Application Note

Public

Connecting Cisco Unified Communication Manager [14.0.1] to Cox SIP Trunk via Cisco Unified Border Element v14.1 [IOS-XE 17.3.3]

9 February, 2022

Table of Contents

Table of Figures

Introduction

Service Providers such as Cox, 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.

Cox 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 Cox network, Cisco Unified Border Element (Cisco UBE) ISR4331/K9 running IOS-XE 17.3.3 can be used. The Cisco Unified Border Element provides demarcation, security, interworking and session control services for Cisco Unified Communications Manager 14.0.1 connected to Cox 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 Cox 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 14.0.1, and Cisco UBE on ISR 4331/K9 [IOS-XE 17.3.3] for connectivity to Cox SIP Trunking service. The deployment model covered in this application note is CPE (Cisco UCM) to PSTN (Cox) via Cisco UBE v14.1 [IOS-XE 17.3.3].
- Testing was performed in accordance to Cox generic SIP Trunking test methodology and among features verified were – basic calls, DTMF transport, Music on Hold (MOH), semi-attended 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 Cox 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 with Cox SIP Trunking network.

Network Topology

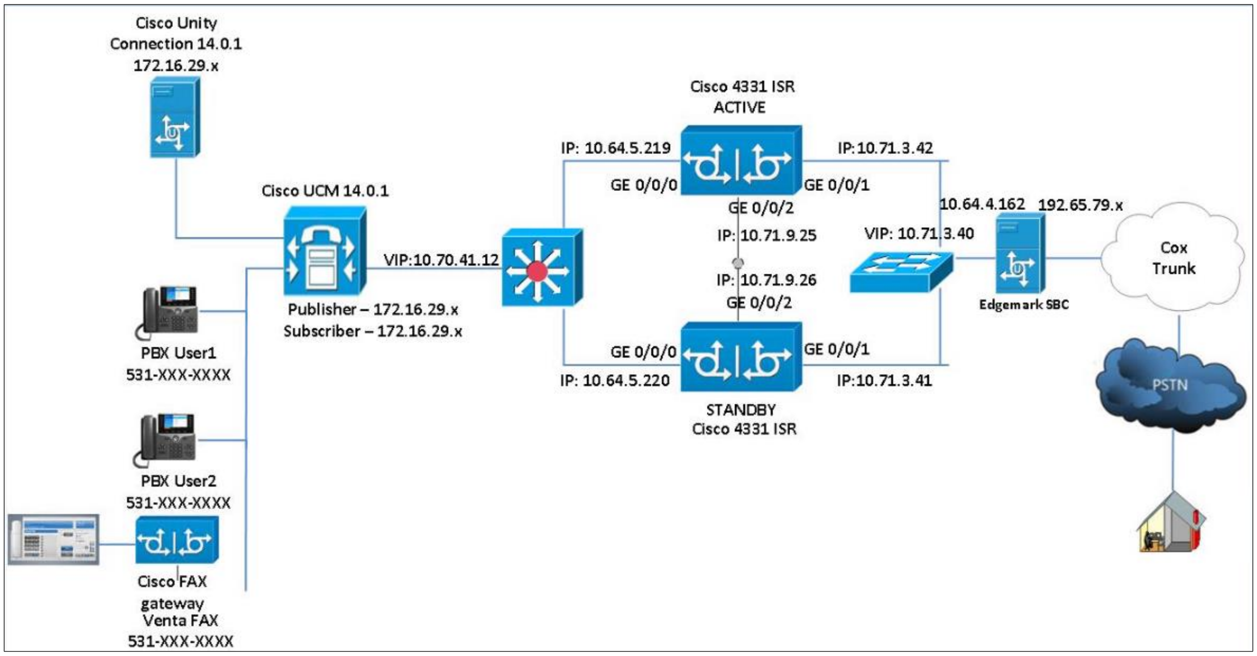

Figure 1 Network Topology

- The network topology includes the Cisco UCM Cluster, Cisco Unity Connection Voicemail system and Cisco Endpoints. Cisco UCM has a trunk configured to Cisco UBE's Virtual IP Address. Cox is used as the service provider with SIP trunk to the Cisco UBE using the WAN Virtual IP Address.
- 2 Cisco UBE's are used here for High Availability.
- SIP Trunk transport type used between Cisco UBE and Cisco UCM is UDP and to Cox 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 Cox	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
- VMware ESXi v7.0.2
- Generic Cisco IP-Phones

Software Requirements

- Cisco UBE-Version: 14.1 running IOS-XE 17.3.3
- Cisco Unified Communications Manager release 14.0.1.10000-20
- Cisco Unity Connection release 14.0.1.10000-19

Features

Features Supported

- Incoming and outgoing national and international calls using G711alaw voice codecs
- Call Conference
- Fax
    - G711 A-Law Pass-through
    - T.38
- 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)
- IP-PBX Calling number privacy
- High Availability

Features Not Supported

- Cox supports only G711. G729 specific scenarios hence are not supported.
- Cisco UCM does not support Blind transfer feature.
- Cox does not support SG3. All the fax scenarios hence worked only on G3 speed.

