Application Note

Connecting Cisco Unified Communication Manager [12.5.1] to Peerless Network SIP Trunk via Cisco Unified Border Element v12.7.0 [IOS-XE 16.12.04]

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Introduction

Service Providers today, such as Peerless Network, are offering alternative methods to connect to the PSTN via their IP network. Most of these services utilize SIP as the primary signaling method and centralized IP to TDM POP gateways to provide on-net and off-net services.

Peerless Network is a service provider offering that allows connection to the PSTN and may offer the end customer a viable alternative to traditional PSTN connectivity. A demarcation device between these services and customer owned services is recommended. As an intermediary device between Cisco Unified Communications Manager (Cisco UCM) and Peerless Network, Cisco Unified Border Element (Cisco UBE) ISR 4331/K9 running IOS-XE 16.12.04 can be used. The Cisco Unified Border Element v12.7.0 provides demarcation, security, interworking and session control services for Cisco Unified Communications Manager 12.5.1 connected to Peerless Network IP network.

This document assumes the reader is knowledgeable with the terminology and configuration of Cisco Unified Communications Manager. Only configuration settings specifically required for Peerless Network interoperability are presented. Feature configuration and most importantly the dial plan are customer specific and need individual approach.

- This application note describes how to configure Cisco UCM 12.5.1, and Cisco UBE on ISR 4331/K9 [IOS-XE – 16.12.04] for connectivity to Peerless Network SIP Trunking service. The deployment model covered in this application note is CPE (Cisco UCM) to PSTN (Peerless Network) via Cisco UBE v12.7.0 [IOS-XE] 16.12.04.
- Testing was performed in accordance to Peerless Network generic SIP Trunking test methodology and among features verified were – basic calls, DTMF transport, Music on Hold (MOH), unattended and attended transfers, call forward, conferences and High Availability.
- The Cisco UBE configuration detailed in this document is based on a lab environment with a simple dial-plan used to ensure proper interoperability between Peerless Network SIP network and Cisco Unified Communications. The configuration described in this document details the important configuration settings to have enabled for interoperability to be successful and care must be taken by the network administrator deploying Cisco UCM to interoperate to Peerless Network SIP Trunking network.

Network Topology

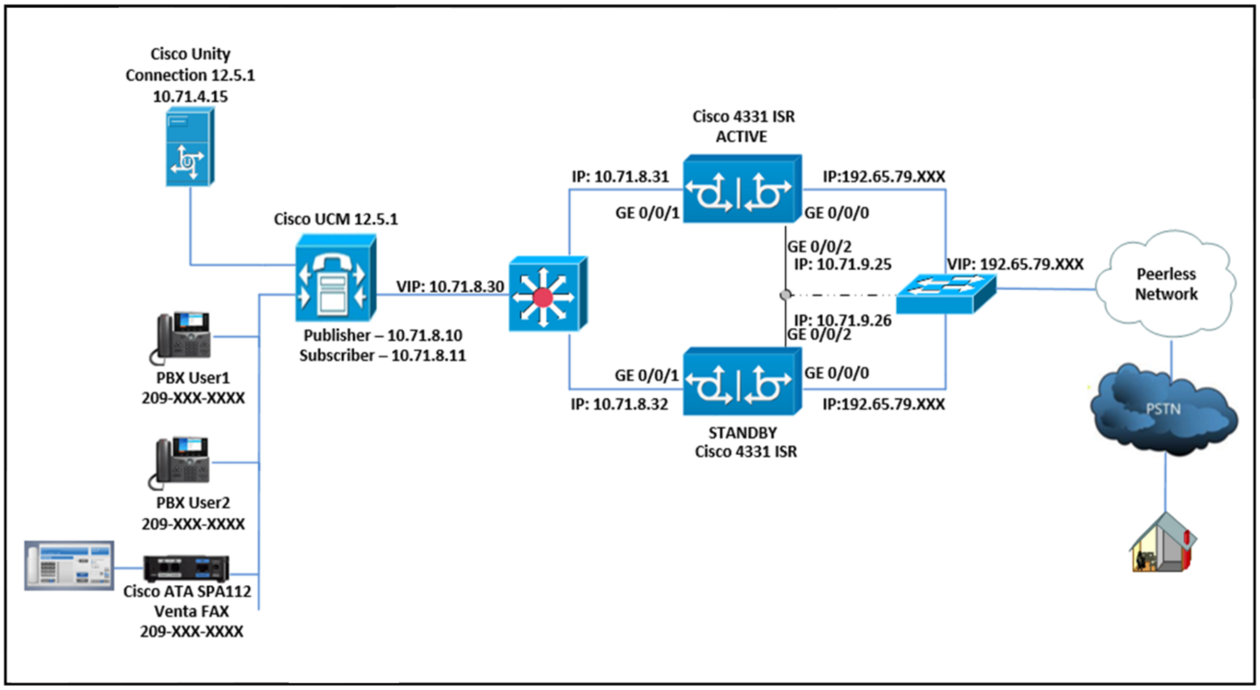

Figure 1 Network Topology

- The network topology includes the Cisco UCM Cluster, Unity Voicemail system and 2 Cisco Endpoints. Cisco UCM has a trunk configured to Cisco UBE's Virtual IP Address. Peerless Network was used as the service provider with SIP trunk to the Cisco UBE using the WAN Virtual IP Address.
- 2 Cisco Unified Border Elements are used here for High Availability.
- SIP Trunk transport type used between Cisco Unified Border Element and Cisco UCM is UDP and to Peerless Network is UDP.

Cisco UCM and Cisco UBE Settings:

Setting	Value
Transport from Cisco UBE to Cisco UCM	UDP with RTP
Transport from Cisco UBE to Peerless Network IP	UDP with RTP
Voice Mail Support	YES
Session Refresh	YES
Early Media support with PRACK	YES

System Components

Hardware Requirements

- Cisco UBE on Cisco ISR 4331 router.
- CUCM cluster on UCS C240, 1 Publisher node and 1 Subscriber node.
- Generic Cisco IP-Phones.

Software Requirements

- Cisco UBE-Version: 12.7.0 running IOS-XE 16.12.4
- Cisco UCM-Version: 12.5.1.13900-152

Features

Features Supported

- Incoming, Outgoing and International calls using G711ulaw and G729 voice codecs
- Call Conference
- Voice Mail
- Auto Attendant
- Call hold & Resume(MoH and ToH)
- Semi-attended and Attended Call transfer
- Call forward (all, busy and no answer)
- DTMF (RFC2833)
- Fax
    - G711 u-Law Pass-through
    - T.38
- IP-PBX Calling number privacy
- High Availability

Features Not Supported

- Cisco UCM does not support Blind Call transfer
- Peerless Network doesn’t support 0,0+10 dial plan

Caveats

- None

Observations

- Only one IP PBX is used for testing.
- Cisco UCM phones used in this test does not support Blind Call transfer feature and hence the feature related test cases are not tested.
- Caller ID is not updated on attended and semi-attended transfer scenarios

Configuration

Configuring Cisco Unified Border Element

Network Interface

The IP address used are for illustration only, the actual IP address can vary. The Active/Standby pair share the same virtual IP address and continually exchange status messages.

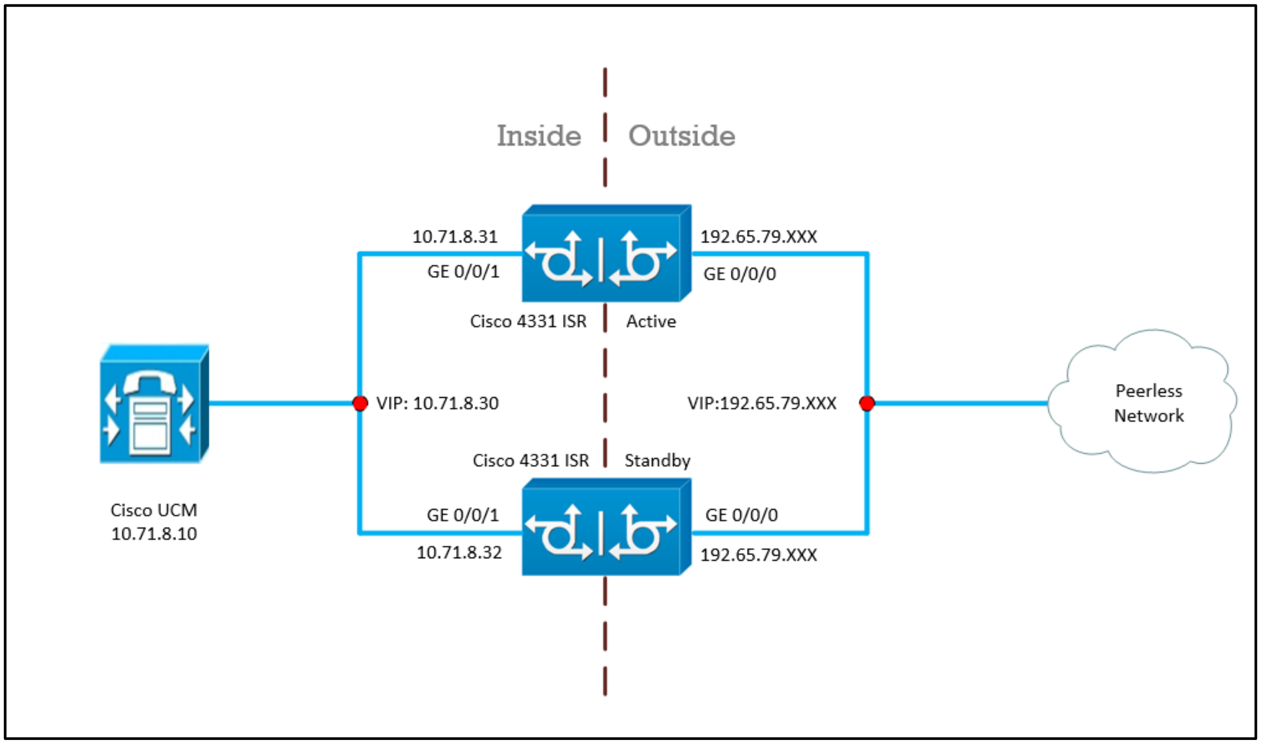

Figure 2 High Availability topology

Cisco UBE 1:

```
interface GigabitEthernet0/0/0
 description Peerless CUBE WAN interface
 ip address 192.65.79.XXX 255.255.255.128
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 192.65.79.XXX exclusive
!
interface GigabitEthernet0/0/1
 description Peerless CUBE LAN interface
 ip address 10.71.8.31 255.255.255.0
 negotiation auto
 redundancy rii 20
 redundancy group 1 ip 10.71.8.30 exclusive
!
interface GigabitEthernet0/0/2
 description Peerless CUBE HA Interface
 ip address 10.71.9.25 255.255.255.0
 negotiation auto
!
```

Cisco UBE 2:

```
interface GigabitEthernet0/0/0
 description Peerless CUBE WAN interface
 ip address 192.65.79.XXX 255.255.255.128
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 192.65.79.XXX exclusive
!
interface GigabitEthernet0/0/1
 description Peerless CUBE LAN interface
 ip address 10.71.8.32 255.255.255.0
 negotiation auto
 redundancy rii 20
 redundancy group 1 ip 10.71.8.30 exclusive
!
interface GigabitEthernet0/0/2
 description Peerless CUBE HA Interface
 ip address 10.71.9.26 255.255.255.0
 negotiation auto
!
```

