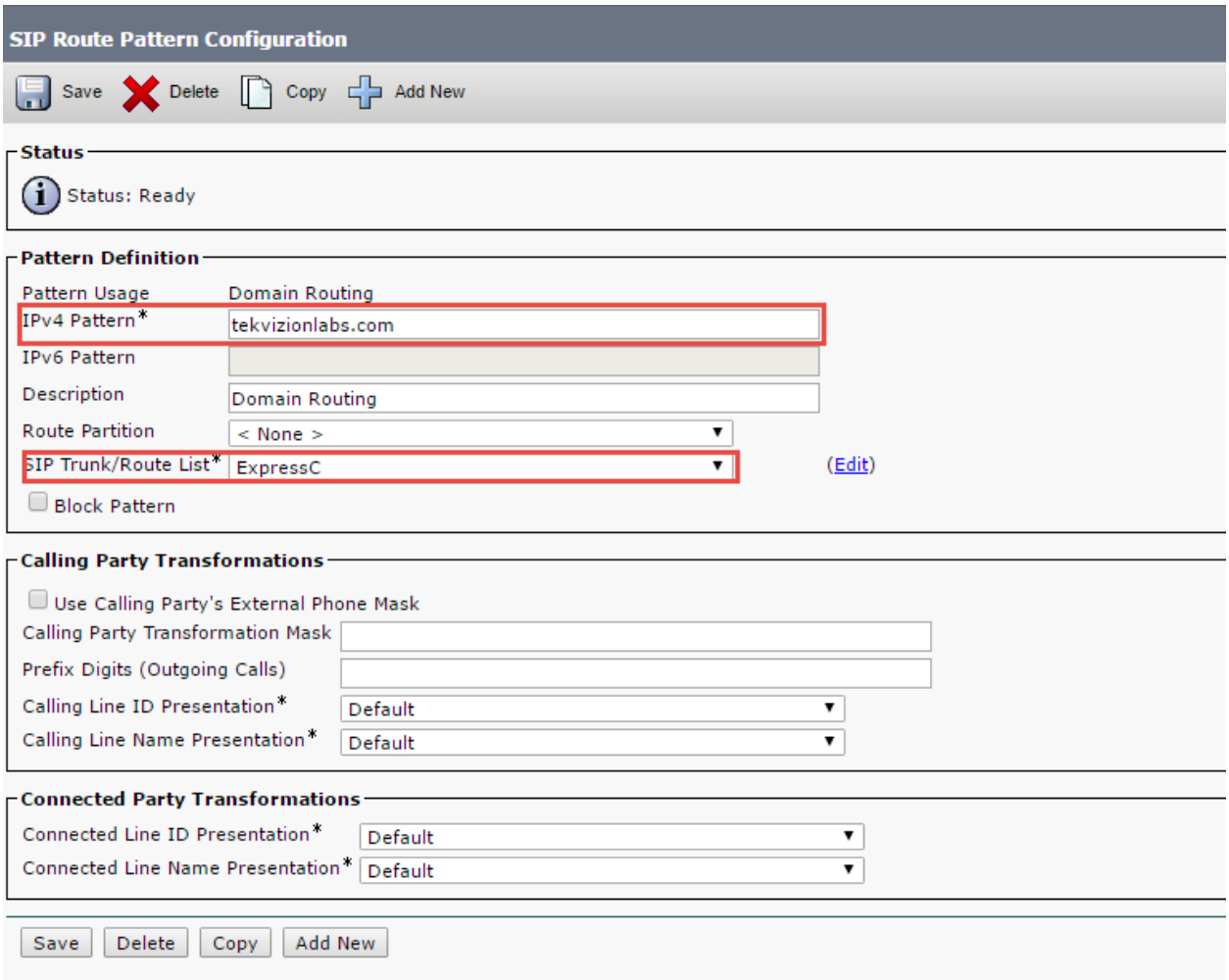


Figure 36: Cisco UCM SIP Route Pattern

Media Resource Group Configuration

Navigation: Media Resources->Media Resource Group

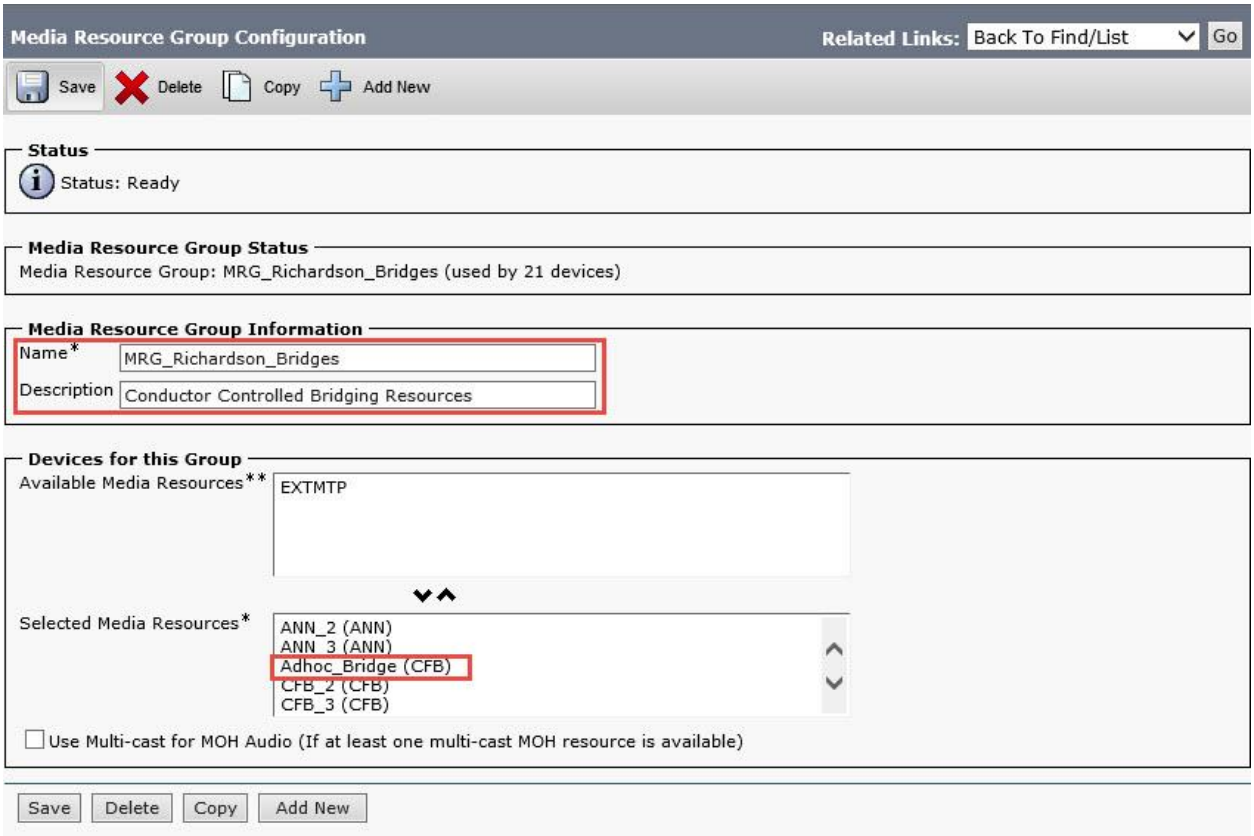


Figure 37: Media Resource Group Configuration

Media Resource Group List Configuration

Navigation: Media Resources->Media Resource Group List

Add the above created media resource group to a newly defined media resource group list.

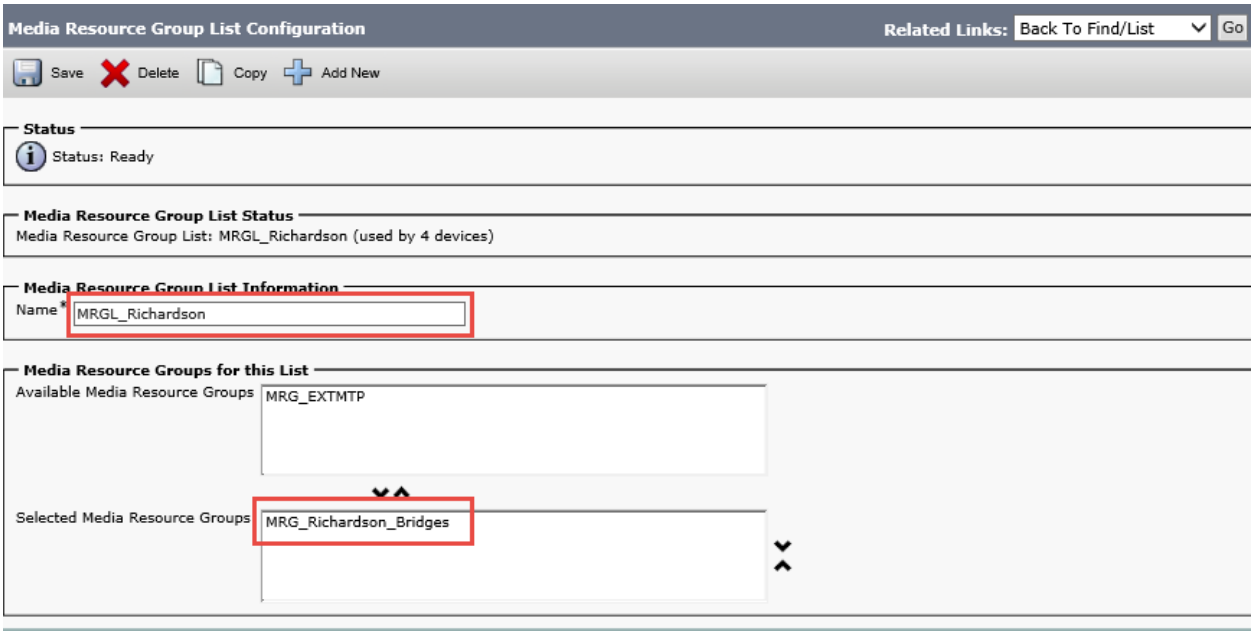


Figure 38: Media Resource Group List Configuration

Add MRGL to Device or Device Pool

Navigation: System->Device Pool

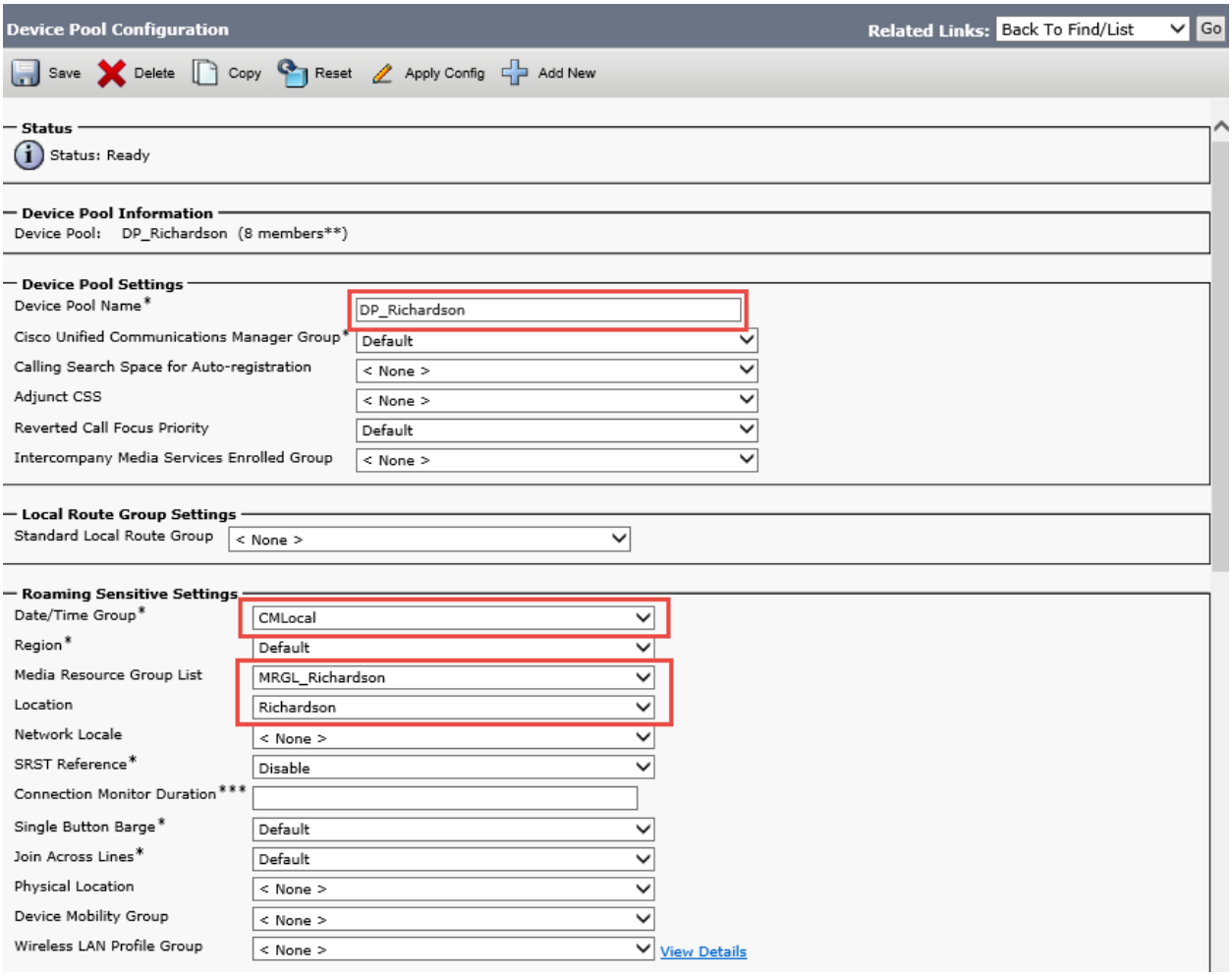


Figure 39: Device Pool Configuration -1

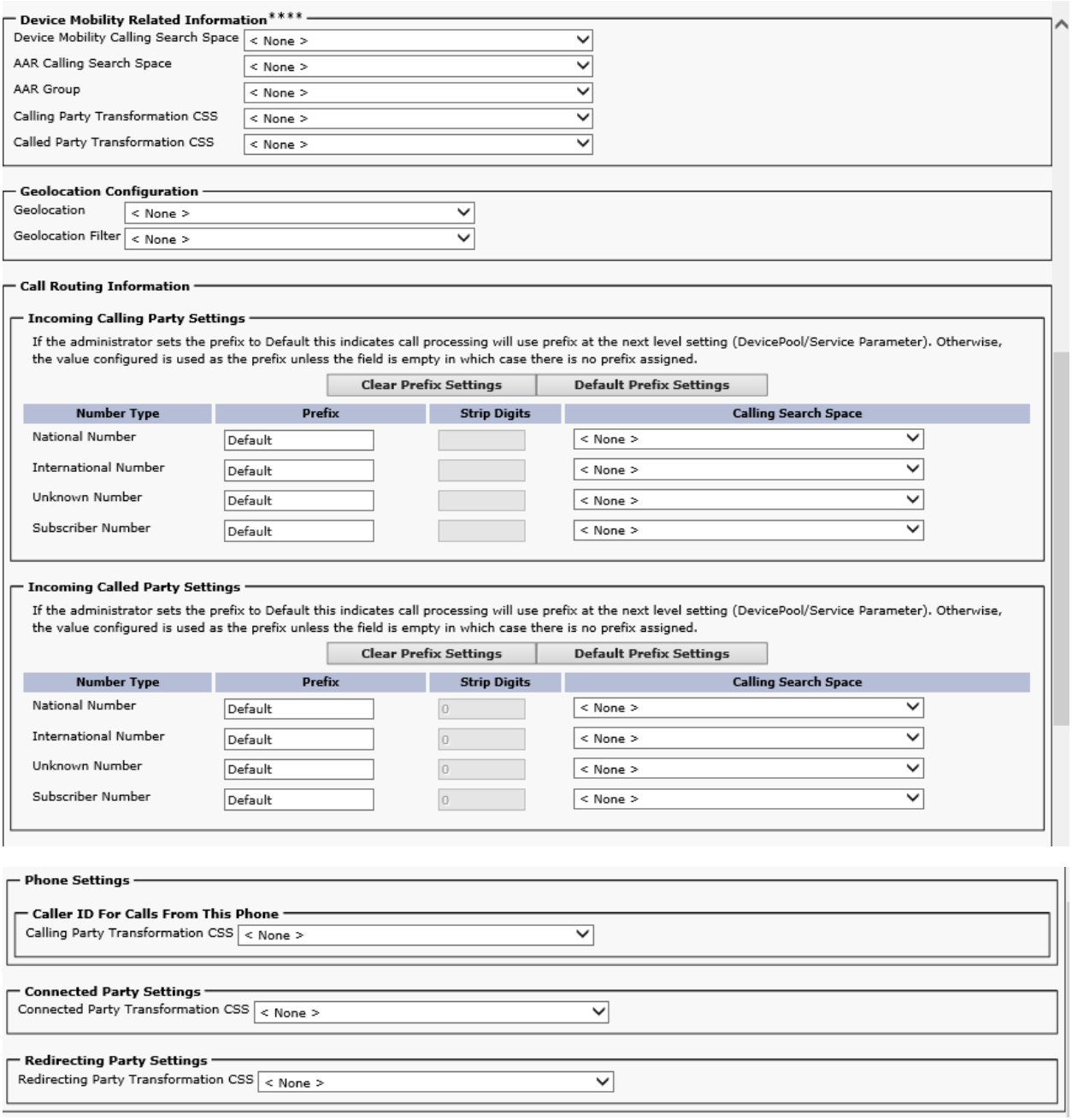


Figure 40: Device Pool Configuration -2

Cisco UCM LDAP Configuration

LDAP System Configuration

Navigation: System->LDAP->LDAP System

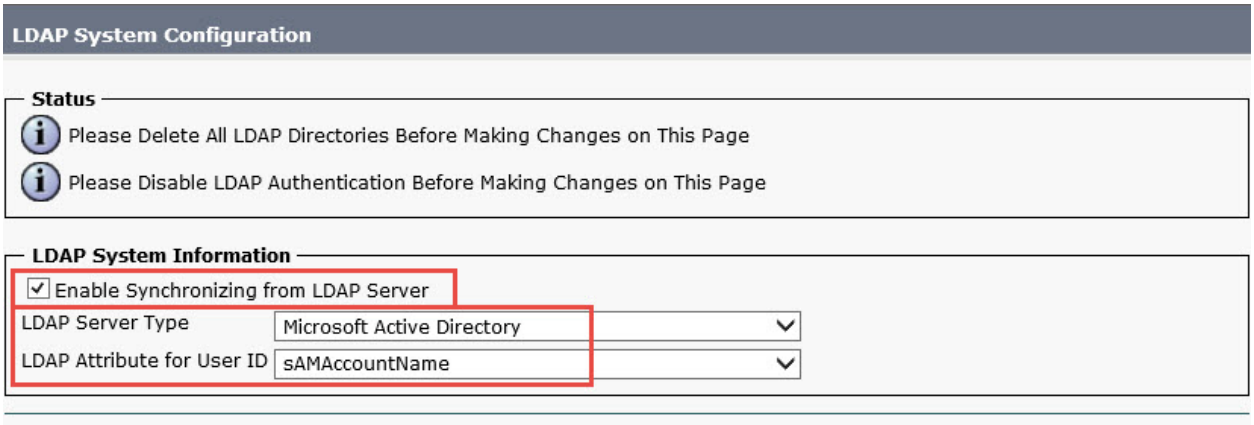


Figure 41: LDAP System Configuration

LDAP Directory

Navigation: System->LDAP->LDAP Directory

1. Set **LDAP Configuration Name**: Enter a unique name for the LDAP directory
2. Set **LDAP Manager Distinguished Name:** Enter the user ID of the LDAP Manager, who has administrator access rights
3. Set **LDAP Password:** Enter a password for the LDAP Manager
4. Set **Confirm Password:** Renter the password you provided in LDAP Password field
5. Set **LDAP User Search Base:** Enter the location where all LDAP users exist. This location acts as a container or a directory. This information varies depending on customer setup.
6. LDAP Server Information:
    a. Set **Host Name or IP Address for Server:** Enter the host name or IP address of the server where the data for this LDAP directory resides**.**
    b. Set **LDAP Port:** Enter the port number on which the corporate directory receives the LDAP requests.
    c. **Confirm Use SSL:** is checked
7. Click save
8. To sync users from the LDAP Directory directly into Communications Manager, you must activate the **Cisco DirSync service**
9. Before performing full sync, make sure '**Email**' field for users are configured in **Active Directory Users and Computers** as shown in Figure 2: Active Directory User

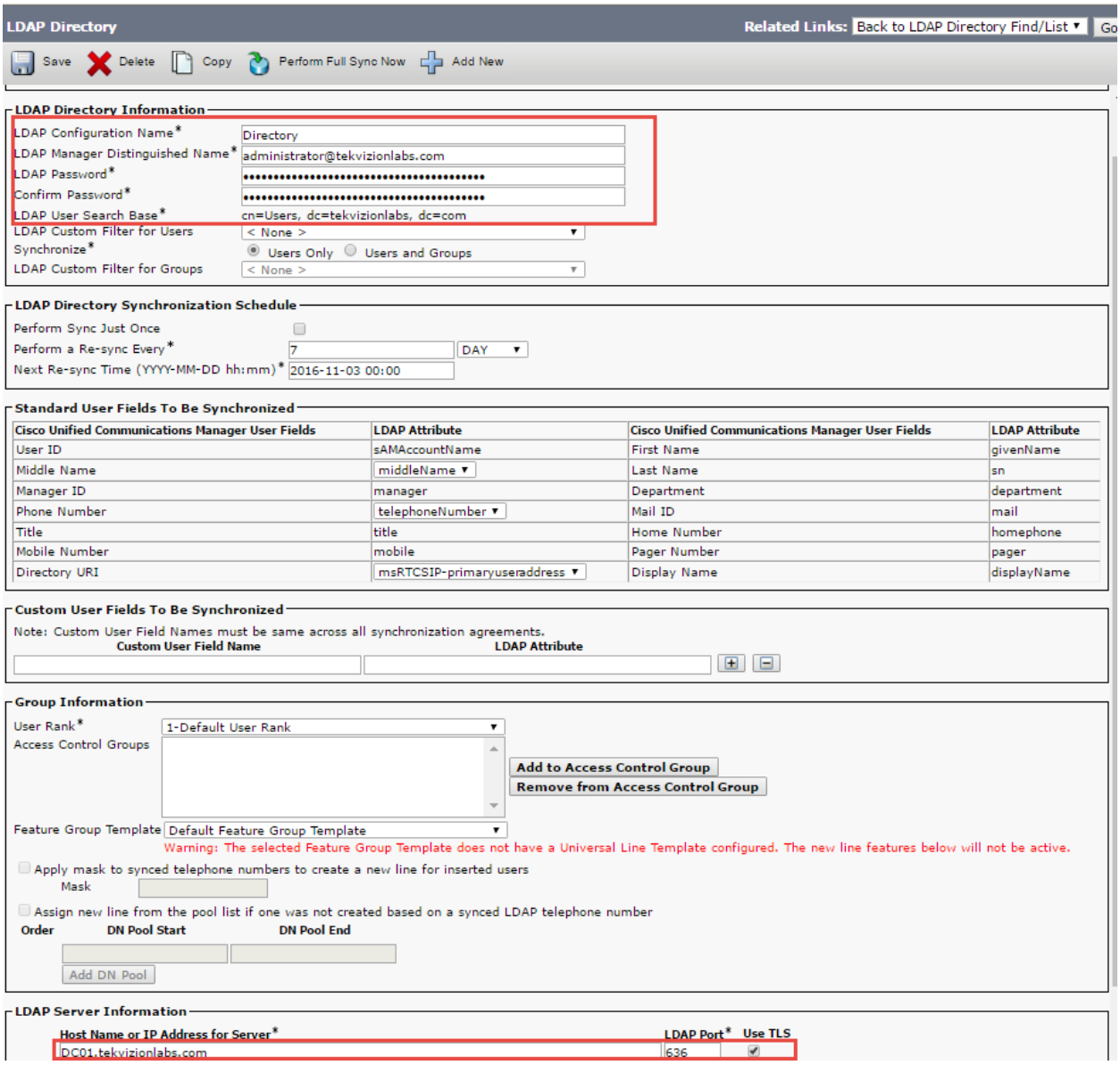


Figure 42: Cisco UCM LDAP Directory

LDAP Authentication

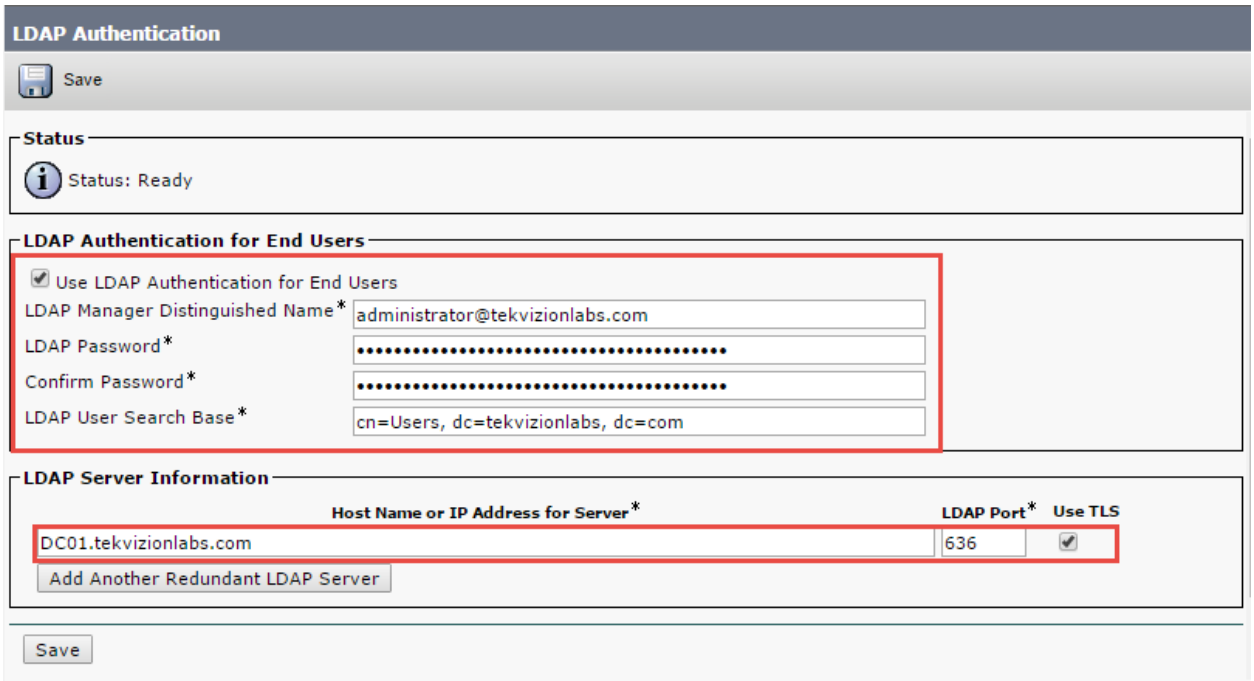


Figure 43: Cisco UCM LDAP Authentication

LDAP-Synced users

Navigation: User Management-> End User

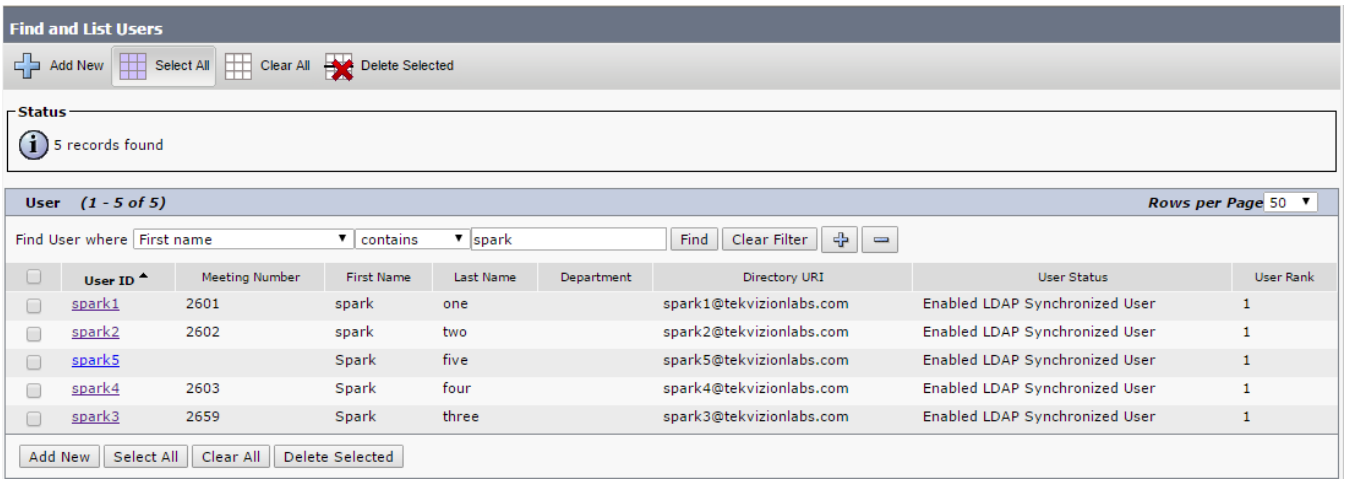


Figure 44: LDAP-Synced users

User Management Configuration – Settings to Associate Services

Cisco UCM End User Configuration

Navigation: User Management->End User

User Information

User Status	Enabled LDAP Synchronized User
User ID*	spark1
Self-Service User ID	2601
PIN	•• [Edit Credential]
Confirm PIN	••
Last name*	one
Middle name	
First name	spark
Display name	spark one
Title	
Directory URI	spark1@tekvizionlabs.com
Telephone Number	
Home Number	
Mobile Number	
Pager Number	
Mail ID	spark1@tekvizionlabs.com
Manager User ID	
Department	
User Locale	< None >
Associated PC	
Digest Credentials	••
Confirm Digest Credentials	••
User Profile	Standard (Factory Default) User Profile [View Details]
User Rank*	1-Default User Rank

Convert User Account

☐ Convert LDAP Synchronized User to Local User

Service Settings

☑ Home Cluster

☐ Enable User for Unified CM IM and Presence (Configure IM and Presence in the associated UC Service Profile)

☐ Include meeting information in presence(Requires Exchange Presence Gateway to be configured on CUCM IM and Presence server)

UC Service Profile: Service_Profile [View Details]