Caveats

- Only one IP PBX is used for testing.
- Caller ID is not updated for attended and unattended transfer scenarios.
- For anonymous call between IP PBX phone numbers over Cox, Cox copies the caller number from the PAI header into the From header and sends it while looping back. This make the target IP PBX phone to display the actual caller ID instead of concealing the identity of the originator. Cox also discards Privacy ID parameter in the INVITE while looping back.
- For a call between IP PBX phone numbers over Cox, Cox changes the calling number in the From header from 10 digits DID to 4 digits number (ignoring the first 6 digits of the DID) and also modifies the display-name of the From and To headers as "Unassigned Unassigned".

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.

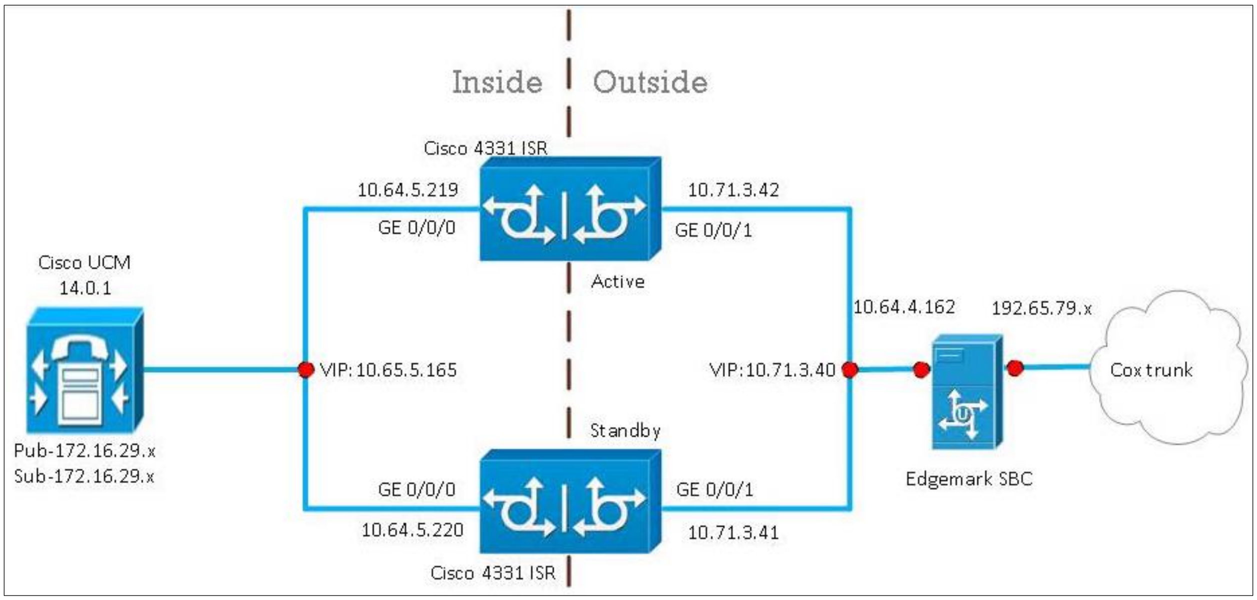

Figure 2 High Availability topology

Cisco UBE -Active:

```
interface GigabitEthernet0/0/0
 description CUBE LAN INTERFACE
 ip address 10.64.5.219 255.255.0.0
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 10.64.5.165 exclusive
!
interface GigabitEthernet0/0/1
 description CUBE WAN INTERFACE
 ip address 10.71.3.x 255.255.255.0
 negotiation auto
 redundancy rii 20
 redundancy group 1 ip 10.71.3.x exclusive
!
interface GigabitEthernet0/0/2
 description HA interface
 ip address 10.71.9.25 255.255.255.0
 negotiation auto
!
```

Cisco UBE -Standby:

```
interface GigabitEthernet0/0/0
 description CUBE LAN INTERFACE
 ip address 10.64.5.220 255.255.0.0
 negotiation auto
 no mop enabled
 redundancy rii 10
 redundancy group 1 ip 10.64.5.165 exclusive
!
interface GigabitEthernet0/0/1
 description CUBE WAN INTERFACE
 ip dhcp client client-id ascii cisco-ec1d.8bd2.9751-Gi0/0/1
 ip address 10.71.3.x 255.255.255.0
 negotiation auto
```

```
 no mop enabled
 redundancy rii 20
 redundancy group 1 ip 10.71.3.x exclusive
!
interface GigabitEthernet0/0/2
 description HA interface
 ip address 10.71.9.26 255.255.255.0
 negotiation auto
 no mop enabled
!
```

Global Cisco UBE settings

In order to enable Cisco UBE IP2IP SBC functionality, following command has to be entered:

```
voice service voip
 ip address trusted list
  ipv4 172.16.29.x
  ipv4 10.64.5.0 255.255.255.0
  ipv4 172.17.8.0 255.255.255.0
 no ip address trusted authenticate
 address-hiding
 mode border-element
 media bulk-stats
 allow-connections sip to sip
 redundancy-group 1
 no supplementary-service sip refer
 no supplementary-service sip handle-replaces
 supplementary-service media-renegotiate
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 trace
 sip
  session refresh
  header-passing
  error-passthru
  asserted-id pai
  privacy pstn
  conn-reuse
  early-offer forced
  midcall-signaling passthru
  g729 annexb-all
  sip-profiles inbound
  no call service stop
```