Global Cisco UBE settings

To enable Cisco UBE IP2IP SBC functionality, following commands have to be entered:

```
voice service voip
 ip address trusted list
  ipv4 208.93.42.XXX 255.255.255.255
  ipv4 10.71.8.10 255.255.255.255
  ipv4 10.71.8.11 255.255.255.255
  ipv4 10.71.8.12 255.255.255.255
 address-hiding
 mode border-element license capacity 20
 allow-connections sip to sip
 redundancy-group 1
 fax protocol pass-through g711ulaw
 sip
  bind control source-interface GigabitEthernet0/0/0
  bind media source-interface GigabitEthernet0/0/0
  session refresh
  asserted-id pai
  early-offer forced
  midcall-signaling passthru
  privacy-policy passthru
  g729 annexb-all
!
```

Explanation

Command	**Description**
allow-connections sip to sip	Allow IP2IP connections between two SIP call legs
redundancy-group 1	Enable High Availability for the VoIP service
fax protocol	Specifies the fax protocol
asserted-id	Specifies the privacy header in the outgoing SIP requests and response messages

Codecs

G711u-Law and G729 voice codecs are configured for this testing. Codec preferences used to change according to the test plan description.

```
voice class codec 1
 codec preference 1 g711ulaw
 codec preference 2 g729r8
!
voice class codec 2
 codec preference 1 g729r8
 codec preference 2 g711ulaw
!
```

Dial peer

Outbound Dial-peer to Peerless Network:

```
dial-peer voice 101 voip
 description *** Outbound Call from CUBE-LAN to CUCM****
 destination-pattern 120........
 session protocol sipv2
 session target ipv4:10.71.8.10:5060
 session transport udp
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 201 voip
 description *** Outbound Call from CUBE-WAN to Peerless ****
```

```
 destination-pattern .T
 session protocol sipv2
 session target sip-server
 session transport udp
 voice-class codec 1
 voice-class sip profiles 1
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
```

Inbound Dial-peer from Peerless Network:

```
dial-peer voice 100 voip
 description *** Inbound Call from CUCM to CUBE-LAN ***
 session protocol sipv2
 session transport udp
 incoming called-number .T
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 200 voip
 description *** Inbound Call from Peerless to CUBE-WAN ***
 session protocol sipv2
```

```
 session transport udp
 incoming called-number 120........
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
```

Configuration example

The following configuration snippet contains a sample configuration of Cisco UBE with all parameters mentioned previously.

Active Cisco UBE:

```
version 16.12
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service call-home
platform qfp utilization monitor load 80
platform punt-keepalive disable-kernel-core
!
hostname CUBE7
!
boot-start-marker
boot system bootflash:isr4300-universalk9.16.12.04.SPA.bin
boot-end-marker
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
!
enable secret 9 $9$WqvWswdeKDYk$aWfZx9jLuxYKTg1njANmuDAxLCRXapdky0zd9.KvFRc
!
no aaa new-model
call-home
profile "XXXX"
```

```
  active
  destination transport-method http
  no destination transport-method email
!
ip name-server 8.8.8.8
!
login on-success log
subscriber templating
!
multilink bundle-name authenticated
!
crypto pki trustpoint SLA-TrustPoint
 enrollment pkcs12
 revocation-check crl
!
!
crypto pki certificate chain SLA-TrustPoint
 certificate ca 01
  30820321 30820209 A0030201 02020101 300D0609 2A864886 F70D0101 0B050030
  32310E30 0C060355 040A1305 43697363 6F312030 1E060355 04031317 43697363
  6F204C69 63656E73 696E6720 526F6F74 20434130 1E170D31 33303533 30313934
  3834375A 170D3338 30353330 31393438 34375A30 32310E30 0C060355 040A1305
  43697363 6F312030 1E060355 04031317 43697363 6F204C69 63656E73 696E6720
  526F6F74 20434130 82012230 0D06092A 864886F7 0D010101 05000382 010F0030
  82010A02 82010100 A6BCBD96 131E05F7 145EA72C 2CD686E6 17222EA1 F1EFF64D
  CBB4C798 212AA147 C655D8D7 9471380D 8711441E 1AAF071A 9CAE6388 8A38E520
  1C394D78 462EF239 C659F715 B98C0A59 5BBB5CBD 0CFEBEA3 700A8BF7 D8F256EE
  4AA4E80D DB6FD1C9 60B1FD18 FFC69C96 6FA68957 A2617DE7 104FDC5F EA2956AC
  7390A3EB 2B5436AD C847A2C5 DAB553EB 69A9A535 58E9F3E3 C0BD23CF 58BD7188
  68E69491 20F320E7 948E71D7 AE3BCC84 F10684C7 4BC8E00F 539BA42B 42C68BB7
  C7479096 B4CB2D62 EA2F505D C7B062A4 6811D95B E8250FC4 5D5D5FB8 8F27D191
  C55F0D76 61F9A4CD 3D992327 A8BB03BD 4E6D7069 7CBADF8B DF5F4368 95135E44
  DFC7C6CF 04DD7FD1 02030100 01A34230 40300E06 03551D0F 0101FF04 04030201
```

```
  06300F06 03551D13 0101FF04 05300301 01FF301D 0603551D 0E041604 1449DC85
  4B3D31E5 1B3E6A17 606AF333 3D3B4C73 E8300D06 092A8648 86F70D01 010B0500
  03820101 00507F24 D3932A66 86025D9F E838AE5C 6D4DF6B0 49631C78 240DA905
  604EDCDE FF4FED2B 77FC460E CD636FDB DD44681E 3A5673AB 9093D3B1 6C9E3D8B
  D98987BF E40CBD9E 1AECA0C2 2189BB5C 8FA85686 CD98B646 5575B146 8DFC66A8
  467A3DF4 4D565700 6ADF0F0D CF835015 3C04FF7C 21E878AC 11BA9CD2 55A9232C
  7CA7B7E6 C1AF74F6 152E99B7 B1FCF9BB E973DE7F 5BDDEB86 C71E3B49 1765308B
  5FB0DA06 B92AFE7F 494E8A9E 07B85737 F3A58BE1 1A48A229 C37C1E69 39F08678
  80DDCD16 D6BACECA EEBC7CF9 8428787B 35202CDC 60E4616A B623CDBD 230E3AFB
  418616A9 4093E049 4D10AB75 27E86F73 932E35B5 8862FDAE 0275156F 719BB2F0
  D697DF7F 28
        quit
!
voice service voip
 ip address trusted list
  ipv4 208.93.42.XXX 255.255.255.255
  ipv4 10.71.8.10 255.255.255.255
  ipv4 10.71.8.11 255.255.255.255
  ipv4 10.71.8.12 255.255.255.255
 address-hiding
 mode border-element license capacity 20
 allow-connections sip to sip
 redundancy-group 1
 fax protocol pass-through g711ulaw
 sip
  bind control source-interface GigabitEthernet0/0/0
  bind media source-interface GigabitEthernet0/0/0
  session refresh
  asserted-id pai
  early-offer forced
  midcall-signaling passthru
  privacy-policy passthru
  g729 annexb-all
```

```
!
voice class codec 1
 codec preference 1 g711ulaw
 codec preference 2 g729r8
!
voice class codec 2
 codec preference 1 g729r8
 codec preference 2 g711ulaw
!
!
voice class sip-profiles 1
 request INVITE sip-header Diversion modify "<sip:(....)@" "<sip:209XXX\1@"
 request INVITE sip-header From modify "<sip:(.*)@.*>"
"<sip:XXXXXXXXXX_CISCOC661@gw1.peerlessnetwork.io:5060>"
!
voice translation-rule 1
 rule 1 /9209XXXXXXX/ /209XXXXXXX/
!
!
voice translation-profile loopback
 translate called 1
!
voice-card 0/2
 no watchdog
!
voice-card 0/4
 no watchdog
!
no license feature hseck9
license udi pid ISR4331/K9 sn XXXXXXX
license accept end user agreement
license boot level appxk9
license boot level uck9
```

```
license boot level securityk9
memory free low-watermark processor 67123
!
diagnostic bootup level minimal
!
spanning-tree extend system-id
!
redundancy
 mode none
 application redundancy
  group 1
   priority 200 failover threshold 75
   timers delay 30 reload 60
   control GigabitEthernet0/0/2 protocol 1
   data GigabitEthernet0/0/2
   track 1 shutdown
   track 2 shutdown
!
track 1 interface GigabitEthernet0/0/0 line-protocol
track 2 interface GigabitEthernet0/0/1 line-protocol
!
interface GigabitEthernet0/0/0
 description Peerless CUBE WAN interface
 ip address 192.65.79.XXX 255.255.255.128
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 192.65.79.XXX exclusive
!
interface GigabitEthernet0/0/1
 description Peerless CUBE LAN interface
 ip address 10.71.8.31 255.255.255.0
 negotiation auto
 redundancy rii 20
```

```
 redundancy group 1 ip 10.71.8.30 exclusive
!
interface GigabitEthernet0/0/2
 description Peerless CUBE HA Interface
 ip address 10.71.9.25 255.255.255.0
 negotiation auto
!
interface GigabitEthernet0/1/0
 no ip address
 negotiation auto
!
interface Service-Engine0/2/0
!
interface Service-Engine0/4/0
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 negotiation auto
!
ip forward-protocol nd
no ip http server
no ip http secure-server
ip route 0.0.0.0 0.0.0.0 192.65.79.XXX
ip route 10.64.0.0 255.255.0.0 10.64.1.1
ip route 10.71.8.0 255.255.255.0 10.64.1.1
ip route 10.71.9.0 255.255.255.0 10.64.1.1
ip route 172.16.0.0 255.255.0.0 10.71.8.1
ip route 172.17.0.0 255.255.0.0 10.71.8.1
!
control-plane
voice-port 0/2/0
!
```

```
voice-port 0/2/1
!
mgcp behavior rsip-range tgcp-only
mgcp behavior comedia-role none
mgcp behavior comedia-check-media-src disable
mgcp behavior comedia-sdp-force disable
!
mgcp profile default
!
dial-peer voice 100 voip
 description *** Inbound Call from CUCM to CUBE-LAN ***
 session protocol sipv2
 session transport udp
 incoming called-number .T
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 101 voip
 description *** Outbound Call from CUBE-LAN to CUCM****
 destination-pattern 120........
 session protocol sipv2
 session target ipv4:10.71.8.10:5060
 session transport udp
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
```

```
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 200 voip
 description *** Inbound Call from Peerless to CUBE-WAN ***
 session protocol sipv2
 session transport udp
 incoming called-number 120........
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 201 voip
 description *** Outbound Call from CUBE-WAN to Peerless ****
 translation-profile outgoing loopback
 destination-pattern .T
 session protocol sipv2
 session target sip-server
 session transport udp
 voice-class codec 1
 voice-class sip profiles 1
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
```

```
!
gateway
 timer receive-rtp 1200
!
sip-ua
 credentials username XXXXXXXX_CISCOC661 password 7 XXXXXX realm
reg.peerlessnetwork.io
 registrar dns:gw1.peerlessnetwork.io:5060 expires 60
 sip-server dns:gw1.peerlessnetwork.io:5060
!
!
line con 0
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 30 30
 password 7 XXXXXXXX
 login
!
!
!
end
```