Figure 45: Cisco UCM End User Configuration-1

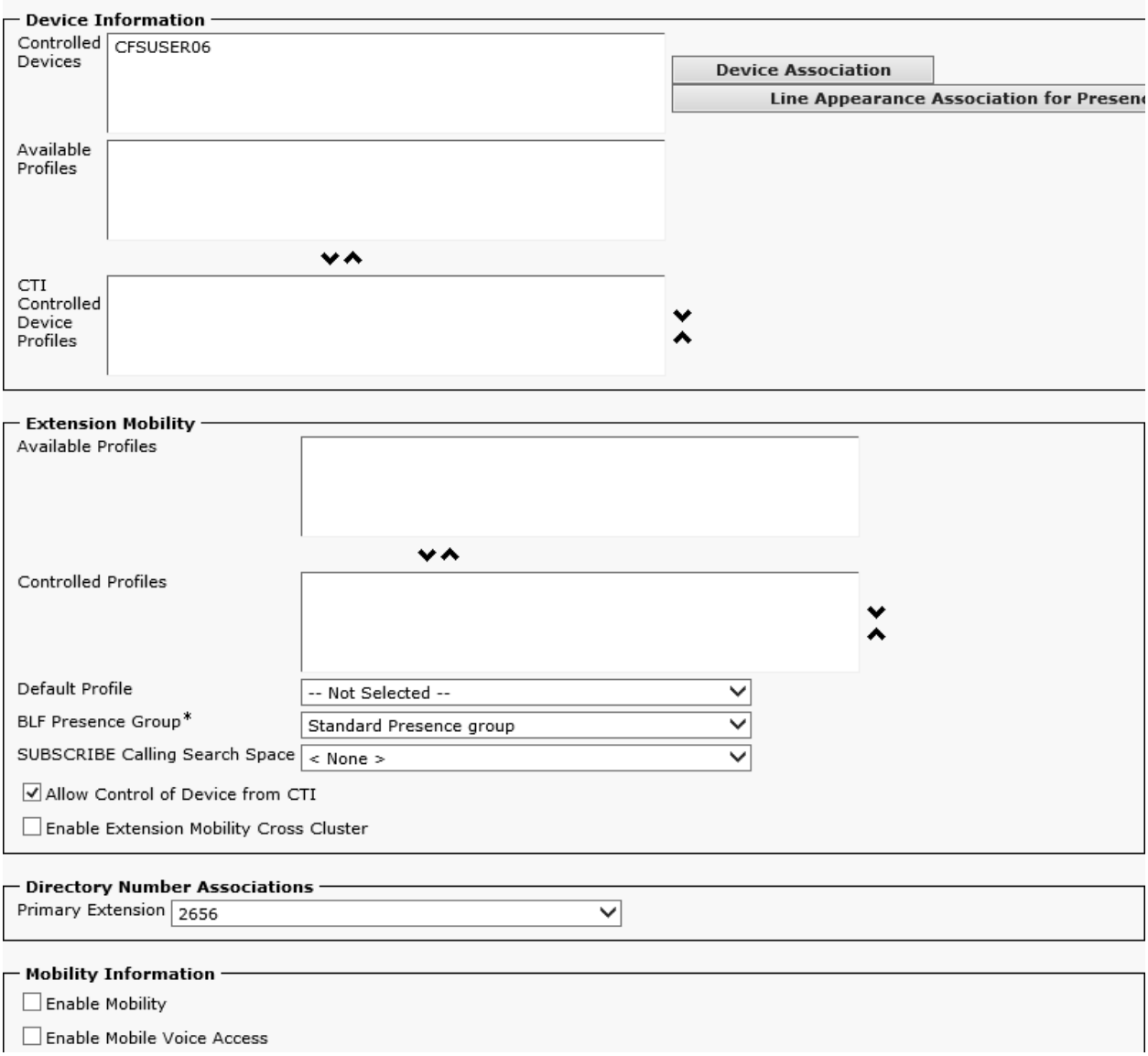


Figure 46: Cisco UCM End User Configuration-2

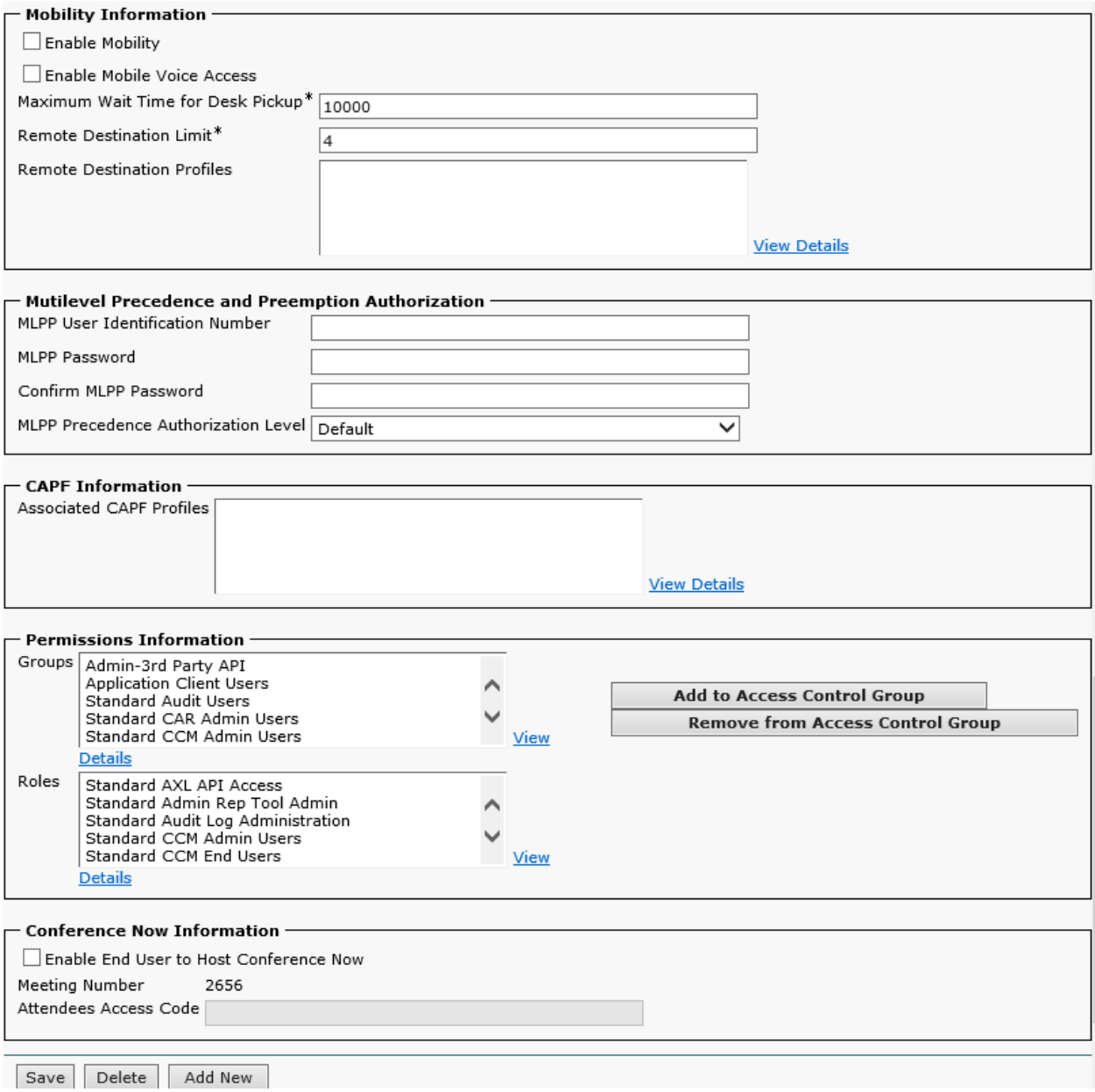


Figure 47: Cisco UCM End User Configuration-3

Cisco Jabber User Configuration

Navigation: Device->Phone

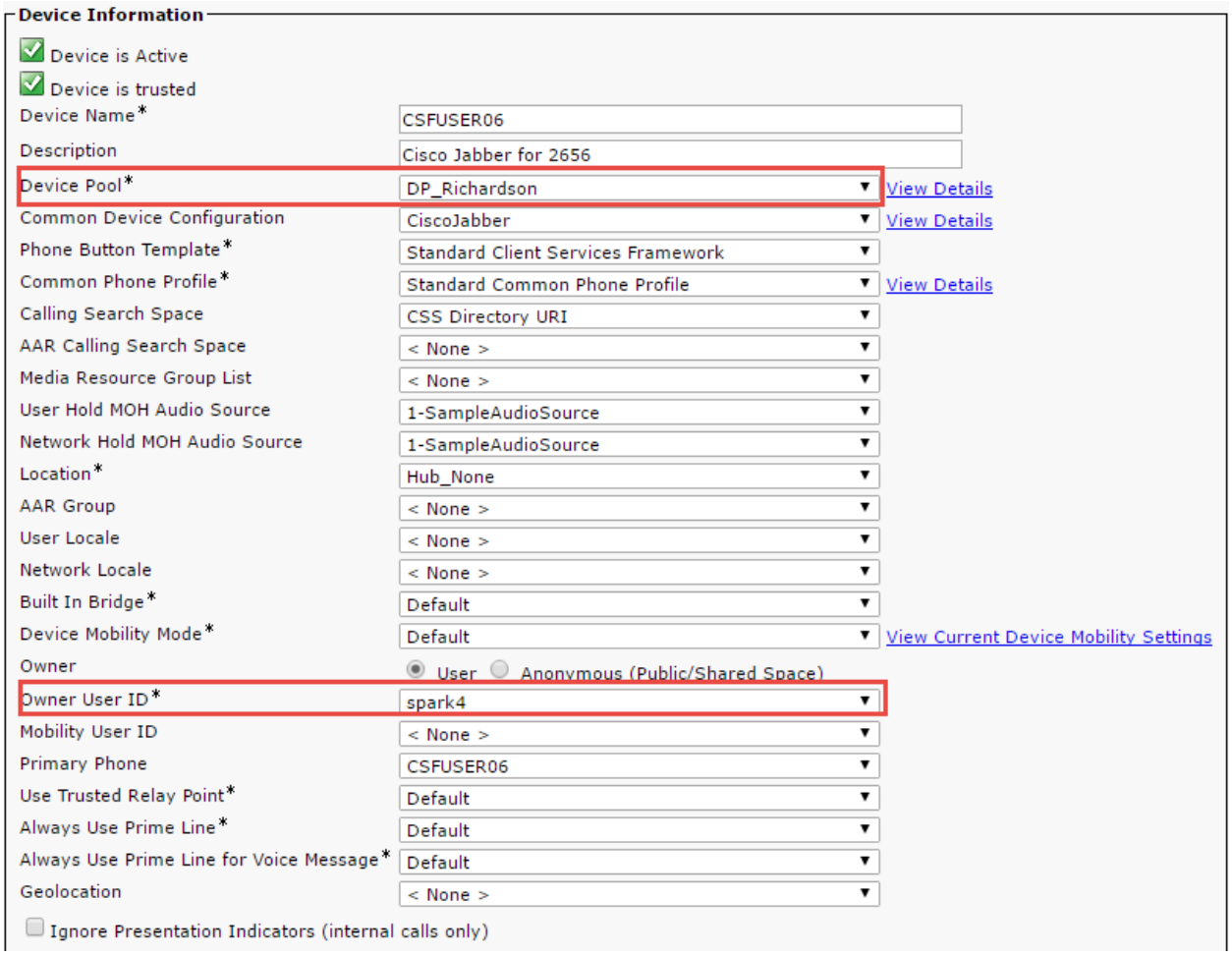


Figure 48: Cisco UCM Jabber Client Configuration-1

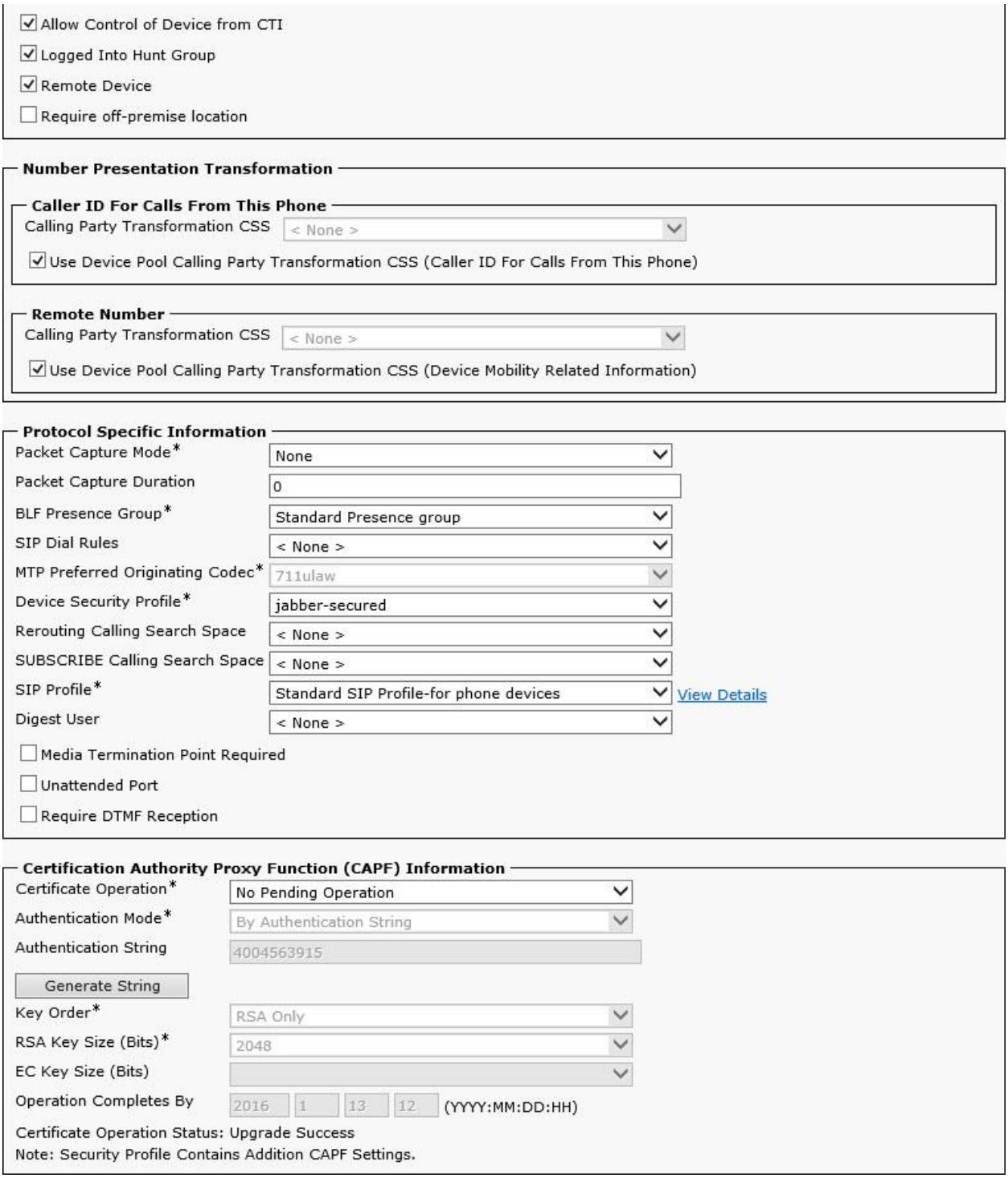


Figure 49: Cisco UCM Jabber Client Configuration-2

Extension Information

☐ Enable Extension Mobility

Log Out Profile: -- Use Current Device Settings --

Log in Time: < None >

Log out Time: < None >

MLPP and Confidential Access Level Information

MLPP Domain: < None >

Confidential Access Mode: < None >

Confidential Access Level: < None >

Do Not Disturb

☐ Do Not Disturb

DND Option*: Ringer Off

DND Incoming Call Alert: < None >

Product Specific Configuration Layout

	Parameter Value	Override Common Settings
Video Calling*	Enabled	☐

Interactive Connectivity Establishment (ICE)

ICE	Enabled	☐
Default Candidate Type	Host	☐
Server Reflexive Address	Enabled	☐
Primary TURN Server Host Name or IP Address		☐
Secondary TURN Server Host Name or IP Address		☐
TURN Server Transport Type	Auto	☐
TURN Server Username		☐
TURN Server Password		☐

Instant Messaging

File Types to Block in File Transfer		☐
URLs to Block in File Transfer		☐

Desktop Client Settings

Automatically Start in Phone Control*	Enabled	☑
Automatically Control Tethered Desk Phone*	Disabled	☐
Extend and Connect Capability*	Enabled	☐
Display Contact Photos*	Enabled	☐
Number Lookups on Directory*	Enabled	☐
Jabber For Windows Software Update Server URL		☐
Problem Report Server URL		☐
Analytics Collection*	Disabled	☐
Analytics Server URL		☐
Cisco Support Field	configurationfile=jabber-config.xml	☑

Figure 50: Cisco UCM Jabber Client Configuration-3

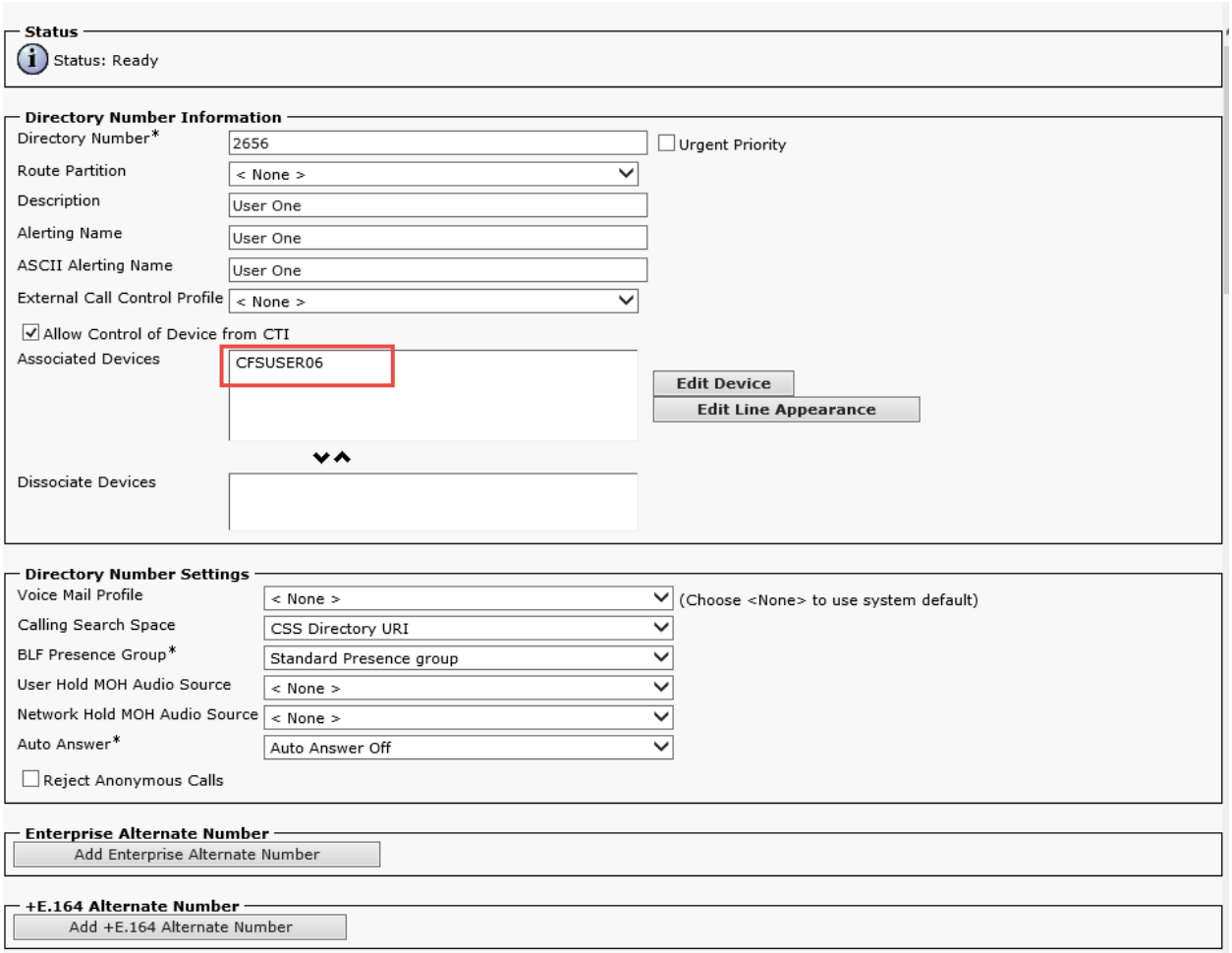


Figure 51: Cisco UCM Jabber Client Configuration-4

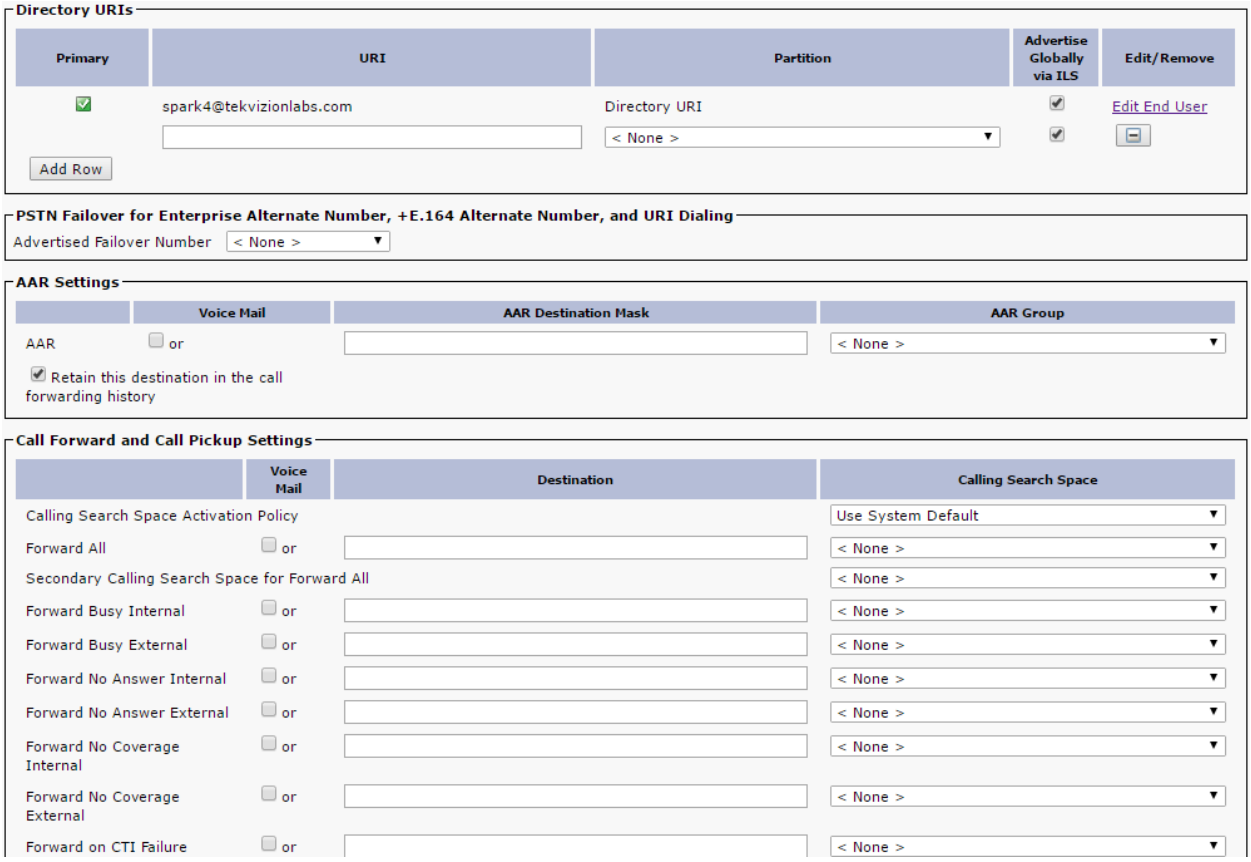


Figure 52: Cisco UCM Jabber Client Configuration-5

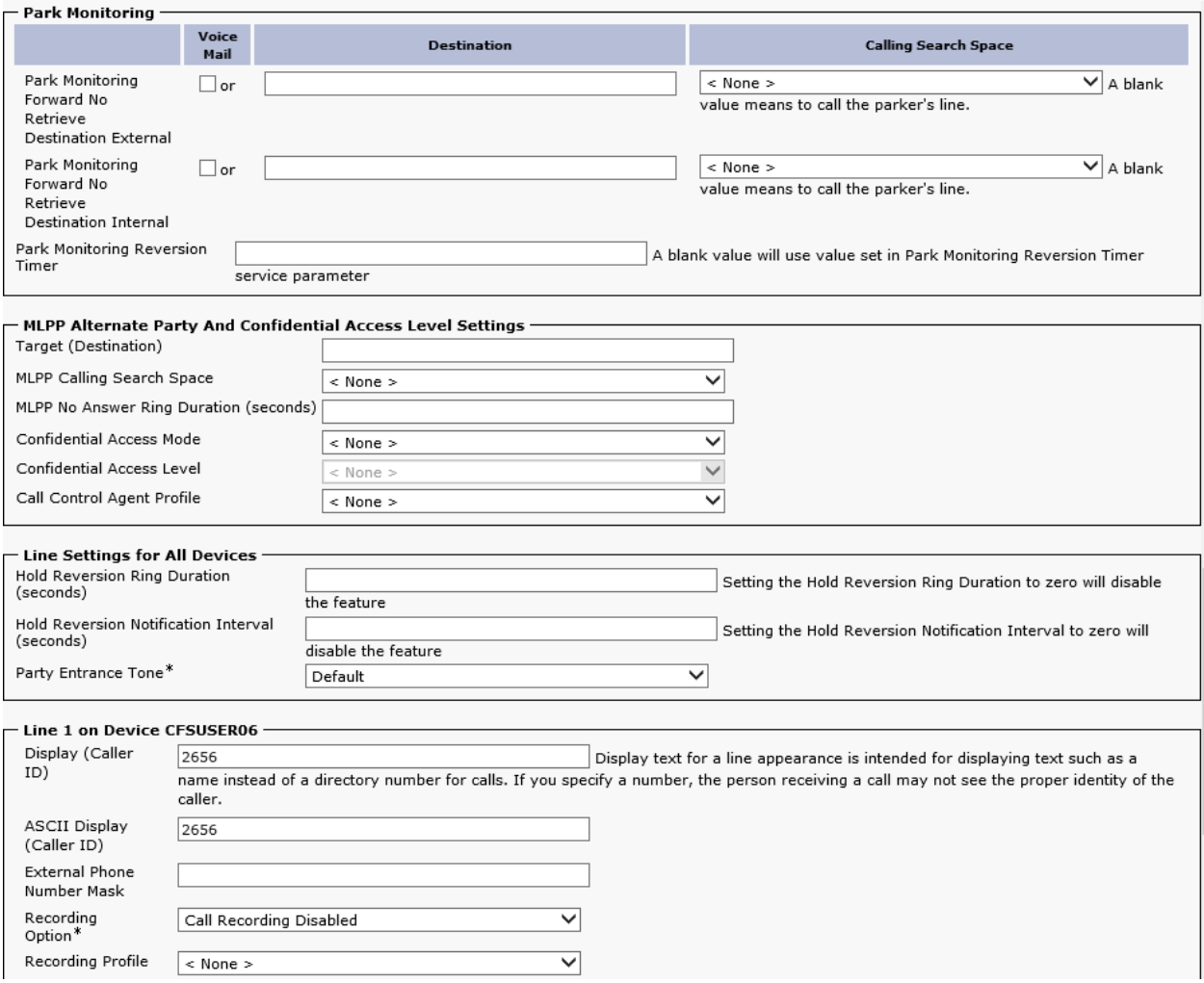


Figure 53: Cisco UCM Jabber Client Configuration-6

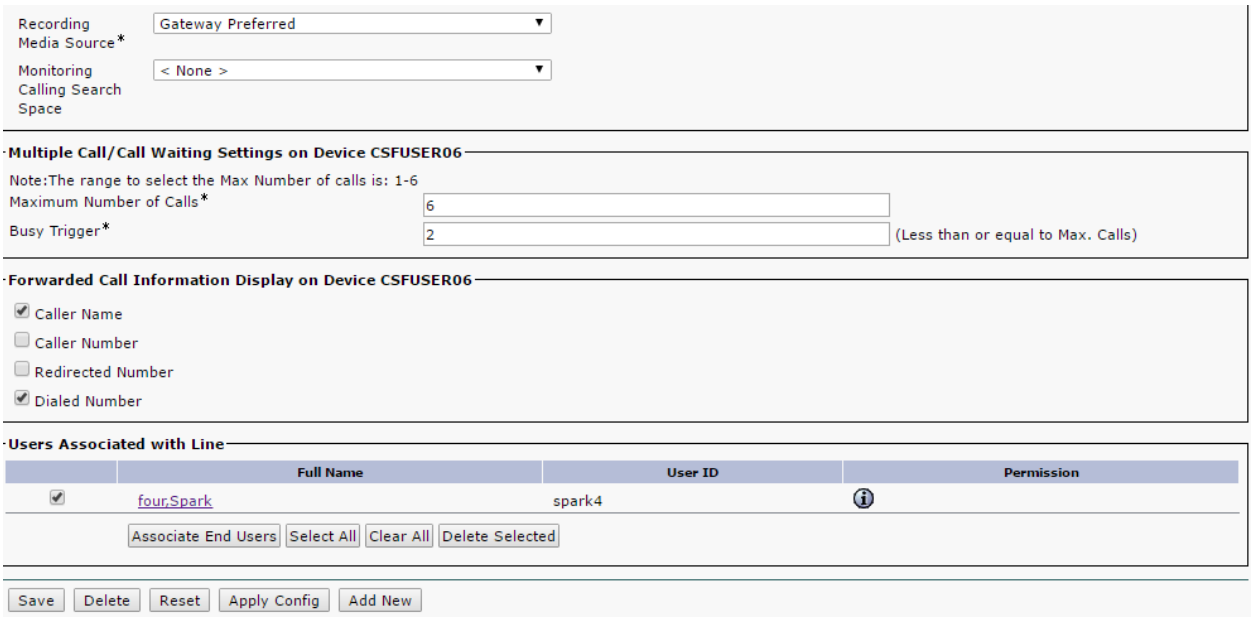


Figure 54: Cisco UCM Jabber Client Configuration-7

End Point configurations

Cisco Telepresence DX70 Configuration

Device Configuration

Navigation: Device->Phone->DX70

Phone Type

Product Type:	**Cisco DX70**
Device Protocol:	**SIP**

Real-time Device Status

Registration:	Registered with Cisco Unified Communications Manager clus30sub1.tekvizionlabs.com
IPv4 Address:	10.80.20.29
Active Load ID:	sipdx70.10-2-5-212
Inactive Load ID:	sipdx70.10-2-5-60
Download Status:	None

Device Information

Device is Active

Device is trusted

MAC Address*	881DFC6123C8	
Description	SEP881DFC6123C8	
Device Pool*	DP_Richardson	View Details
Common Device Configuration	< None >	View Details
Phone Button Template*	Cisco DX70 SIP	
Common Phone Profile*	Standard Common Phone Profile	View Details
Calling Search Space	< None >	
AAR Calling Search Space	< None >	
Media Resource Group List	MRGL_Richardson	
User Hold MOH Audio Source	< None >	
Network Hold MOH Audio Source	< None >	
Location*	Hub_None	
AAR Group	< None >	
User Locale	< None >	
Network Locale	< None >	

Figure 55: DX70 Device Configuration-1

Owner — User / Anonymous (Public/Shared Space)
Owner User ID* — spark2
Mobility User ID — < None >
Phone Personalization* — Default
Services Provisioning* — Default
Phone Load Name —
Use Trusted Relay Point* — Default
BLF Audible Alert Setting (Phone Idle)* — Default
BLF Audible Alert Setting (Phone Busy)* — Default
Always Use Prime Line* — Default
Always Use Prime Line for Voice Message* — Default
Geolocation — < None >
Feature Control Policy — < None >

- [ ] Ignore Presentation Indicators (internal calls only)
- [x] Allow Control of Device from CTI
- [x] Logged Into Hunt Group
- [ ] Remote Device
- [ ] Protected Device****

Number Presentation Transformation

Caller ID For Calls From This Phone

Calling Party Transformation CSS — < None >

- [x] Use Device Pool Calling Party Transformation CSS (Caller ID For Calls From This Phone)

Remote Number

Calling Party Transformation CSS — < None >

- [x] Use Device Pool Calling Party Transformation CSS (Device Mobility Related Information)

Protocol Specific Information

Packet Capture Mode* — None
Packet Capture Duration — 0
BLF Presence Group* — Standard Presence group

Figure 56: DX70 Device Configuration-2

Device Security Profile* Secured DX70

Rerouting Calling Search Space < None >

SUBSCRIBE Calling Search Space < None >

SIP Profile* Standard SIP Profile For Cisco VCS View Details

Digest User < None >

Media Termination Point Required

Unattended Port

Require DTMF Reception

Certification Authority Proxy Function (CAPF) Information

Certificate Operation* No Pending Operation

Authentication Mode* By Null String

Authentication String

Generate String

Key Order* RSA Only

RSA Key Size (Bits)* 2048

EC Key Size (Bits)

Operation Completes By 2016 11 10 12 (YYYY:MM:DD:HH)

Certificate Operation Status: None

Note: Security Profile Contains Addition CAPF Settings.

External Data Locations Information (Leave blank to use default)

Information

Directory

Messages

Services

Authentication Server

Proxy Server

Idle

Idle Timer (seconds)

Secure Authentication URL

Secure Directory URL

Secure Idle URL

Figure 57: DX70 Device Configuration-3

Secure Idle URL

Secure Information URL

Secure Messages URL

Secure Services URL

Extension Information

☐ Enable Extension Mobility

Log Out Profile -- Use Current Device Settings --

Log in Time < None >

Log out Time < None >

MLPP and Confidential Access Level Information

MLPP Domain < None >

Confidential Access Mode < None >

Confidential Access Level < None >

Product Specific Configuration Layout

	Parameter Value	Override Common Settings
Room Name (from Exchange(R))		
Web Access*	Enabled	
SSH Access*	Disabled	
Default Call Protocol*	SIP	
Quality Improvement Server		
Multipoint Mode*	Use Media Resource Group List	
Telnet Access*	On	
Microphone Unmute On Disconnect*	On	
Call Logging Mode*	On	
OSD Encryption Indicator*	Auto	
Alternate phone book server type*	UDS	
Alternate phone book server address		

Figure 58: DX70 Device Configuration-4

Default Volume	70
Max Total Downstream Rate	10000
Max Total Upstream Rate	10000
System Name	

CTMS Settings

CTMS Multiparty Conferencing*	On
CTMS Encryption Mode*	Off

Far End Camera Control Settings

Far End Camera Control*	On
Far End Camera Control Signaling Capability*	On

Facility Service Settings

Facility Service Type*	Helpdesk
Facility Service Name	
Facility Service Number	
Facility Service Call Type*	Video

Standby Settings

Standby Mode*	On
Standby Delay	10
Standby Action*	Privacy Position

Serial Port Settings

Serial Port*	On
Serial Port Login Required*	On

Admin username and password

Admin Username	admin
Admin Password	••••••••••••••••••••••••••••••

Figure 59: DX70 Device Configuration-5

Dial Plan

Site Access Code	
Inter Site Access Code	
Off-Net Access Code	
National Dialing Digits	
International Dialing Digits	

Directory Number

Country Code	
Area Code	
Local Number	

Osd

Todays Bookings*	Off

Figure 60: DX70 Device Configuration-6

Line Configuration

Navigation: Device->Phone->DX70->Line [1]

Directory Number Information

Directory Number* 2602 — Urgent Priority

Route Partition < None >

Description

Alerting Name

ASCII Alerting Name

External Call Control Profile < None >

☑ Allow Control of Device from CTI

Associated Devices SEP881DFC6123C8 — Edit Device — Edit Line Appearance

Dissociate Devices

Directory Number Settings

Voice Mail Profile < None > (Choose <None> to use system default)

Calling Search Space CSS Directory URI

BLF Presence Group* Standard Presence group

User Hold MOH Audio Source < None >

Network Hold MOH Audio Source < None >

Auto Answer* Auto Answer with Speakerphone

☐ Reject Anonymous Calls

Enterprise Alternate Number

Add Enterprise Alternate Number

Figure 61: DX70 Line [1] Configuration-1

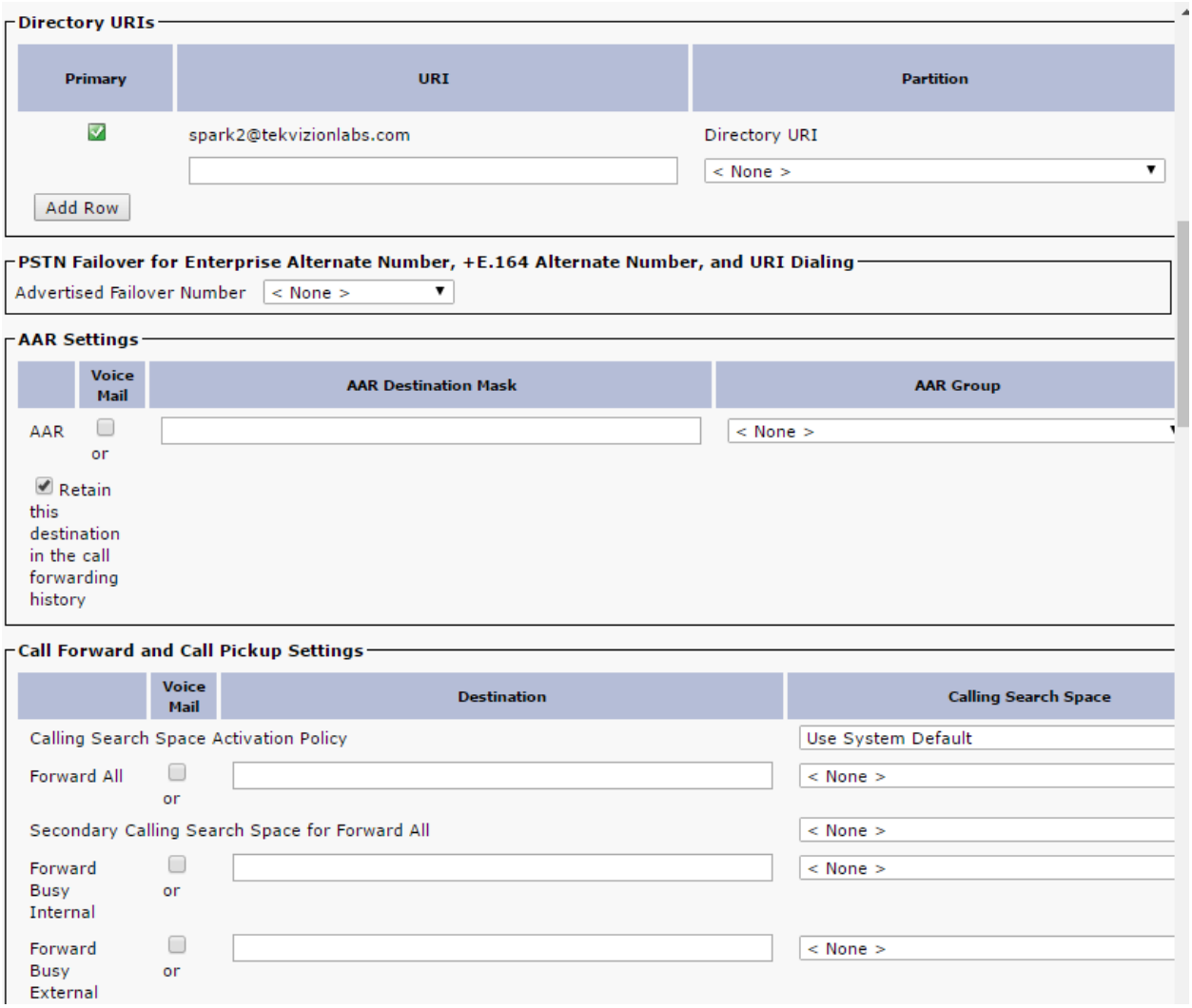


Figure 62: DX70 Line [1] Configuration-2

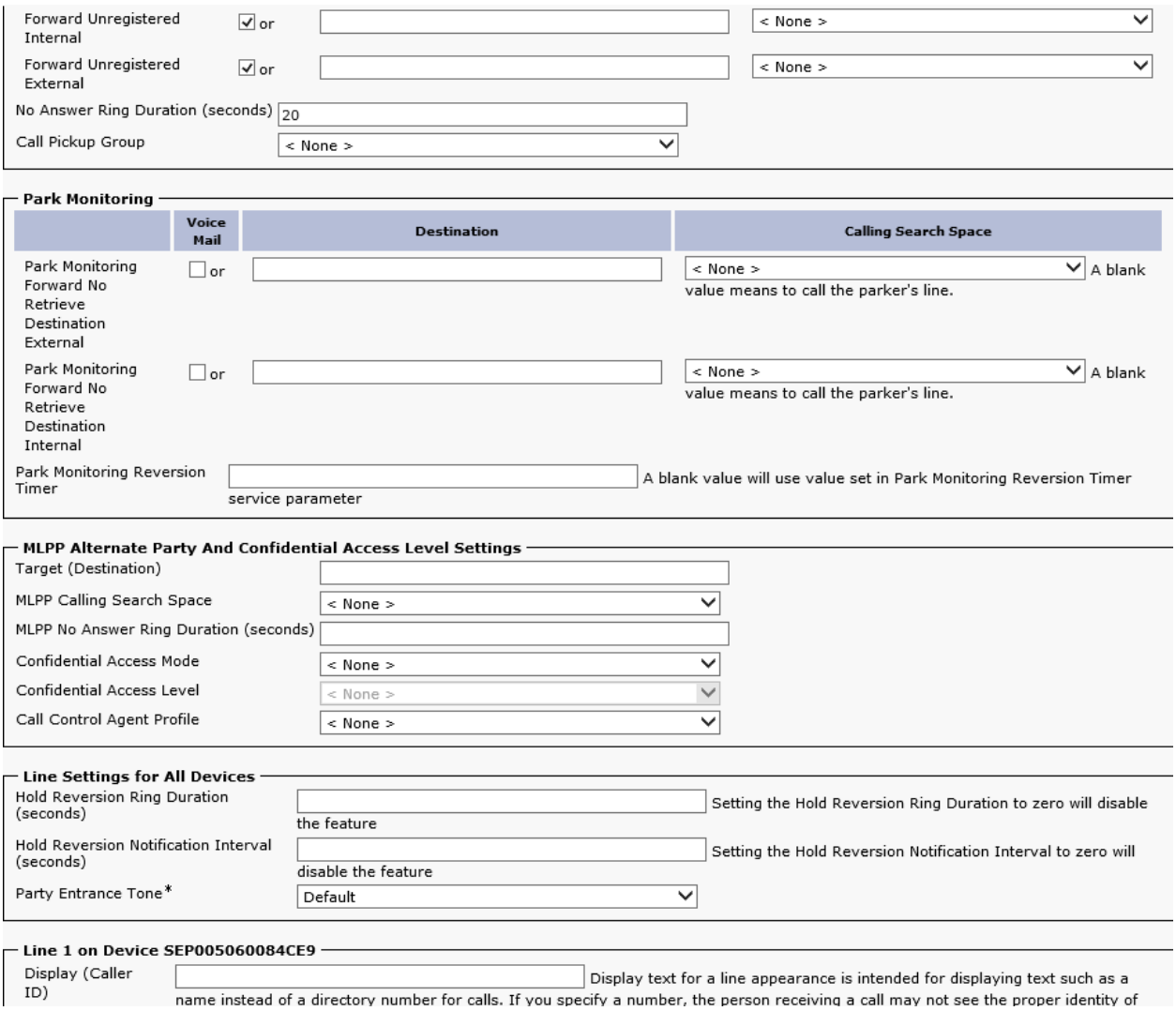


Figure 63: DX70 Line [1] Configuration-3

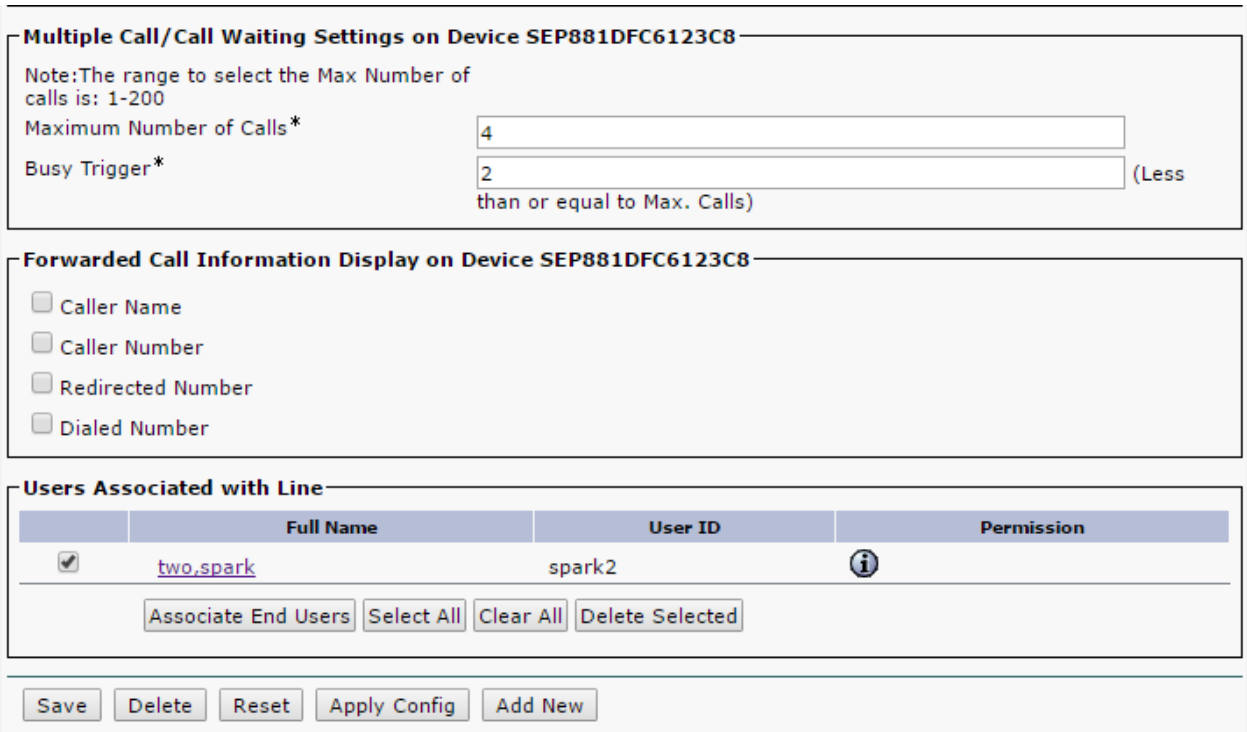


Figure 64: DX70 Line [1] Configuration-4

Cisco DX80 Configuration

Device Configuration

Navigation: Device->Phone->DX80

Device Information

- [x] Device is Active
- [x] Device is trusted

MAC Address*	7426ACEF053D
Description	SEP7426ACEF053D
Device Pool*	DP_Richardson ▼ View Details
Common Device Configuration	< None > ▼ View Details
Phone Button Template*	Standard Cisco TelePresence DX80 ▼
Common Phone Profile*	Standard Common Phone Profile ▼ View Details
Calling Search Space	< None > ▼
AAR Calling Search Space	< None > ▼
Media Resource Group List	< None > ▼
User Hold MOH Audio Source	< None > ▼
Network Hold MOH Audio Source	< None > ▼
Location*	Hub_None ▼
AAR Group	< None > ▼
User Locale	< None > ▼
Network Locale	< None > ▼
Privacy*	Default ▼
Device Mobility Mode*	Default ▼ View Current Device Mobility Settings
Owner	(•) User ( ) Anonymous (Public/Shared Space)
Owner User ID*	spark3 ▼
Mobility User ID	< None > ▼
Phone Load Name	sipdx80.ce821.rel.loads
Use Trusted Relay Point*	Default ▼
Always Use Prime Line*	Default ▼
Always Use Prime Line for Voice Message*	Default ▼
Geolocation	< None > ▼

- [x] Retry Video Call as Audio
- [ ] Ignore Presentation Indicators (internal calls only)

Figure 65: DX80 Device Configuration-1

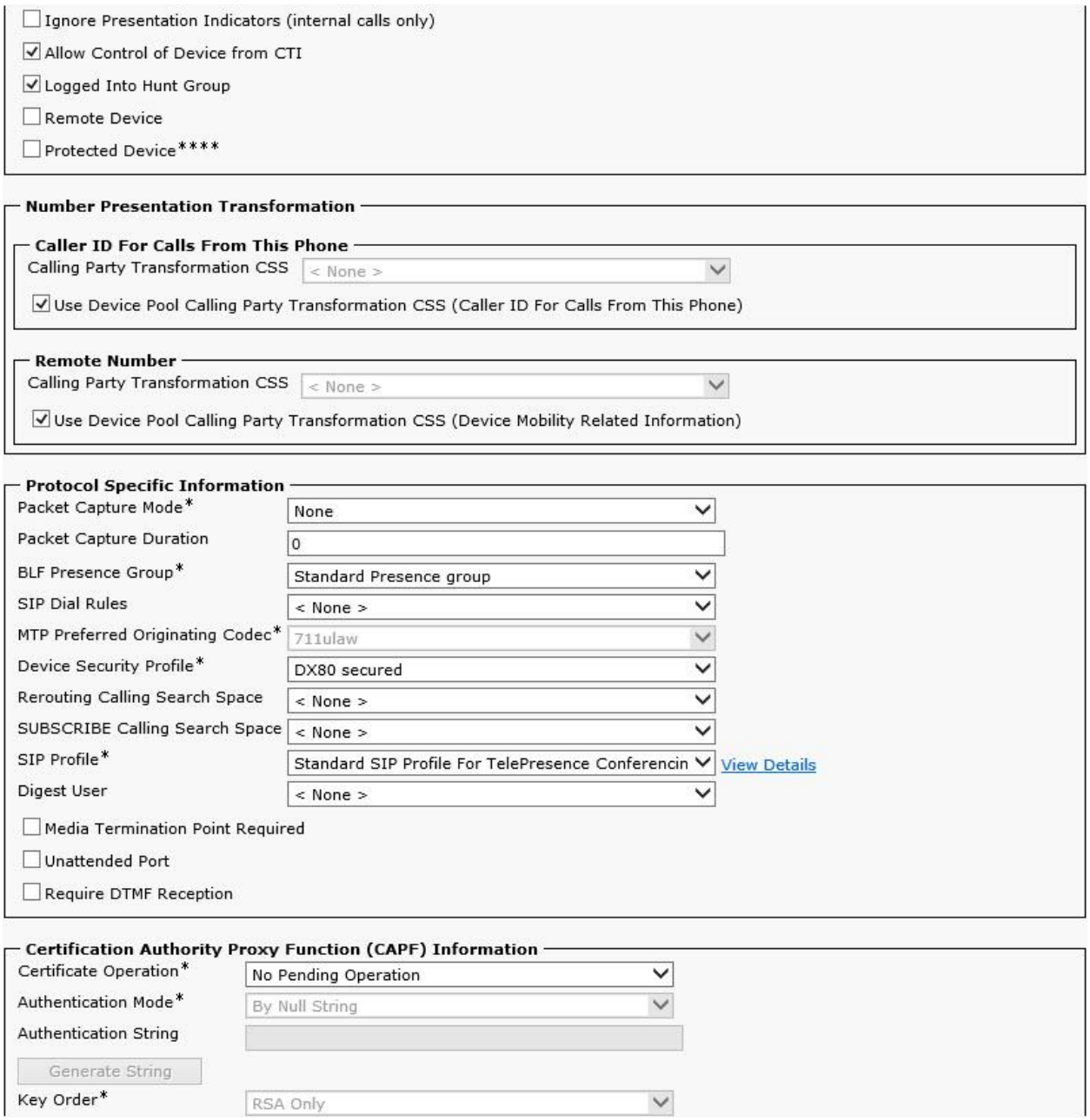


Figure 66: DX80 Device Configuration-2

RSA Key Size (Bits)* 2048

EC Key Size (Bits)

Operation Completes By 2016 2 7 12 (YYYY:MM:DD:HH)

Certificate Operation Status: None

Note: Security Profile Contains Addition CAPF Settings.