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 pai	Specifies the PAI 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 3 g729r8
```

Dial peer

Inbound calls from CUCM

```
!
dial-peer voice 100 voip
 description *** Inbound Dial-Peer- from CUCM to CUBE ***
 session protocol sipv2
 session transport udp
 incoming uri via CUCM
 voice-class codec 2
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
```

Outbound calls to CUCM:

```
dial-peer voice 410 voip
 description *** Outbound Dial-Peer towards CUCM ***
 huntstop
 destination-pattern 531.......
 session protocol sipv2
 session target ipv4:172.16.29.72
 session transport udp
 voice-class codec 2
 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
 fax-relay ecm disable
 fax rate disable
```

```
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
```

Inbound from COX:

```
dial-peer voice 200 voip
 description *** Inbound Dial-Peer- from COX to CUBE ***
 translation-profile incoming for_FOPBX
 session protocol sipv2
 session transport udp
 incoming uri via COX
 voice-class codec 2
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
```

Outbound To COX:

```
dial-peer voice 310 voip
 description *** Outbound Dial-Peer towards COX over EDGESBC-PSTN ***
 huntstop
 destination-pattern .T
 session protocol sipv2
 session target ipv4:10.64.4.162:5060
 session transport udp
 voice-class codec 2
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 fax-relay ecm disable
```

```
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
```

Dial peer group

```
voice class dpg 100
 description incoming CUCM to Cox
 dial-peer 310 preference 1
!
voice class dpg 300
 description incoming COX to CUCM
 dial-peer 410 preference 1
```

Configuration example

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

Active Cisco UBE:

```
version 17.3
service config
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
no service private-config-encryption
service call-home
platform qfp utilization monitor load 80
platform punt-keepalive disable-kernel-core
!
hostname CUBE7
!
boot-start-marker
boot system flash bootflash:isr4300-universalk9.17.03.03.SPA.bin
boot-end-marker
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
!
logging buffered 2000000
enable password 7 0010160D320A11575F2F
!
no aaa new-model
```

```
ip name-server x.x.x.x
login on-success log
!
subscriber templating
multilink bundle-name authenticated
no device-tracking logging theft
!
password encryption aes
!
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
!
crypto pki certificate pool
 ! ('certificate ca' cmd has been deprecated. Downloaded
 !  Trustpool certificates should be re-downloaded
 !  using 'crypro pki trustpool import url <url>')
!
voice service voip
 ip address trusted list
  ipv4 172.16.29.x
  ipv4 10.64.5.0 255.255.255.0
  ipv4 172.17.8.0 255.255.255.0
 no ip address trusted authenticate
 address-hiding
 mode border-element
 media bulk-stats
 allow-connections sip to sip
 redundancy-group 1
 no supplementary-service sip refer
 no supplementary-service sip handle-replaces
 supplementary-service media-renegotiate
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 trace
 sip
  session refresh
  header-passing
  error-passthru
```

```
  asserted-id pai
  privacy pstn
  conn-reuse
  early-offer forced
  midcall-signaling passthru
  g729 annexb-all
  sip-profiles inbound
  no call service stop
!
!
voice class uri CUCM sip
 host 172.16.29.72
!
voice class uri COX sip
 host ipv4:10.64.4.x
voice class codec 1
 codec preference 1 g711ulaw
 codec preference 3 g729r8
!
!
voice class sip-profiles 101
request INVITE sip-header Diversion modify "(<.*:.*)(@.*>)" "\1@10.71.3.40>"
!
voice class dpg 100
 description incoming CUCM to Cox
 dial-peer 310 preference 1
!
voice class dpg 300
 description incoming COX to CUCM
 dial-peer 410 preference 1
!
voice class sip-options-keepalive 1
 description ** global options pings settings **
 up-interval 30
```

```
 retry 3
!
voice-card 0/2
 no watchdog
!
voice-card 0/4
 no watchdog
!
no license feature hseck9
license udi pid ISR4331/K9 sn FDO21381GMV
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 CUBE LAN INTERFACE
 ip address 10.64.5.x 255.255.0.0
 negotiation auto
 redundancy rii 10
 redundancy group 1 ip 10.64.5.x exclusive
!
interface GigabitEthernet0/0/1
 description CUBE WAN INTERFACE
 ip address 10.71.3.42 255.255.255.0
 negotiation auto
 redundancy rii 20
 redundancy group 1 ip 10.71.3.40 exclusive
!
interface GigabitEthernet0/0/2
 description Access01 g4/0/9
 ip address 10.71.9.25 255.255.255.0
 negotiation auto
!
interface GigabitEthernet0/1/0
 no ip address
 shutdown
 negotiation auto
!
interface Service-Engine0/2/0
!
interface Service-Engine0/4/0
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 negotiation auto
!
```

```
no ip http server
ip http authentication local
no ip http secure-server
ip http client source-interface GigabitEthernet0/0/0
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 10.71.3.1
ip route 10.64.4.0 255.255.255.0 10.71.3.1
ip route 10.64.5.0 255.255.255.0 10.64.1.1
!
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 Dial-Peer- from CUCM to CUBE ***
 session protocol sipv2
 session transport udp
 incoming uri via CUCM
 voice-class codec 2
 voice-class sip bind control source-interface GigabitEthernet0/0/0
 voice-class sip bind media source-interface GigabitEthernet0/0/0
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax rate disable
```