Standby Cisco UBE:

```
version 16.12
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service call-home
platform qfp utilization monitor load 80
platform punt-keepalive disable-kernel-core
!
hostname CUBE8
!
boot-start-marker
boot system bootflash:isr4300-universalk9.16.12.04.SPA.bin
boot-end-marker
!
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
!
enable secret 9 $9$sOATbbL5j5ok4.mNCRebFwGyWcBoZunVuUhRIWv6SHw1dsDtrrj7nghc.
!
no aaa new-model
call-home
profile "XXXXXX"
  active
  destination transport-method http
  no destination transport-method email
```

```
ip name-server 8.8.8.8
!
login on-success log
subscriber templating
multilink bundle-name authenticated
!
password encryption aes
!
crypto pki trustpoint SLA-TrustPoint
 enrollment terminal
 revocation-check crl
!
crypto pki trustpoint TP-self-signed-3616943619
 enrollment selfsigned
 subject-name cn=IOS-Self-Signed-Certificate-3616943619
 revocation-check none
 rsakeypair TP-self-signed-3616943619
!
!
crypto pki certificate chain SLA-TrustPoint
 certificate ca 01
  30820321 30820209 A0030201 02020101 300D0609 2A864886 F70D0101 0B050030
  32310E30 0C060355 040A1305 43697363 6F312030 1E060355 04031317 43697363
  6F204C69 63656E73 696E6720 526F6F74 20434130 1E170D31 33303533 30313934
  3834375A 170D3338 30353330 31393438 34375A30 32310E30 0C060355 040A1305
  43697363 6F312030 1E060355 04031317 43697363 6F204C69 63656E73 696E6720
  526F6F74 20434130 82012230 0D06092A 864886F7 0D010101 05000382 010F0030
  82010A02 82010100 A6BCBD96 131E05F7 145EA72C 2CD686E6 17222EA1 F1EFF64D
  CBB4C798 212AA147 C655D8D7 9471380D 8711441E 1AAF071A 9CAE6388 8A38E520
  1C394D78 462EF239 C659F715 B98C0A59 5BBB5CBD 0CFEBEA3 700A8BF7 D8F256EE
  4AA4E80D DB6FD1C9 60B1FD18 FFC69C96 6FA68957 A2617DE7 104FDC5F EA2956AC
  7390A3EB 2B5436AD C847A2C5 DAB553EB 69A9A535 58E9F3E3 C0BD23CF 58BD7188
  68E69491 20F320E7 948E71D7 AE3BCC84 F10684C7 4BC8E00F 539BA42B 42C68BB7
```

```
  C7479096 B4CB2D62 EA2F505D C7B062A4 6811D95B E8250FC4 5D5D5FB8 8F27D191
  C55F0D76 61F9A4CD 3D992327 A8BB03BD 4E6D7069 7CBADF8B DF5F4368 95135E44
  DFC7C6CF 04DD7FD1 02030100 01A34230 40300E06 03551D0F 0101FF04 04030201
  06300F06 03551D13 0101FF04 05300301 01FF301D 0603551D 0E041604 1449DC85
  4B3D31E5 1B3E6A17 606AF333 3D3B4C73 E8300D06 092A8648 86F70D01 010B0500
  03820101 00507F24 D3932A66 86025D9F E838AE5C 6D4DF6B0 49631C78 240DA905
  604EDCDE FF4FED2B 77FC460E CD636FDB DD44681E 3A5673AB 9093D3B1 6C9E3D8B
  D98987BF E40CBD9E 1AECA0C2 2189BB5C 8FA85686 CD98B646 5575B146 8DFC66A8
  467A3DF4 4D565700 6ADF0F0D CF835015 3C04FF7C 21E878AC 11BA9CD2 55A9232C
  7CA7B7E6 C1AF74F6 152E99B7 B1FCF9BB E973DE7F 5BDDEB86 C71E3B49 1765308B
  5FB0DA06 B92AFE7F 494E8A9E 07B85737 F3A58BE1 1A48A229 C37C1E69 39F08678
  80DDCD16 D6BACECA EEBC7CF9 8428787B 35202CDC 60E4616A B623CDBD 230E3AFB
  418616A9 4093E049 4D10AB75 27E86F73 932E35B5 8862FDAE 0275156F 719BB2F0
  D697DF7F 28
        quit
crypto pki certificate chain TP-self-signed-3616943619
 certificate self-signed 01
  30820330 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
  31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274
  69666963 6174652D 33363136 39343336 3139301E 170D3230 31303037 30383332
  35305A17 0D333030 31303130 30303030 305A3031 312F302D 06035504 03132649
  4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D33 36313639
  34333631 39308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201
  0A028201 0100D7B5 B01CB61F 405692AB 0367B5FD FFDD7DE7 F2779111 6742D4CC
  729BA52D 38816BC7 BD076992 B8FB4CFF 9EF76D2F 2B170F33 58302925 E8BC82A3
  2730377A 53B10B7E 887D003B 4F117214 2AB94356 BA35364F 01AF4B32 20AAE06E
  33FC9D86 4E52101B 32BD500B FB8E154C 71602FC7 CF65C1FA 87BAF066 D4CA48ED
  A19EA403 2DC6374B 719905A1 C6600AF2 AA0B64F5 6D00EE5B 4A165757 2F3C93C4
  2C9C8E7B 54B4733C 89FCBBFF 663174C9 D6661110 9ACCC49C DE25143D 5DF87ECB
  DC0F7183 E76D02D7 1F3E89FC D30D91C1 165483D6 AF5270B6 14C83073 6C2B5990
  E0D66B36 6A98D663 C969A8BA 45F7F5CB FADD5C6F B15E13DB 4C5F0E72 9FB6B049
  0F16EA21 44130203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF
  301F0603 551D2304 18301680 14B2A0A6 33E67A00 23D6FD1E C788ADE1 2E569223
```

```
  6D301D06 03551D0E 04160414 B2A0A633 E67A0023 D6FD1EC7 88ADE12E 5692236D
  300D0609 2A864886 F70D0101 05050003 82010100 8C471DC9 C1CEB945 5C84C148
  64938048 988D4F8A DE90C28C CD23386E 6BE64436 7AA84811 8CD3E5F6 93A4E8EF
  8D8DC5AE 4D3129EA 9BC9773A 049E2D80 DEC3A3D5 54252CB3 AD73D570 B242240E
  B934D489 FC547738 FF502D71 BB2A332E A06A2219 3F69FECA 1AEEFF2E D0C30C8A
  C0F41FCE 4875BDE7 EF489676 67097E4D 07DEB502 1F4DE3E4 28E01CA0 30887BAD
  8BAF7F58 C51E2F32 A2661908 8E4E9427 4D98BE1E 3B7E3565 97A60C1D D56692A7
  480B7F5F 016BC74C 756740AE 9BCDABCA 0AAD574B 5AB3A1AB A7A3D570 4FDB4D7A
  093CF60C B7C5CFAC 329CC205 804CBC91 46F93DDD 87311771 73EA8AF5 01E8DE4D
  5CB04AEE 03A47061 9C3DF7E9 AAB0C7F1 276F29A6
        quit
!
voice service voip
 ip address trusted list
  ipv4 10.71.8.10 255.255.255.255
  ipv4 10.71.8.11 255.255.255.255
  ipv4 10.71.8.12 255.255.255.255
  ipv4 208.93.42.XXX 255.255.255.255
 address-hiding
 mode border-element license capacity 20
 allow-connections sip to sip
 redundancy-group 1
 fax protocol pass-through g711ulaw
 sip
  bind control source-interface GigabitEthernet0/0/0
  bind media source-interface GigabitEthernet0/0/0
  session refresh
  asserted-id pai
  early-offer forced
  midcall-signaling passthru
  privacy-policy passthru
  g729 annexb-all
!
```

```
voice class codec 1
 codec preference 1 g711ulaw
 codec preference 2 g729r8
!
voice class codec 2
 codec preference 1 g729r8
 codec preference 2 g711ulaw
!
voice class sip-profiles 1
 request INVITE sip-header Diversion modify "<sip:(....)@" "<sip:209XXX\1@"
 request INVITE sip-header From modify "<sip:(.*)@.*>"
"<sip:XXXXXXXXXX_CISCOC661@gw1.peerlessnetwork.io:5060>"
!
voice translation-rule 1
 rule 1 /9209XXXXXXX/ /209XXXXXXX/
!
voice translation-profile loopback
 translate called 1
!
voice-card 0/2
 no watchdog
!
voice-card 0/4
 no watchdog
!
no license feature hseck9
license udi pid ISR4331/K9 sn XXXXXXXXXX
license accept end user agreement
license boot level appxk9
license boot level uck9
license boot level securityk9
memory free low-watermark processor 67123
!
```

```
diagnostic bootup level minimal
!
spanning-tree extend system-id
!
redundancy
 mode none
 application redundancy
  group 1
   priority 150 failover threshold 75
   timers delay 30 reload 60
   control GigabitEthernet0/0/2 protocol 1
   data GigabitEthernet0/0/2
   track 1 shutdown
   track 2 shutdown
!
track 1 interface GigabitEthernet0/0/0 line-protocol
!
track 2 interface GigabitEthernet0/0/1 line-protocol
!
interface GigabitEthernet0/0/0
 description Peerless CUBE WAN interface
 ip address 192.65.79.XXX 255.255.255.128
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 192.65.79.XXX exclusive
!
interface GigabitEthernet0/0/1
 description Peerless CUBE LAN interface
 ip address 10.71.8.32 255.255.255.0
 negotiation auto
 redundancy rii 20
 redundancy group 1 ip 10.71.8.30 exclusive
!
```

```
interface GigabitEthernet0/0/2
 description Peerless CUBE HA Interface
 ip address 10.71.9.26 255.255.255.0
 negotiation auto
!
interface Service-Engine0/2/0
!
interface Service-Engine0/4/0
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 negotiation auto
!
ip forward-protocol nd
no ip http server
no ip http secure-server
ip route 0.0.0.0 0.0.0.0 192.65.79.XXX
ip route 10.64.0.0 255.255.0.0 10.64.1.1
ip route 10.71.8.0 255.255.255.0 10.64.1.1
ip route 10.71.9.0 255.255.255.0 10.64.1.1
ip route 172.16.0.0 255.255.0.0 10.71.8.1
ip route 172.17.0.0 255.255.0.0 10.71.8.1
!
control-plane
!
voice-port 0/2/0
!
voice-port 0/2/1
!
mgcp behavior rsip-range tgcp-only
mgcp behavior comedia-role none
mgcp behavior comedia-check-media-src disable
```

```
mgcp behavior comedia-sdp-force disable
!
mgcp profile default
!
dial-peer voice 100 voip
 description *** Inbound Call from CUCM to CUBE-LAN ***
 session protocol sipv2
 session transport udp
 incoming called-number .T
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 101 voip
 description *** Outbound Call from CUBE-LAN to CUCM****
 destination-pattern 120........
 session protocol sipv2
 session target ipv4:10.71.8.10:5060
 session transport udp
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 200 voip
 description *** Inbound Call from Peerless to CUBE-WAN ***
```

```
 session protocol sipv2
 session transport udp
 incoming called-number 120........
 voice-class codec 1
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
dial-peer voice 201 voip
 description *** Outbound Call from CUBE-WAN to Peerless ****
 translation-profile outgoing loopback
 destination-pattern .T
 session protocol sipv2
 session target sip-server
 session transport udp
 voice-class codec 1
 voice-class sip profiles 1
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 no fax-relay sg3-to-g3
 fax protocol pass-through g711ulaw
 no vad
!
gateway
 timer receive-rtp 1200
!
sip-ua
```

```
 credentials username XXXXXXXX_CISCOC661 password 7 XXXXXX realm
reg.peerlessnetwork.io
 registrar dns:gw1.peerlessnetwork.io:5060 expires 60
 sip-server dns:gw1.peerlessnetwork.io:5060
!
line con 0
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 30 30
 password 7 XXXXXXXXX
 login
!
!
End
```