External Data Locations Information (Leave blank to use default)

Information

Directory

Messages

Services

Authentication Server

Proxy Server

Idle

Idle Timer (seconds)

Secure Authentication URL

Secure Directory URL

Secure Idle URL

Secure Information URL

Secure Messages URL

Secure Services URL

Extension Information

☐ Enable Extension Mobility

Log Out Profile -- Use Current Device Settings --

Log in Time < None >

Log out Time < None >

MLPP and Confidential Access Level Information

MLPP Domain < None >

MLPP Indication* Default

MLPP Preemption* Default

Confidential Access Mode < None >

Confidential Access Level < None >

Figure 67: DX80 Device Configuration-3

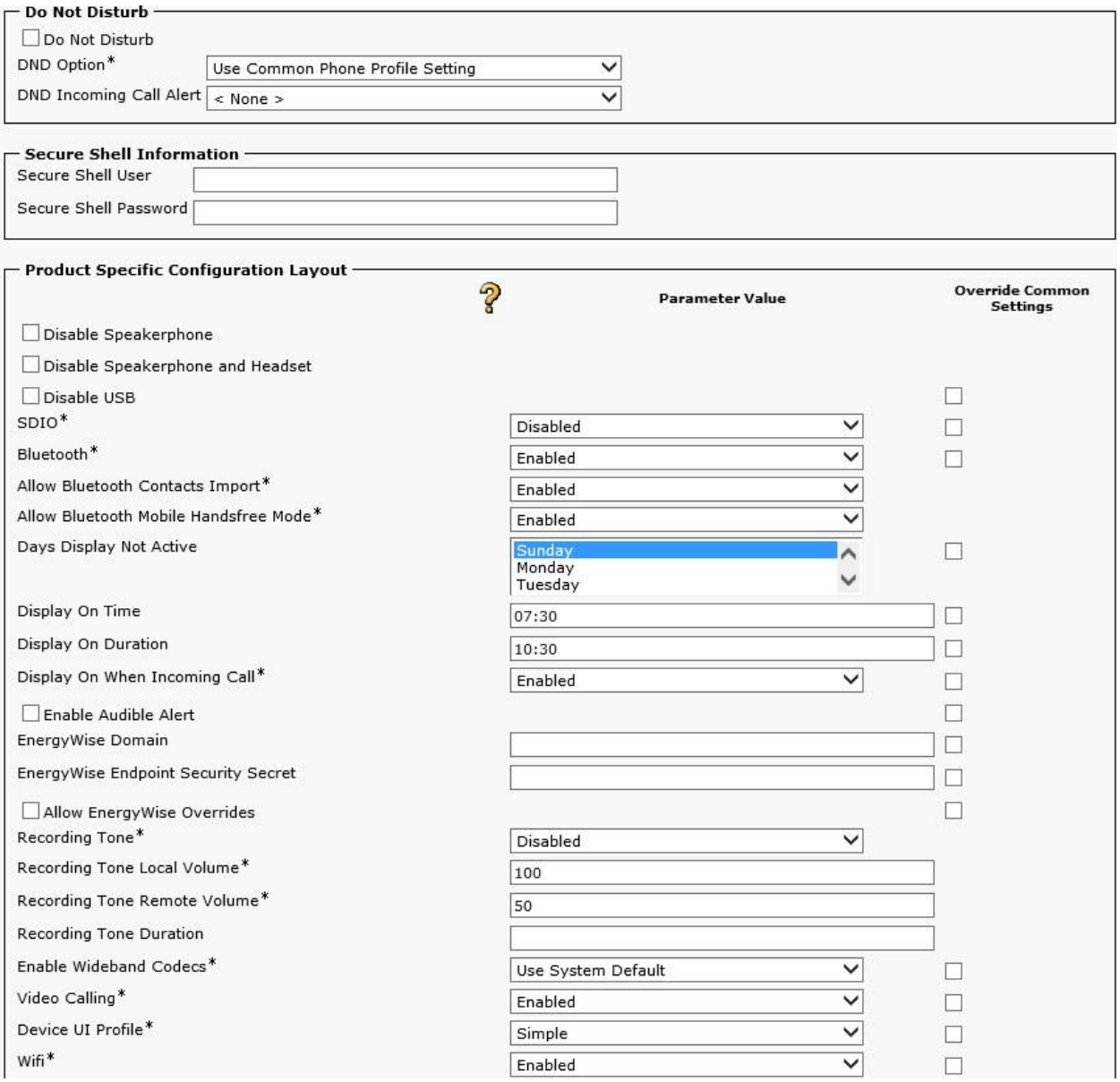


Figure 68: DX80 Device Configuration-4

PC Port*	Enabled	☐
Span to PC Port*	Disabled	☐
PC Voice VLAN Access*	Enabled	☐
PC Port Remote Configuration*	Disabled	☐
Switch Port Remote Configuration*	Disabled	☐
Detect Unified CM Connection Failure*	Normal	
Gratuitous ARP*	Disabled	
Cisco Discovery Protocol (CDP): Switch Port*	Enabled	☐
Cisco Discovery Protocol (CDP): PC Port*	Enabled	☐
Link Layer Discovery Protocol - Media Endpoint Discover (LLDP-MED): Switch Port*	Enabled	☐
Link Layer Discovery Protocol (LLDP): PC Port*	Enabled	☐
LLDP Asset ID		☐
LLDP Power Priority*	Unknown	☐
Power Negotiation*	Enabled	☐
Automatic Port Synchronization*	Disabled	☐
802.1x Authentication*	User Controlled	☐
☐ Always On VPN		☐
☐ Store VPN Password on Device		☐
☑ Allow User-Defined VPN Profiles		☐
Require Screen Lock*	User Controlled	☐
Maximum Screen Lock Timeout*	600	☐
☑ Enforce Screen Lock During Display-On Time		☐
Lock Device During Audio Call*	Disabled	☐
Kerberos Server		☐
Kerberos Realm		☐
Load Server		☐
IPv6 Load Server		☐
Peer Firmware Sharing*	Enabled	☐
Log Server		☐
IPv6 Log Server		☐
Log Profile	Default Preset Telephony	☐
Web Access*	Disabled	☐

Figure 69: DX80 Device Configuration-5

SSH Access*	Disabled	☐
Android Debug Bridge (ADB)*	Disabled	☐
Multi-User*	Disabled	☐
Allow Applications from Unknown Sources*	Disabled	☐
☐ Allow Applications from Google Play		☐
☐ Enable Cisco UCM App Client		☐
Background Image		☐
Company Photo Directory		☐
Voicemail Server (Primary)		☐
Voicemail Server (Backup)		☐
Presence and Chat Server (Primary)		☐
Presence and Chat Server Type*	Cisco WebEx Connect	☐
Presence and Chat Single Sign-On (SSO) Domain		☐
Multi-User URL		☐
Email address for customer support		☐
Customer support upload URL		☐
User Credentials Persistent for Expressway Sign in*	Disabled	☐

Figure 70: DX80 Device Configuration-6

Line Configuration

Navigation: Device->Phone-> DX80 *->Line [1]*

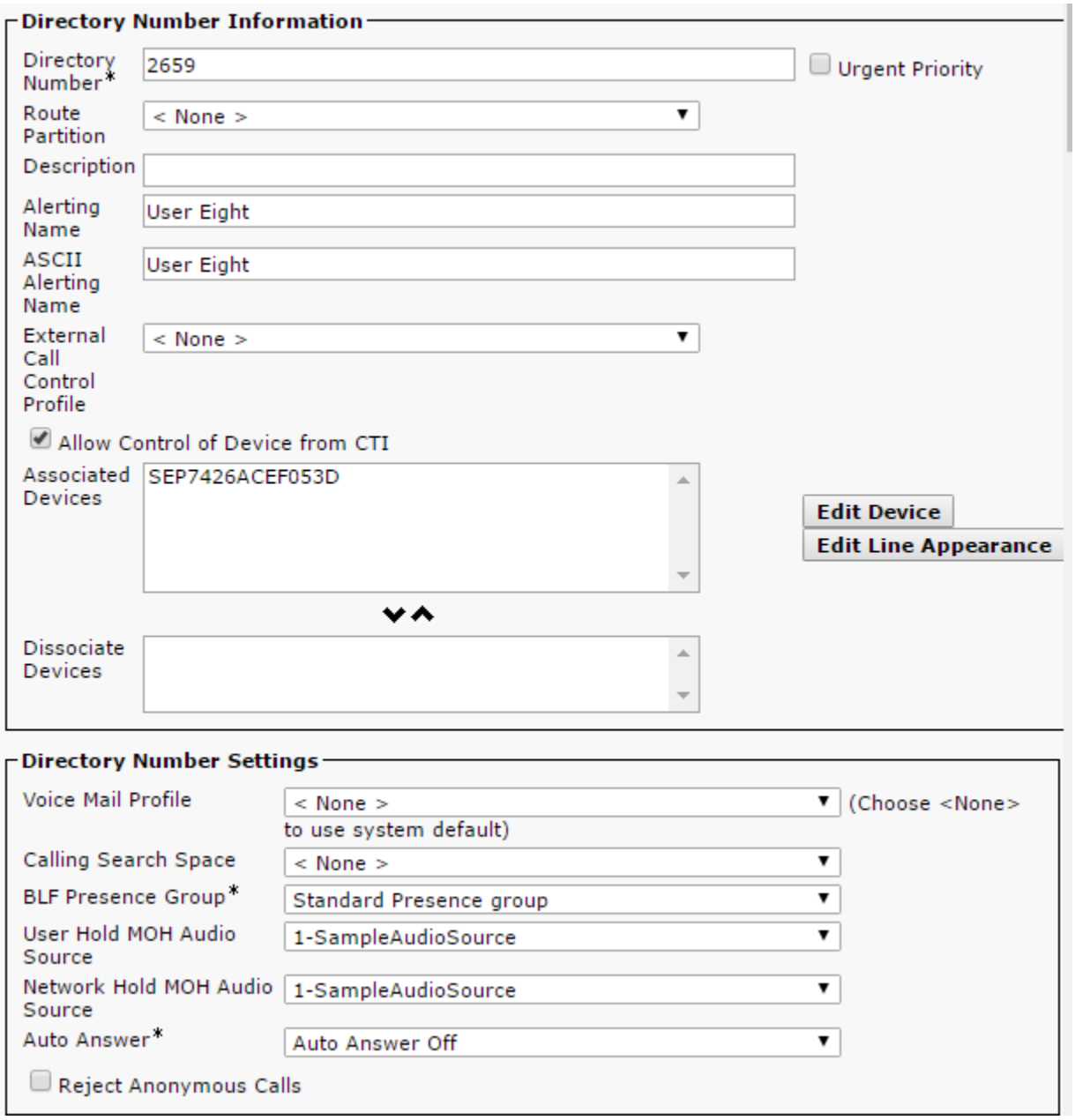


Figure 71: DX80 Line [1] Configuration-1

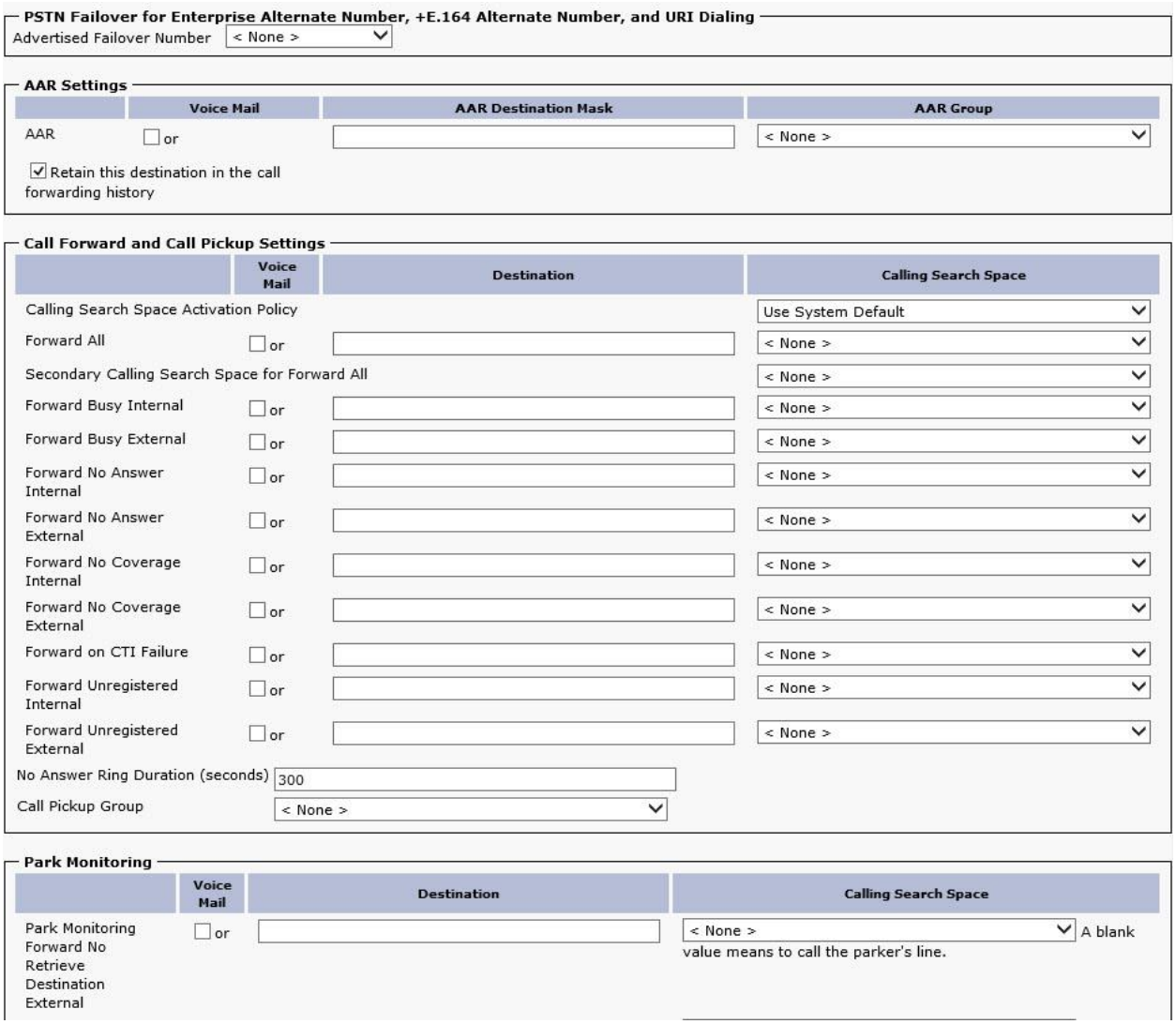


Figure 72: DX80 Line [1] Configuration-2

Park Monitoring Forward No Retrieve Destination Internal ☐ or < None > A blank value means to call the parker's line.

Park Monitoring Reversion Timer A blank value will use value set in Park Monitoring Reversion Timer service parameter

MLPP Alternate Party And Confidential Access Level Settings

Target (Destination)

MLPP Calling Search Space < None >

MLPP No Answer Ring Duration (seconds)

Confidential Access Mode < None >

Confidential Access Level < None >

Call Control Agent Profile < None >

Line Settings for All Devices

Hold Reversion Ring Duration (seconds) Setting the Hold Reversion Ring Duration to zero will disable the feature

Hold Reversion Notification Interval (seconds) Setting the Hold Reversion Notification Interval to zero will disable the feature

Party Entrance Tone* Default

Line 1 on Device SEP7426ACEF053D

Display (Caller ID) Display text for a line appearance is intended for displaying text such as a name instead of a directory number for calls. If you specify a number, the person receiving a call may not see the proper identity of the caller.

ASCII Display (Caller ID)

Line Text Label

External Phone Number Mask

Visual Message Waiting Indicator Policy* Use System Policy

Audible Message Waiting Indicator Policy* Default

Ring Setting (Phone Idle)* Use System Default

Ring Setting (Phone Active) Use System Default Applies to this line when any line on the phone has a call in progress.

Call Pickup Group Audio Alert Setting (Phone Idle) Use System Default

Figure 73: DX80 Line [1] Configuration-3

Multiple Call/Call Waiting Settings on Device SEP7426ACEF053D

Note:The range to select the Max Number of calls is: 1-4

Maximum Number of Calls* 4

Busy Trigger* 4 (Less than or equal to Max. Calls)

Forwarded Call Information Display on Device SEP7426ACEF053D

☐ Caller Name

☐ Caller Number

☐ Redirected Number

☐ Dialed Number

Users Associated with Line

	Full Name	User ID	Permission
☑	three,Spark	spark3	ⓘ

Associate End Users | Select All | Clear All | Delete Selected

Save | Delete | Reset | Apply Config | Add New

Figure 74: DX80 Line [1] Configuration-4

Expressway-C Configuration

System Configuration

IP Configuration

Navigation: System->IP Address

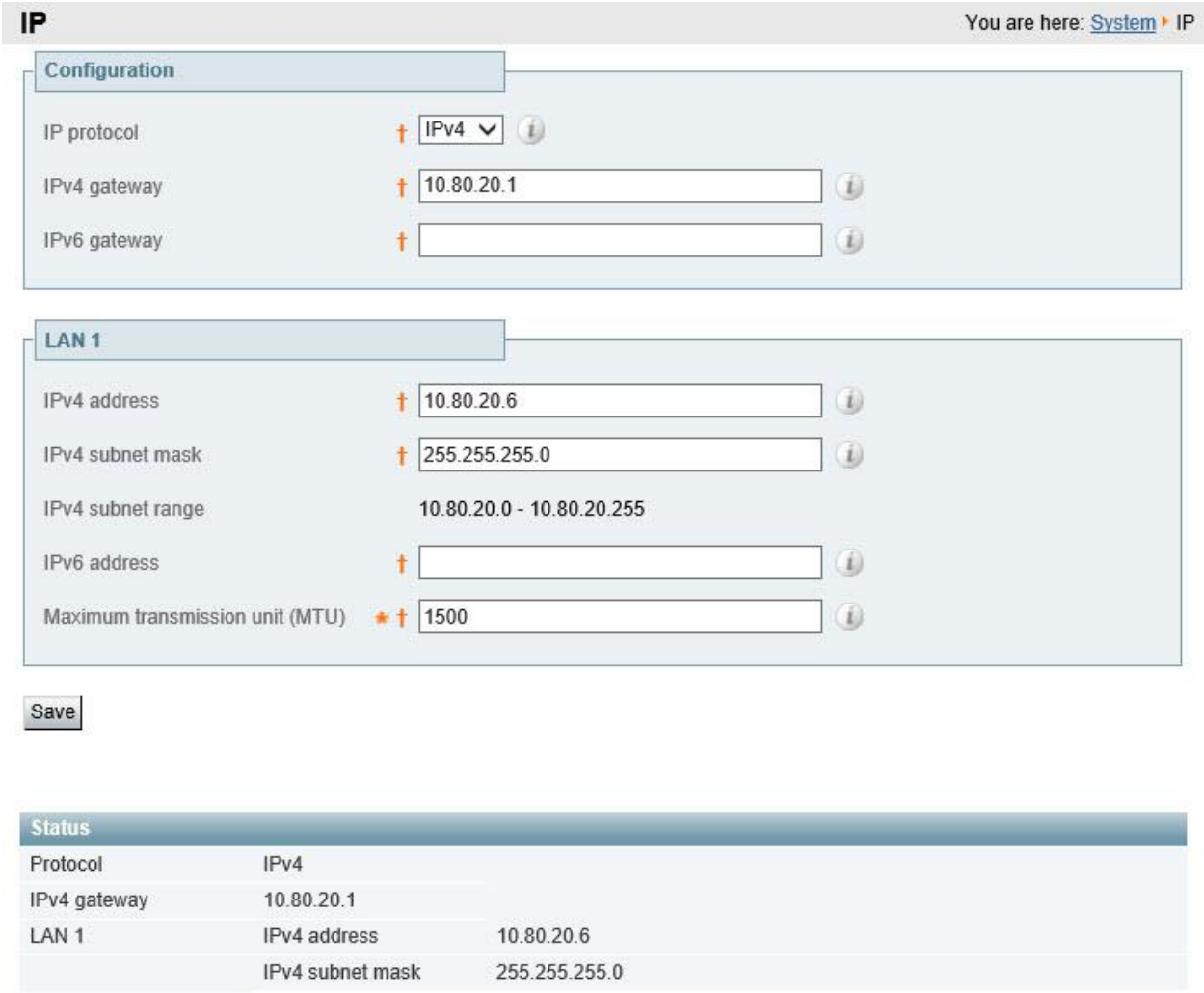


Figure 75: Expressway-C-IP Address Configuration

Option Keys

Navigation: Maintenance->Option keys

Note: AV integration between Skype for Business and UCM via Expressway requires the option keys as shown below.

Ensure the required licenses for the highlighted options are installed and available if video integration is performed.

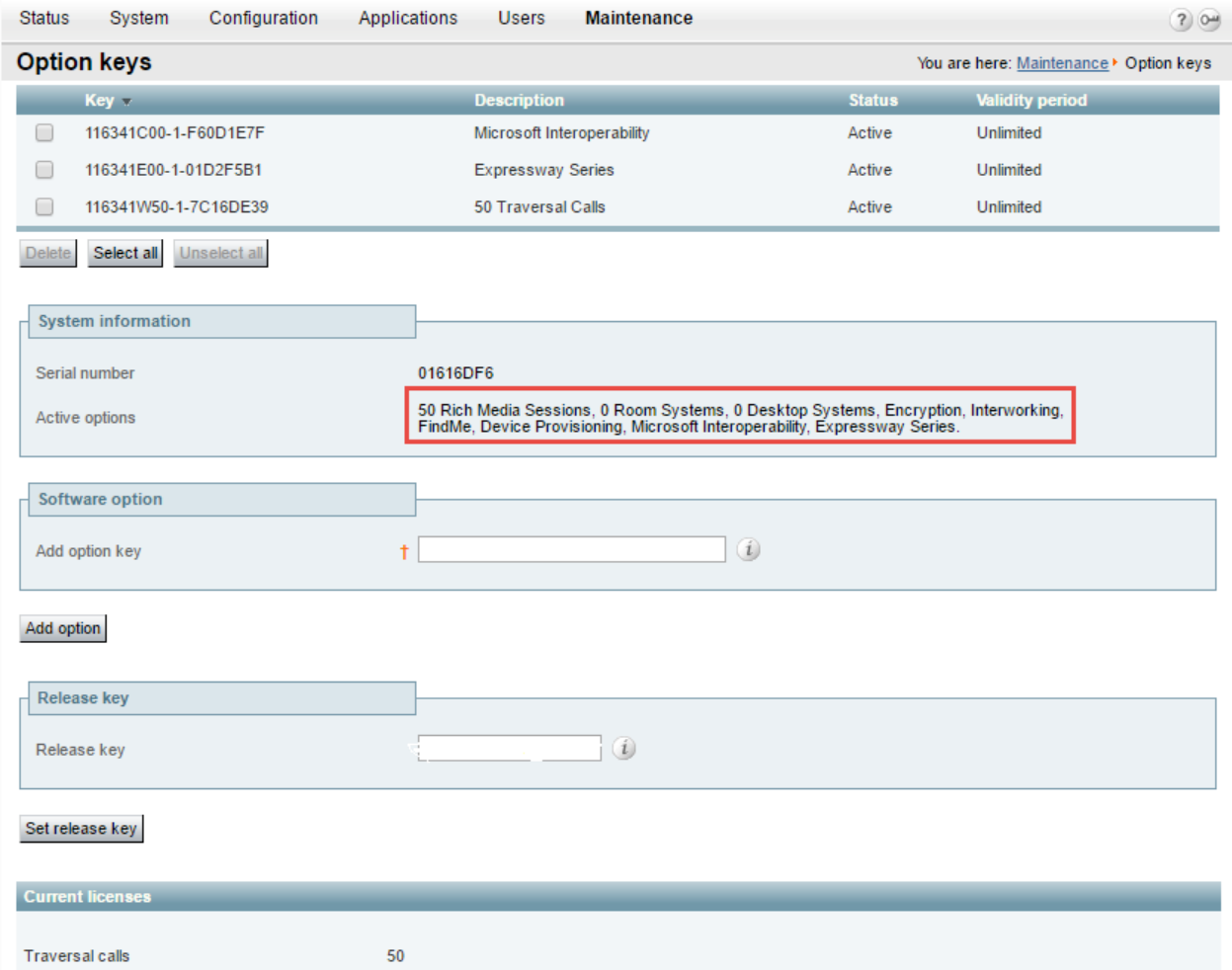


Figure 76: Expressway-C-Options

DNS Configuration

Navigation: System-> DNS

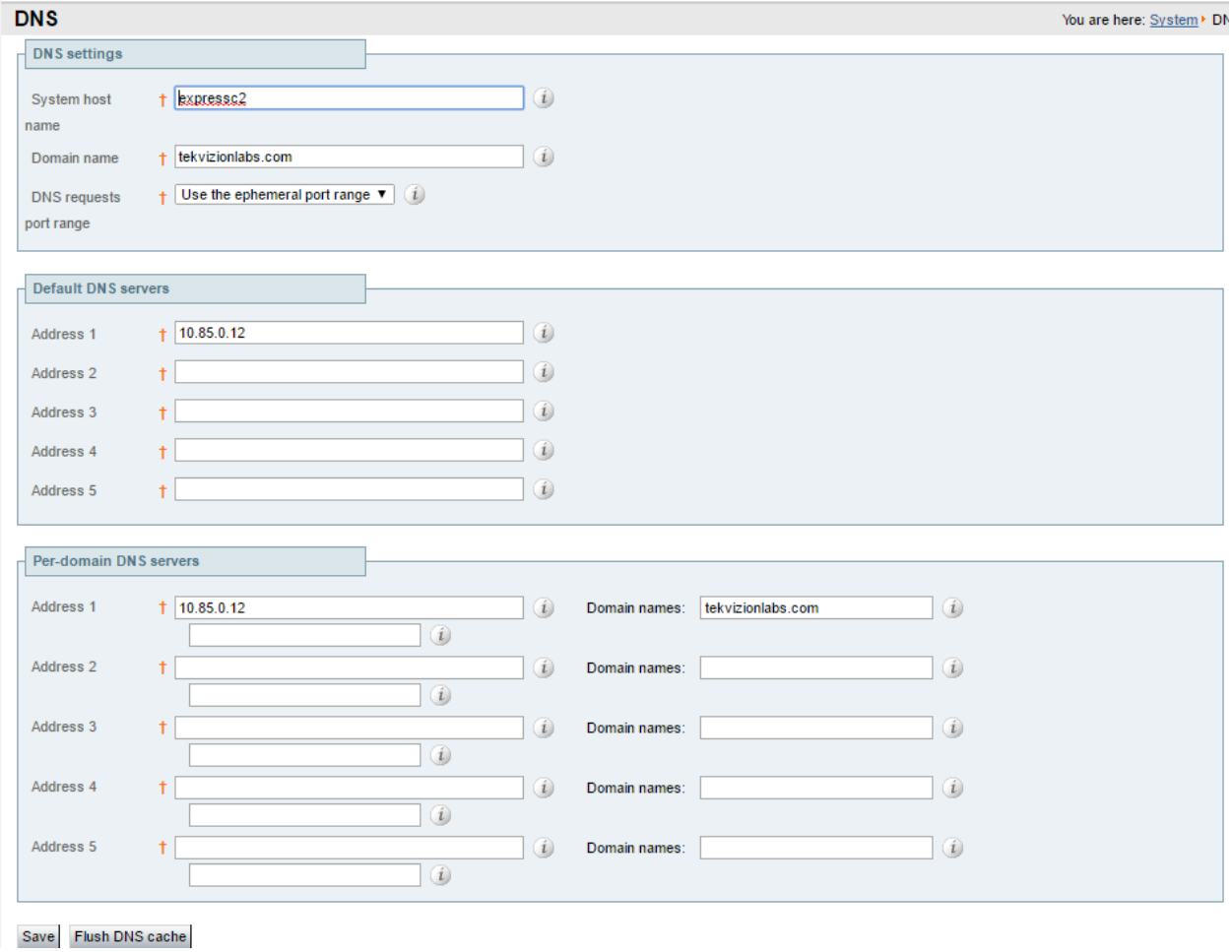


Figure 77: Expressway-C-DNS Configuration

NTP Configuration

Navigation: System->Time

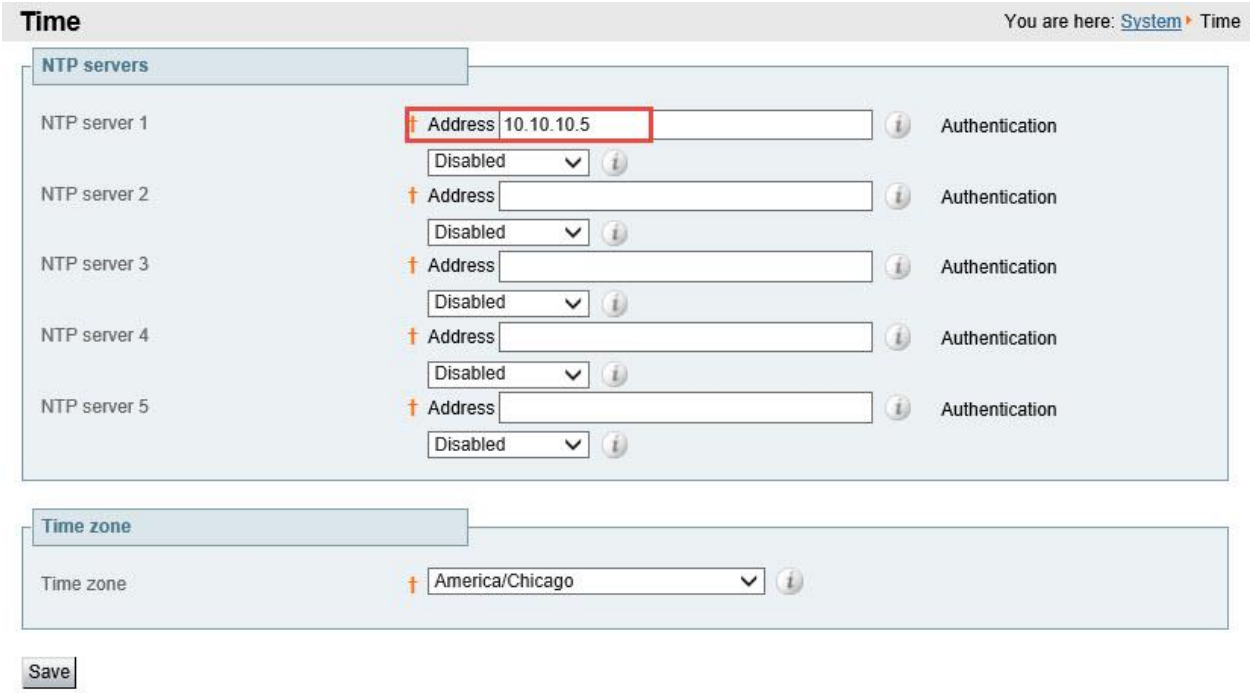


Figure 78: Expressway-C-NTP Configuration

TLS in SIP Configuration

Navigation: Configuration->Protocols->SIP

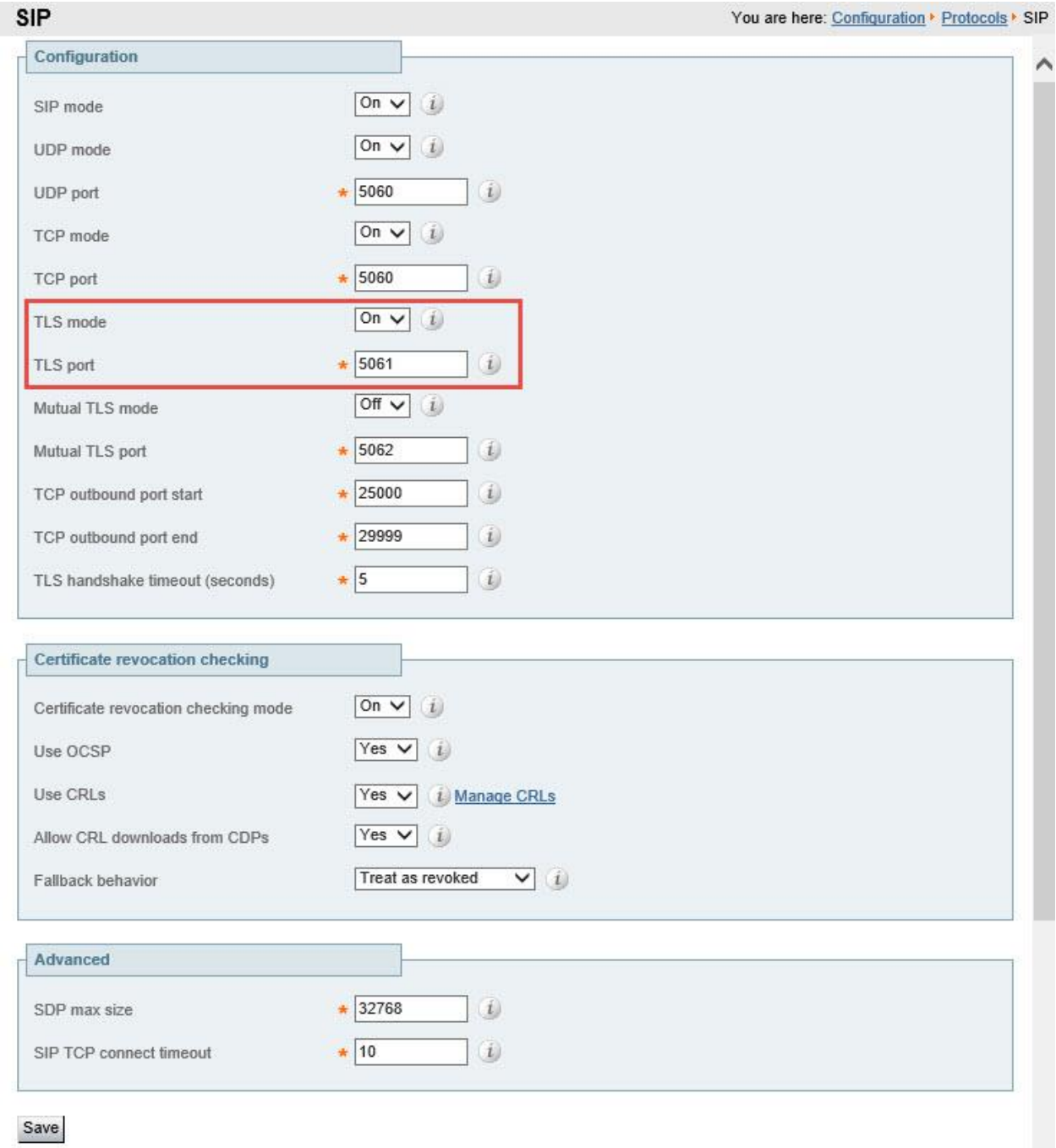


Figure 79: Expressway-C-SIP Configuration

Microsoft Lync B2BUA configuration (Skype for Business B2BUA)

Navigation: Applications->B2BUA->Microsoft Interoperability->Configuration

1. Set **Microsoft Interoperability:** Enabled
2. Set **destination address:** Enter the IP address or FQDN of the server to which the B2BUA sends the signaling messages, Skype for Business Server here.
3. Set **destination port:** 5061
4. Set **signaling transport:** TLS

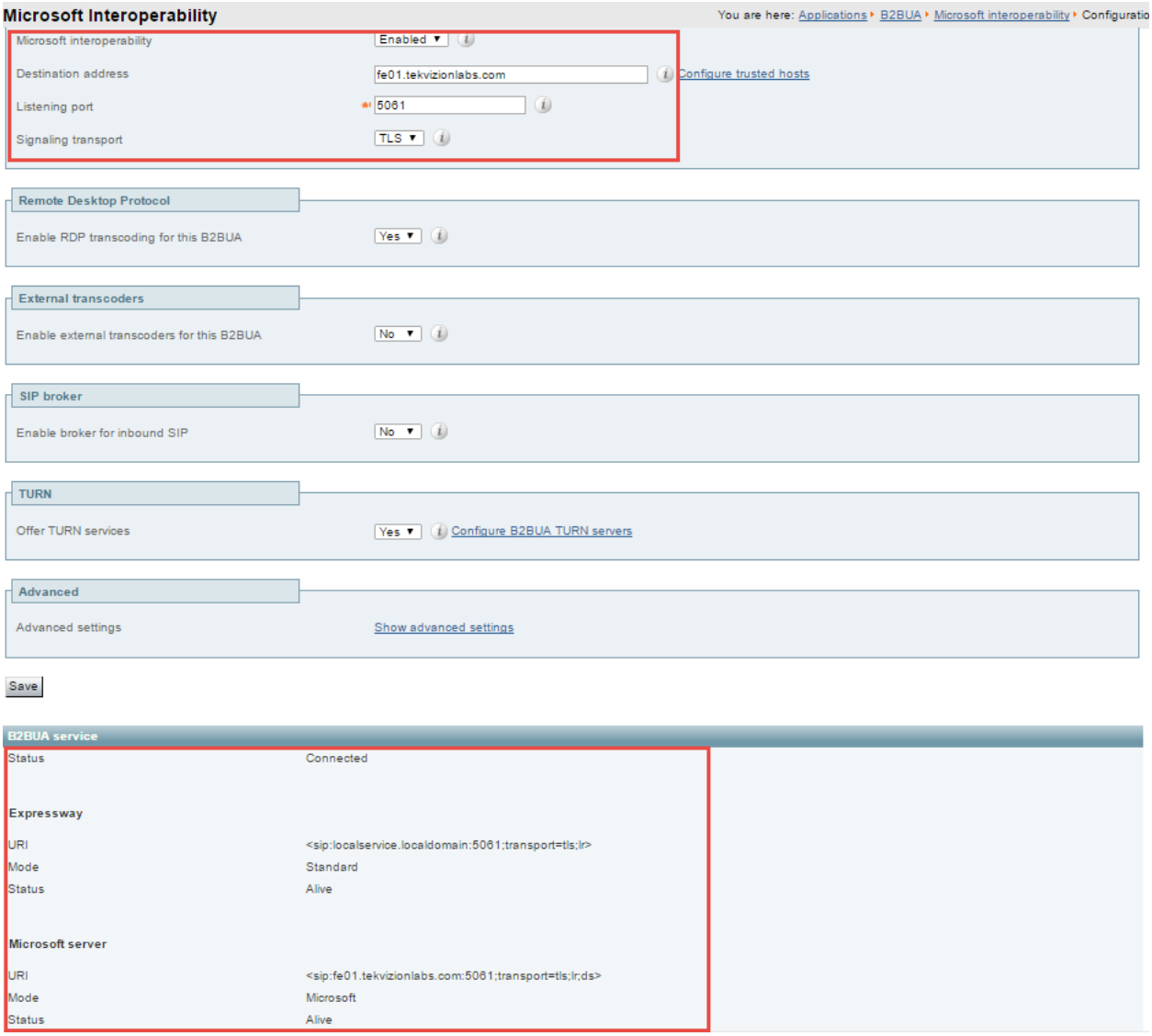


Figure 80: Expressway-C-Microsoft Lync (Skype for Business B2BUA) B2BUA Configuration

Microsoft Lync (Skype for Business) B2BUA trusted hosts

Expressway and Skype for Business Front End server should be added to the trusted host list.