```
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 200 voip
 description *** Inbound Dial-Peer- from COX to CUBE ***
 translation-profile incoming for_FOPBX
 session protocol sipv2
 session transport udp
 incoming uri via COX
 voice-class codec 2
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 310 voip
 description *** Outbound Dial-Peer towards COX over EDGESBC-PSTN ***
 huntstop
 destination-pattern .T
 session protocol sipv2
 session target ipv4:10.64.4.162:5060
 session transport udp
 voice-class codec 2
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
```

```
!
dial-peer voice 410 voip
 description *** Outbound Dial-Peer towards CUCM ***
 huntstop
 destination-pattern 531.......
 session protocol sipv2
 session target ipv4:172.16.29.72
 session transport udp
 voice-class codec 2
 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
 fax-relay ecm disable
 fax rate disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
!
gateway
 timer receive-rtp 1200
!
!
line con 0
 exec-timeout 0 0
 logging synchronous
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 30 30
logging synchronous
 login
 transport input telnet
```

```
!
call-home
 ! If contact email address in call-home is configured as sch-smart-licensing@cisco.com
 ! the email address configured in Cisco Smart License Portal will be used as contact email address to send SCH notifications.
 contact-email-addr sch-smart-licensing@cisco.com
 profile "CiscoTAC-1"
  active
  destination transport-method http
!
End
```

Standby Cisco UBE:

```
version 17.3
service config
service timestamps debug datetime msec
service timestamps log datetime msec
service call-home
platform qfp utilization monitor load 80
platform punt-keepalive disable-kernel-core
!
hostname CUBE8
!
boot-start-marker
boot system flash bootflash:isr4300-universalk9.17.03.03.SPA.bin
boot-end-marker
!
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
!
no aaa new-model
!
ip vrf forwarding
!
ip name-server x.x.x.x
login on-success log
!
subscriber templating
!
```

```
multilink bundle-name authenticated
no device-tracking logging theft
!
password encryption aes
!
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 trustpoint SLA-TrustPoint
 enrollment pkcs12
 revocation-check crl
!
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 170D3231 30333131 31383336
  31385A17 0D333130 33313131 38333631 385A3031 312F302D 06035504 03132649
  4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D33 36313639
  34333631 39308201 22300D06 092A8648 86F70D01 01010500 0382010F 00308201
  0A028201 0100CC32 F6D8D39C A0BC8806 96974E12 4390FF0C 9EFD8638 C41CD0F7
  E13A6180 ABF9F775 F5E0680E D9441928 11492752 81251D9F 8FB05970 6144AB81
  0AAAB492 9C3F8533 330DF760 E5D0CBCD BDA740B2 046A0D9E EFA02C07 68A65747
  5507EEAE A91258A4 C116FBB9 B77A6A80 83AA6562 5A026D02 8B71578E 4D7FE57E
  E742AC93 DCF4BA4B 0A7F0F61 95E50CD2 2DB9A832 DF21404A BBCC4026 FC121099
  23B93665 C45BC25B 66BF11DA 9C9F52C6 22172878 3C973DC4 A96BB055 88776359
  BA6621DC ECE7162C 8C3C0079 09613EC6 0E96C6BD 7A3AED3C 4BA1E681 C7CDE874
  1F32AE69 22A3BE86 FD0EBC19 858E6015 66226E81 61169B97 8B01C38C 84ABBFAB
  30A92E56 EBA90203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF
  301F0603 551D2304 18301680 14A9AA09 C6C70997 473BB054 F8B6F282 35C2E198
  43301D06 03551D0E 04160414 A9AA09C6 C7099747 3BB054F8 B6F28235 C2E19843
```

```
  300D0609 2A864886 F70D0101 05050003 82010100 1451CDA7 97C50823 04FFBBBD
  49040A2C 84AC3CF0 1370FC6B B1DB5D54 E93A999F 9CB12E4B EEF7EC69 0892C4C1
  48932BA1 FC4B4EBF 7420DFFD C777038A 8F6BC679 FC87C3BE 1D8FF0D8 6B75477B
  219FD6B3 B8277864 8179E6DF 6A48242C 4C38A48E 081E1737 9A8DDA86 4BE7577F
  6E467B9C B729B607 F4E7D941 2E857F70 C892BCE4 D21696AB 19889BC7 F9C33106
  9BCA8181 3B390EED 7AEE9A0A 61E68CA0 AB8B48CC 0E69DB56 D9340B75 CC3372EA
  F38B8270 406FB86F 57222154 959701FC C0855F08 E8751094 1AAD4E63 B66457E7
  F311EE8A 619E7E49 409E65CC C4D99221 D7D12A3A 51BB134D 9A0077BC 5FCA0F69
  2CF41AF5 E9DCEB60 442FB6F5 1FDB376E 4D2BD28C
        quit
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 pool
 cabundle nvram:ios_core.p7b
!
voice service voip
 mode border-element
 media bulk-stats
 allow-connections sip to sip
 redundancy-group 1
 no supplementary-service sip refer
 no supplementary-service sip handle-replaces
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 trace
sip
  rel1xx disable
  conn-reuse
  early-offer forced
  midcall-signaling passthru
  privacy-policy passthru
  g729 annexb-all
!
voice class uri CUCM sip
 host 172.16.29.72
!
voice class uri COX sip
 host ipv4:10.64.4.x
voice class codec 1
 codec preference 1 g729r8
 codec preference 2 g711ulaw
```