Configuring Cisco UCM 12.5

Cisco UCM Version

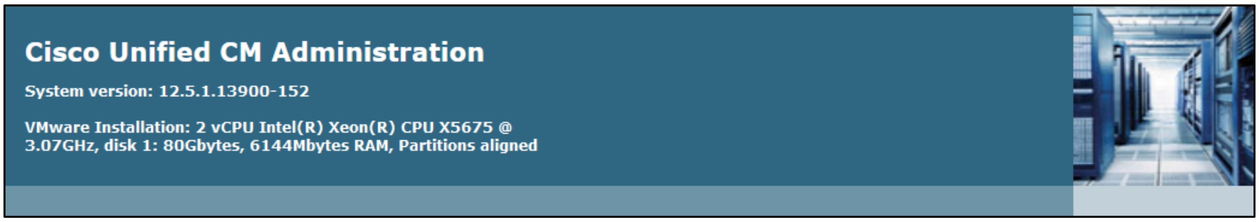

Figure 3: Cisco UCM Version

Cisco Call Manager Service Parameters

Navigation: System → Service Parameters

- Select Server* = cucm1-XXXXXX--CUCM Voice/Video (Active)
- Select Service*= Cisco CallManager (Active)
- All other fields are set to default values

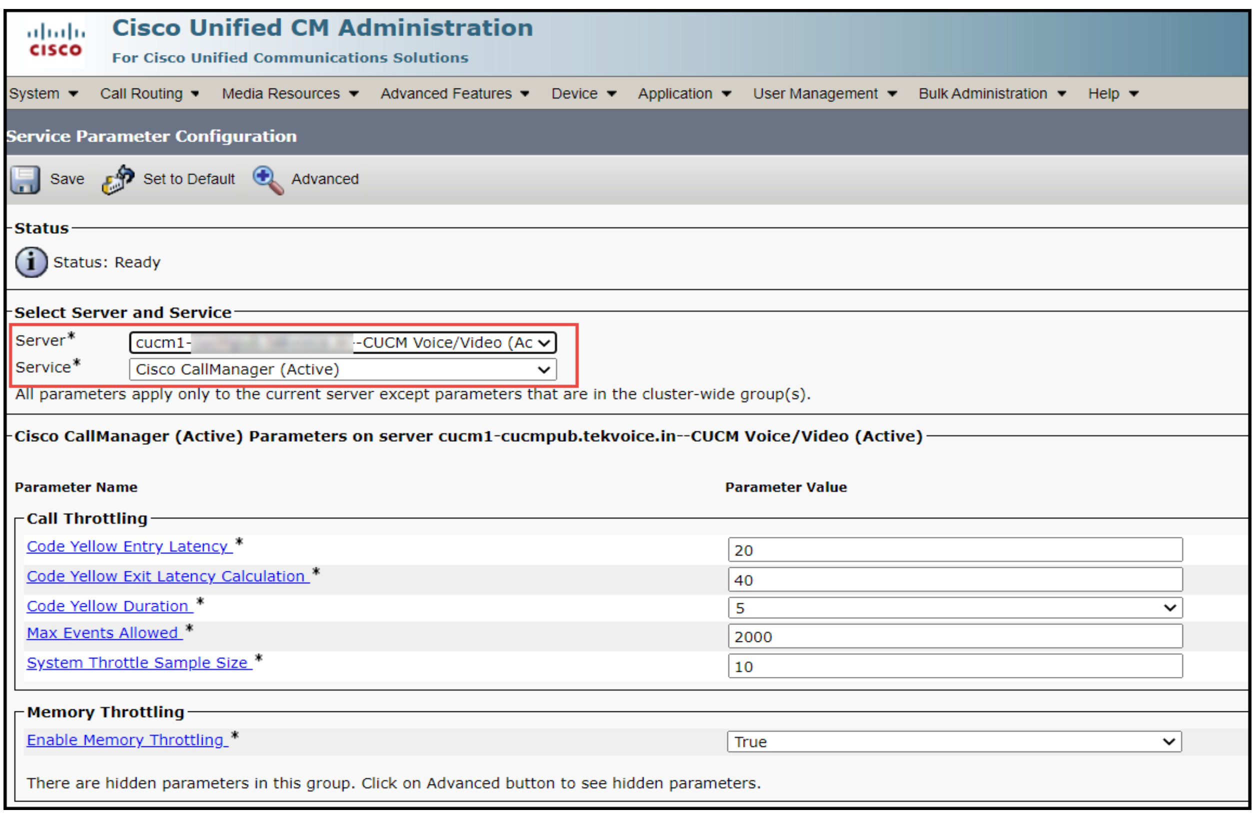

Figure 4: Service Parameters

SIP Trunk Security Profile

Navigation: System → Security → SIP Trunk Security Profile

- Name*= **Peerless Network SIP Trunk Profile** is used as an example
- Description = **Non Secure SIP Trunk Profile authenticated by null String** is used as an example
- Device Security Mode = **Non Secure**
- Incoming Transport Type* = **TCP + UDP**
- Outgoing Transport Type = **UDP**

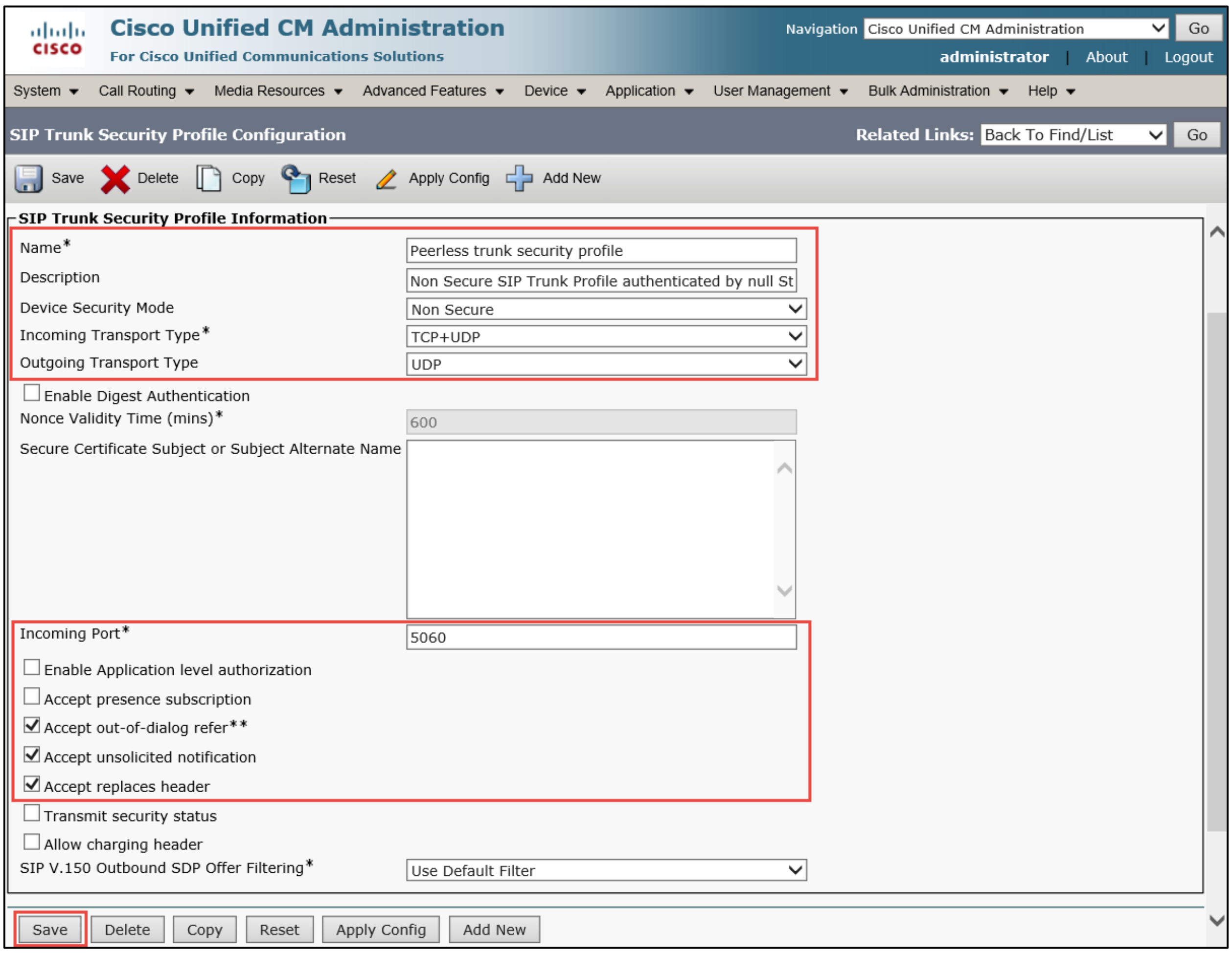

Figure 5: SIP Trunk Security Profile

SIP Profile

Navigation: Device → Device Settings → SIP Profile

- Name*= **Peerless SIP Profile** is used as an example
- Description = **Peerless SIP Profile** is used as an example