Navigation: Applications->B2BUA->Microsoft Lync->B2BUA trusted hosts

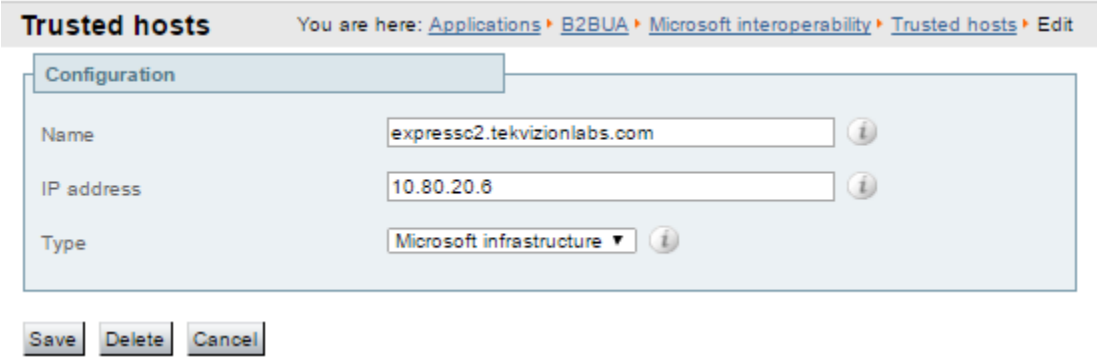


Figure 81: Expressway-C-Microsoft Lync (Skype for Business) B2BUA trusted hosts-1

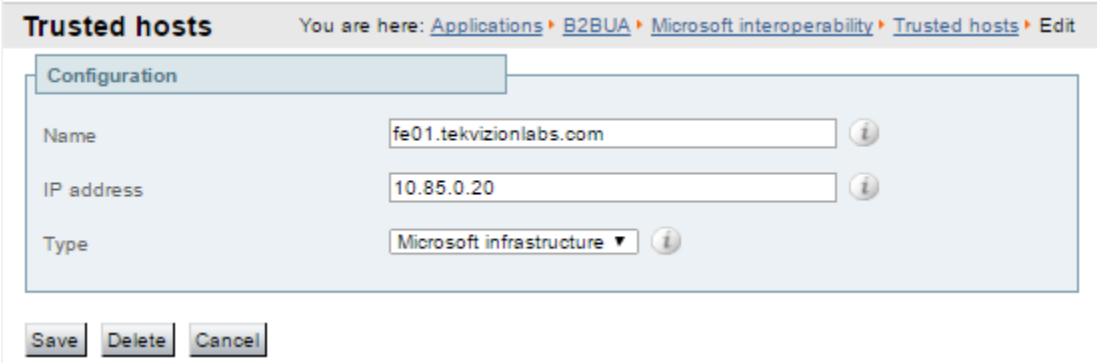


Figure 82: Expressway-C-Microsoft Lync (Skype for Business) B2BUA trusted hosts-2

Loading server and trust certificates

Expressway-C Server Certificate

Navigation: Maintenance->Security Certificates->Server certificate

This is used to manage the Expressway-C's server certificate. This certificate is used to identify the Expressway-C server when it communicates with systems using TLS encryption.

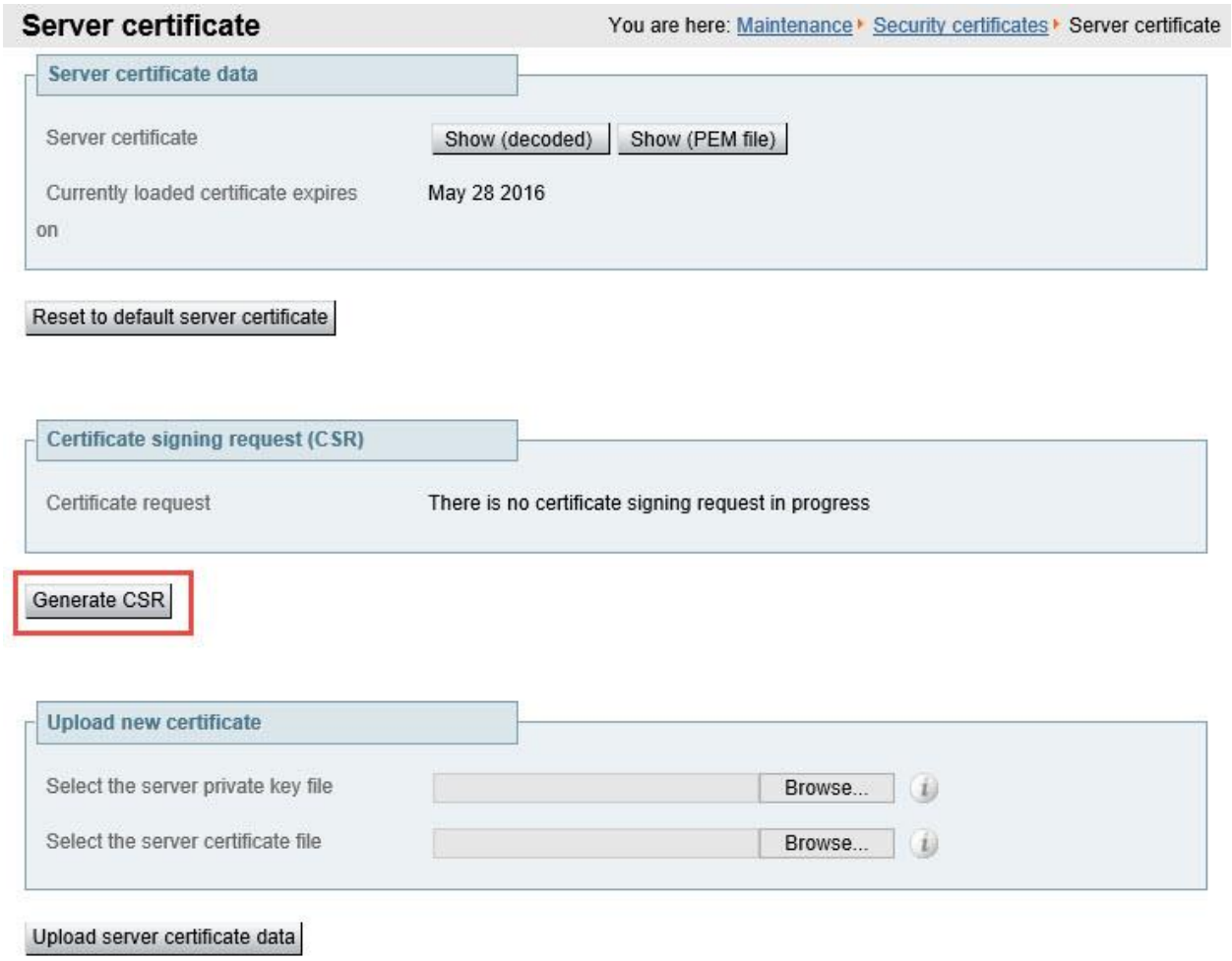


Figure 83: Expressway-C-Generate CSR-1

List of SAN entries required for Generating CSR:

- Fqdn of the expressway, expressc2.tekvizionlabs.com here.
- Fqdn of the CUCM, clus30pub.tekvizionlabs.com here.

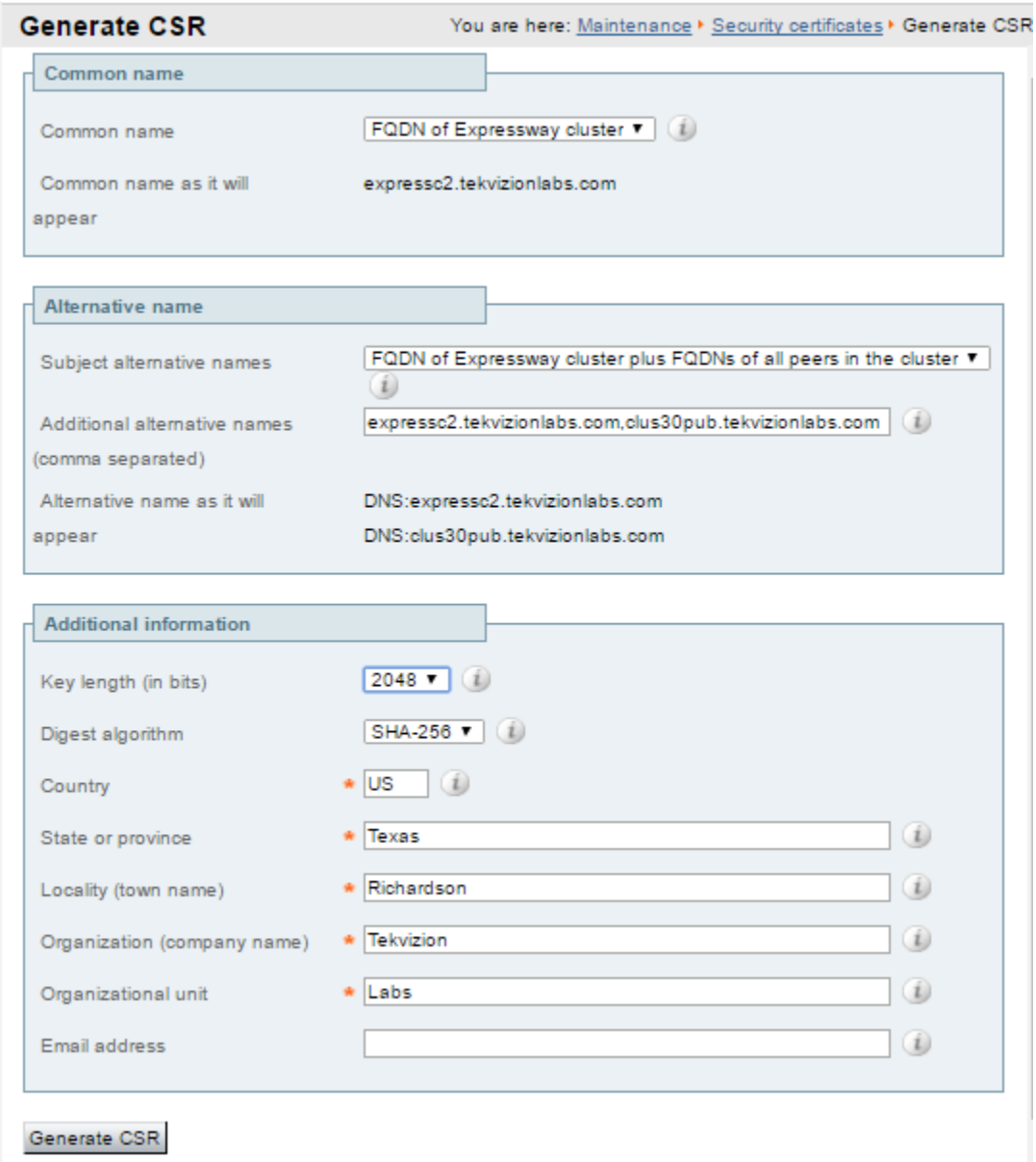


Figure 84: Expressway-C-Generate CSR-2

After the CSR is generated and downloaded, follow the steps described in [Submit a certificate request in the Certificate Authority] to create a certificate request in CA.

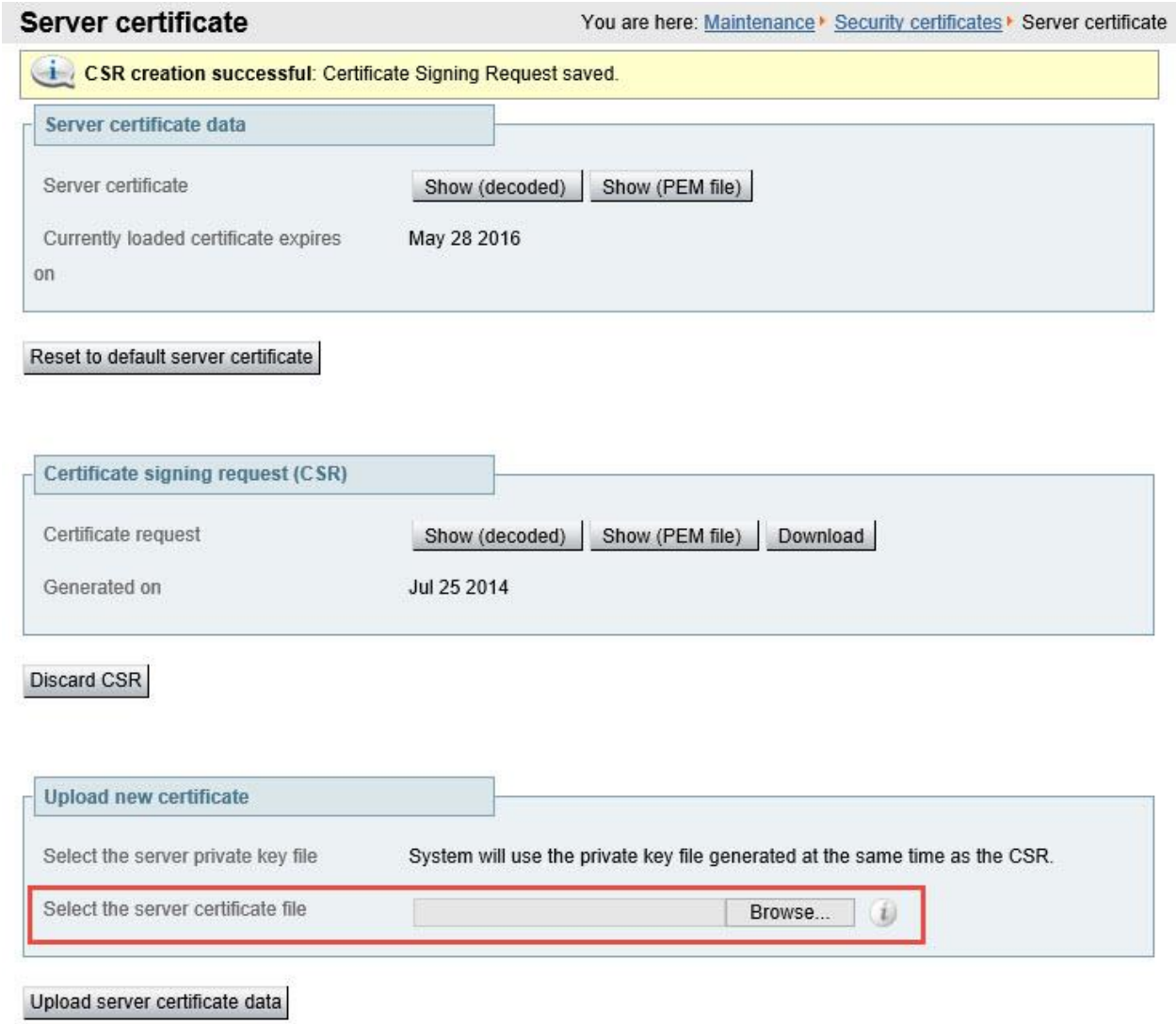


Figure 85: Expressway-C-Server Certificate Upload

Expressway-C Trusted CA Certificate

Navigation: Maintenance->Security Certificates->Trusted CA certificate

This allows you to manage the list of certificates for the Certificate Authorities (CAs) trusted by this Expressway-C. When a TLS connection to Expressway-C mandates certificate verification, the certificate presented to the Expressway-C must be signed by a trusted CA in this list and there must be a full chain of trust (intermediate CAs) to the root CA.

Follow the steps described in Download a root certificate from CA to download the root certificate from CA.

Figure 86 Expressway-C-Trusted Certificate Upload

Call Routing

Navigation: Configuration->Call routing

1. Set **Call Signaling optimization:** On
2. Set **Call loop detection mode:** On

Figure 87: Expressway-C-Call routing

Call Flows

CISCO UCM -> Skype for Business Internal

The Audio/Video signaling flow from Cisco UCM (including PSTN calls) to Skype for Business are as follows:

1. The CISCO UCM routes it to the Expressway-C.
2. Expressway-C routes the Cisco UCM call to the Skype for Business Front End.
3. The resulting signaling path:
    a. Audio/Video signaling: session is established between the CISCO UCM and the B2BUA on the Expressway-C and Expressway-C to Skype for Business Front End.

Skype for Business->CISCO UCM Internal

The Audio/Video (AV) signaling flows are as follows:

1. A Skype for Business user starts a call.
2. The Skype for Business Front End routes it to the Expressway-C.
3. Expressway-C routes the SIP AV invite to CUCM and thereby it is sent to the CUCM endpoint.
4. The resulting signaling path:
    a. Audio/Video signaling: session is established between the Skype for Business Front End and the B2BUA on the Expressway-C.

CISCO UCM -> Skype for Business External

The Audio/Video signaling flow from Cisco UCM (including PSTN calls) to Skype for Business are as follows:

1. The Expressway-E routes the call to Expressway-C and the expressway-C routes the call towards CISCO UCM and the CUCM routes it to the Expressway-C.
2. Expressway-C routes the Cisco UCM call to the Skype for Business Front End.
3. The resulting signaling path:
    a. Audio/Video Media: Expressway- E and Microsoft Edge server anchors the media between Cisco and Skype for Business external clients

Zone and Search Rule Configuration for Audio/Video Integration

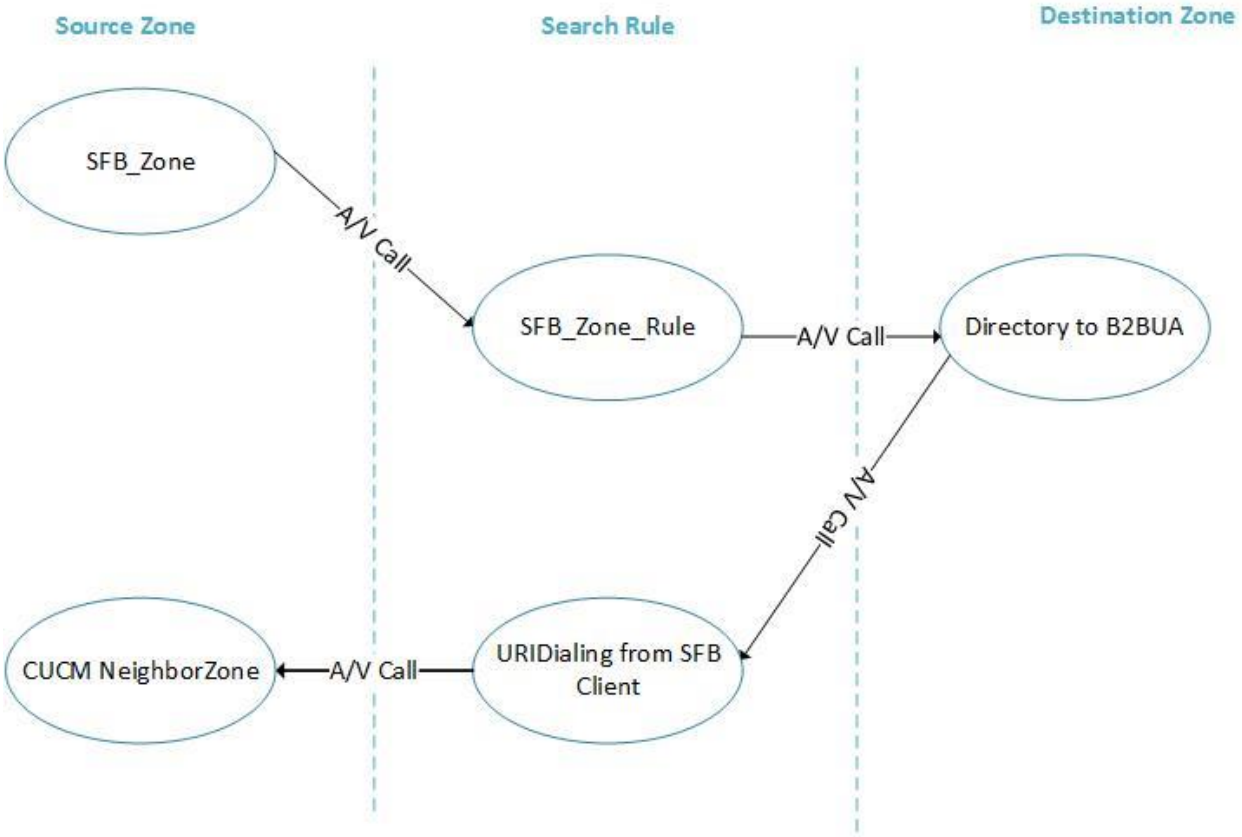


Figure 88: Audio/Video Call flow Skype for Business to UCM

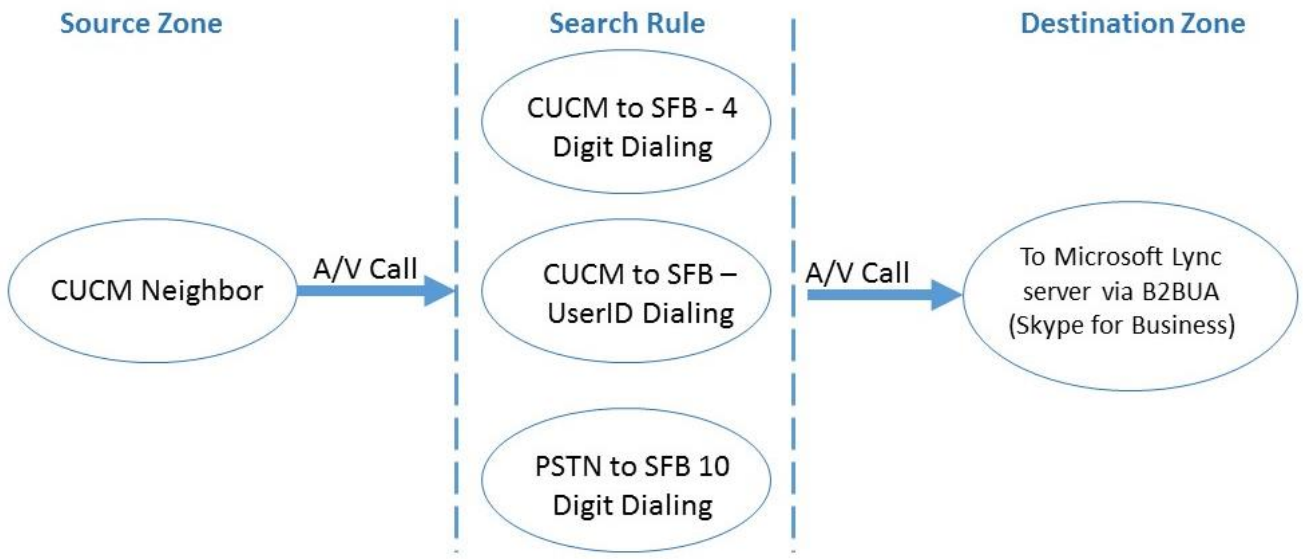
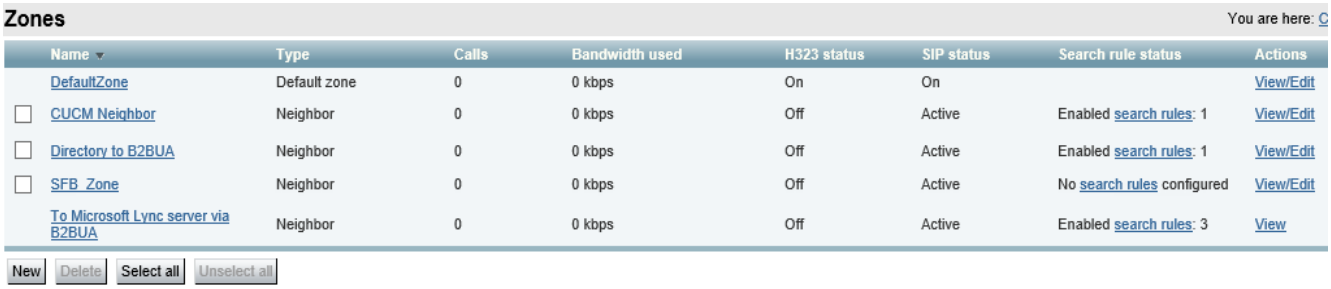


Figure 89: Audio/Video Call flow UCM to Skype for Business

Zones Configurations

Figure 90 captures all configured Zones in Expressway-C:



Zones You are here: C

	Name	Type	Calls	Bandwidth used	H323 status	SIP status	Search rule status	Actions
	DefaultZone	Default zone	0	0 kbps	On	On		View/Edit
☐	CUCM Neighbor	Neighbor	0	0 kbps	Off	Active	Enabled search rules: 1	View/Edit
☐	Directory to B2BUA	Neighbor	0	0 kbps	Off	Active	Enabled search rules: 1	View/Edit
☐	SFB_Zone	Neighbor	0	0 kbps	Off	Active	No search rules configured	View/Edit
	To Microsoft Lync server via B2BUA	Neighbor	0	0 kbps	Off	Active	Enabled search rules: 3	View

New Delete Select all Unselect all

Figure 90: Summary of all Zones configured in Expressway-C

Zone Configuration for CISCO UCM

Navigation: Configuration->Zones->Zones

1. Set **Name:** Enter a name for this zone
2. Set **Type:** Neighbor
3. Set **Mode:** On
4. Set **Port:** 5061
5. Set **Transport:** TLS
6. Set **TLS verify mode:** Off
7. Set **Authentication policy:** Treat as authenticated
8. Set **SIP authentication trust mode:** Off
9. Set the **Peers:** Enter the IP address or FQDN of the neighbor, Cisco UCM here

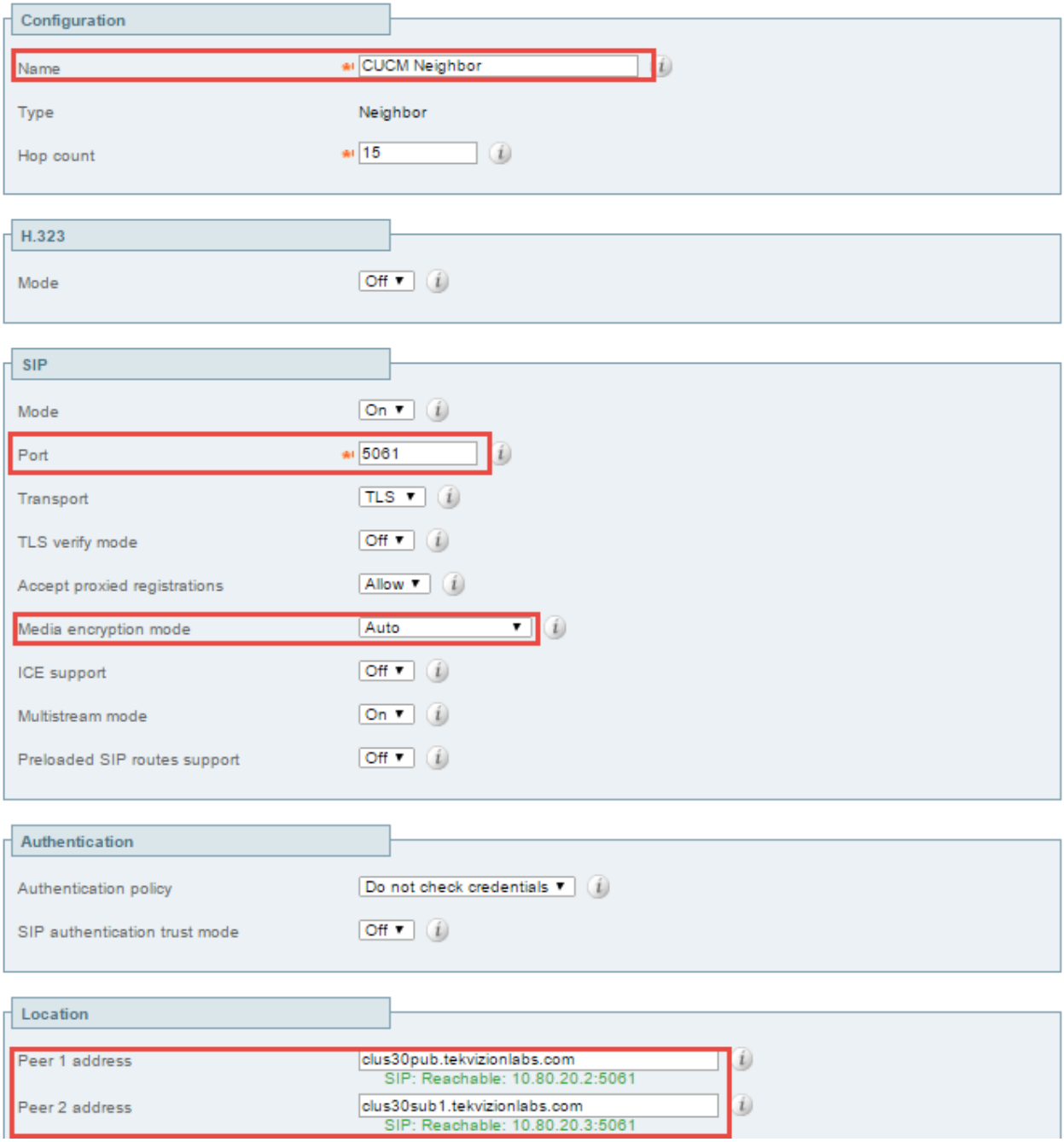


Figure 91: Expressway-C Zone Configuration for UCM-1

Peer 3 address	
Peer 4 address	
Peer 5 address	
Peer 6 address	

Advanced

Zone profile	Custom
Monitor peer status	Yes
Call signaling routed mode	Always
Automatically respond to H.323 searches	Off
Automatically respond to SIP searches	Off
Send empty INVITE for interworked calls	On
SIP parameter preservation	Off
SIP poison mode	Off
SIP encryption mode	Auto
SIP REFER mode	Forward
SIP multipart MIME strip mode	Off
SIP UPDATE strip mode	Off
Interworking SIP search strategy	Options
SIP UDP/BFCP filter mode	On
SIP UDP/IX filter mode	Off
SIP record route address type	IP
SIP Proxy-Require header strip list	

Save Cancel Delete

Status

State	Active
Number of calls to this zone	0
Bandwidth used on this Expressway	0 kbps
Total bandwidth used across this cluster	0 kbps
Search rules targeting this zone	1

Related tasks

Configure search rules

Figure 92: Expressway-C Zone Configuration for UCM-2

Search Rules

Figure 93 shows a summary of all the defined Search rules.