```
!
!
voice class sip-profiles 200
 request INVITE sip-header Diversion modify "(<.*:.*)(@.*>)" "\1@10.71.3.40>"
!
voice class dpg 100
 description incoming CUCM to Cox
 dial-peer 310 preference 1
!
voice class dpg 300
 description incoming COX to CUCM
 dial-peer 410 preference 1
!
voice-card 0/2
 no watchdog
!
voice-card 0/4
 dsp services dspfarm
 no watchdog
!
no license feature hseck9
license udi pid ISR4331/K9 sn FDO21381FEY
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
!
username cisco privilege 15 password 6 `egTW_bFQEGWfSiSiVgM_]H^VRFAAB
!
```

```
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 CUBE LAN INTERFACE
 ip address 10.64.5.220 255.255.0.0
 negotiation auto
 no mop enabled
 redundancy rii 10
 redundancy group 1 ip 10.64.5.165 exclusive
!
interface GigabitEthernet0/0/1
 description CUBE WAN INTERFACE
 ip dhcp client client-id ascii cisco-ec1d.8bd2.9751-Gi0/0/1
 ip address 10.71.3.x 255.255.255.0
 negotiation auto
 no mop enabled
 redundancy rii 20
 redundancy group 1 ip 10.71.3.x exclusive
!
interface GigabitEthernet0/0/2
 description HA interface
```

```
 ip address 10.71.9.26 255.255.255.0
 negotiation auto
 no mop enabled
!
interface Service-Engine0/2/0
!
interface Service-Engine0/4/0
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 negotiation auto
 no mop enabled
!
no ip http server
ip http authentication local
no ip http secure-server
ip http client source-interface GigabitEthernet0/0/1
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 10.71.3.1
ip route 10.64.4.0 255.255.255.0 10.71.3.1
ip route 10.64.5.0 255.255.255.0 10.64.1.1
!
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
!
dspfarm profile 1 transcode
 codec g729abr8
 codec g729ar8
 codec g711alaw
 codec g711ulaw
 codec g729r8
 codec g729br8
 maximum sessions 10
 associate application CUBE
 shutdown
!
dial-peer voice 100 voip
 description *** Inbound Dial-Peer- from CUCM to CUBE ***
 session protocol sipv2
 session transport udp
 destination dpg 100
 incoming uri via CUCM
 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
 fax-relay ecm disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 200 voip
 description *** Inbound Dial-Peer- from COX to CUBE ***
 translation-profile incoming for_FOPBX
 session protocol sipv2
 session transport udp
 destination dpg 300
 incoming uri via COX
```

```
 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
 fax-relay ecm disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 310 voip
 description *** Outbound Dial-Peer towards COX over EDGESBC-PSTN ***
 huntstop
 destination-pattern .T
 session protocol sipv2
 session target ipv4:10.64.4.162:5060
 session transport udp
 voice-class codec 1
 voice-class sip asserted-id pai
 voice-class sip profiles 200
 voice-class sip options-keepalive
 voice-class sip bind control source-interface GigabitEthernet0/0/1
 voice-class sip bind media source-interface GigabitEthernet0/0/1
 dtmf-relay rtp-nte
 fax-relay ecm disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 410 voip
 description *** Outbound Dial-Peer towards CUCM ***
 huntstop
 destination-pattern 531999....
 session protocol sipv2
 session target ipv4:172.16.29.72
 session transport udp
 voice-class codec 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
 fax-relay ecm disable
 fax protocol t38 version 3 ls-redundancy 0 hs-redundancy 0 fallback none
 no vad
!
dial-peer voice 320 voip
 description *** Outbound Dial-Peer towards COX over EDGESBC-PSTN ***
 huntstop
 shutdown
 destination-pattern 031.........
 session protocol sipv2
 session target ipv4:10.64.4.162:5060
 session transport udp
 voice-class codec 1
 voice-class sip asserted-id pai
 voice-class sip profiles 200
 voice-class sip options-keepalive
 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 vad
!
gateway
 timer receive-rtp 1200
!
!
line con 0
 logging synchronous
 stopbits 1
line aux 0
 stopbits 1
```