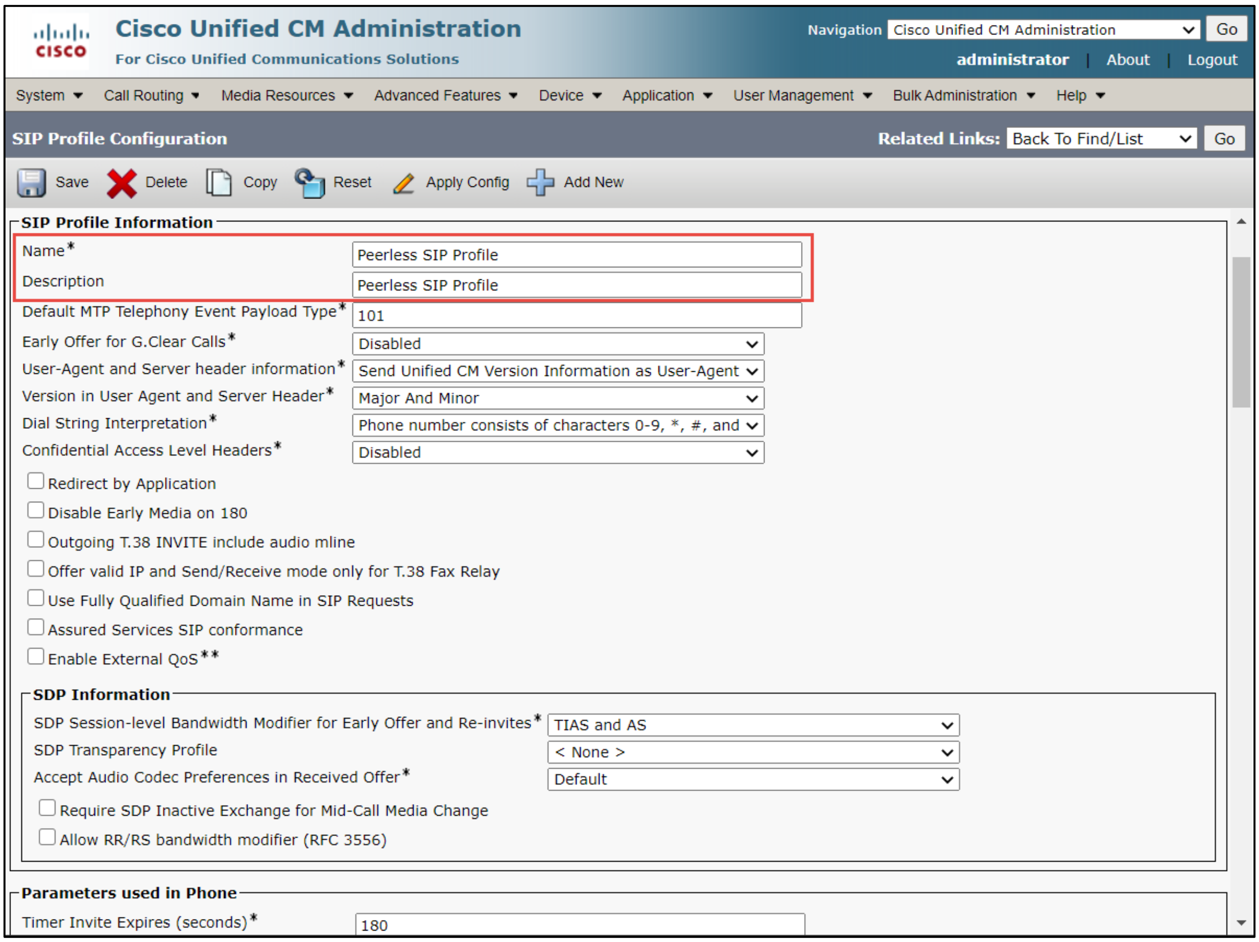

Figure 6: SIP Profile

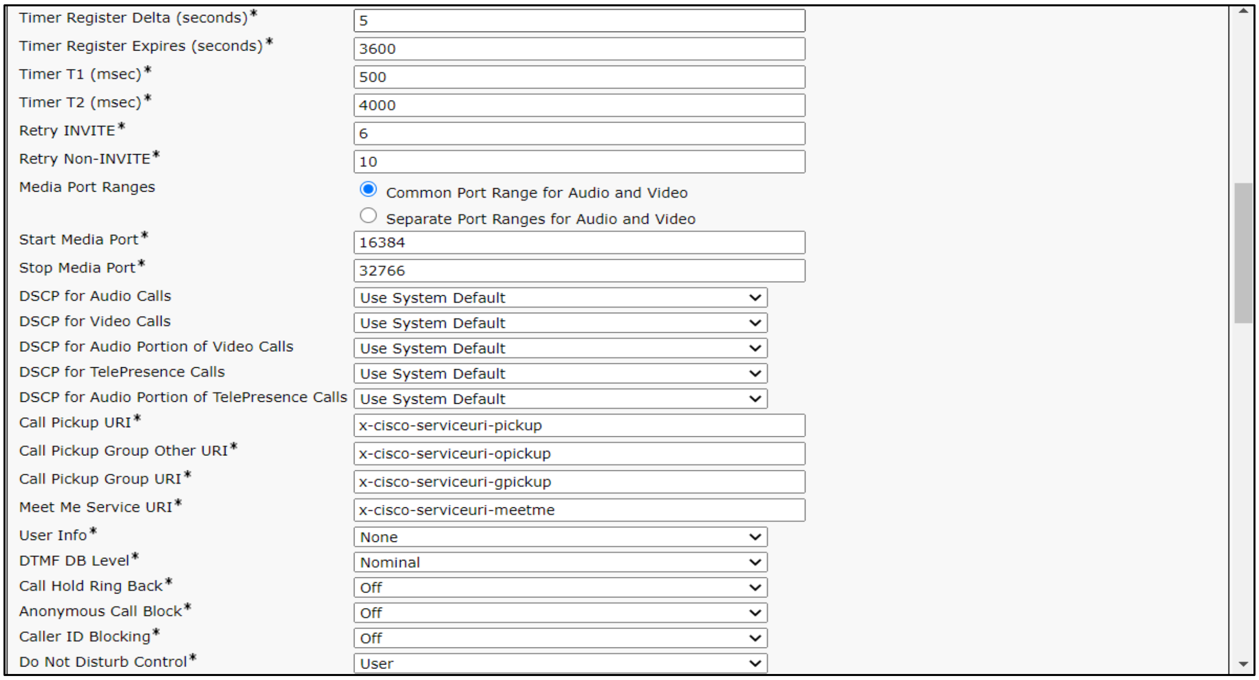

Figure 7: SIP Profile (Cont.)

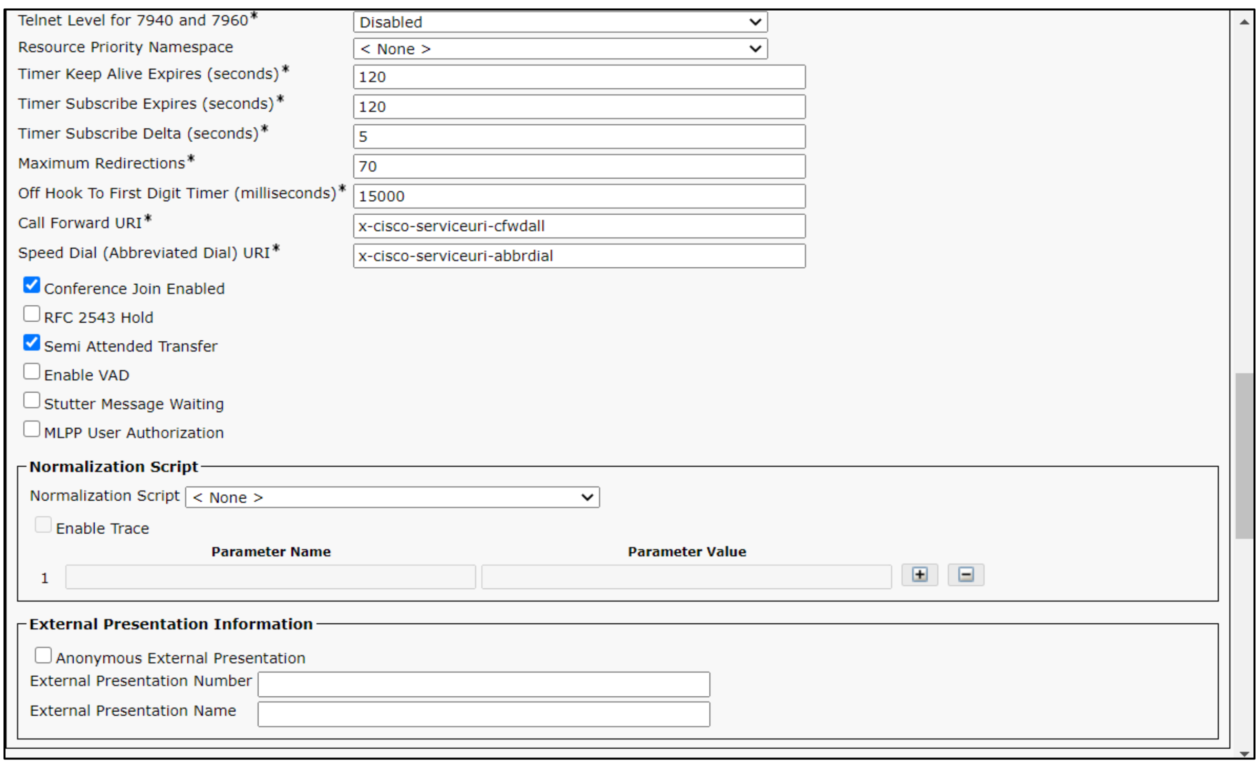

Figure 8: SIP Profile (Cont.)

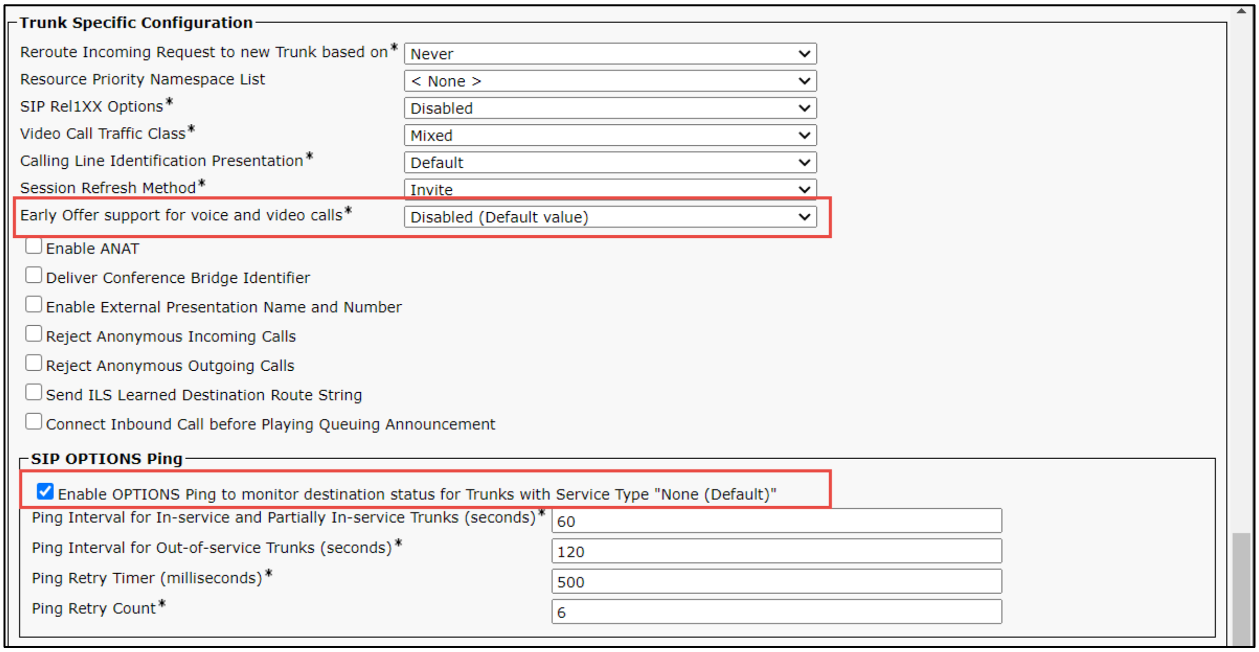

Figure 9: SIP Profile (Cont.)

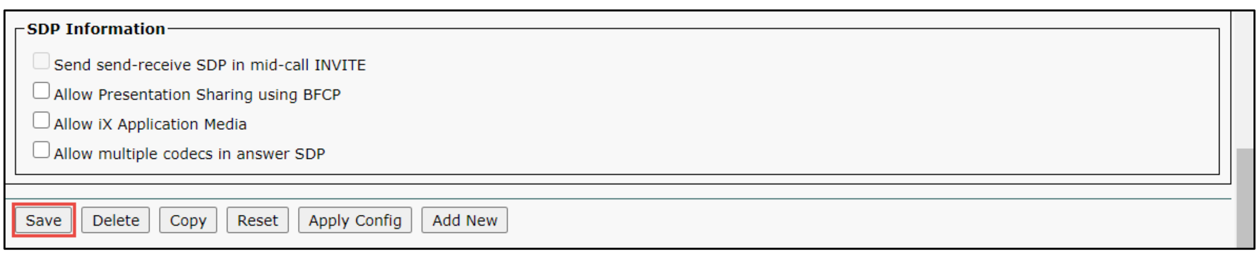

Figure 10: SIP Profile (Cont.)

Trunk configuration

Trunk configuration from Cisco UCM to the LAN side of the Cisco UBE:

Navigation: Device → Trunk → Add New

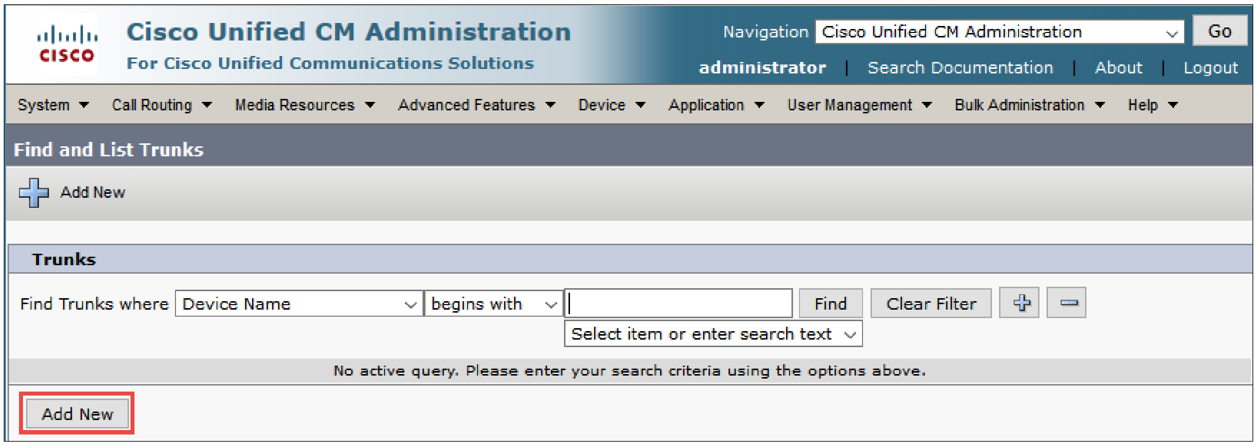

Figure 11: Add New Trunk to Cisco UBE

- Select 'Trunk Type' as SIP Trunk and 'Device Protocol' as SIP and select 'Next' as shown below.