Priority	Rule name	Protocol	Source	Authentication required	Mode	Pattern type	Pattern string	Pattern behavior	On match	Target	State	Actions
25	CUCM to Lync - 4 Digit Dialing	SIP	CUCM Neighbor	No	Alias pattern match	Regex	(2...)@tekvizionlabs.com:5061	Replace	Continue	To Microsoft Lync server via B2BUA	Enabled	View/Edit | Clone
30	PSTN to Lync 10 Digit Dialing	SIP	CUCM Neighbor	No	Alias pattern match	Suffix	@expressc2.tekvizionlabs.com:5061	Replace	Stop	To Microsoft Lync server via B2BUA	Enabled	View/Edit | Clone
50	LocalZoneMatch	Any	Any	No	Any alias				Continue	LocalZone	Enabled	View/Edit | Clone
100	Route to IM&P	SIP	SFB_Zone	No	Alias pattern match	Regex	CUP_(.*)	Replace	Continue	IMP	Enabled	View/Edit | Clone
110	SFB_Zone_Rule	SIP	SFB_Zone	No	Any alias				Stop	Directory to B2BUA	Enabled	View/Edit | Clone
130	CUCM to Lync - UserID Dialing	SIP	CUCM Neighbor	No	Any alias				Continue	To Microsoft Lync server via B2BUA	Enabled	View/Edit | Clone
140	B2BUA to CUCM	SIP	Any	No	Any alias				Stop	CUCM Neighbor	Enabled	View/Edit | Clone
160	Traversal zone search rule	Any	Any	No	Any alias				Continue	Traversalzone	Enabled	View/Edit | Clone
170	External IP address search rule	Any	Any	No	Any IP address				Continue	Traversalzone	Enabled	View/Edit | Clone

New | Delete | Enable | Disable | Select all | Unselect all

Search rules are applied in priority order, with 1 being the highest priority

Figure 93: Summary of Expressway-C Search Rules

Search Rule CISCO UCM to Skype for Business - 4 Digit Dialing

Navigation: Configuration->Dial Plan-> Search rules

1. Set **Rule name:** Enter a name for this search rule
2. Set **Priority:** This represents the order in the search process that this rule is applied, when compared to the priority of the other search rules.
3. Set **Protocol:** SIP
4. Set **Source name:** Enter the zone to which this rule applies
5. Set **Mode:** Alias pattern match
6. Set **Pattern type:** Regex
7. Set **Pattern string:** (2...)@expressc2.tekvizionlabs.com:5061
8. Set **Pattern behavior:** Replace
9. Set **Replace string:** +1972852\1@tekvizionlabs.com;user=phone
10. Set **On successful match:** Continue
11. Set **Target:** Select the zone to query if the alias matches the search rule, to B2BUA here
12. Set **State:** Enabled

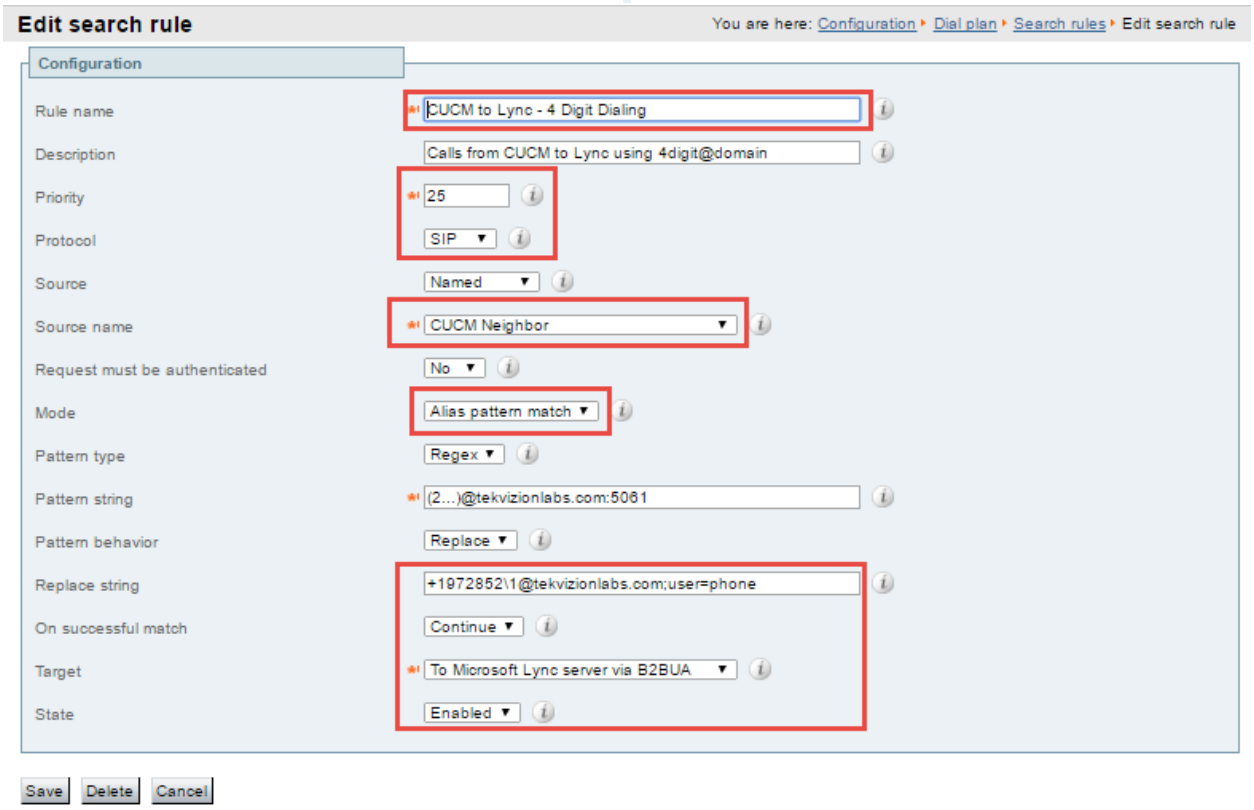


Figure 94: Expressway-C Search rule CISCO UCM to Skype for Business - 4 Digit Dialing

Search Rule CISCO UCM to Skype for Business - UserID Dialing

Navigation: Configuration->Dial Plan-> Search rules

1. Set **Rule name:** Enter a name for this search rule
2. Set **Priority:** This represents the order in the search process that this rule is applied, when compared to the priority of the other search rules.
3. Set **Protocol:** SIP
4. Set **Source**: Named
5. Set **Source name:** CUCM_ Neighbor
6. Set **Target:** To Microsoft Lync server via B2BUA (Skype for Business server)
7. Set **State:** Enabled

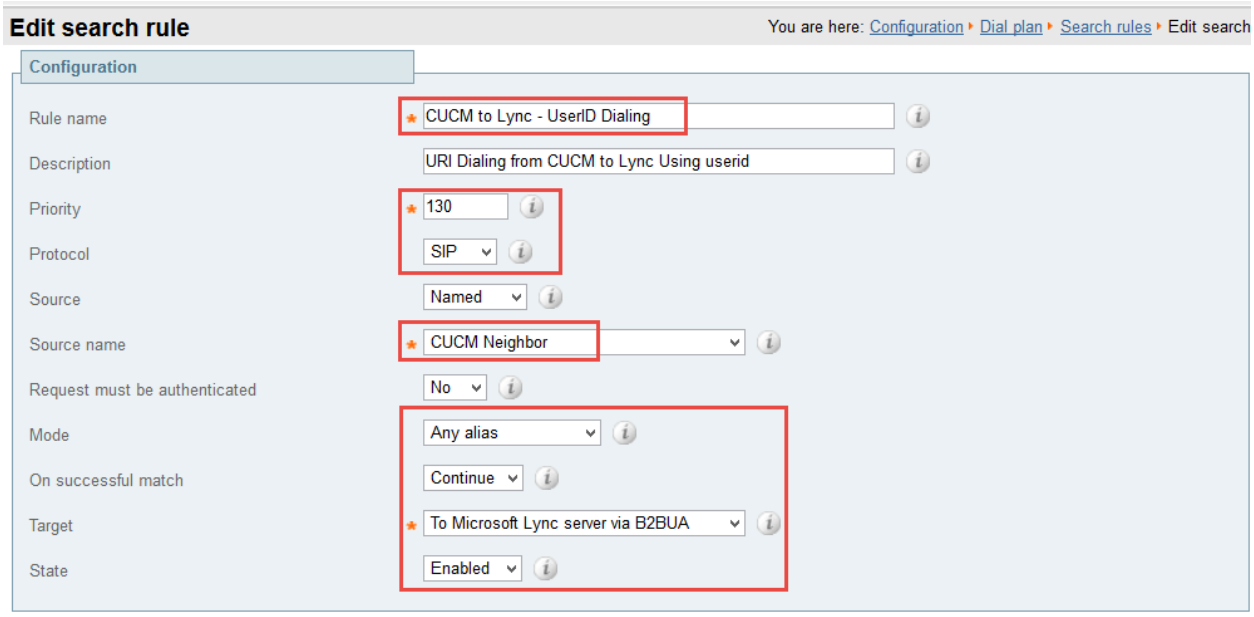


Figure 95: Expressway-C Search rule for URI based dialing from CISCO UCM to Skype for Business

Search Rule B2BUA to CISCO UCM

Navigation: Configuration->Dial Plan-> Search rules

1. Set **Rule name:** Enter a name for this search rule
2. Set **Priority:** This represents the order in the search process that this rule is applied, when compared to the priority of the other search rules.
3. Set **Protocol:** SIP
4. Set **Source**: Any
5. Set **Mode:** Any alias
6. Set **On successful match:** Stop
7. Set **Target:** CUCM_ Neighbor
8. Set **State:** Enabled

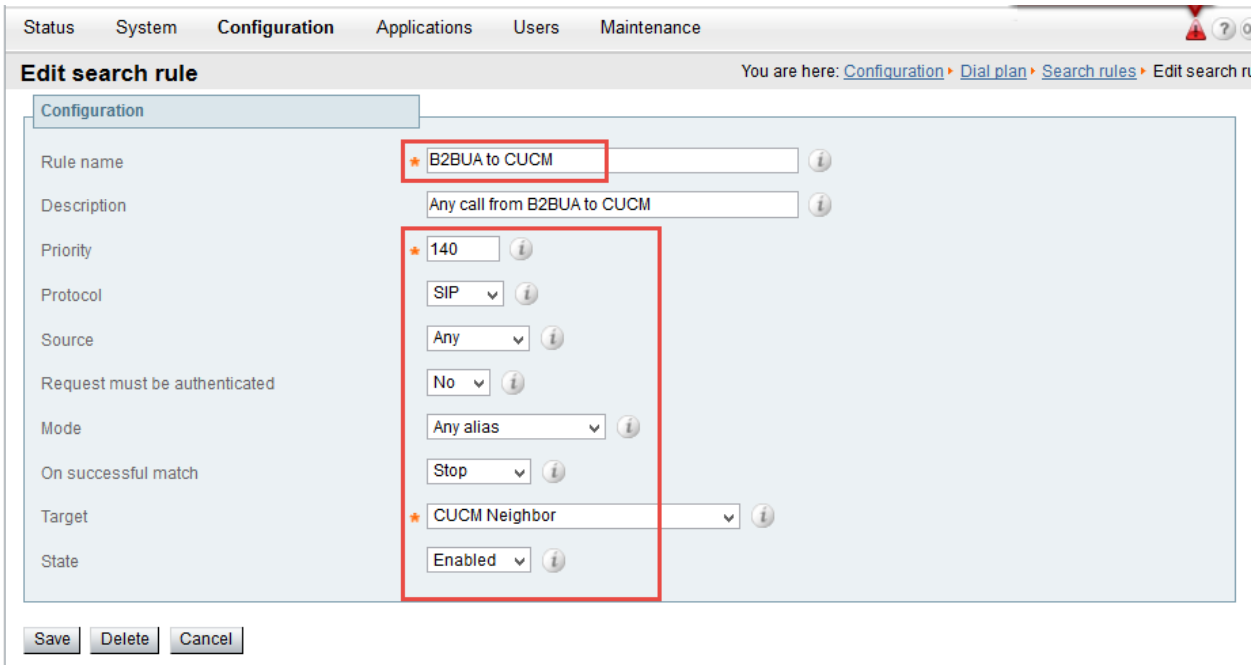


Figure 96: Expressway-C Search rule for B2BUA to CUCM

Configuring Secure Traversal Zone Connection for Unified Communications

To support Unified Communications features (such as mobile and remote access or Jabber Guest), there must be a Unified Communications traversal zone connection between the Expressway-C and the Expressway-E. This involves:

- Installing suitable security certificates on the Expressway-C and the Expressway-E.
- Configuring a Unified Communications traversal zone between the Expressway-C and the Expressway-E

Installing Expressway Security Certificates

Expressway-C and Expressway-E should have the trusted and signed CA certificate. Refer to Loading server and trusted certificates in the expressway-C section for certificate request and upload.

Note: When you generate a CSR in the expressway-c, you must include the phone security profile names under the Unified CM Phone Security profile names in the Alternative names section as shown below, this will help you to register jabber as an external User:

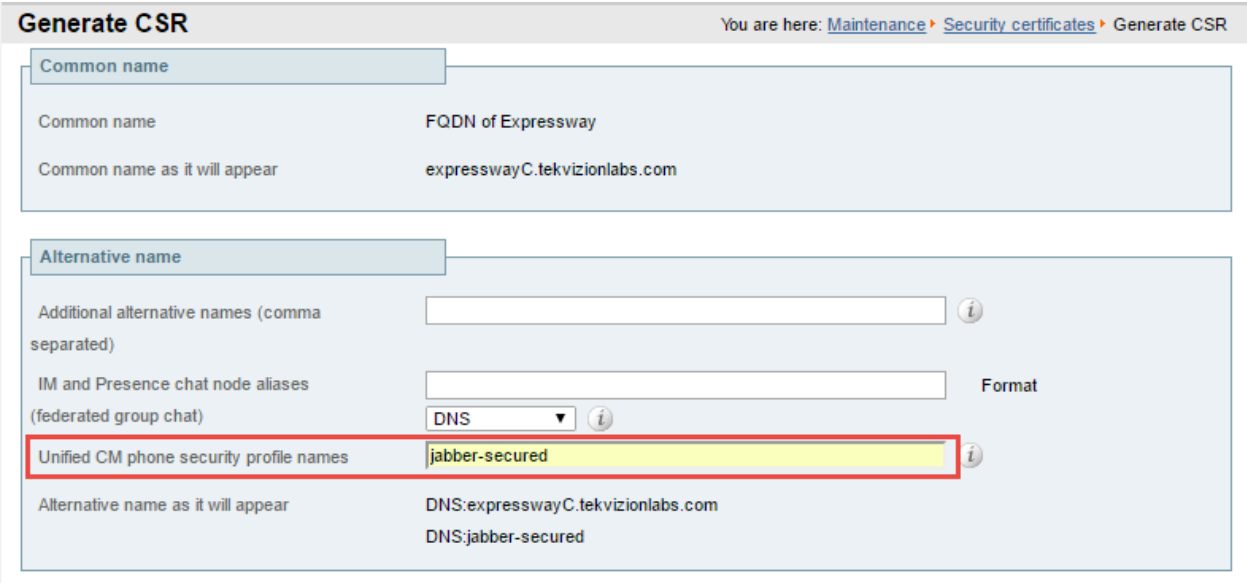


Figure 97:Expressway-C certificate request

Expressway-C Traversal Zone Configuration

There should be a Unified Communications traversal zone between Expressway-C and Expressway-E for the MRA services.

Navigation: Configuration->Zones->Zones

1. Set **Name:** Enter a name for this zone
2. Set **Type:** Unified Communications traversal
3. Username: username for this traversal zone to communicate with EXP-E
4. Password: Password
5. Set **SIP Mode:** On
6. Set **Port:** 7003
7. Authentication policy: Do not check credentials
8. Set **Peer 1 address:** Enter the FQDN of the Expressway-E

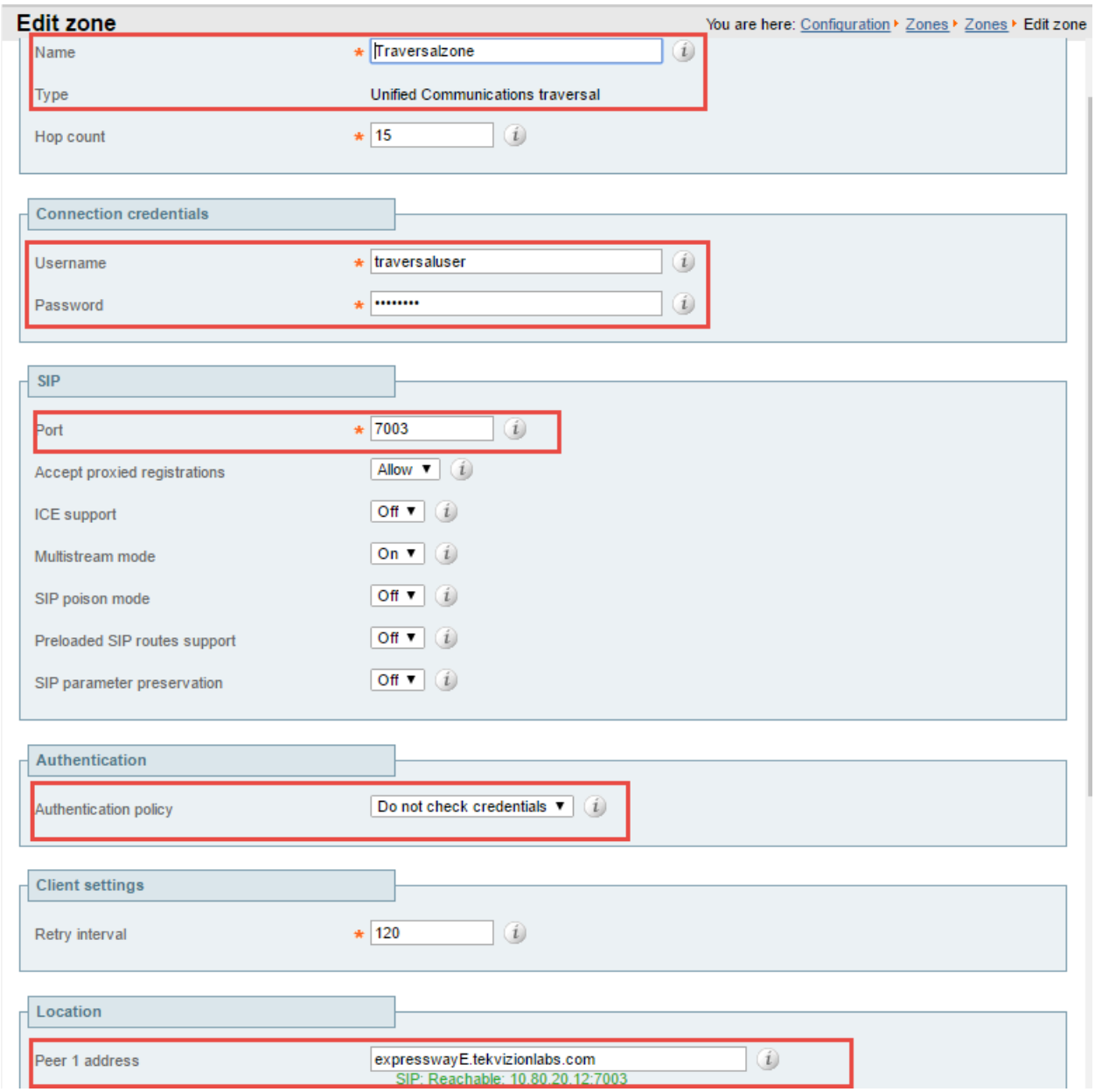


Figure 98: Expressway-C Traversal zone for Expressway-E

Expressway-E Traversal Zone Configuration

Navigation: Configuration->Zones->Zones

1. Set **Name:** Enter a name for this zone
2. Set **Type:** Unified Communications traversal
3. Username: username for this traversal zone to communicate with EXP-E
4. Password: Password

5. Set **Port:** 7003
6. TLS Verify subject name: FQDN of Expressway-C
7. Authentication policy: Do not check credentials

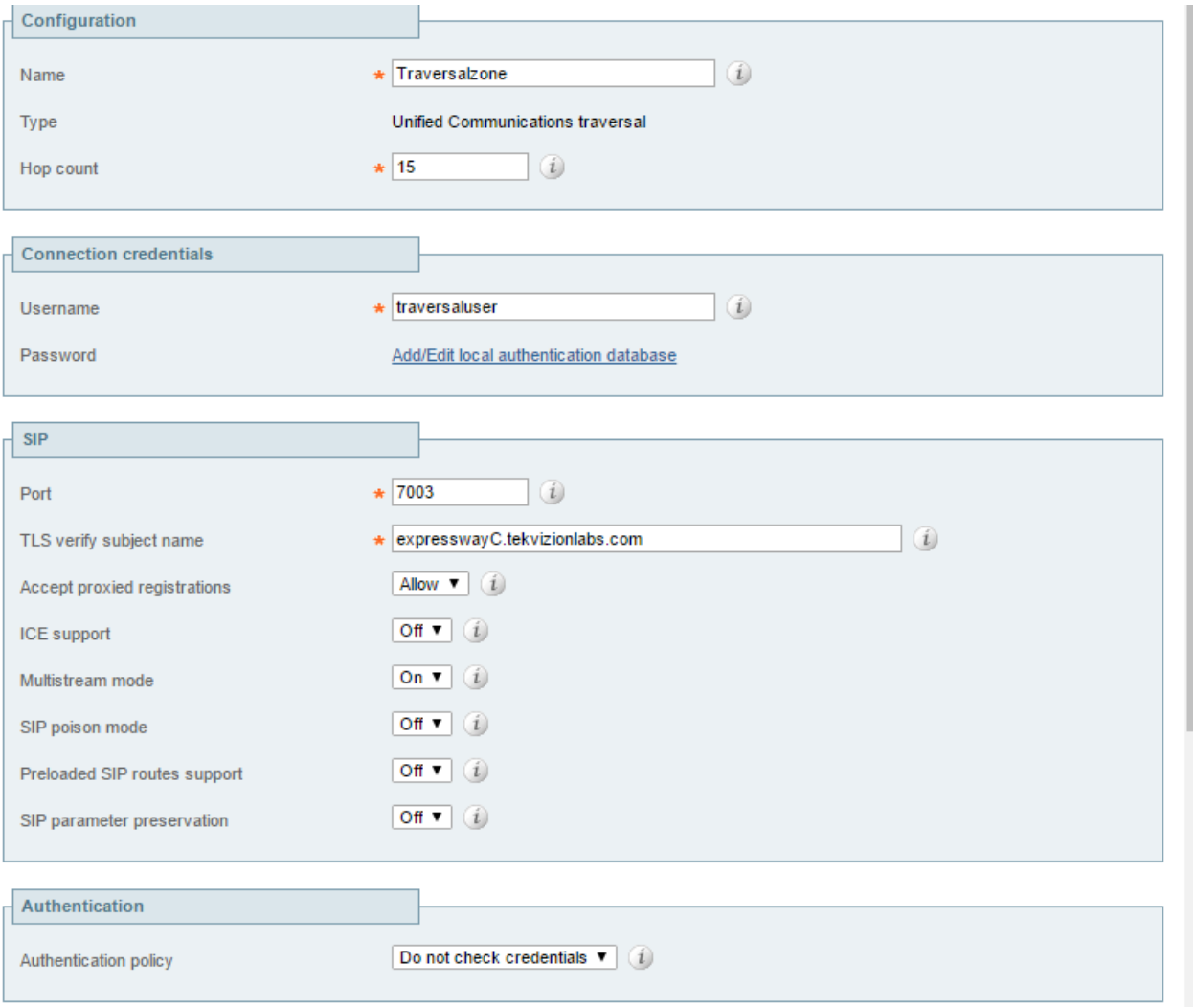


Figure 99: Expressway-E Traversal zone for Expressway-C

Expressway-C Traversal Zone Search Rules

1. Go to Configuration > Dial plan > Search rules.
2. Click New.
3. Configure the fields as follows

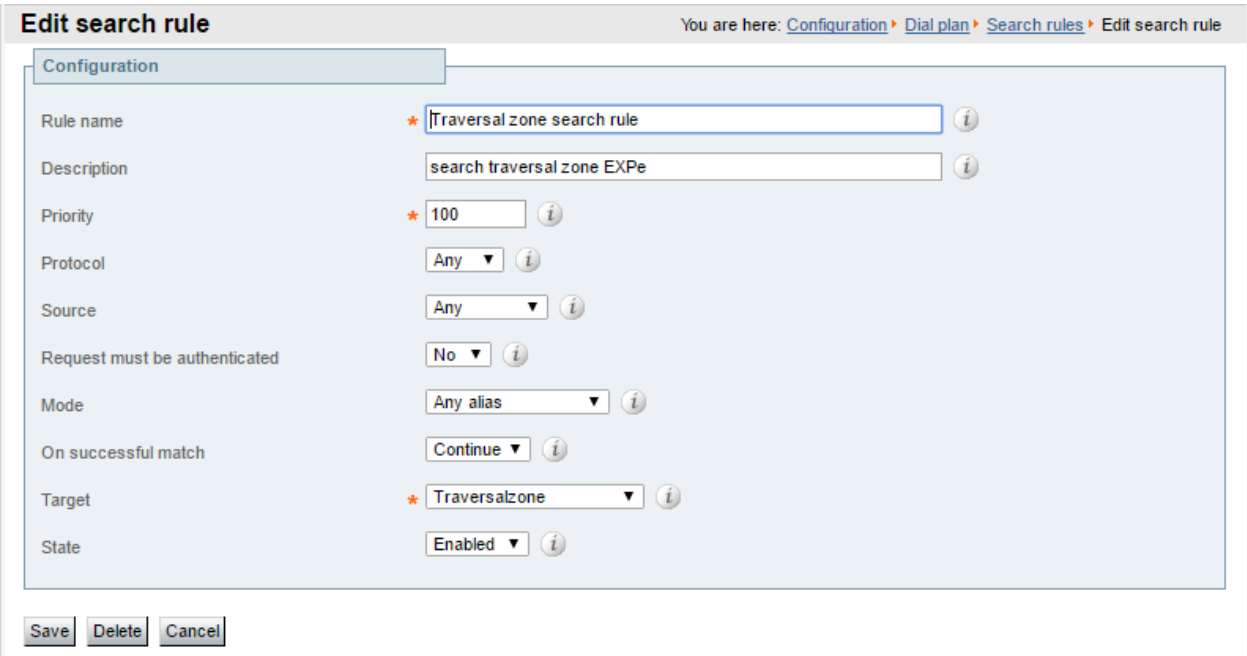


Figure 100: Expressway-C Traversal Zone Search rule for Expressway-E

Expressway-E Traversal Zone Search Rules

1. Go to Configuration > Dial plan > Search rules.
2. Click New.
3. Configure the fields as follows

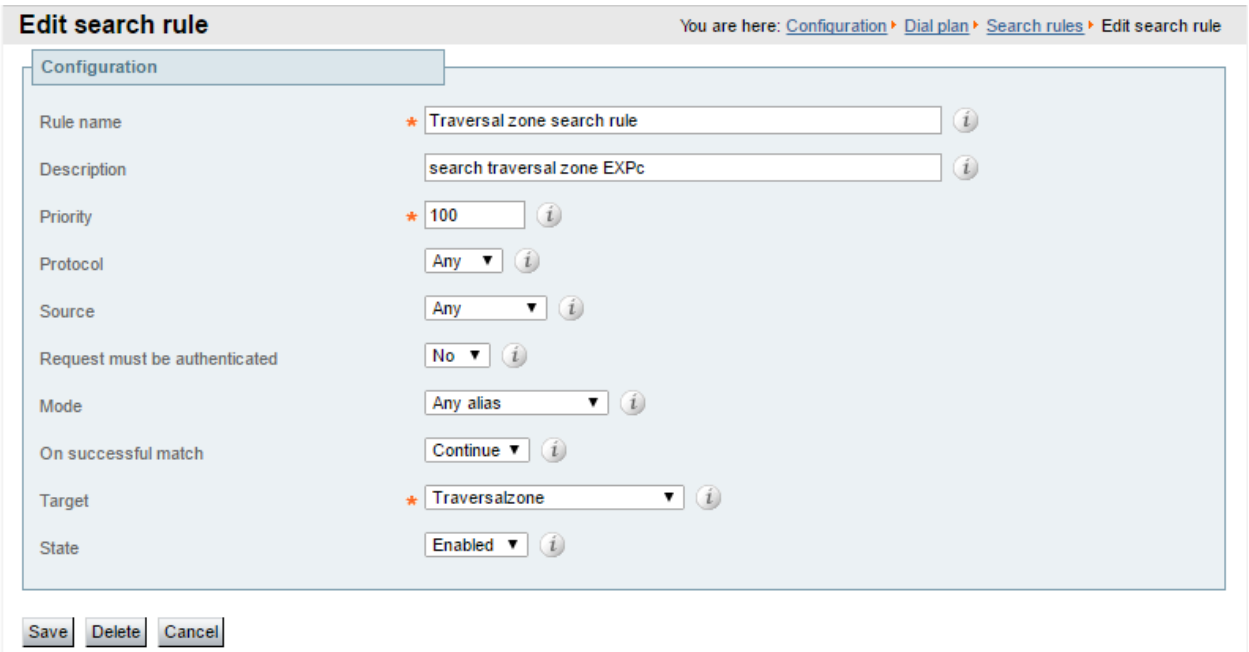


Figure 101: Expressway-E Traversal Zone Search rule for Expressway-C

Configuring External (Unknown) IP Address Routing

The following configuration defines how an Expressway routes calls (and other requests) to external IP addresses. An external IP address is an IP address which is not 'known' to the Expressway and therefore assumed to be a publicly routable address.

Known IP addresses are addresses defined in a subzone (using a subzone membership subnet rule).

- All requests destined for external IP addresses, originating at the Expressway-C are routed to the Expressway-E using a search rule.
- The Expressway-E then attempts to open a connection directly to the IP address

To configure how the Expressway handles calls to unknown IP addresses:

1. Go to Configuration > Dial plan > Configuration.
2. Configure the fields as follows:

Expressway-C:

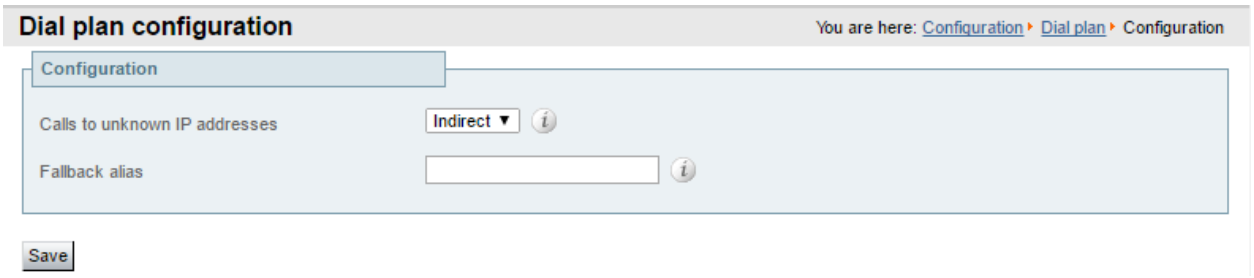


Figure 102: Expressway-C Dial Plan Configuration

Expressway-E:

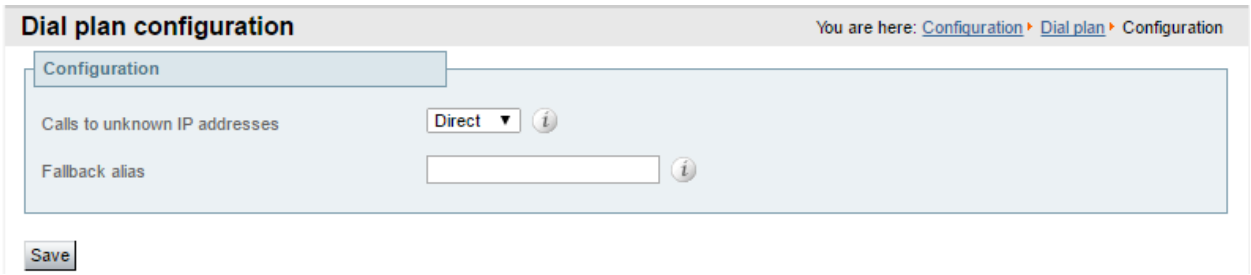


Figure 103: Expressway-E Dial Plan Configuration

To create the search rules to route calls to IP addresses to the Expressway-E:

1. On the Expressway-C Go to Configuration > Dial plan > Search rules.
2. Click New.
3. Configure the fields as follows:

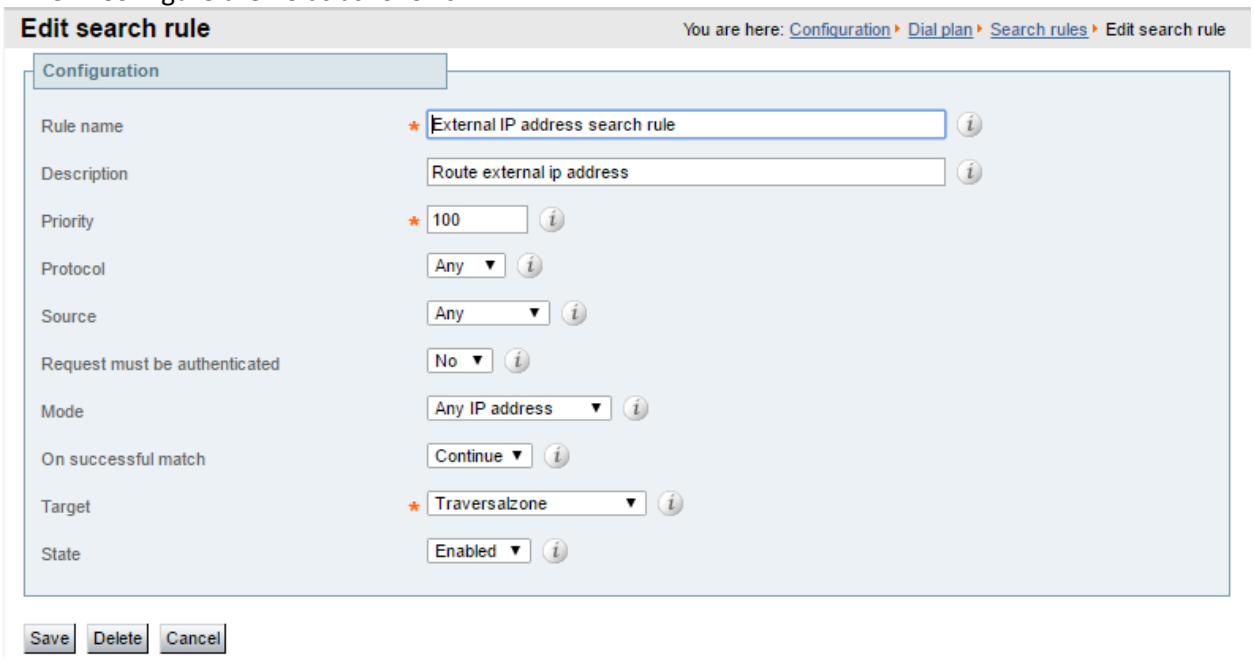


Figure 104: Expressway-C External IP address search rule

Discover Unified Communication Servers and Services

The Expressway-C must be configured with the address details of the Unified Communications services/nodes that are going to provide registration, call control, provisioning, voicemail, messaging, and presence services to MRA users.

Note: The connections configured in this procedure are static. You must refresh the configuration on the Expressway-C after you reconfigure or upgrade any of the discovered Unified Communications nodes

Go to Configuration > Unified Communications > <UC server type> and click Refresh servers.

Trust the Certificates Presented to the Expressway-C

If TLS verify mode is On when discovering Unified Communications services, then you must configure the Expressway-C to trust the certificates presented by the IM and Presence Service nodes and Unified CM servers.

1. Determine the relevant CA certificates to upload:
    - If the servers' tomcat and Call Manager certificates are CA-signed, the Expressway-C's trusted CA list must include the root CA of the certificate issuer.
    - If the servers are using self-signed certificates, the Expressway-C's trusted CA list must include the self-signed certificates from all discovered IM and Presence Service nodes, Cisco Unity Connection servers, and Unified CM servers.
2. Upload the required certificates to the Expressway-C (Maintenance > Security certificates > Trusted CA certificate).
3. Restart the Expressway-C (Maintenance > Restart options).

Discover Unified CM Servers

1. On Expressway-C, go to Configuration > Unified Communications > Unified CM servers. The page lists any Unified CM nodes that have already been discovered

2. Add the details of a Unified CM publisher node
    - Click New.
    - Enter the Unified CM publisher address.
    - You must enter an FQDN when TLS verify mode is On.
    - Enter the Username and Password of an account that can access this server.
    - Note: These credentials are stored permanently in the Expressway database. The corresponding Unified CM user must have the Standard AXL API Access role.
    - [Recommended] Leave TLS verify mode switched On to ensure Expressway verifies the node's certificates.
    - The Unified CM node presents its tomcat certificate for AXL and UDS queries, and its Call Manager certificate for subsequent SIP traffic. If the Unified CM server is using self-signed certificates, the Expressway-C's trusted CA list must include a copy of the tomcat certificate and the Call Manager certificate from every Unified CM server.
    - Click Add address.
    - Set the TLS Verify mode to on, make sure the expressway-c and cucm certificates were signed by the CA.
    - If the secure connection test was successful, or if you did not enable TLS verify mode, then the system attempts to contact the publisher and retrieve details of its associated nodes.

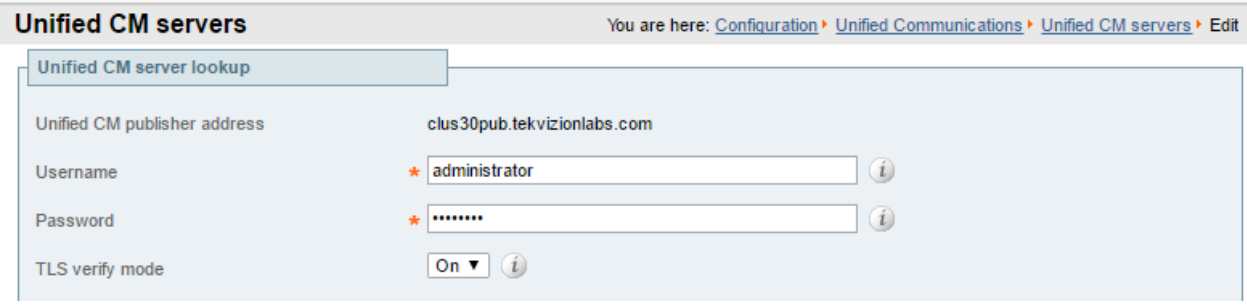


Figure 105: Expressway-C Unified CM Servers

3. Repeat the discovery procedure for other Unified CM nodes/clusters, if required.
4. Click Refresh servers to refresh all the node details after configuring multiple publisher addresses

Discover IM and Presence Service Nodes

1. On Expressway-C, go to Configuration > Unified Communications > IM and Presence Service nodes.
2. The page lists any IM and Presence Service nodes that have already been discovered.
3. Add the details of an IM and Presence Service database publisher node:
    - Click New.
    - Enter the address of the IM and Presence Service database publisher node.
    - You must enter an FQDN when TLS verify mode is On.

- Enter the Username and Password of an account that can access this server.
- Note: These credentials are stored permanently in the Expressway database. The corresponding IM and Presence Service user must have the Standard AXL API Access role.
- [Recommended] Leave TLS verify mode switched On to ensure Expressway verifies the node's tomcat certificate (for XMPP-related communications).
- [Optional] Select which deployment this node/cluster will belong to.
- The Deployment field does not show if you have not created multiple deployments. All nodes belong to the default deployment if you choose not to use multiple deployments.
- Click Add address.
- If you enabled TLS verify mode, then the Expressway tests whether a secure connection can be established. It does this so you can find any TLS configuration errors before it continues the discovery process.
- If the secure connection test was successful, or if you did not enable TLS verify mode, then the system attempts to contact the publisher and retrieve details of its associated nodes.

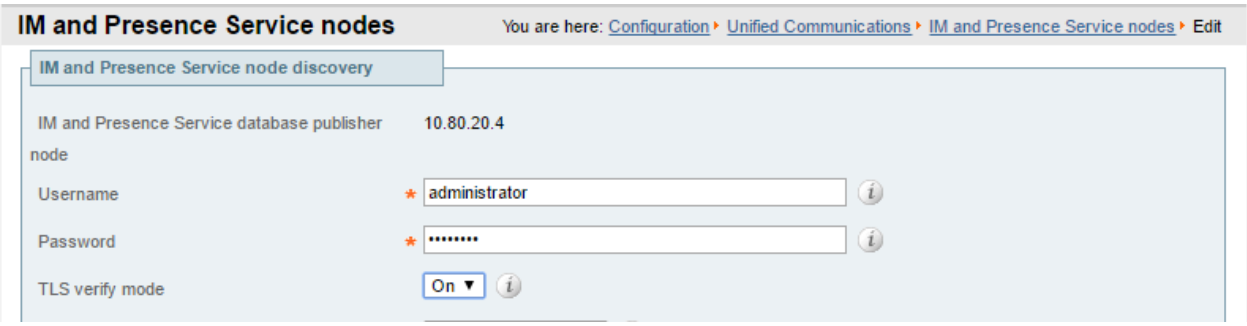


Figure 106: Expressway-C IM and Presence Service nodes

Note: The status of the discovered node will be Inactive unless a valid traversal zone connection exists between the Expressway-C and the Expressway-E (may not yet be configured).

4. Repeat the discovery procedure for other IM and Presence Service nodes/clusters, if required.
5. Click Refresh servers to refresh all the node details after configuring multiple publisher addresses.

Automatically Generated Zones and Search Rules

Expressway-C automatically generates non-configurable neighbor zones between itself and each discovered Unified CM node. A TCP zone is always created, and a TLS zone is created also if the Unified CM node is configured with a Cluster Security Mode (System > Enterprise Parameters > Security Parameters) of 1 (Mixed) (so that it can support devices provisioned with secure profiles). The TLS zone

is configured with its TLS verify mode set to On if the Unified CM discovery had TLS verify mode enabled. This means that the Expressway-C will verify the CallManager certificate for subsequent SIP communications. Each zone is created with a name in the format 'CEtcp-<node name>' or 'CEtls-<node name>'.

A non-configurable search rule, following the same naming convention, is also created automatically for each zone. The rules are created with a priority of 45. If the Unified CM node that is targeted by the search rule has a long name, the search rule will use a regex for its address pattern match.

IM&P Configuration

Loading Server and Trust Certificates

IM&P Server should trust Skype for Business Front End Server.