```
line vty 0 4
 exec-timeout 30 30
logging synchronous
 login
 transport input telnet
!
call-home
 ! If contact email address in call-home is configured as sch-smart-licensing@cisco.com
 ! the email address configured in Cisco Smart License Portal will be used as contact email address to send SCH notifications.
 contact-email-addr sch-smart-licensing@cisco.com
 profile "CiscoTAC-1"
  active
  destination transport-method http
!
end
```

Configuring Cisco UCM 14.0

Cisco UCM Version

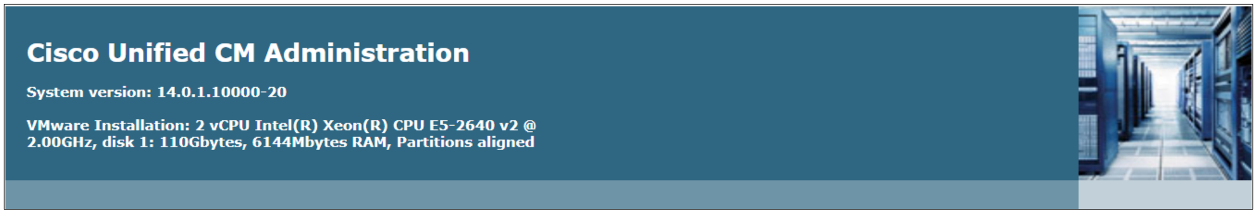