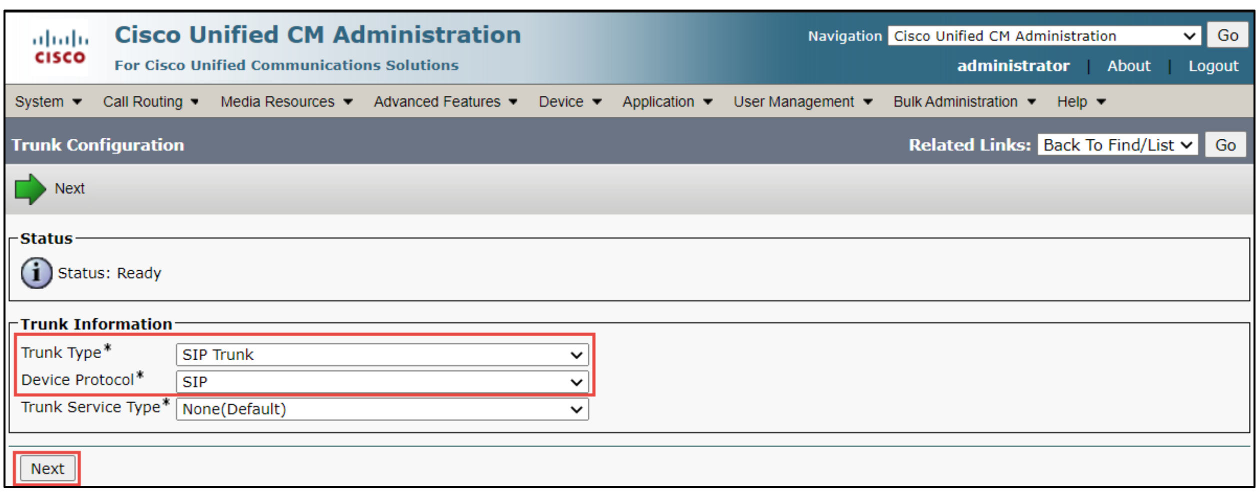

Figure 12: Add SIP Trunk Type

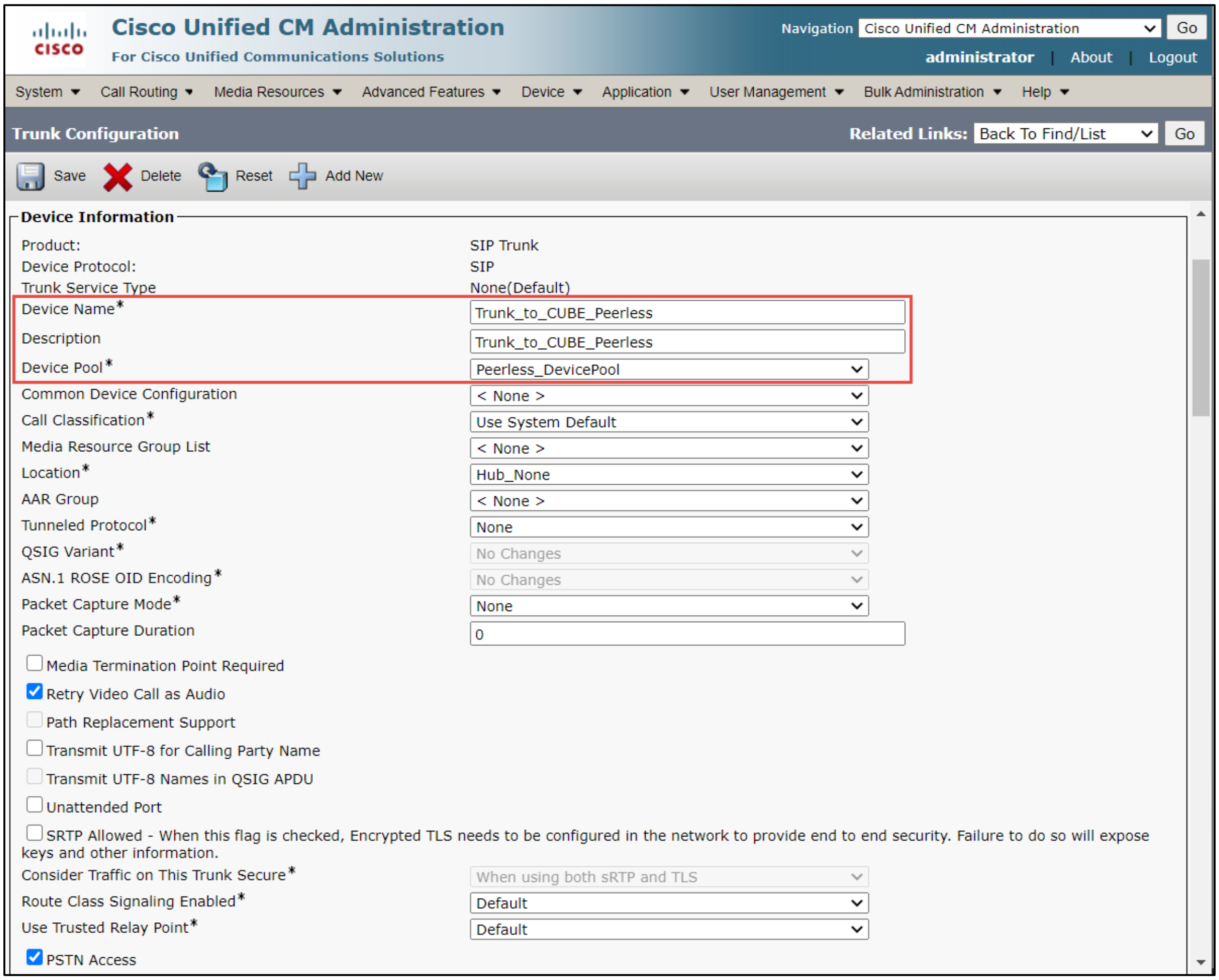

Figure 13: SIP Trunk to Cisco UBE

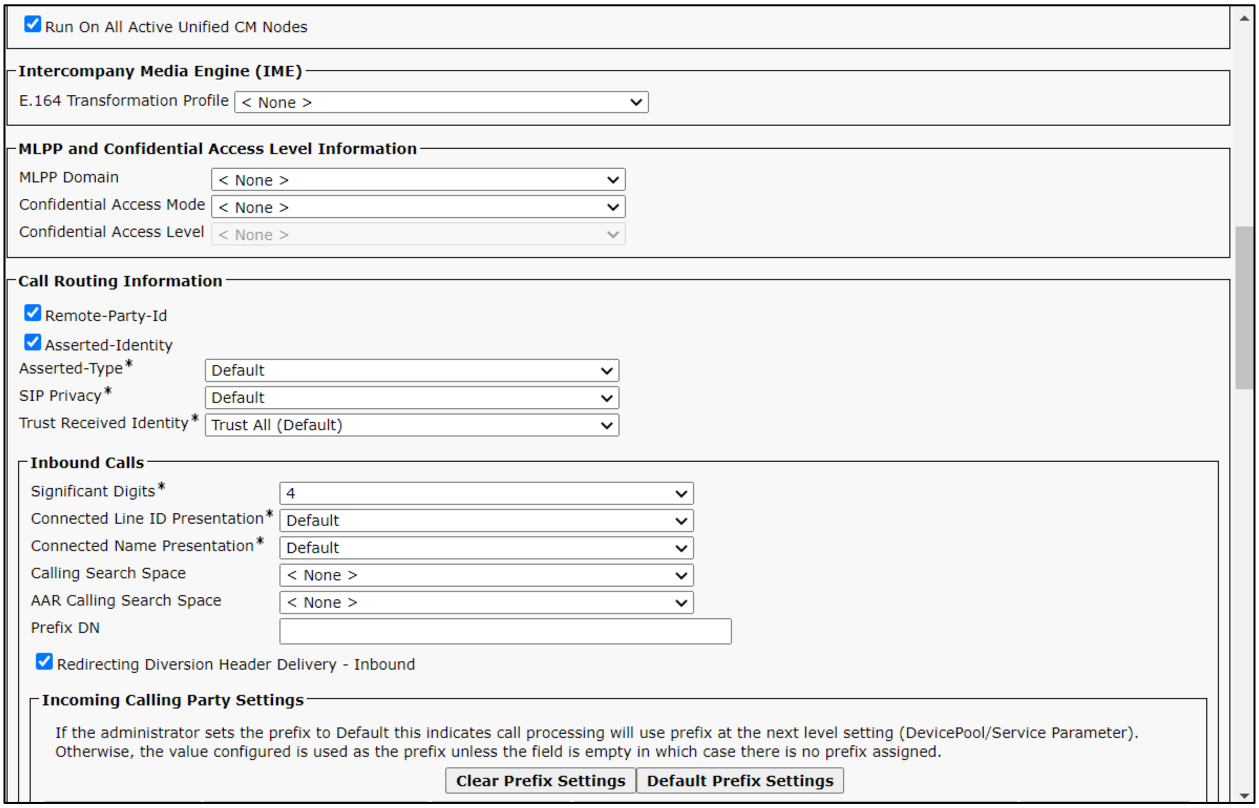

Figure 14: SIP Trunk to Cisco UBE (Cont.)

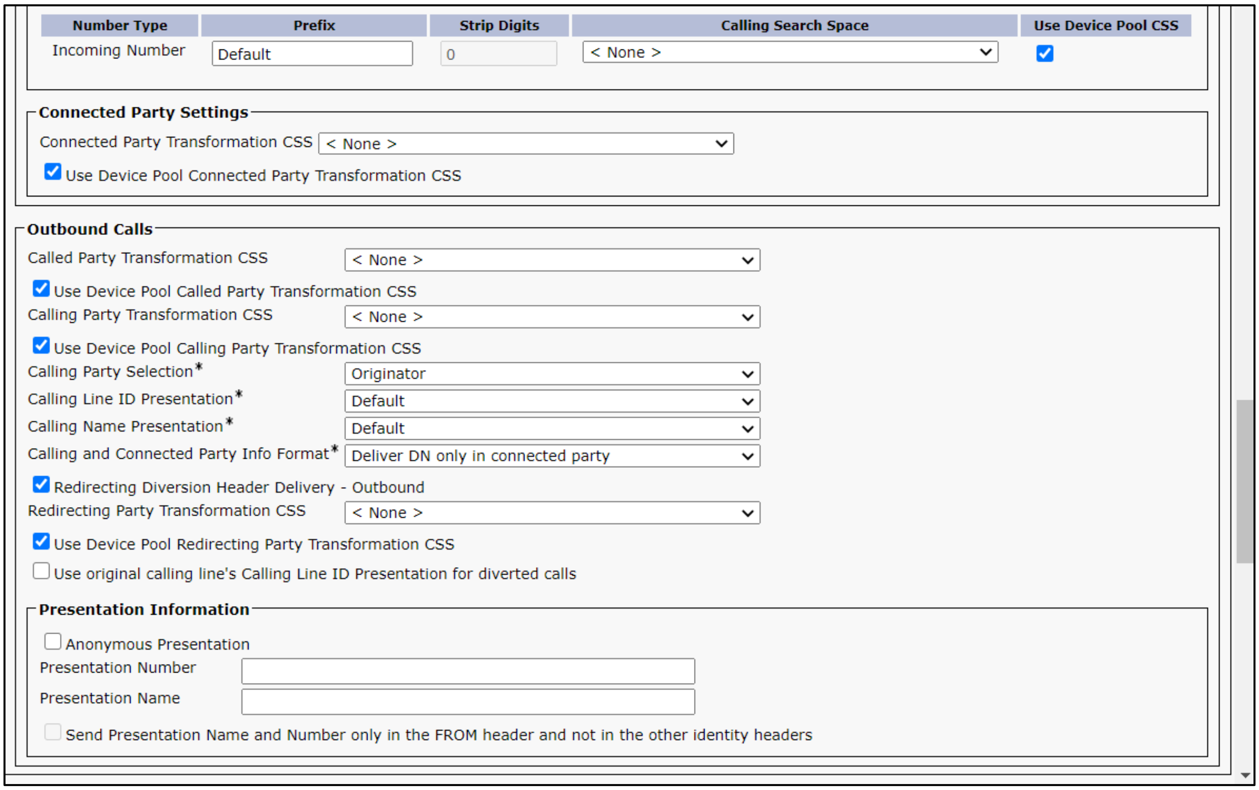

Figure 15: SIP Trunk to Cisco UBE (Cont.)