IM&P Trusted CA Certificate

Follow the steps described in Download a root certificate from CA to download the root certificate from CA

Upload root Certificate

1. Set **Certificate Purpose:** cup-trust
2. The services *Cisco SIP Proxy Service, Cisco Presence Engine* must be restarted in order for the changes to take effect:

Figure 107:IM&P-Upload Root Certificate

3. Click on the uploaded certificate and it should look similar to the one below

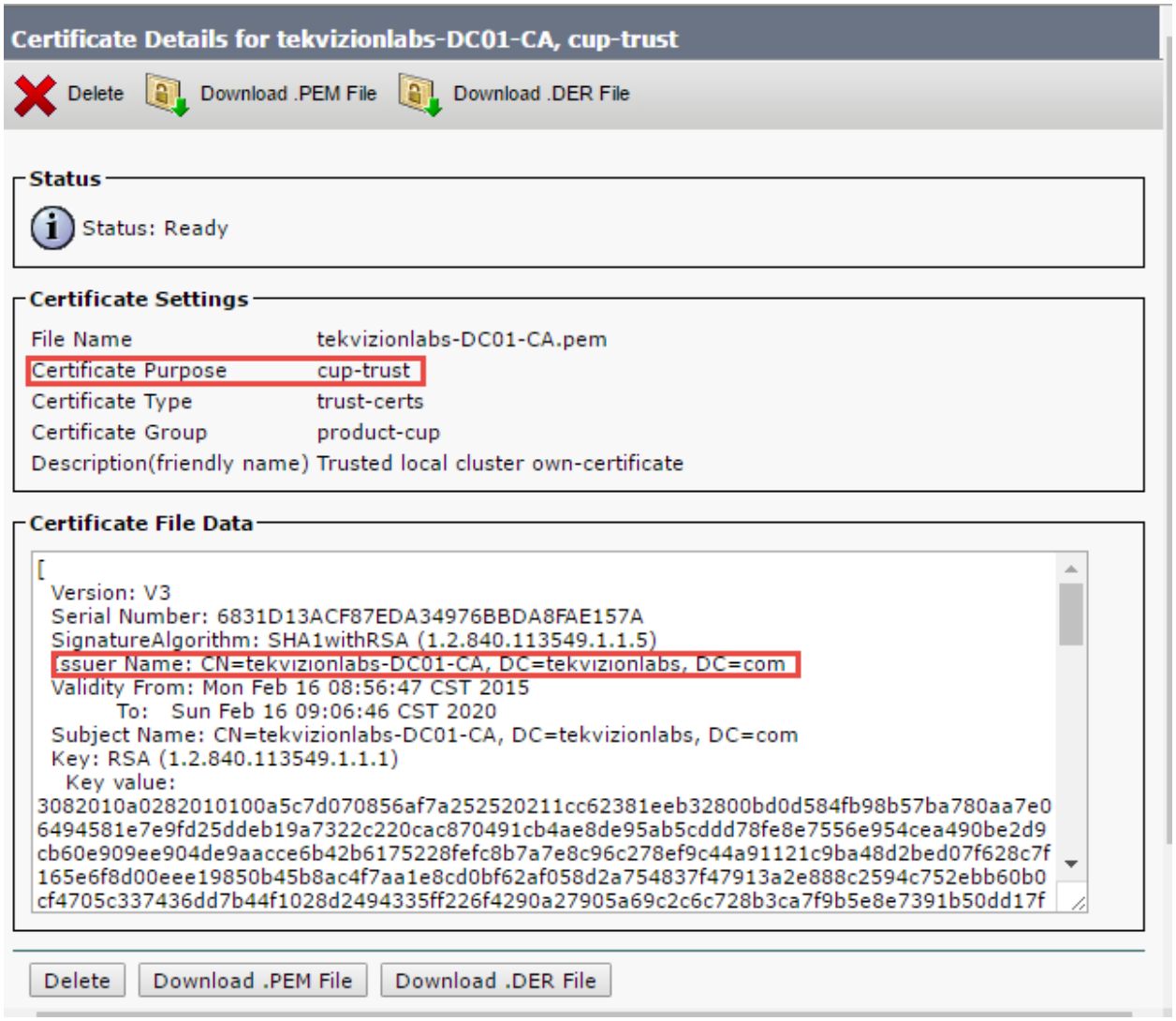


Figure 108:IM&P-Root Certificate Example

IM&P Server Certificate

Navigation: Cisco Unified IM and Presence OS Administration/Security->Certificate Management

Generate CSR

1. Click on 'Generate CSR'

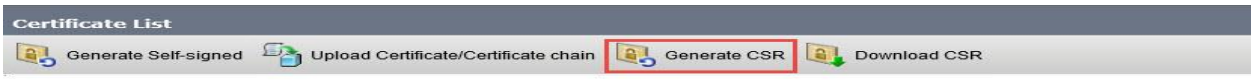


Figure 109: IM&P Generate CSR-1

2. Set **Certificate Purpose:** Cup
3. Set **Distribution:** Select the IM&P publisher node
4. Set **Key Length:** 2048

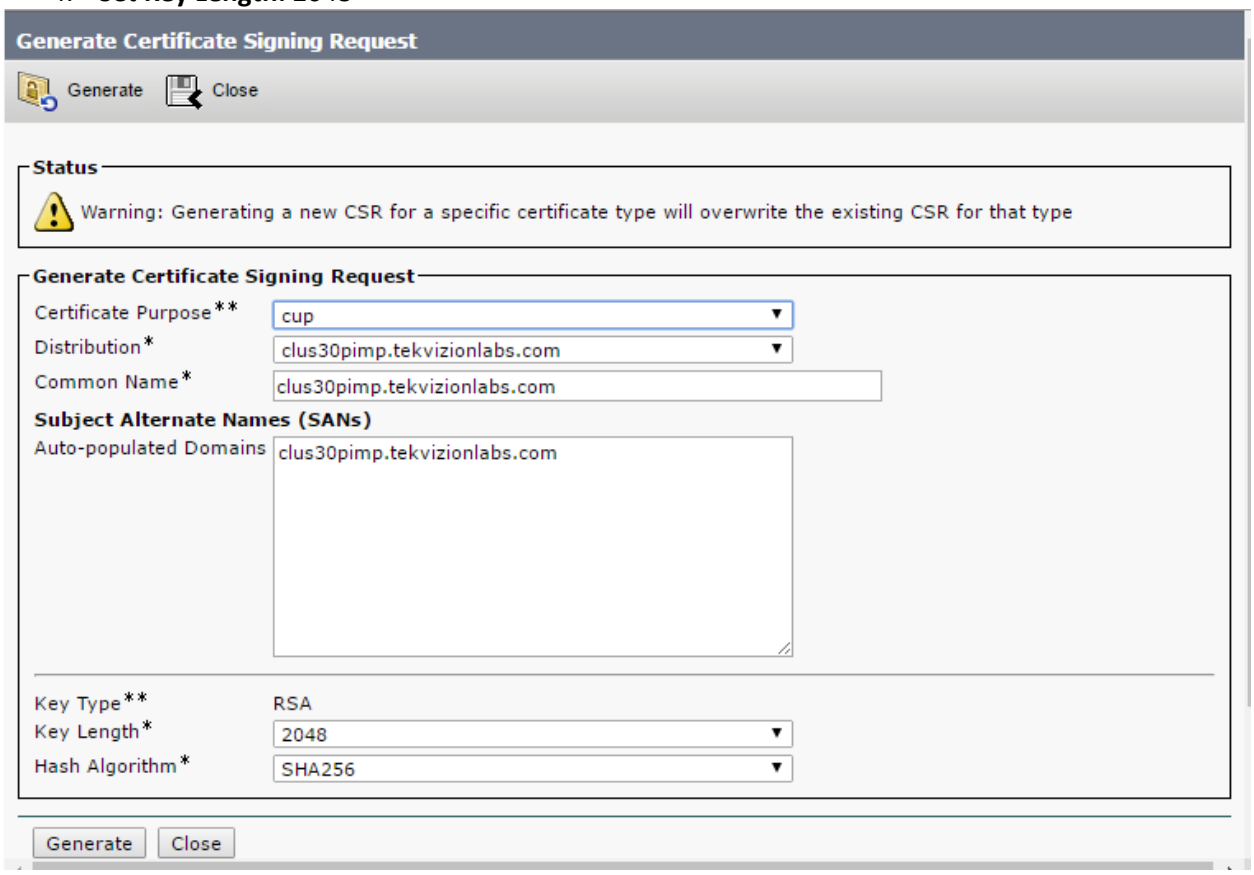


Figure 110:IM&P Generate CSR-2

After the CSR is generated and downloaded, follow the steps described in [Submit a certificate request in the Certificate Authority] to create a certificate request in CA.

Upload Certificate

5. Once the certificate is downloaded, click on 'Upload Certificate/Certificate chain'
6. Set **Certificate Purpose:** cup

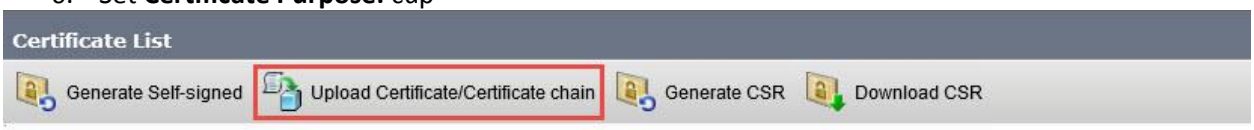


Figure 111: IM&P-Upload Certificate-1

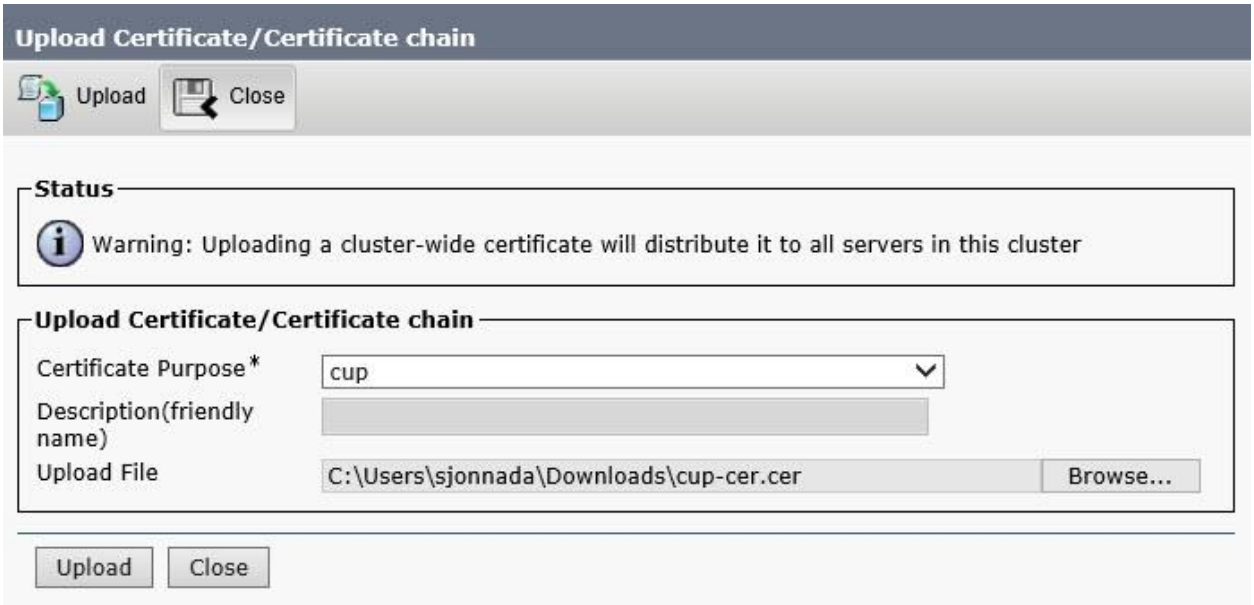


Figure 112:IM&P-Upload Certificate-2

7. Click on the uploaded certificate and it should look similar to the one below

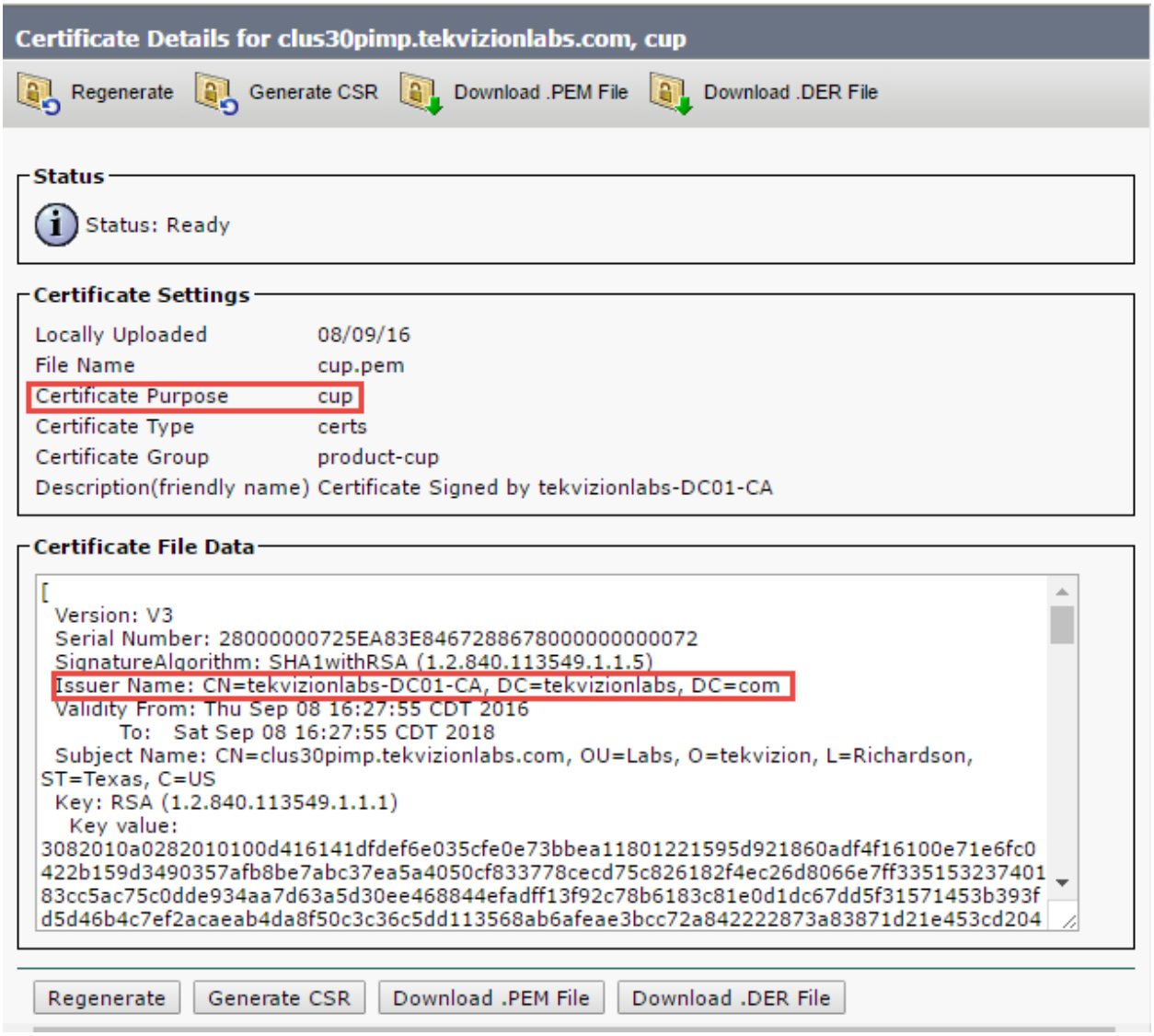


Figure 113: IM&P-Server Certificate Example

Application Listeners

Navigation: System->Application Listeners

Configure the default Cisco SIP Proxy TLS Listeners for Peer and Server Authentication as shown.

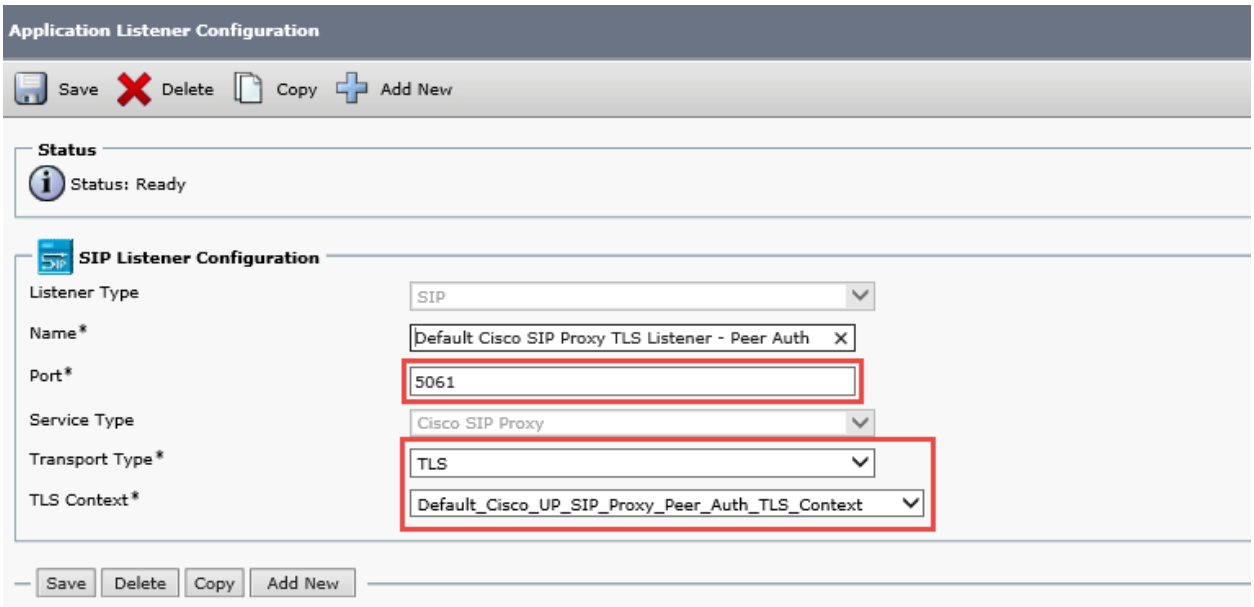


Figure 114:Cisco IM&P Application Listener - Peer Auth

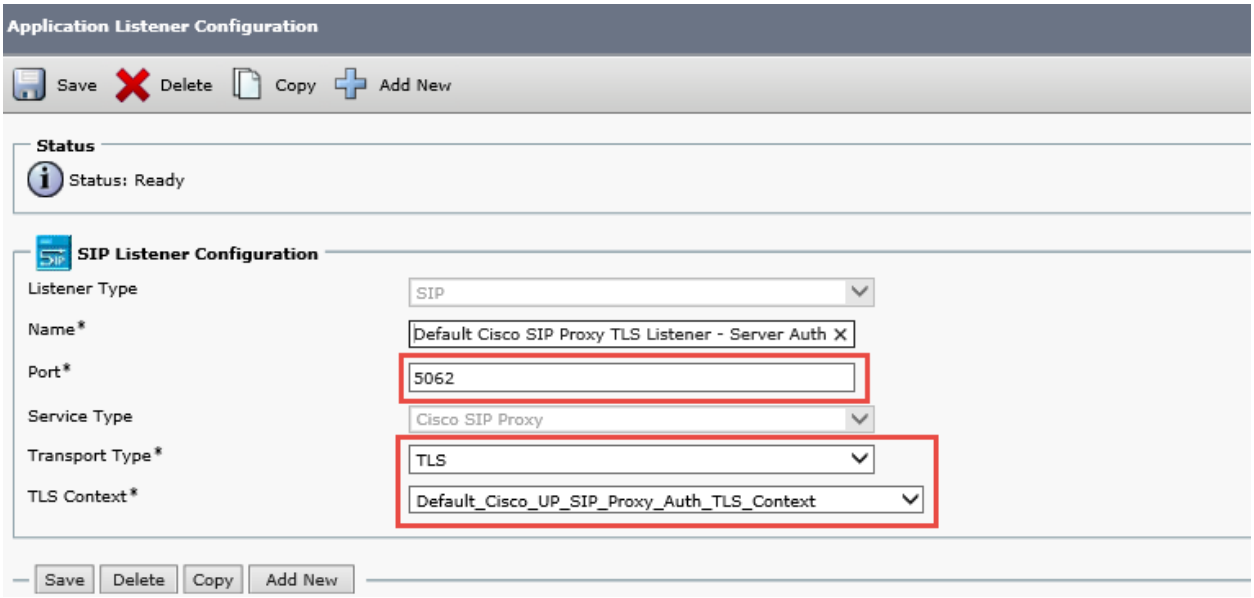


Figure 115: Cisco IM&P Application Listener - Server Auth

TLS Contexts

Navigation: System->Security->TLS Context Configuration

Configure the default Cisco SIP Proxy Peer Authentication TLS context to use the appropriate ciphers and subject mapping as shown

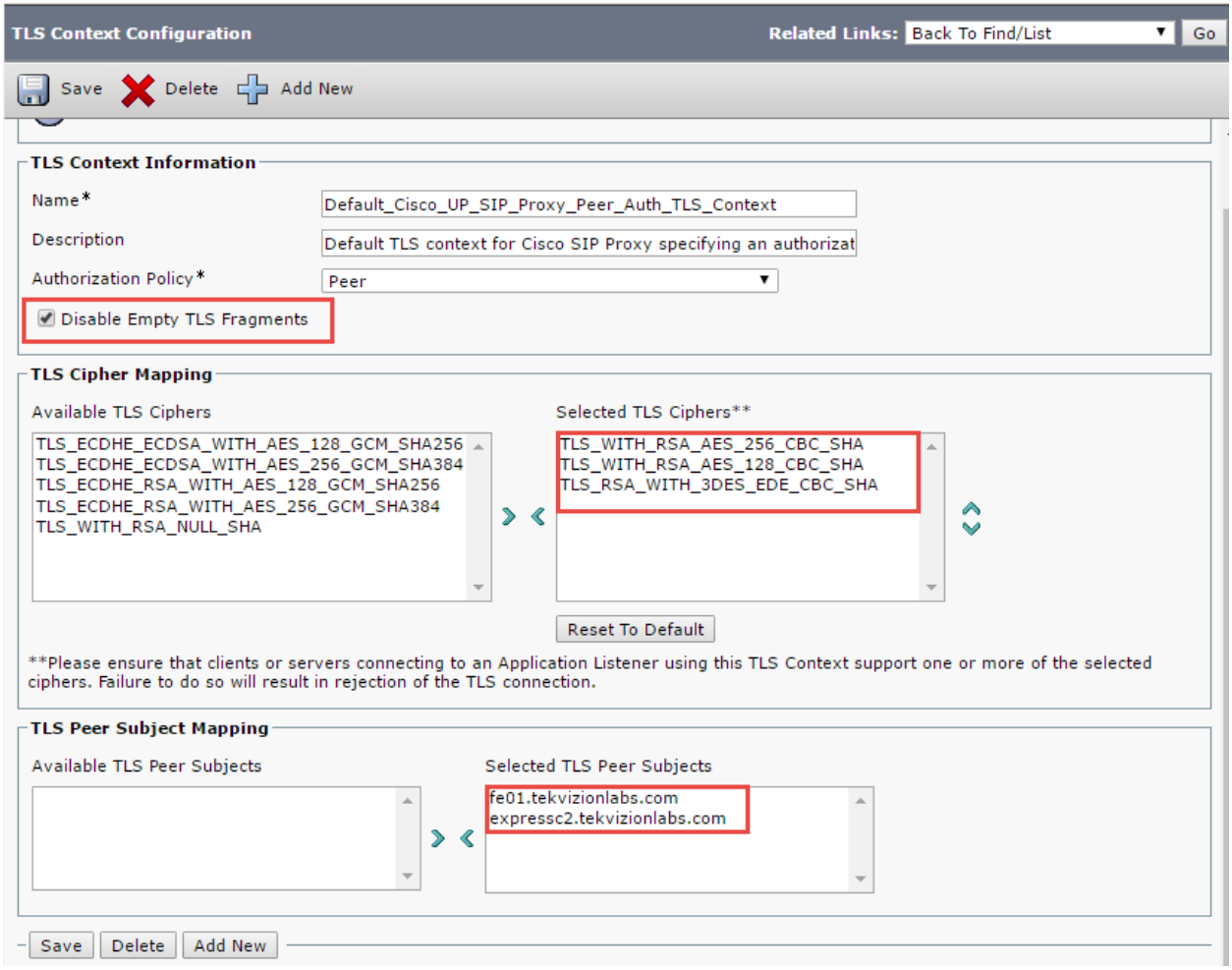


Figure 116: Cisco IM&P TLS Context - SIP Proxy Peer Auth

Proxy Configuration Settings

Navigation: Presence->Routing->Settings.

Configure the Preferred Proxy Listener to *Default Cisco SIP Proxy TLS Listener –Peer Auth*

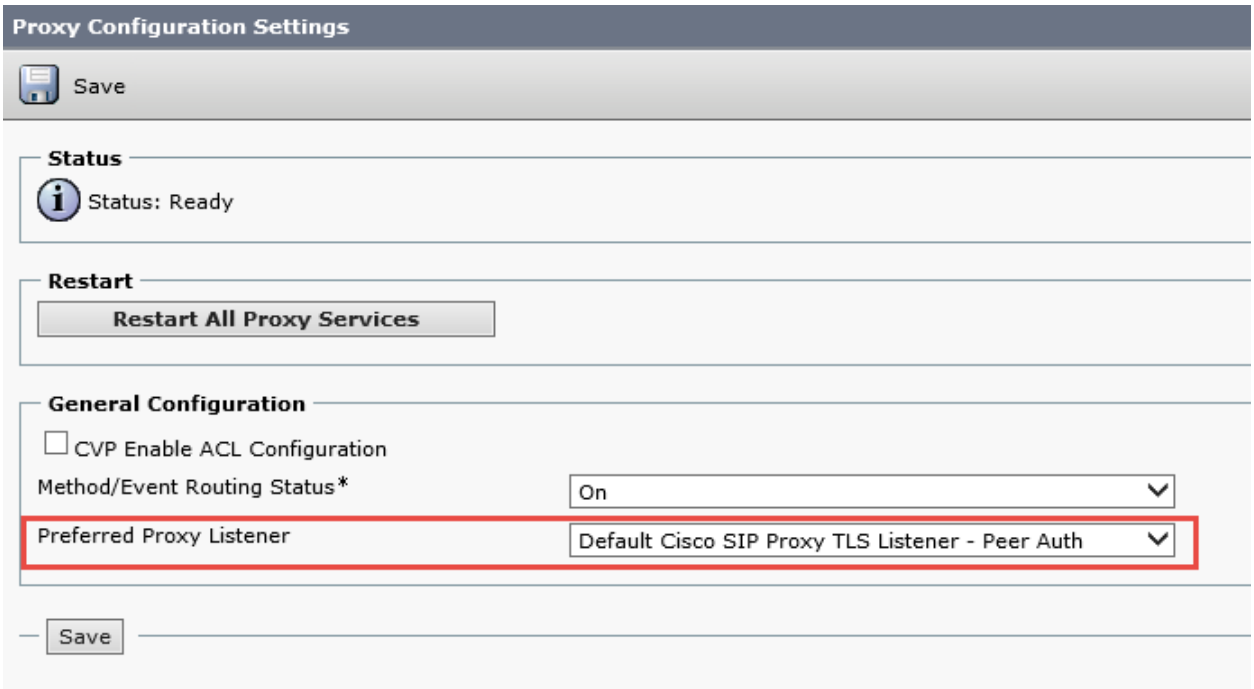


Figure 117: Proxy Configuration Settings

Incoming ACL Configuration

Navigation: System->Security->Incoming ACL

Configure address patterns that control which incoming servers and domains can access the IM and Presence Service without authentication

Incoming ACL connections Lists:

Skype for business internal clients

Expressway server's

Skype for Business server's

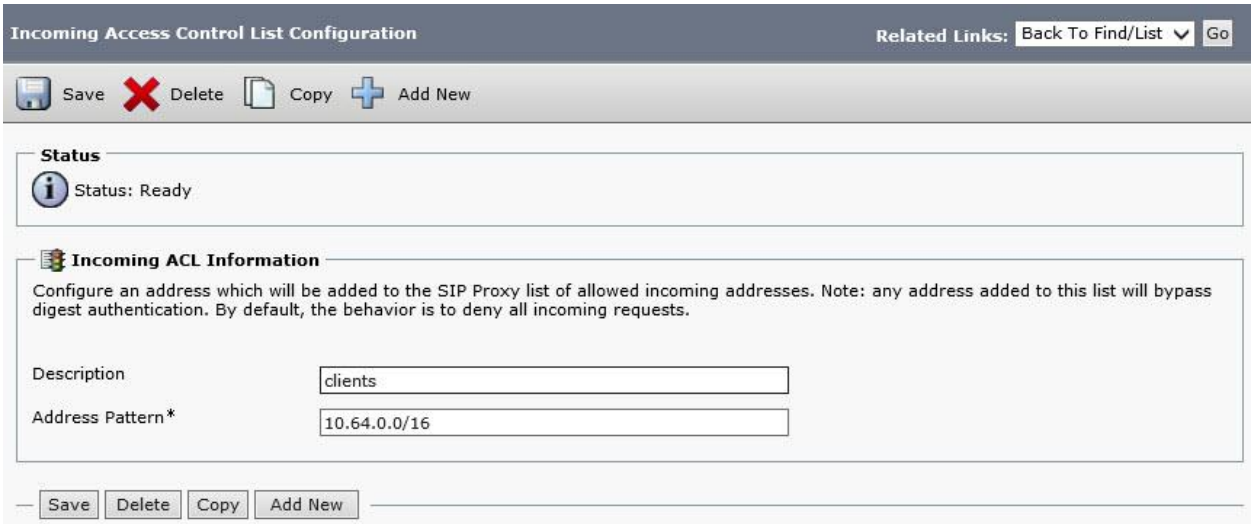


Figure 118: Cisco IM&P Incoming ACL-1

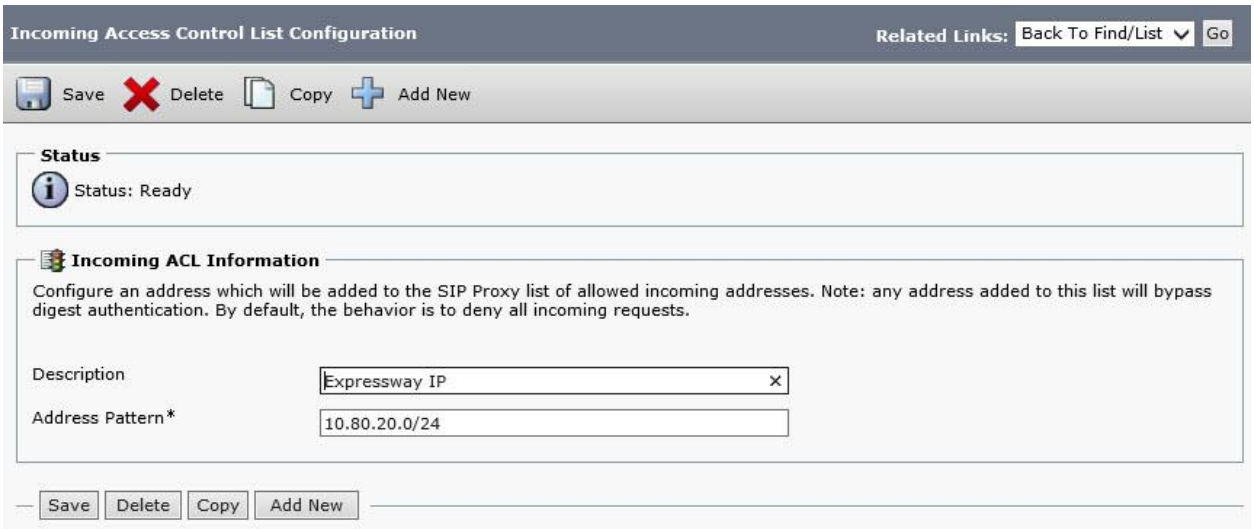


Figure 119: Cisco IM&P Incoming ACL-2

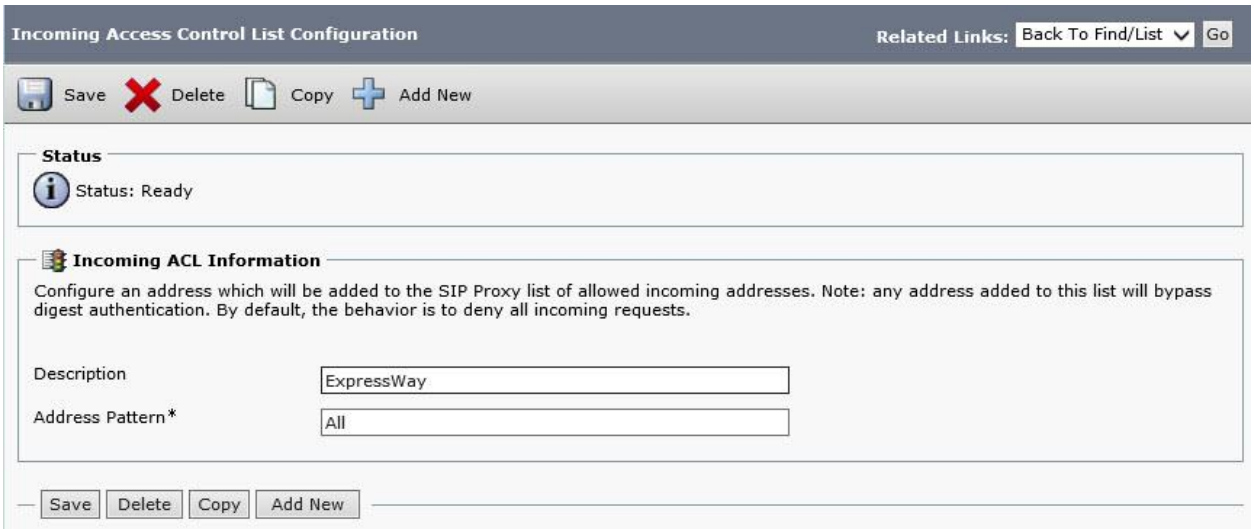


Figure 120: Cisco IM&P Incoming ACL-3

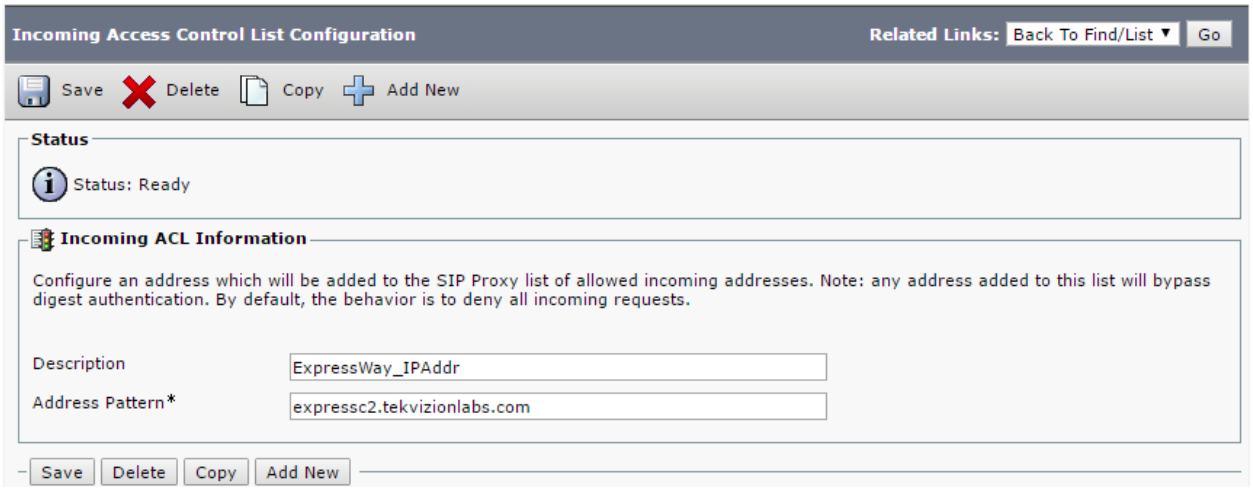


Figure 121: Cisco IM&P Incoming ACL-4

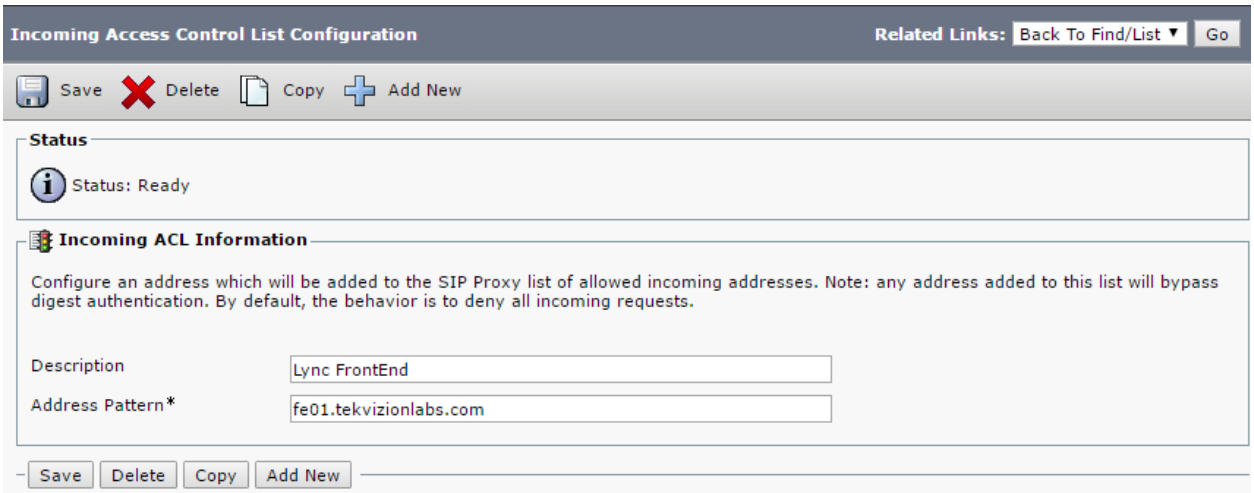


Figure 122: Cisco IM&P Incoming ACL-5

TLS Peer Subject Configuration

Navigation: System->Security->TLS Peer Subject

TLS Peer Subject Configuration for Expressway-C

1. Set **Peer Subject Name:** Enter the Certificate Common Name (CN)

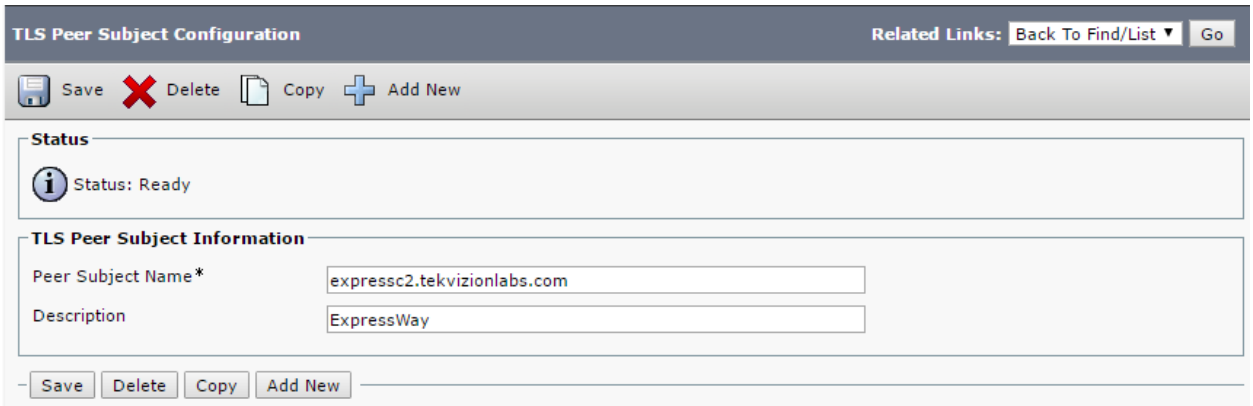


Figure 123: Cisco IMP TLS Peer Subject Configuration-1

TLS Peer Subject Configuration for Skype for Business Server

1. Set **Peer Subject Name:** Enter the Certificate Common Name (CN)

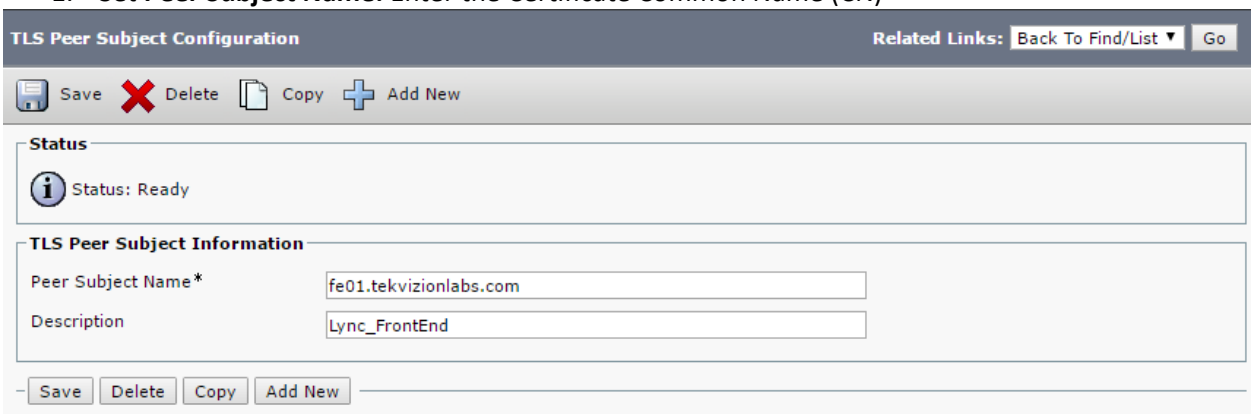


Figure 124: Cisco IMP TLS Peer Subject Configuration-2

Presence Gateway Configuration

Navigation: Presence-> Gateways

Configure a Cisco Unified Communications Manager gateway

1. Set **Presence Gateway Type:** Choose the Cisco UCM to allow IM and Presence Service to receive 'On the Phone' availability information
2. Set **Description:** Enter a meaningful description that will help you to distinguish between presence gateway instances when you have configured more than one type of gateway
3. Set **Presence Gateway:** Enter the IP Address or FQDN of the Cisco Unified Communications Manager node

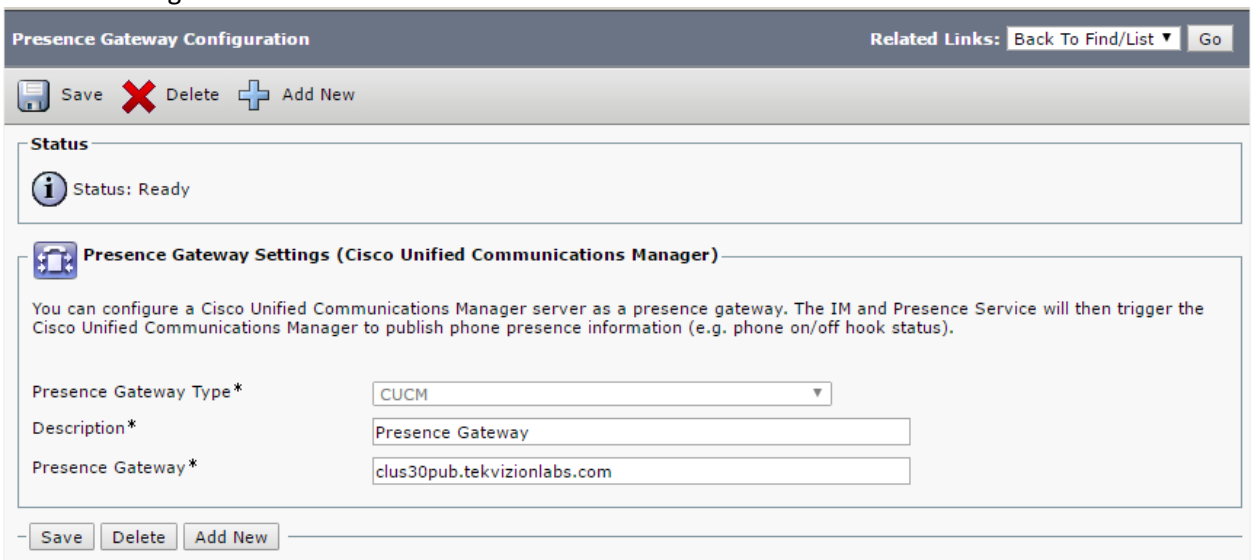


Figure 125: Cisco IM&P Presence Gateway

Presence Settings Configuration

Navigation: Presence->Settings->Standard Configuration

Configure the Presence Settings to manage the global availability sharing capability for all clients that connect to the IM and Presence Service.