Figure 3: Cisco UCM Version

Cisco Call Manager Service Parameters

Navigation: System → Service Parameters

- Select Server* = cucm4-XXXX-CUCM Voice/Video (Active)
- Select Service*= Cisco CallManager (Active)
- All fields are set to default values

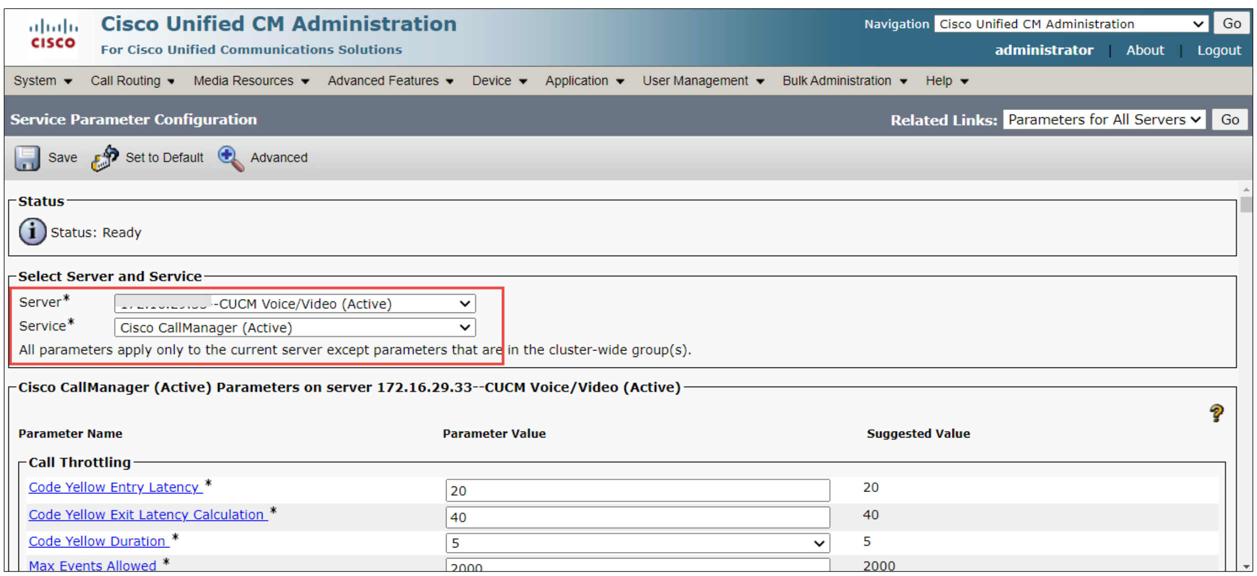

Figure 4: Service Parameters

SIP Trunk Security Profile

Navigation: System → Security → SIP Trunk Security Profile

- Name*= **Non Secure SIP Trunk Profile Cox**
- Description = **Non Secure SIP Trunk Profile authenticated by null String**