- Configure the **Virtual LAN IP address of the Cisco UBE** and the Destination **Port**
- Associate the **SIP Trunk Security Profile** and **SIP Profile** as created earlier
- DTMF Signaling Method: **RFC2833**
- The rest of the configuration are set to default

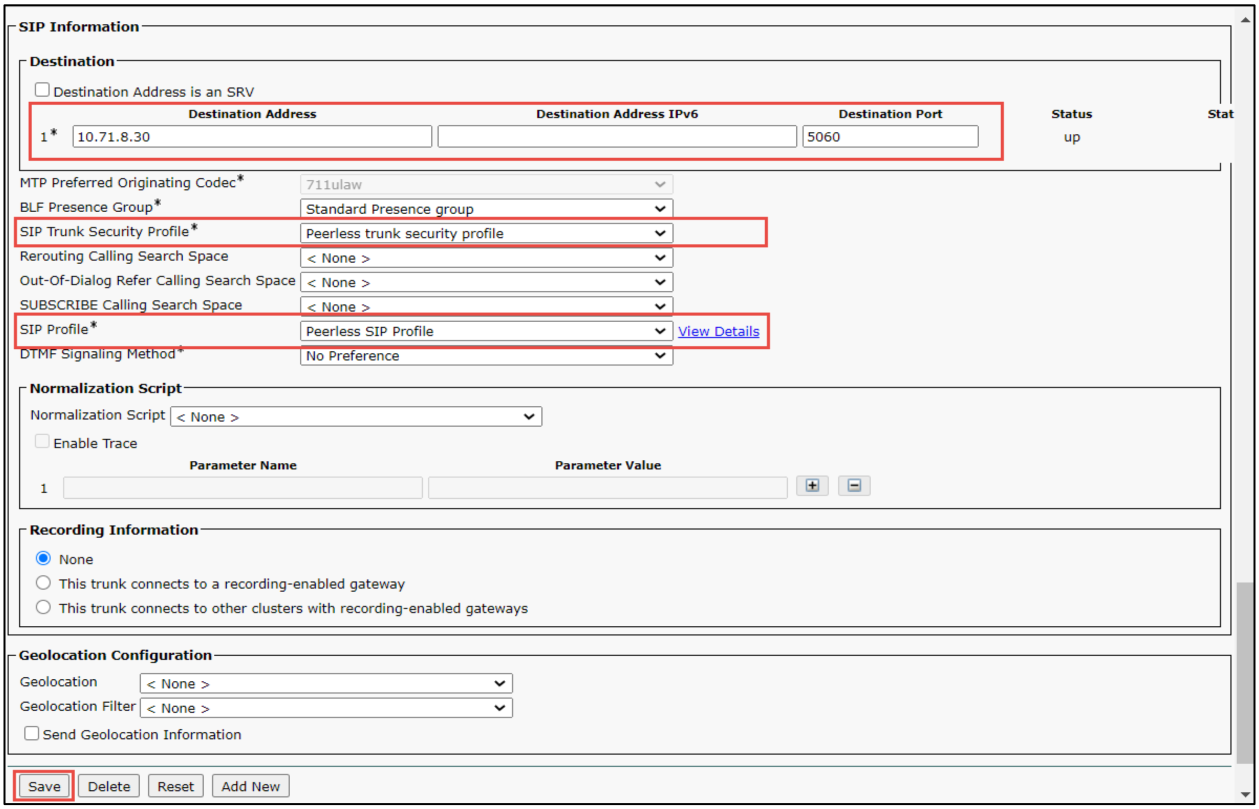

Figure 16: SIP Trunk to Cisco UBE (Cont.)

Routing configuration

Route Pattern for Cisco UBE:

Navigation: Call Routing → Route/Hunt → Route Pattern → Add New

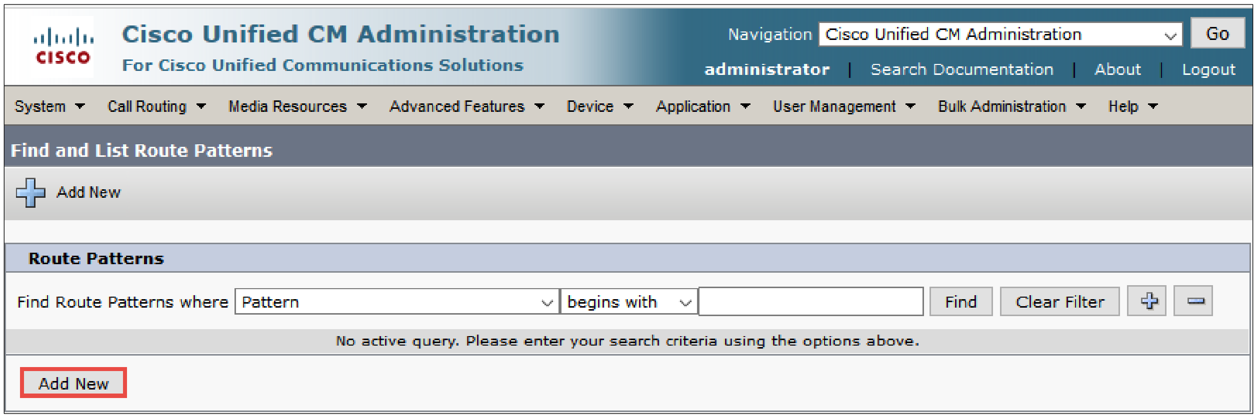

Figure 17: Add New Route Pattern for Cisco UBE

- Route Pattern= **9.@** (Create Route patterns based on the dial plan requirement)
- Description = **Route Pattern for calls to CUBE - Peerless**
- Gateway/Route List **= Trunk_to_CUBE_Peerless** (Associate the SIP Trunk created earlier)