1. Set **Cluster ID:** This unique identifier is automatically generated
2. Set **CUCM IM and Presence Publish Trunk:** Select the appropriate IM and Presence Service SIP trunk required for phone availability integration. This is the trunk configured in Cisco UCM for IM and Presence Server at Devices -> Trunk.
3. Confirm **Enable Partitioned Intra-domain Federation with LCS/OCS/Lync:** is checked
4. Set **Partitioned Intra-domain Routing Mode:** Advanced Routing Mode

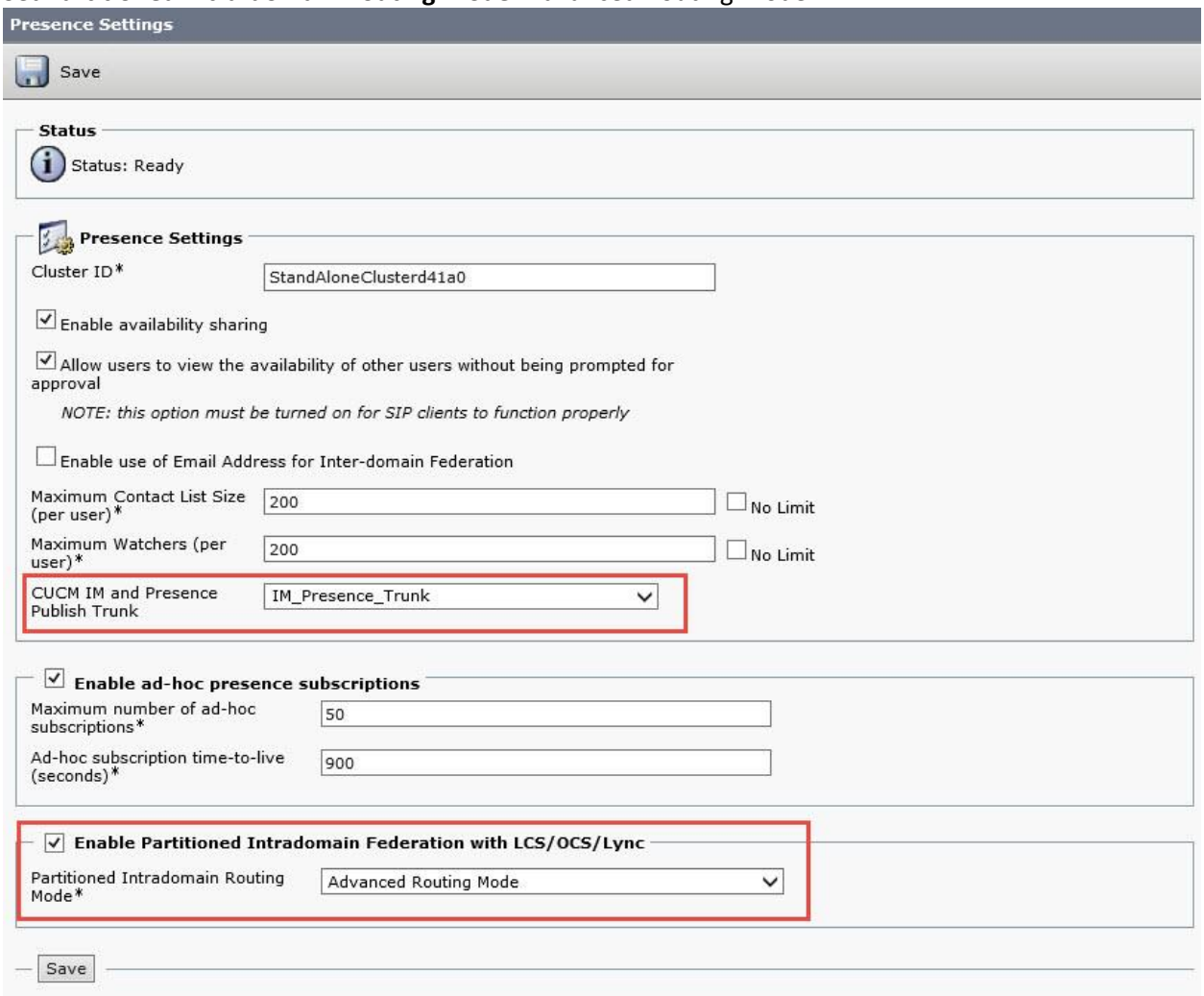


Figure 126: Cisco IM&P Presence Settings

Security Settings Configuration

Navigation: System->Security->Settings

1. Set **SIP Intra-cluster Proxy-to-Proxy Transport Protocol:** TCP

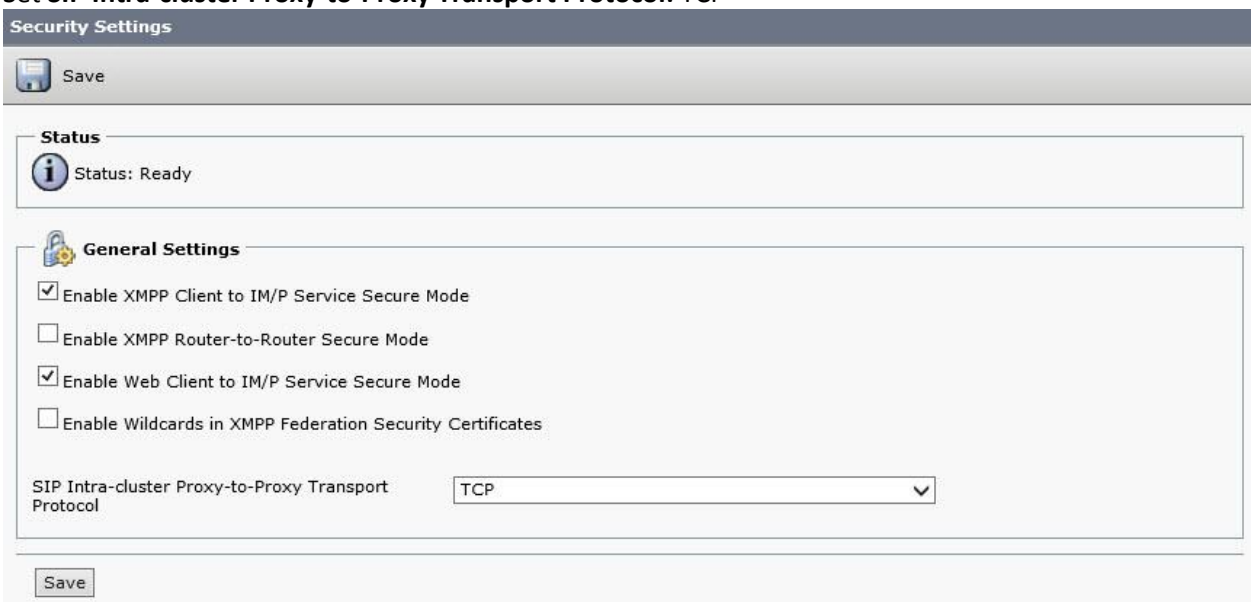


Figure 127: Cisco IM&P Security Settings

Static Route to Front End Configuration

Navigation: Presence->Routing->Static Routes

A static route is a fixed path through the network, unlike a dynamic route path that automatically calculates according to routing protocols and routing update messages

1. Set **Destination Pattern:** Enter the pattern of the static route
2. Set **Next Hop:** Enter the IP address or FQDN of the next hop for the static route.
3. Set **Next Hop Port:** 5061
4. Set **Route Type:** Domain
5. Set **Protocol Type:** TLS

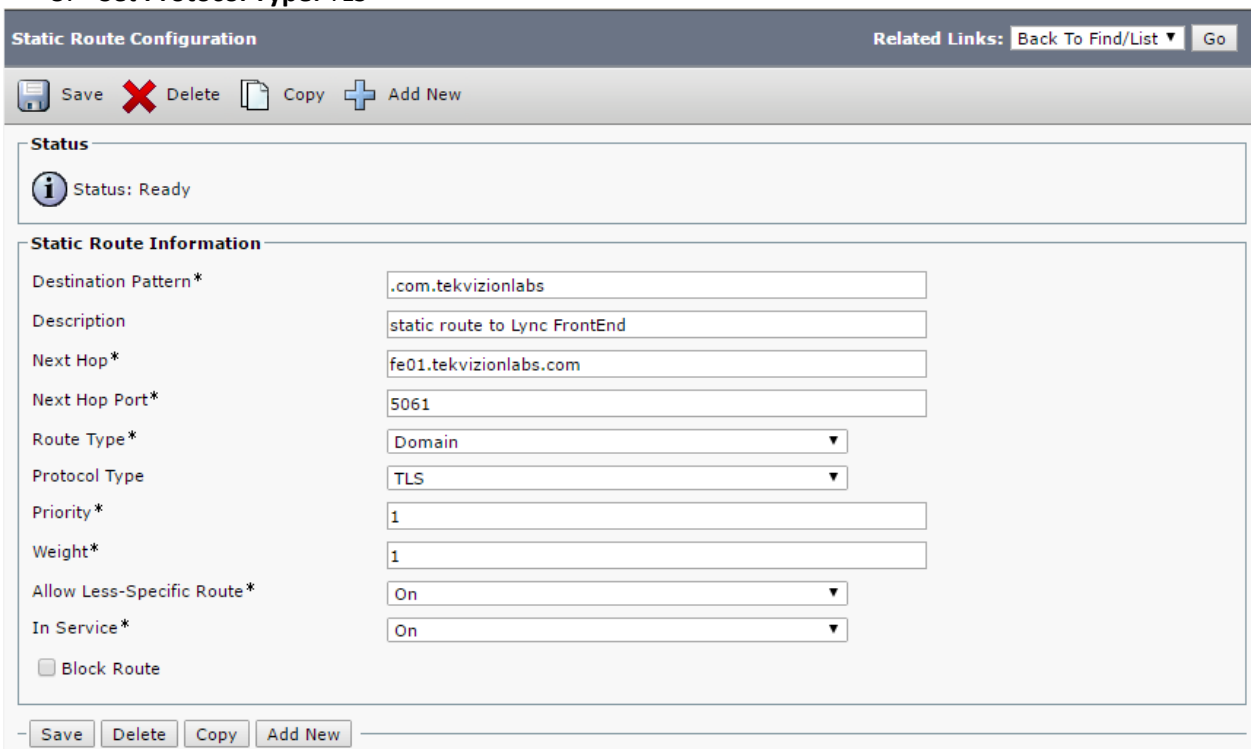


Figure 128: Cisco IM&P Static Route

Skype for Business Server Configuration

Skype for Business Server should trust Expressway.

Add Expressway-C to Skype for Business Topology

Intra-domain federation requires the following configuration on Skype for Business.

- Expressway-C as a trusted application server

In general, the steps to create the trusted application servers is similar to Expressway-C whether using Enterprise or Standard Edition Skype for Business Sever. The steps below outline the overall procedure using the Skype for Business Power Shell.

Trusted Application Server – Expressway-C

a. Create the trusted application pool by running the following command. Use Get-CsPool to verify FQDN of the Registrar.

New-CsTrustedApplicationPool -Identity expressc2.tekvizionlabs.com –Registrar fe01.tekvizionlabs.com –Site CleanDefaultTopology –TreatAsAuthenticated $true –ThrottleAsServer $true –RequiresReplication $false –Outboundonly $false -ComputerFqdn expressc2.tekvizionlabs.com

Identity – Name of the trusted application pool
Registrar – ServiceID or FQDN of registrar service for the pool
Site – Name of the site where you want the pool to be created
ComputerFQDN – FQDN of the Expressway-C (used only if using Enterprise Edition Skype for Business)

b. The following command is used to add additional computers to the trusted application if using Enterprise pools. This step can be skipped if using Standard Edition Skype for Business.

New-CsTrustedApplicationComputer -Identity expressc3.tekvizionlabs.com -Pool expressc2.tekvizionlabs.com

Identity – FQDN of the new server being added to the trusted application pool (Enterprise Edition Skype for Business)
Pool – FQDN of the trusted application pool

c. Finally, create a new trusted application and add to the above created application pool, using port 5061
New-CsTrustedApplication -ApplicationId ExpresswaycApplication1 -TrustedApplicationPoolFqdn expressc2.tekvizionlabs.com -Port 65072

ApplicationID – Name of the application. Can be any name
TrustedApplicationPoolFQDN – FQDN of the trusted application pool
Port: Listening port (65072 for TLS)

d. Publish the topology

Enable-CsTopology

The configuration can be quickly verified as shown below.

```
PS C:\Users\administrator.TEKVIZIONLABS> Get-CsTrustedApplicationComputer -Identity expressc2.tekvizionlabs.com


Identity : expressc2.tekvizionlabs.com
Pool     : expressc2.tekvizionlabs.com
Fqdn     : expressc2.tekvizionlabs.com



PS C:\Users\administrator.TEKVIZIONLABS> Get-CsTrustedApplicationPool -Identity expressc2.tekvizionlabs.com


Identity             : TrustedApplicationPool:expressc2.tekvizionlabs.com
Registrar            : Registrar:FE01.tekvizionlabs.com
FileStore            :
ThrottleAsServer     : True
TreatAsAuthenticated : True
OutboundOnly         : False
RequiresReplication  : False
AudioPortStart       :
AudioPortCount       : 0
AppSharingPortStart  :
AppSharingPortCount  : 0
VideoPortStart       :
VideoPortCount       : 0
Applications         : {urn:application:expresswaycapplication1}
DependentServiceList : {}
ServiceId            : 1-ExternalServer-1
SiteId               : Site:EnterpriseLyncServer
PoolFqdn             : expressc2.tekvizionlabs.com
Version              : 7
Role                 : TrustedApplicationPool


PS C:\Users\administrator.TEKVIZIONLABS> Get-CsTrustedApplication -Identity expressc2.tekvizionlabs.com/expresswaycappli
cation1


Identity                    : expressc2.tekvizionlabs.com/urn:application:expresswaycapplication1
ComputerGruus               : {expressc2.tekvizionlabs.com sip:expressc2.tekvizionlabs.com@tekvizionlabs.com;gruu;opaque
                              =srvr:expresswaycapplication1:ltZWrc2_n1WLrLLeaa2KeQAA}
ServiceGruu                 : sip:expressc2.tekvizionlabs.com@tekvizionlabs.com;gruu;opaque=srvr:expresswaycapplication1
                              :ltZWrc2_n1WLrLLeaa2KeQAA
Protocol                    : Mtls
ApplicationId               : urn:application:expresswaycapplication1
TrustedApplicationPoolFqdn  : expressc2.tekvizionlabs.com
Port                        : 65072
LegacyApplicationName       : expresswaycapplication1
```

Figure 129: Skype for Business Static Route to Expressway-C

Static Route Configuration for federation

In the Skype for Business Management Shell, use the below commands to create a new static route variable on Skype for Business for federation and then add the route variable to the global static routing configuration collection

$route=New-CsStaticRoute -TLSRoute -Destination "expressc2.tekvizionlabs.com" -MatchUri "tekvizionlabs.com" -Port 5061 -UseDefaultCertificate $true

Set-CsStaticRoutingConfiguration -Identity global -Route @{Add=$route}

Destination - FQDN of the Expressway-C
Port – Listening port (usually 5061 for TLS)
MatchUri – Destination domain

- Verify the configured static routes.

Get-CsStaticRoutingConfiguration | Select-Object -ExpandProperty route

```
Transport               : TransportChoice=Certificate=Microsoft.Rtc.Management.WritableConfig.Settings.SipProxy.UseDefa
                          ultCert;Fqdn=expressc2.tekvizionlabs.com;Port=5061
MatchUri                : tekvizionlabs.com
MatchOnlyPhoneUri       : False
Enabled                 : True
ReplaceHostInRequestUri : False
Element                 : <Route xmlns="urn:schema:Microsoft.Rtc.Management.Settings.SipProxy.2008"
                          MatchUri="tekvizionlabs.com" MatchOnlyPhoneUri="false" Enabled="true"
                          ReplaceHostInRequestUri="false">
                            <Transport Port="5061">
                              <TLS Fqdn="expressc2.tekvizionlabs.com">
                                <UseDefaultCert />
                              </TLS>
                            </Transport>
                          </Route>
```

Figure 130: Skype for Business Static Route to Expressway-C

Configure Encryption Level

Configure Encryption level parameters through the Windows PowerShell® command line interface because they are not configurable on Skype for Business Server Control Panel

Media EncryptionLevel must be set to Require Encryption.

Set-CsMediaConfiguration –identity Global -EncryptionLevel RequireEncryption

```
PS C:\Users\administrator.LYNCLABSP> Get-CsMediaConfiguration


Identity                  : Global
EnableQoS                 : False
EncryptionLevel           : RequireEncryption
EnableSiren               : True
MaxVideoRateAllowed       : VGA600K
EnableInCallQoS           : False
InCallQoSIntervalSeconds  : 35
EnableRtpRtcpMultiplexing : True
```

Figure 131: Skype for Business Server – Media Configuration

Trusted Application Server – IM&P Nodes

Add IM&P Publisher as Trusted Application Server

a. Create the trusted application pool by running the following command. Use Get-CsPool to verify FQDN of the Registrar.

New-CsTrustedApplicationPool -Identity clus30pimp.tekvizionlabs.com –Registrar fe01.tekvizionlabs.com –Site CleanDefaultTopology –TreatAsAuthenticated $true –ThrottleAsServer $true –RequiresReplication $false –Outboundonly $false -ComputerFqdn clus30pimp.tekvizionlabs.com

Identity – Name of the trusted application pool
Registrar – ServiceID or FQDN of registrar service for the pool
Site – Name of the site where you want the pool to be created
ComputerFQDN – FQDN of the Cisco IM&P publisher (used only if using Enterprise Edition Skype for Business)

b. The following command is used to add additional peers to the trusted application pool.

New-CsTrustedApplicationComputer -Identity clus30pimp.tekvizionlabs.com -Pool clus30pimp.tekvizionlabs.com

Identity – FQDN of the new server being added to the trusted application pool (Enterprise Edition SFB)
Pool – FQDN of the trusted application pool

c. Finally, create a new trusted application and add to the above created application pool, using port 5061

New-CsTrustedApplication -ApplicationId impapplication1 -TrustedApplicationPoolFqdn clus30pimp.tekvizionlabs.com -Port 5061

ApplicationID – Name of the application. Can be any name
TrustedApplicationPoolFQDN – FQDN of the trusted application pool
Port: Listening port (5061 for TLS)

d. Publish the topology

Enable-CsTopology

Add IM&P Subscriber as Trusted Application Server

a. Create the trusted application pool by running the following command. Use Get-CsPool to verify FQDN of the Registrar.

New-CsTrustedApplicationPool -Identity clus30simp.tekvizionlabs.com –Registrar fe01.tekvizionlabs.com –Site CleanDefaultTopology –TreatAsAuthenticated $true –ThrottleAsServer $true –RequiresReplication $false –Outboundonly $false -ComputerFqdn clus30simp.tekvizionlabs.com

Identity – Name of the trusted application pool
Registrar – ServiceID or FQDN of registrar service for the pool
Site – Name of the site where you want the pool to be created
ComputerFQDN – FQDN of the Cisco IM&P publisher (used only if using Enterprise Edition Skype for Business)

b. The following command is used to add additional peers to the trusted application pool.

New-CsTrustedApplicationComputer -Identity clus30simp.tekvizionlabs.com -Pool clus30simp.tekvizionlabs.com

Identity – FQDN of the new server being added to the trusted application pool (Enterprise Edition SFB)
Pool – FQDN of the trusted application pool

c. Finally, create a new trusted application and add to the above created application pool, using port 5061

New-CsTrustedApplication -ApplicationId impapplication1 -TrustedApplicationPoolFqdn clus30simp.tekvizionlabs.com -Port 5061

ApplicationID – Name of the application. Can be any name
TrustedApplicationPoolFQDN – FQDN of the trusted application pool
Port: Listening port (5061 for TLS)

d. Publish the topology

Enable-CsTopology

Update Skype for Business Certificates

Using the Skype for Business Deployment Wizard update the Skype for Business Certificates with both Server and Client Authentication

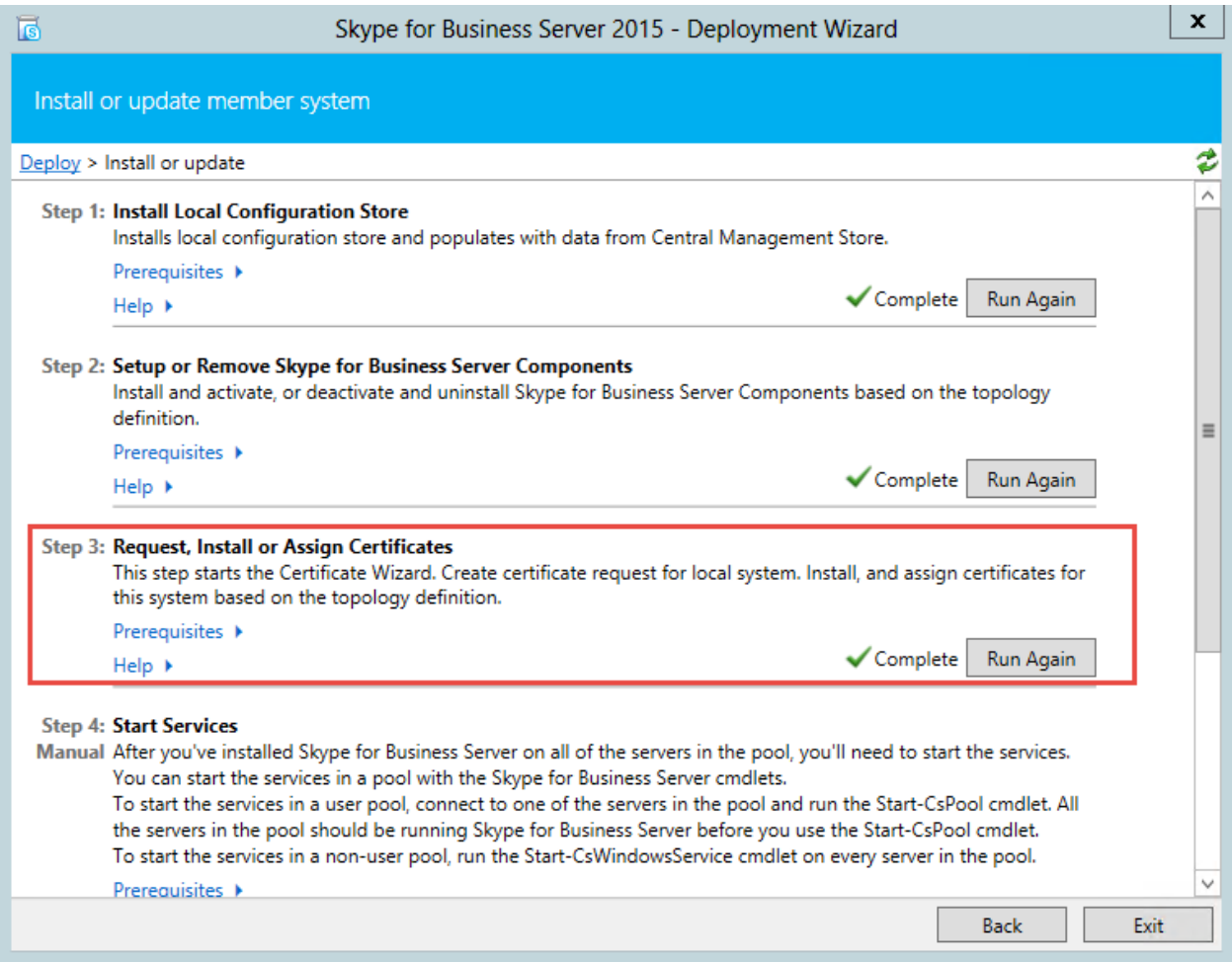


Figure 132: Skype for Business Deployment Wizard- Request & Assign Certificates-1

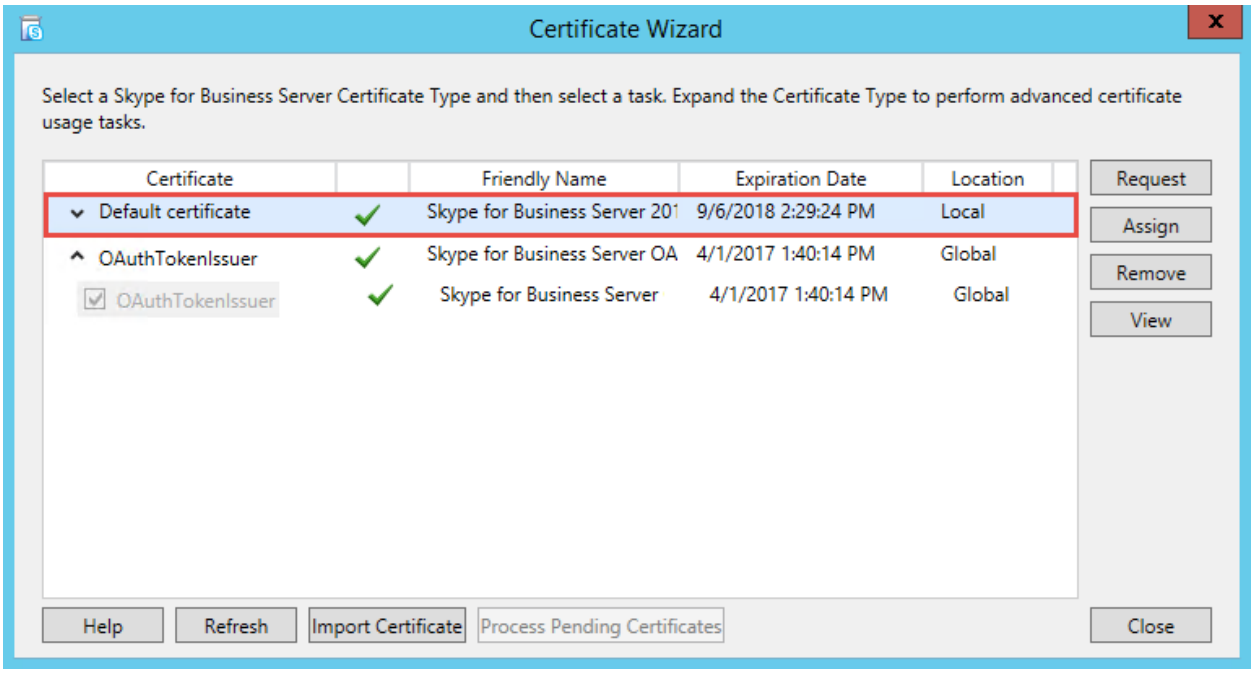


Figure 133: Skype for Business Deployment Wizard- Request & Assign Certificates-2

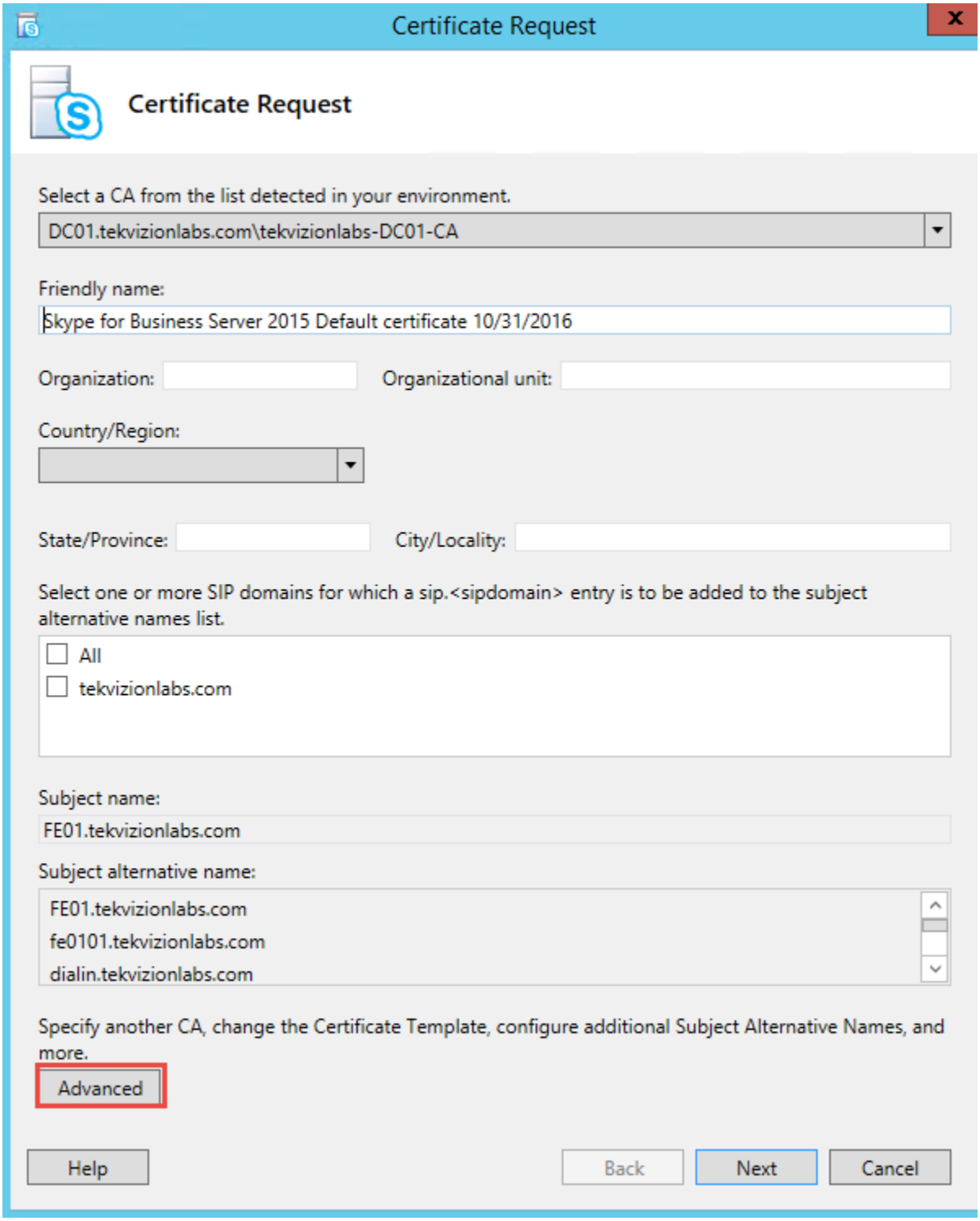


Figure 134: Skype for Business Deployment Wizard- Request & Assign Certificates-3

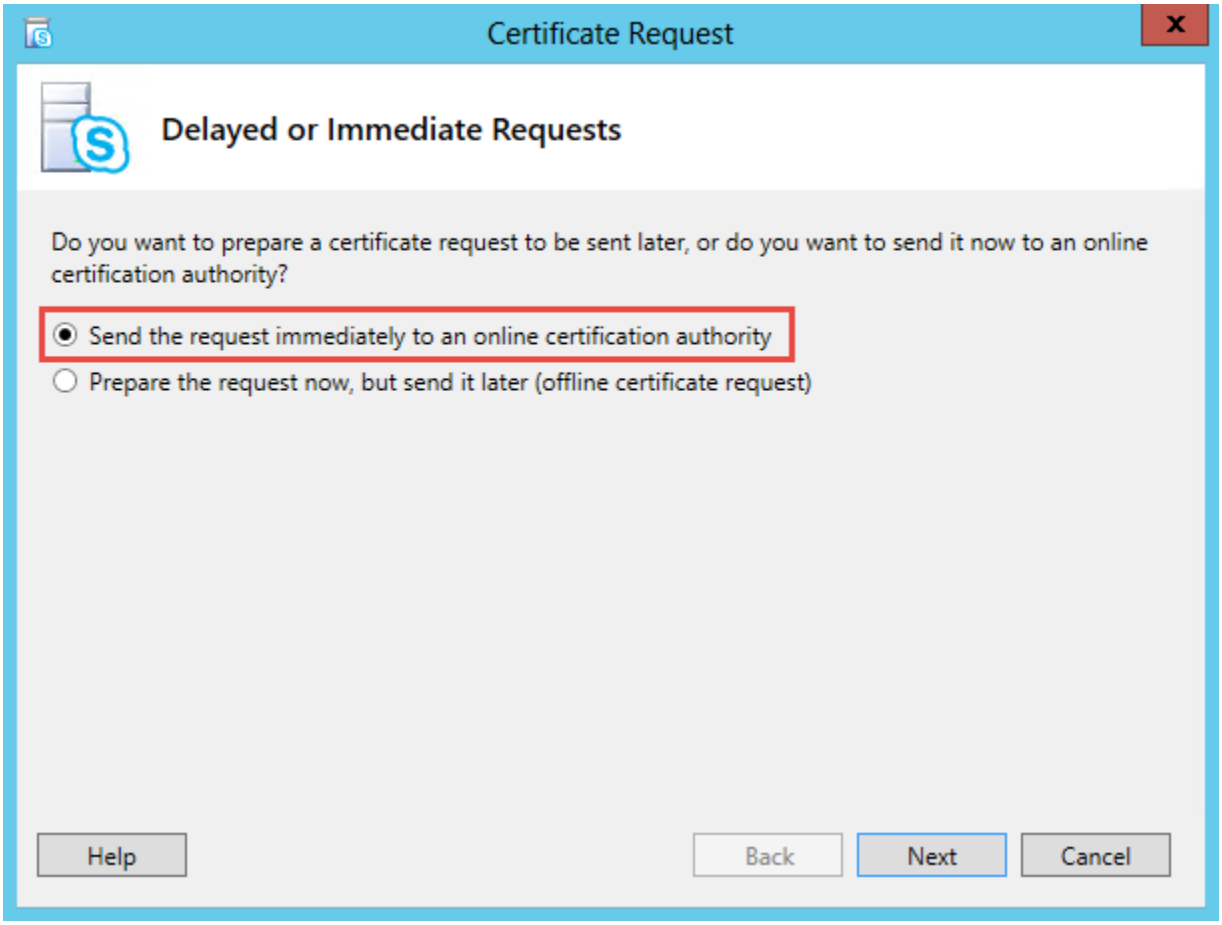


Figure 135: Skype for Business Deployment Wizard- Request & Assign Certificates-4