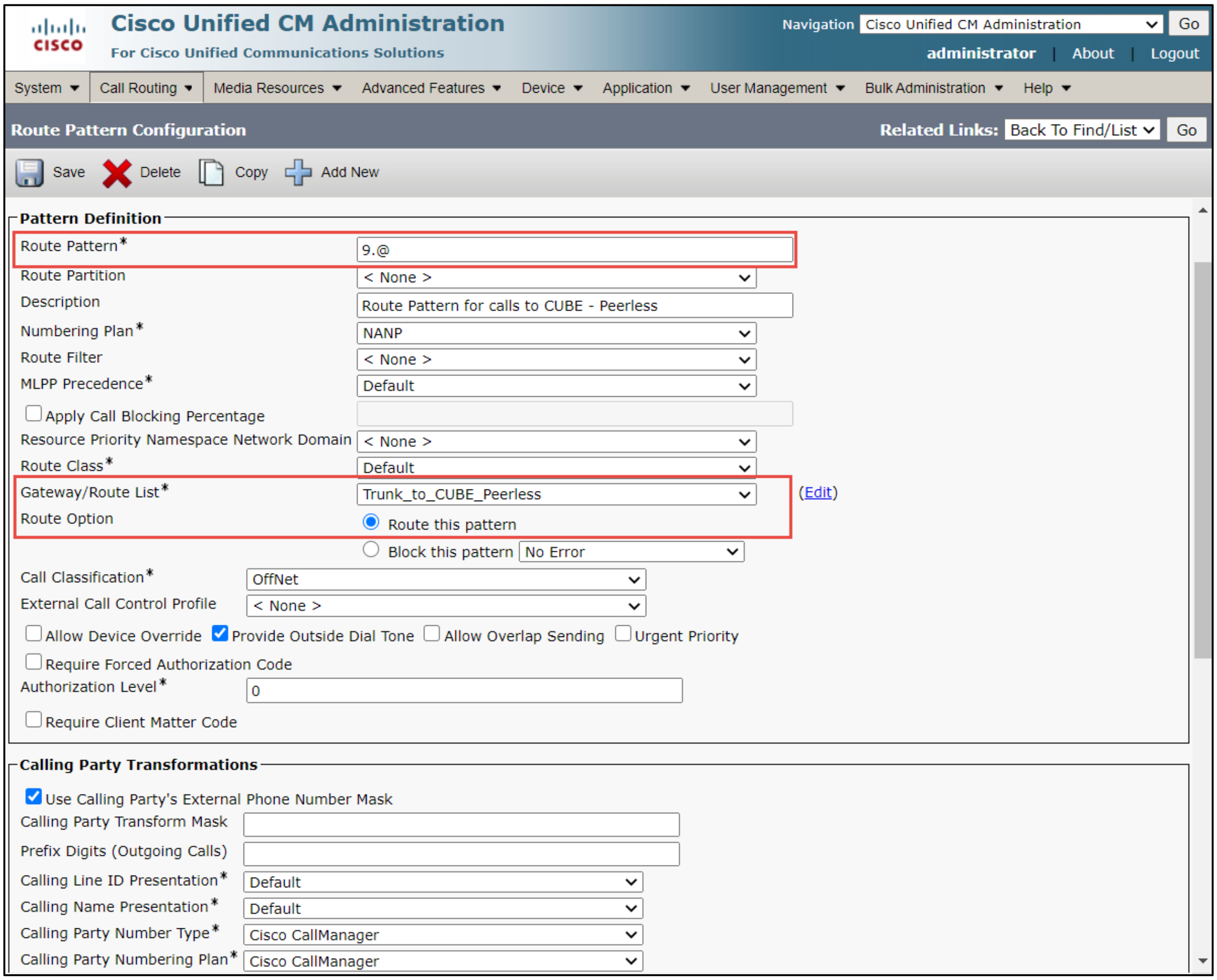

Figure 18: Route Pattern for PSTN dialing

- Discard Digits **PreDot**

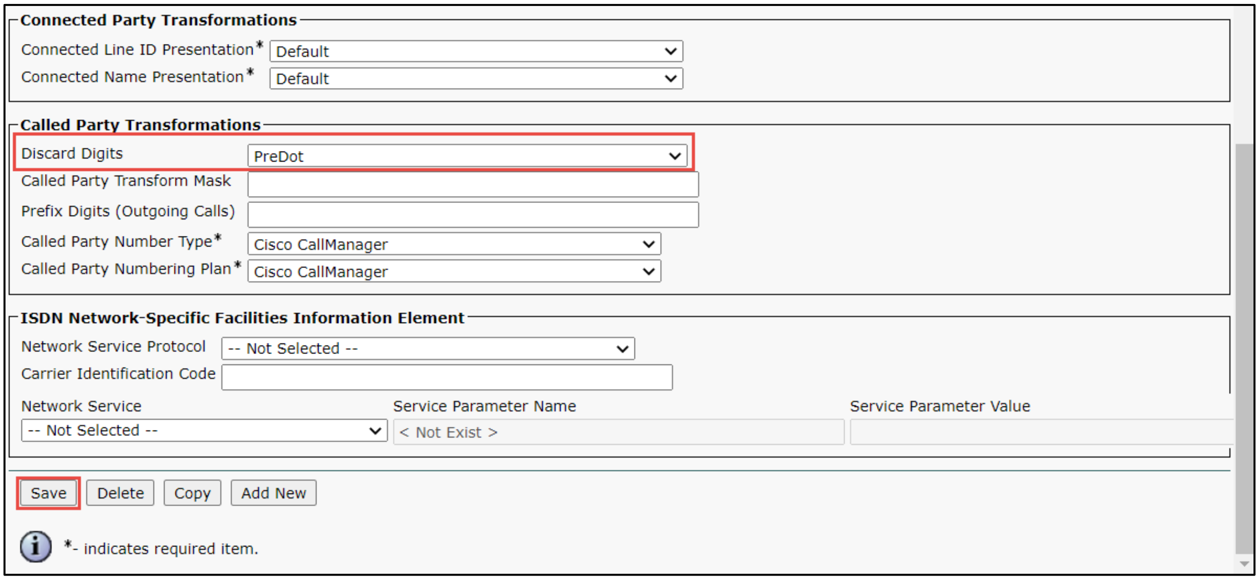

Figure 19: Route Pattern for PSTN dialing (Cont.)

Fax Configuration in Cisco ATA SPA112

Quick Setup

- Access the IP address of Cisco ATA SPA112 using the web browser
- Enter the credentials to authenticate
- Click on **Quick Setup**
- **Line 1:** 10.71.8.10 (Enter the IP address of Cisco UCM)
- **User ID:** 209XXXXXXX (End User Configured in Cisco UCM)
- **Dial Plan:** Use the default values
- Click on **Submit** to save the configuration

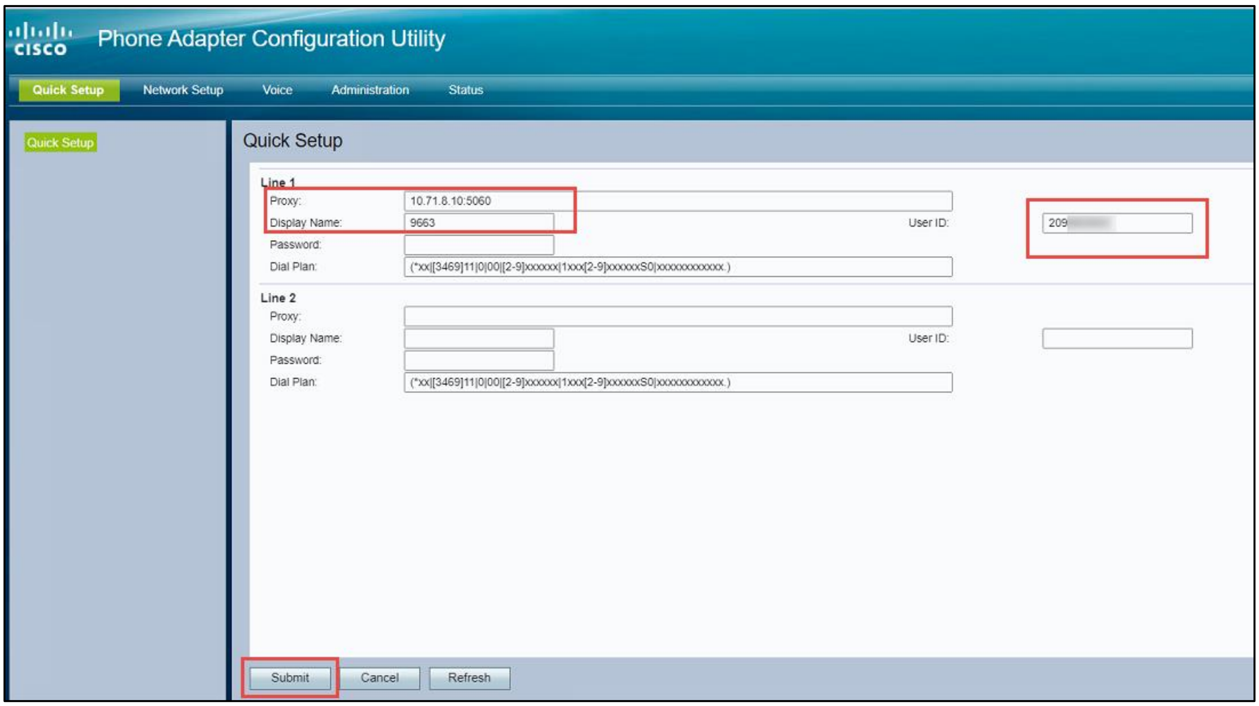

Figure 20: Fax-Quick Setup

Voice

- Click on the tab **Voice**
- Click on **Line 1** from the menu options available in the left panel
- In the SIP Settings section ensure the following and the rest can be set to default values,
  - **SIP Transport**: UDP
  - **SIP Port**: 5060

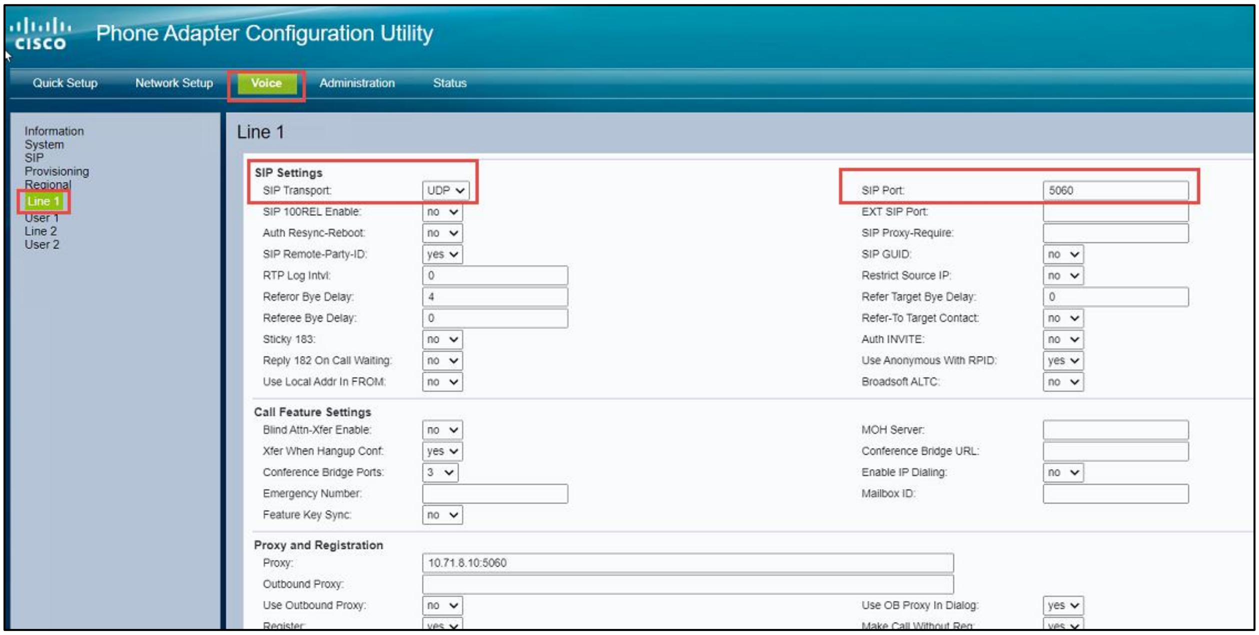

Figure 21: Fax-Line Setup-SIP Settings

- In the **Audio Configuration** section ensure the following and the rest can be set to default values,
  - **Preferred Code**: G711u/G729 (Depending on the Fax codec requirements)
  - **Silence Supp Enable**: no
  - **FAX Passthru Codec**: G711u
  - **FAX Enable T38**: yes/no (Depending on the Fax codec requirements)

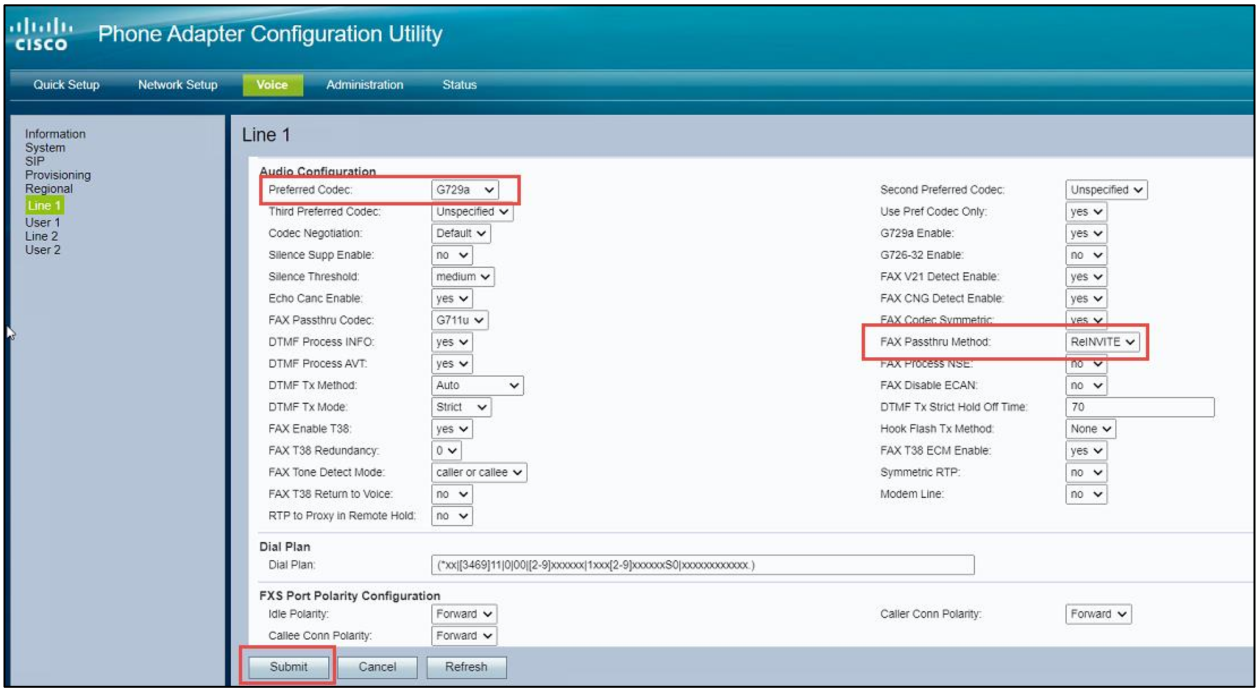

Figure 22: Fax-Line Setup-Audio Configuration

Acronyms

Acronym	Definitions
CPE	Customer Premise Equipment
Cisco UBE	Cisco Unified Border Element
Cisco UCM	Cisco Unified Communications Manager
MTP	Media Termination Point
POP	Point of Presence
PSTN	Public Switched Telephone Network
ESBC	Enterprise Session Border Controller
SCCP	Skinny Client Control Protocol
SIP	Session Initiation Protocol

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Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
CiscoSystems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
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Tel: 408 526-7660
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AsiaPacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
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