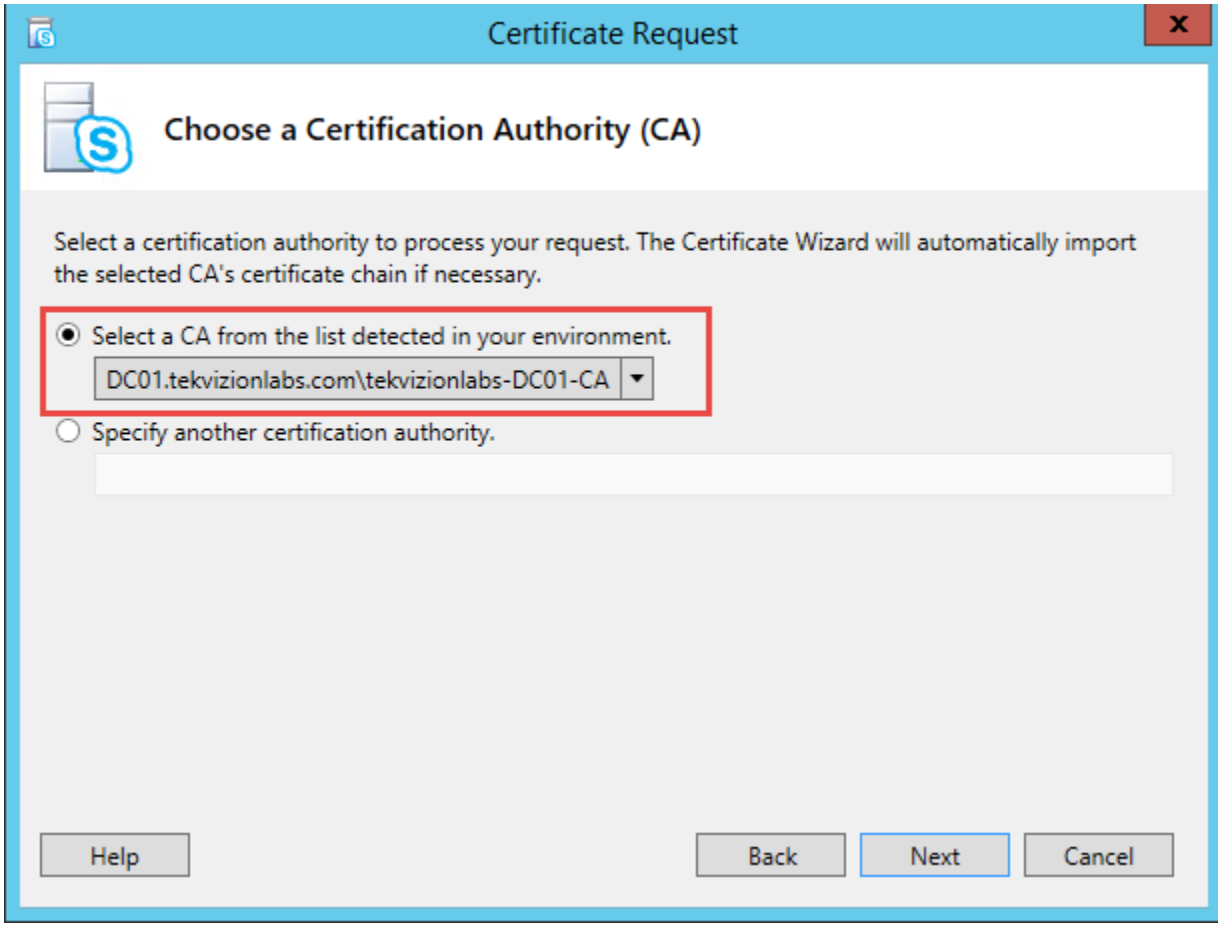


Figure 136: Skype for Business Deployment Wizard- Request & Assign Certificates-5

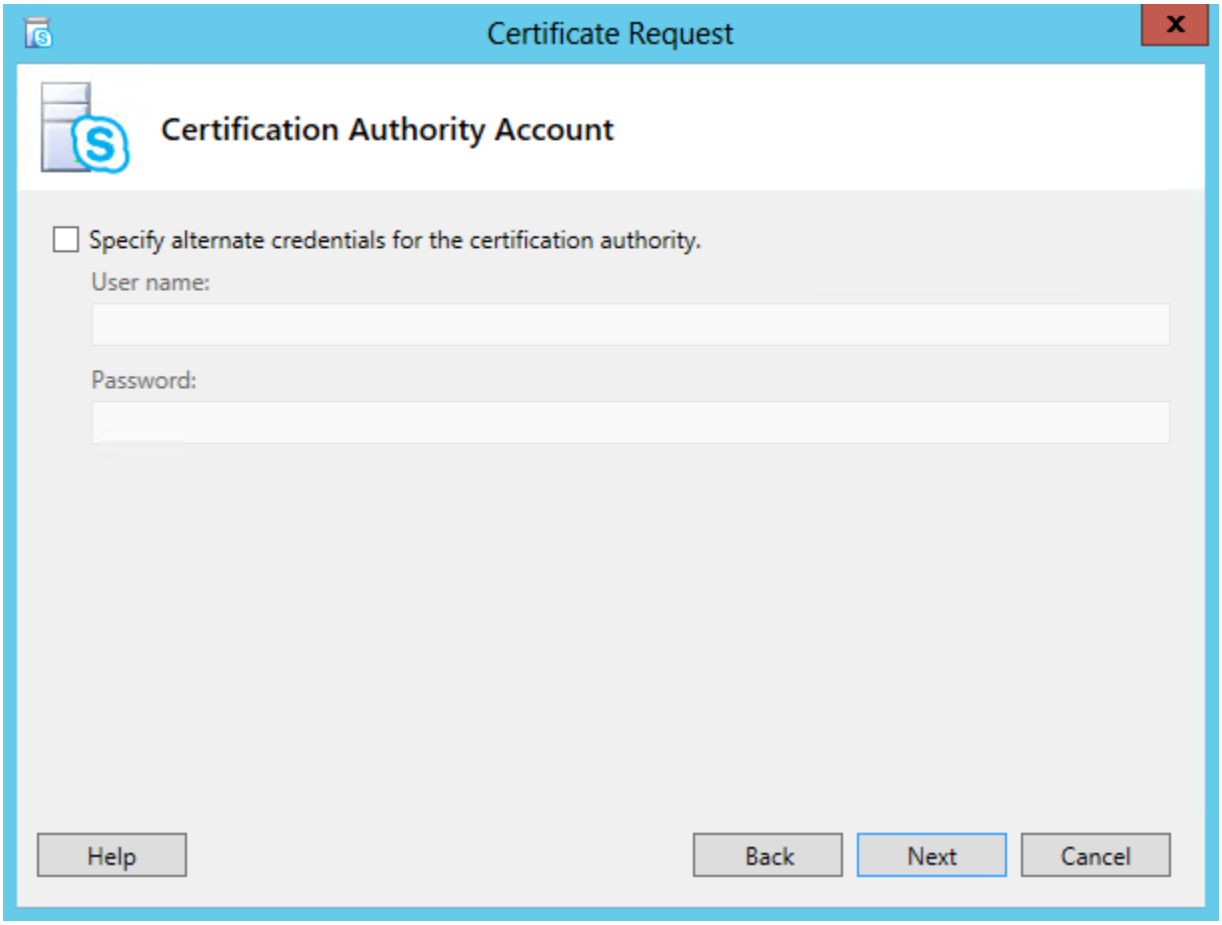


Figure 137: Skype for Business Deployment Wizard- Request & Assign Certificates-6

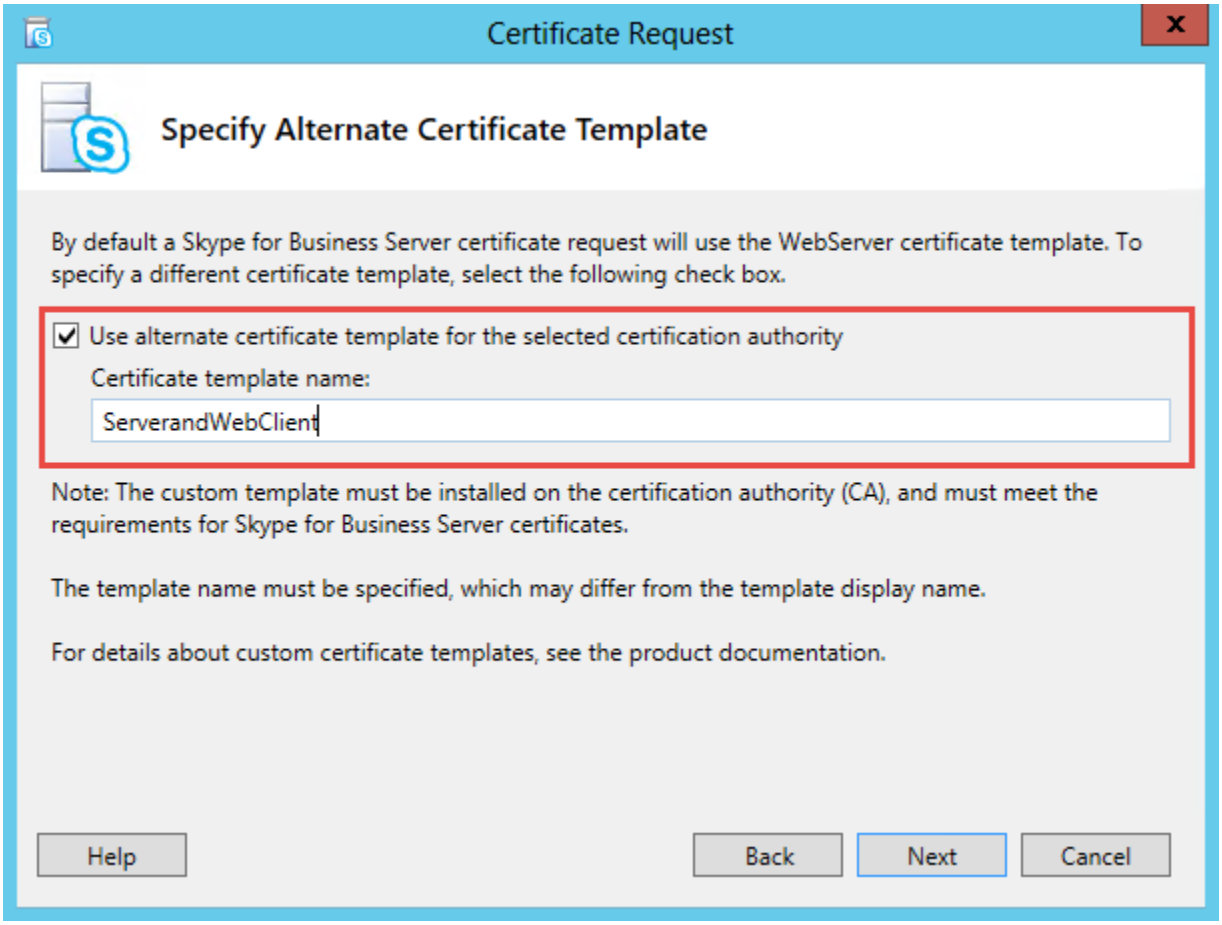


Figure 138: Skype for Business Deployment Wizard- Request & Assign Certificates-7

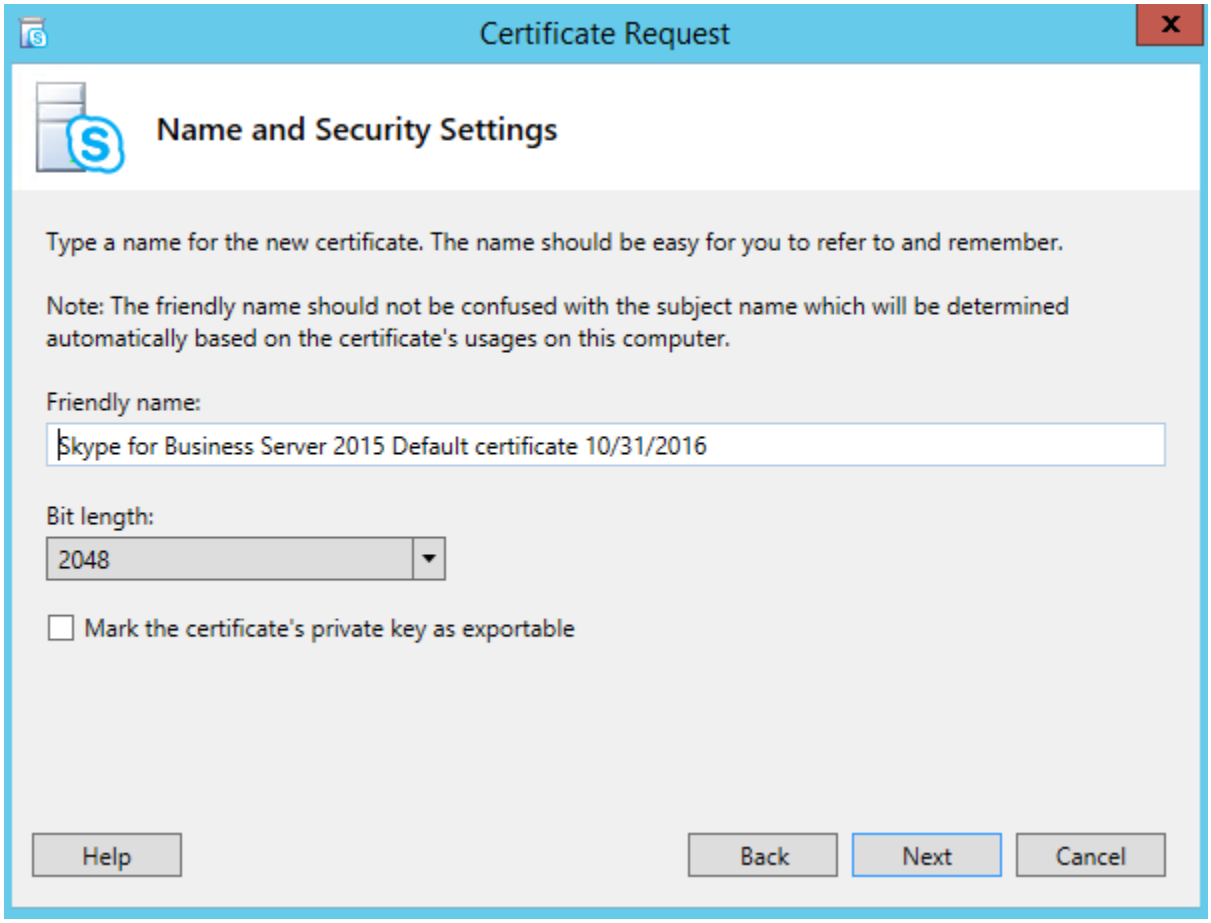


Figure 139: Skype for Business Deployment Wizard- Request & Assign Certificates-8

1. Enter the Organization Information
2. Enter the Geographical Information
3. Select the sip domain

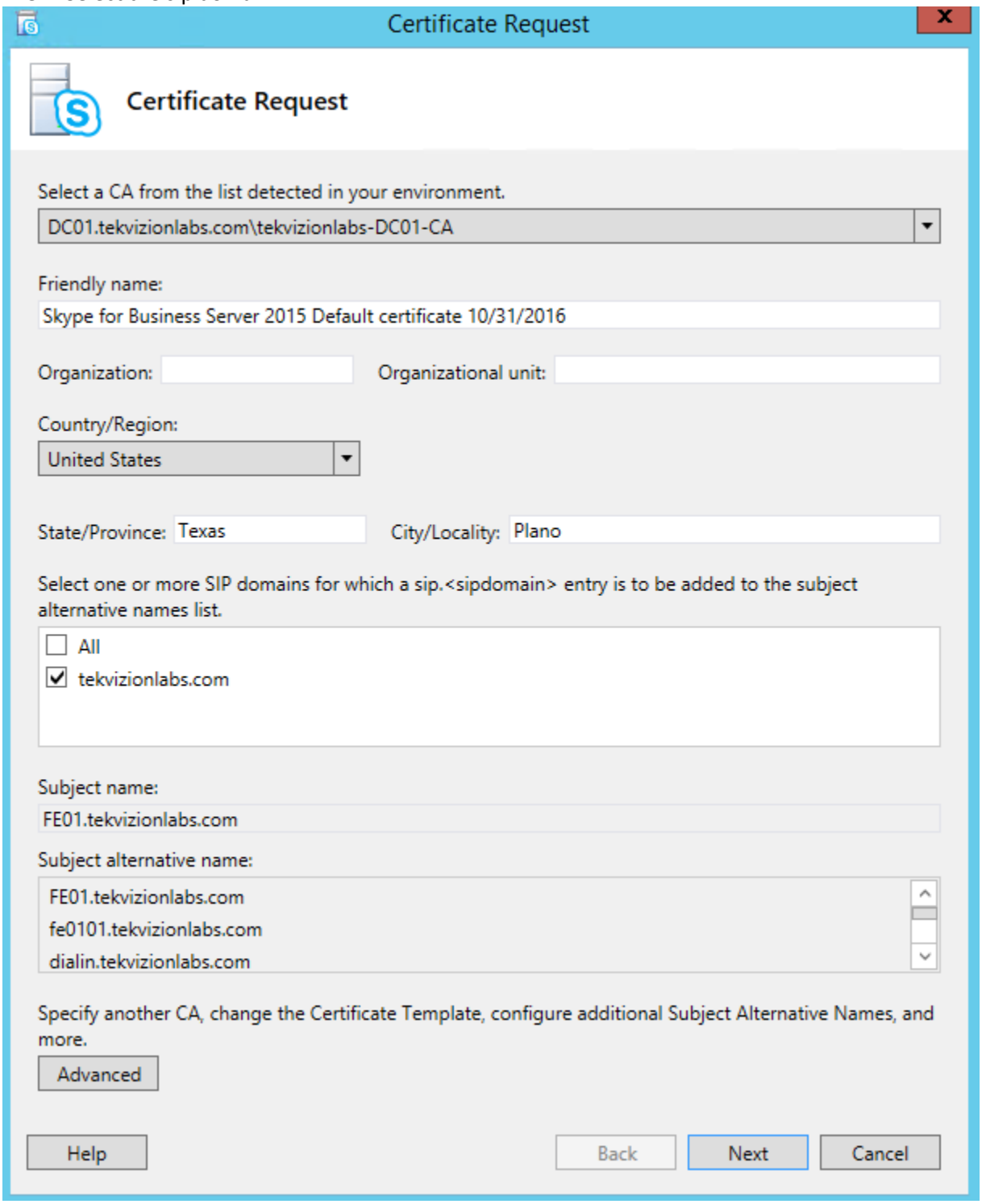


Figure 140: Skype for Business Deployment Wizard- Request & Assign Certificates-9

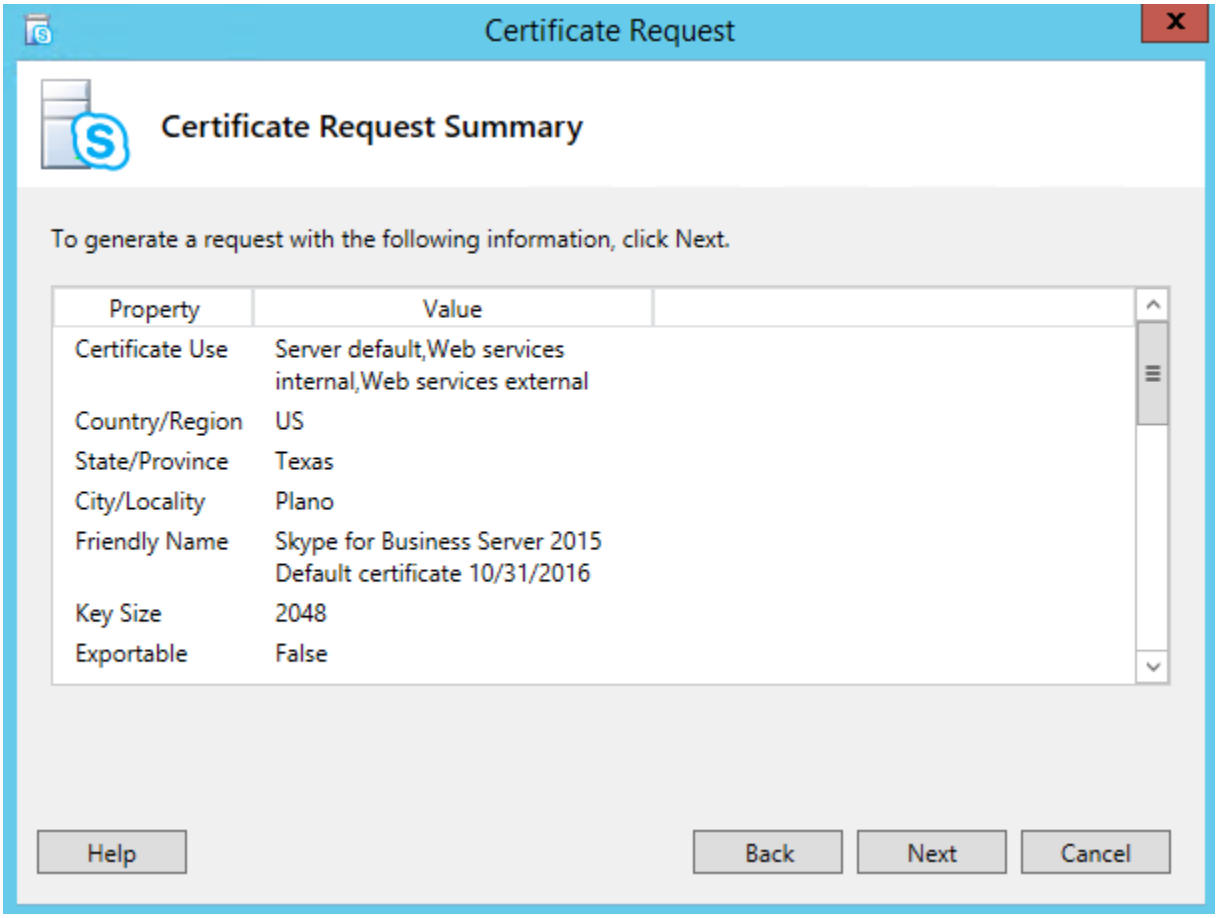


Figure 141: Skype for Business Deployment Wizard- Request & Assign Certificates-14

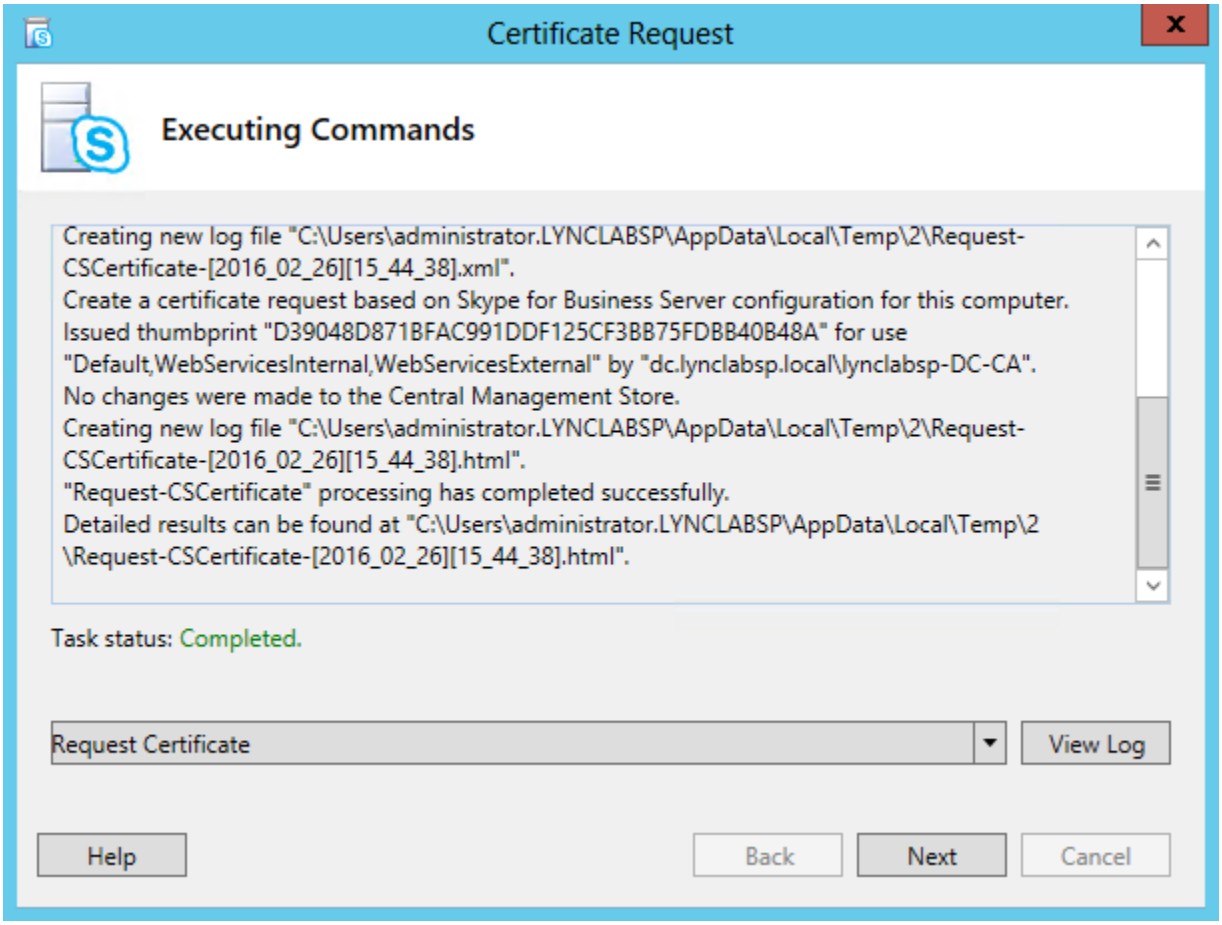


Figure 142: Skype for Business Deployment Wizard- Request & Assign Certificates-15

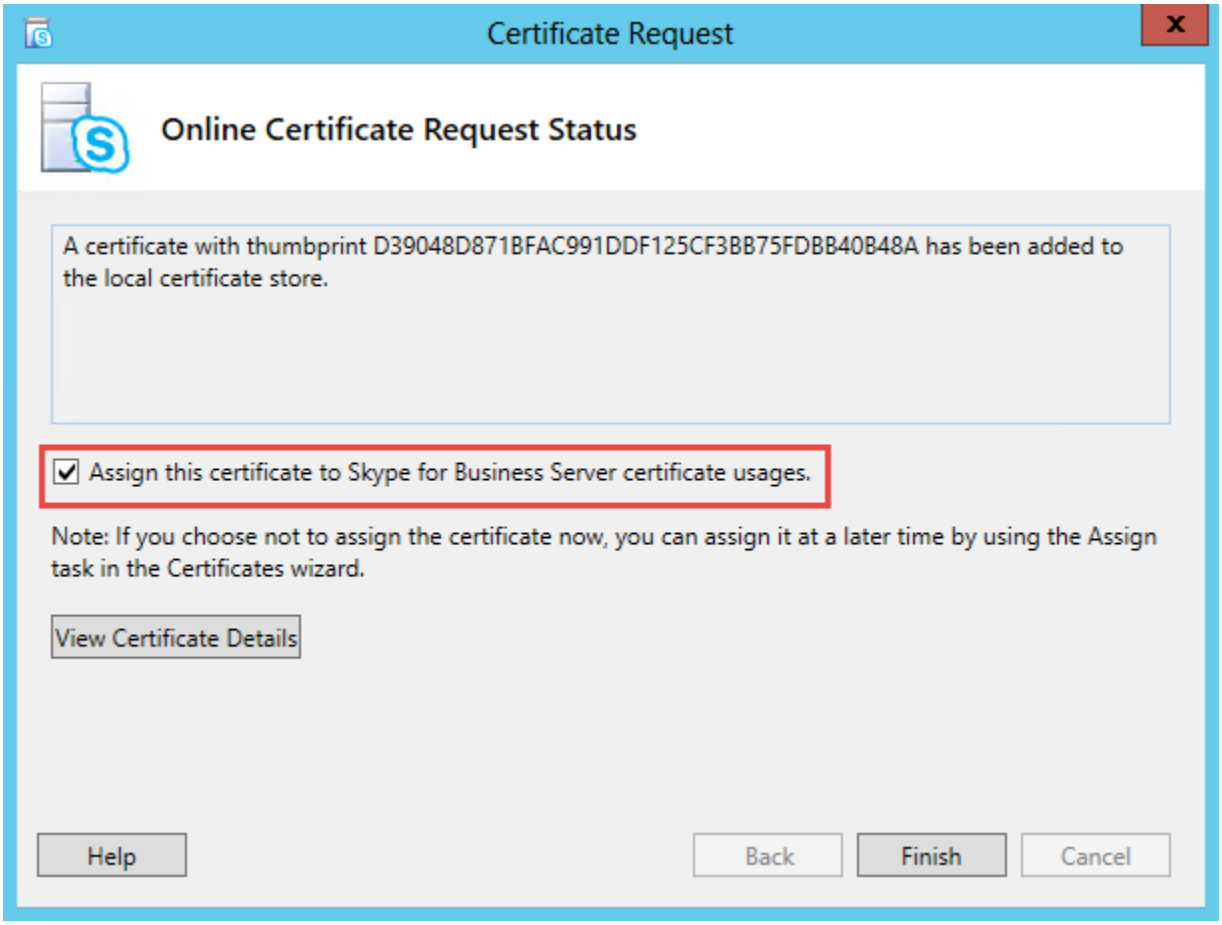


Figure 143: Skype for Business Deployment Wizard- Request & Assign Certificates-16

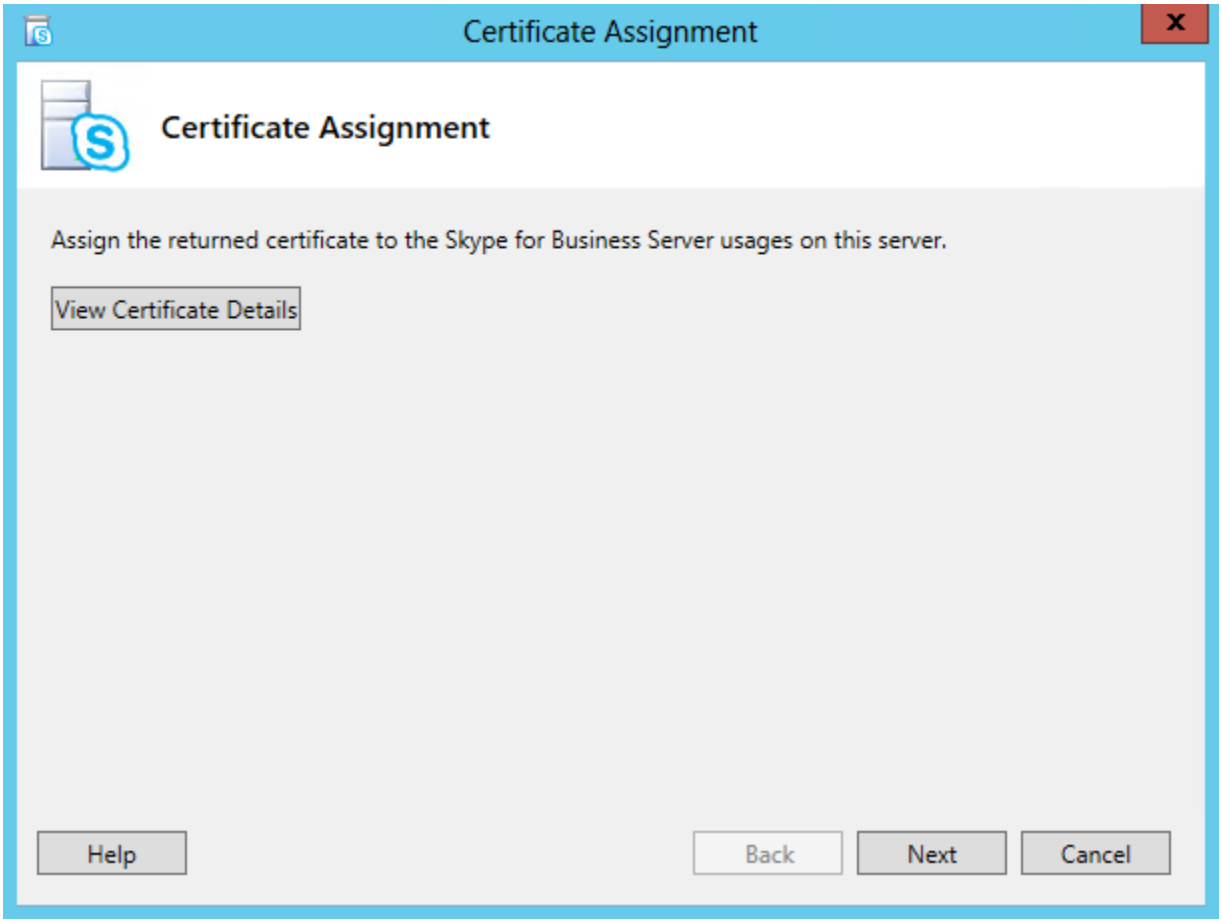


Figure 144: Skype for Business Deployment Wizard- Request & Assign Certificates-18

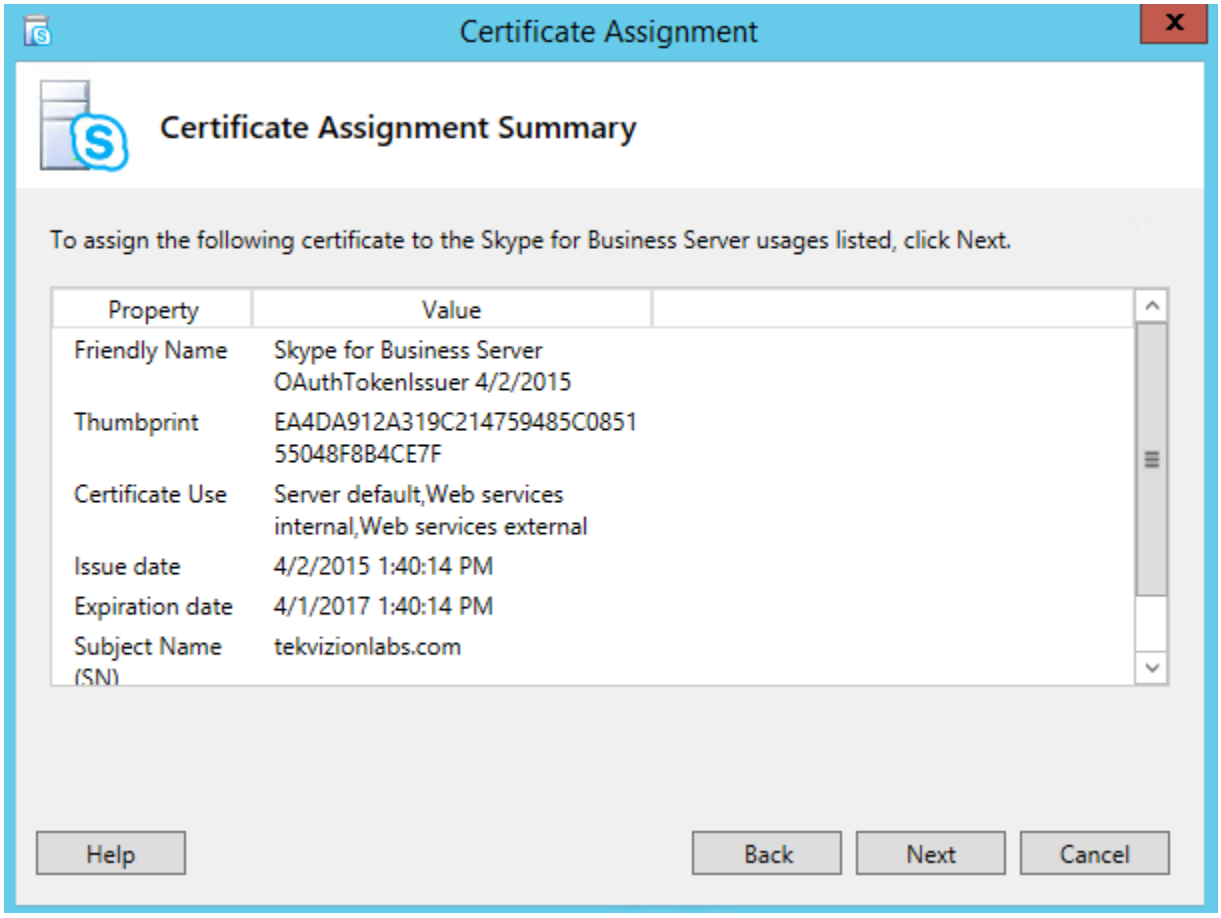


Figure 145: Skype for Business Deployment Wizard- Request & Assign Certificates-19

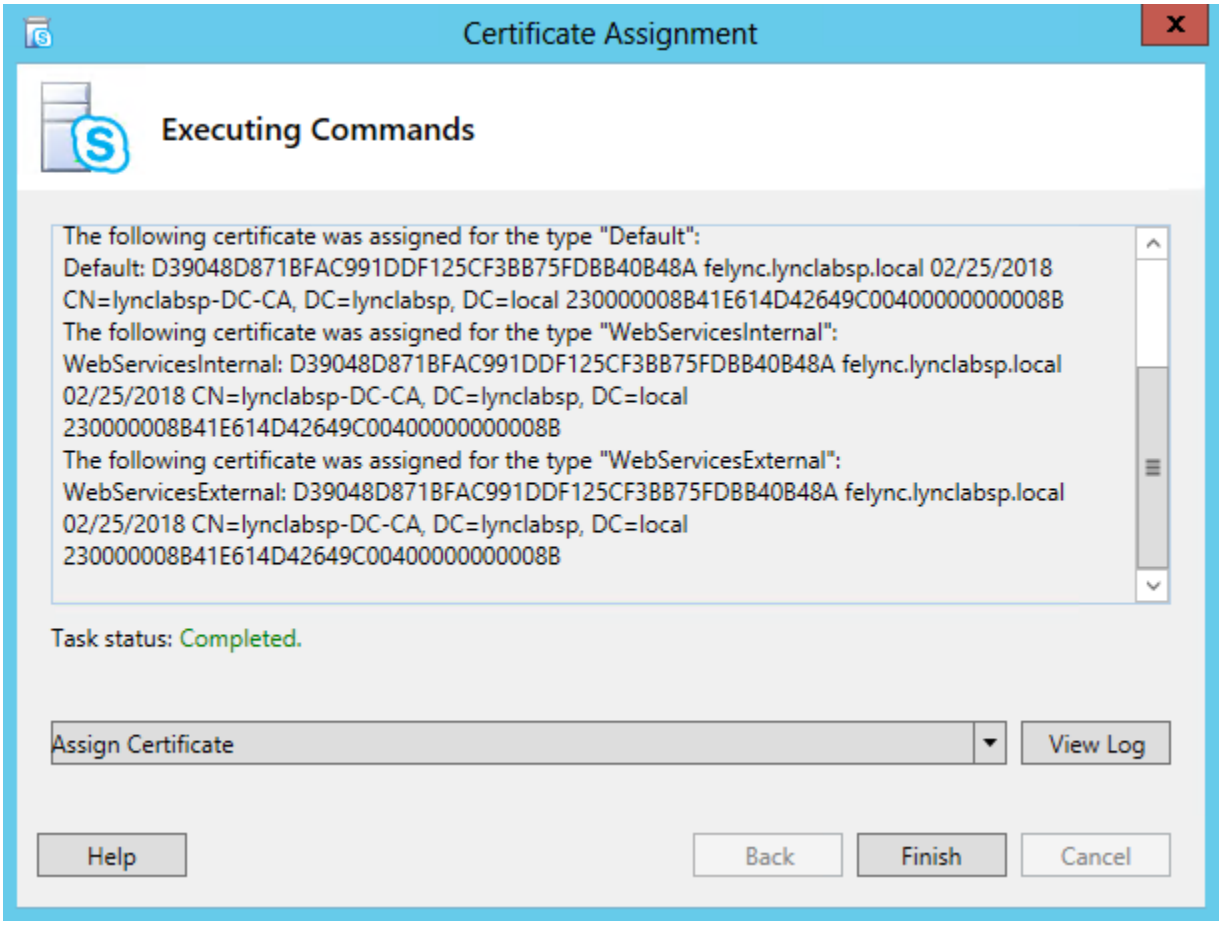


Figure 146: Skype for Business Deployment Wizard- Request & Assign Certificates-20