- Device Security Mode = **Non Secure**
- Incoming Transport Type* = **TCP + UDP**
- Outgoing Transport Type = **UDP**
- Incoming port **= 5060**

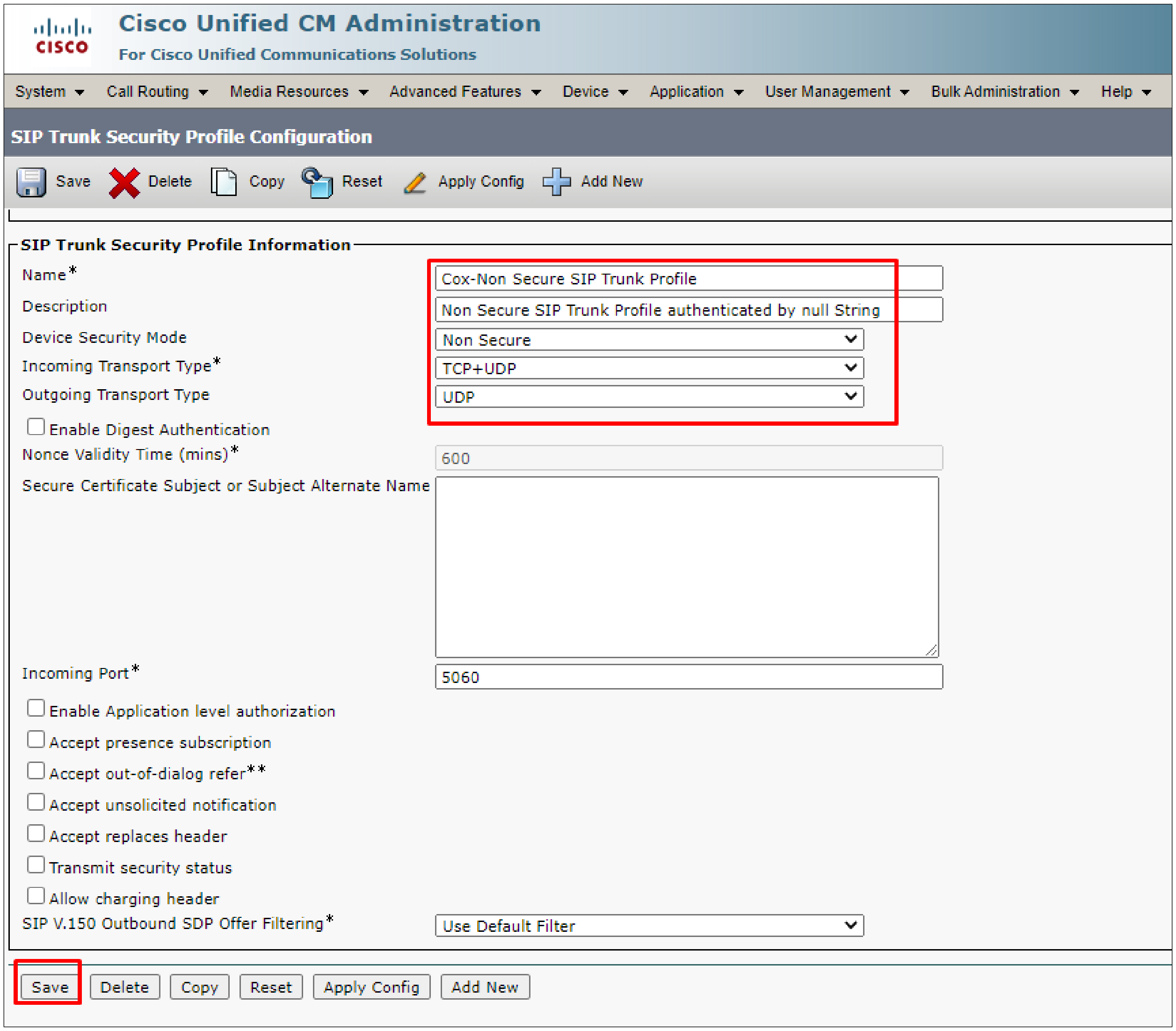

Figure 5: SIP Trunk Security Profile

SIP Profile

Navigation: Device → Device Settings → SIP Profile

- Name*= **Standard SIP Profile -PING**
- Description = **Default SIP Profile -PING**
- Highlighted fields are to be focused

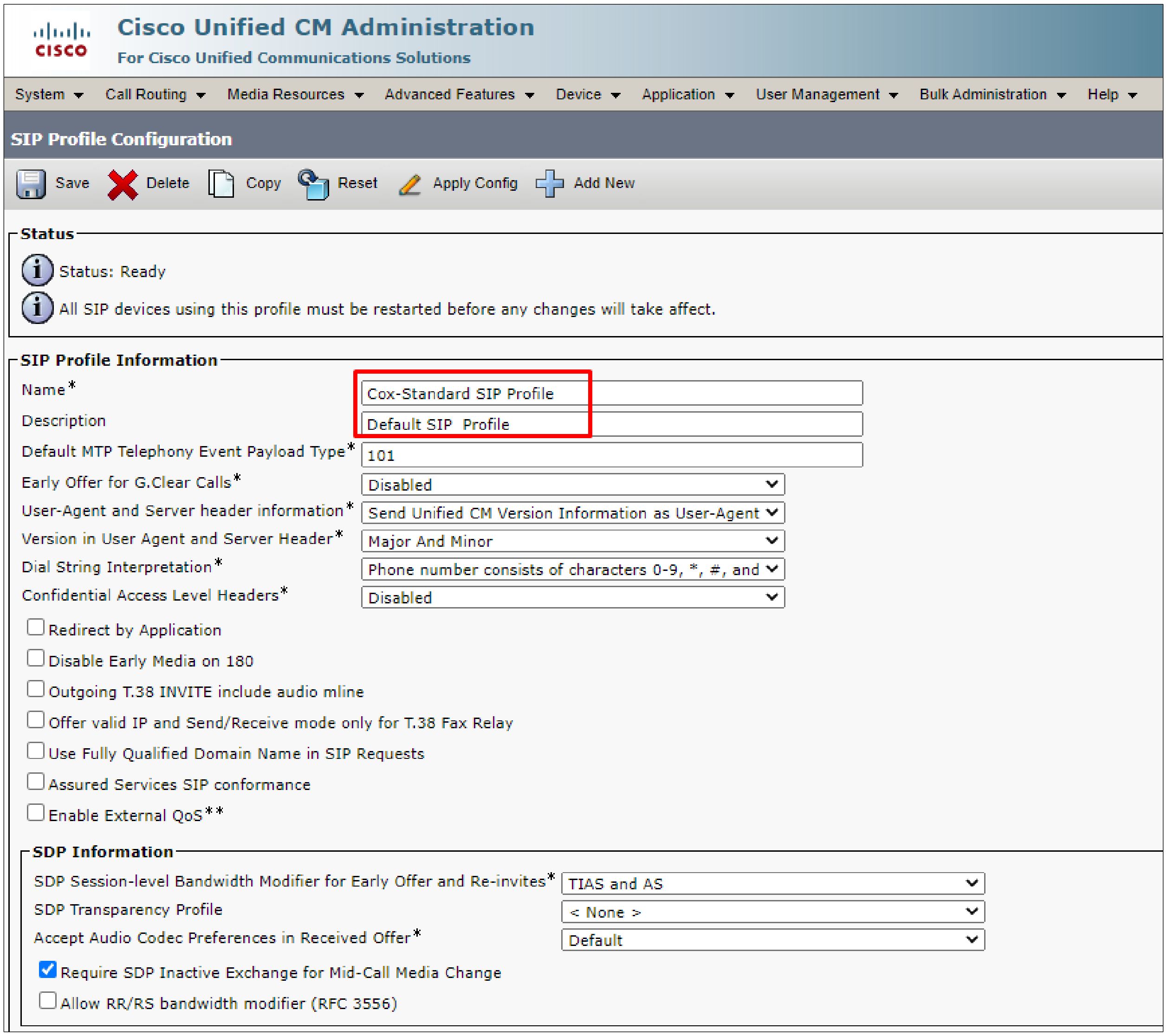

Figure 6: SIP Profile

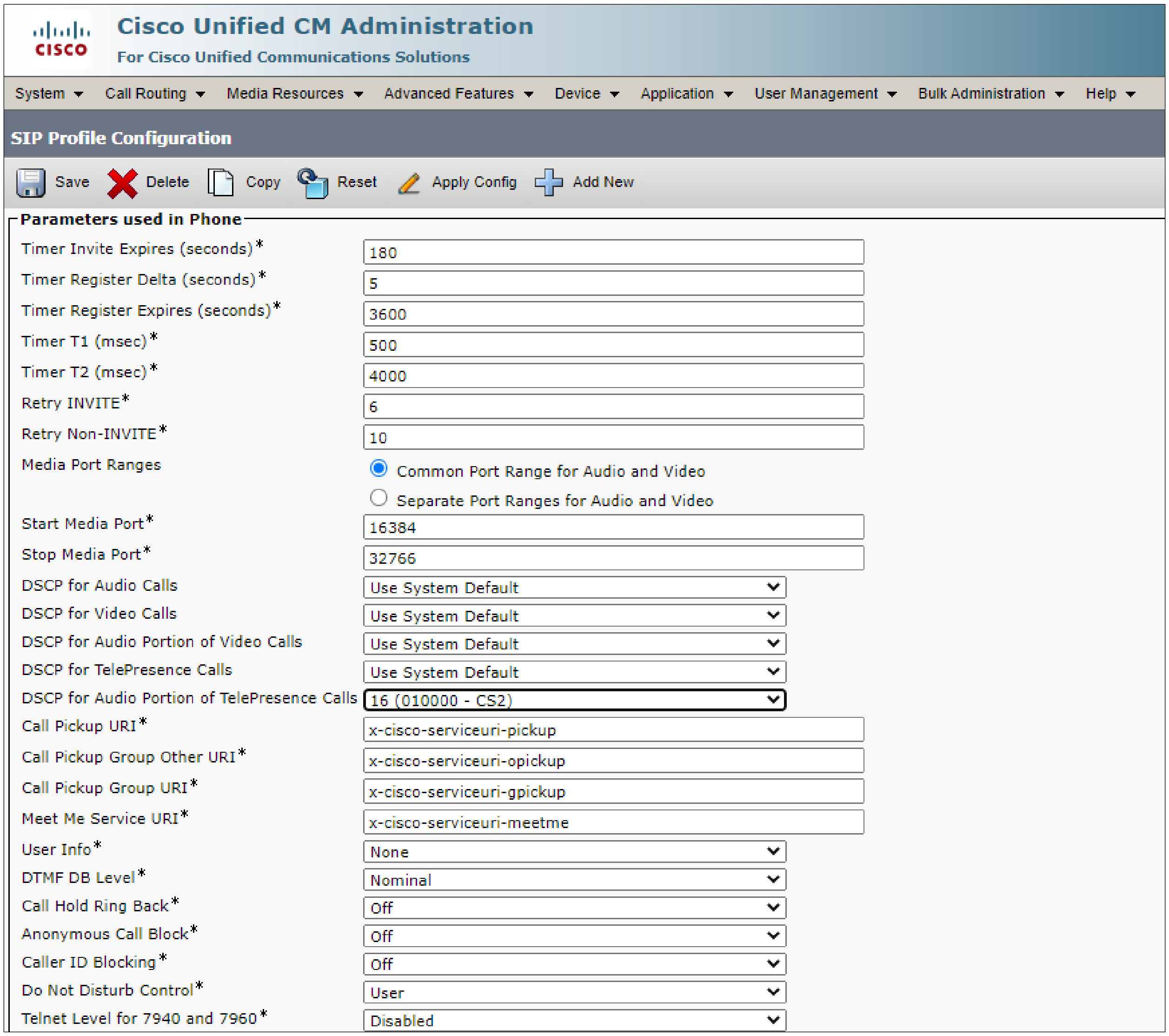

Figure 7: SIP Profile Contd.

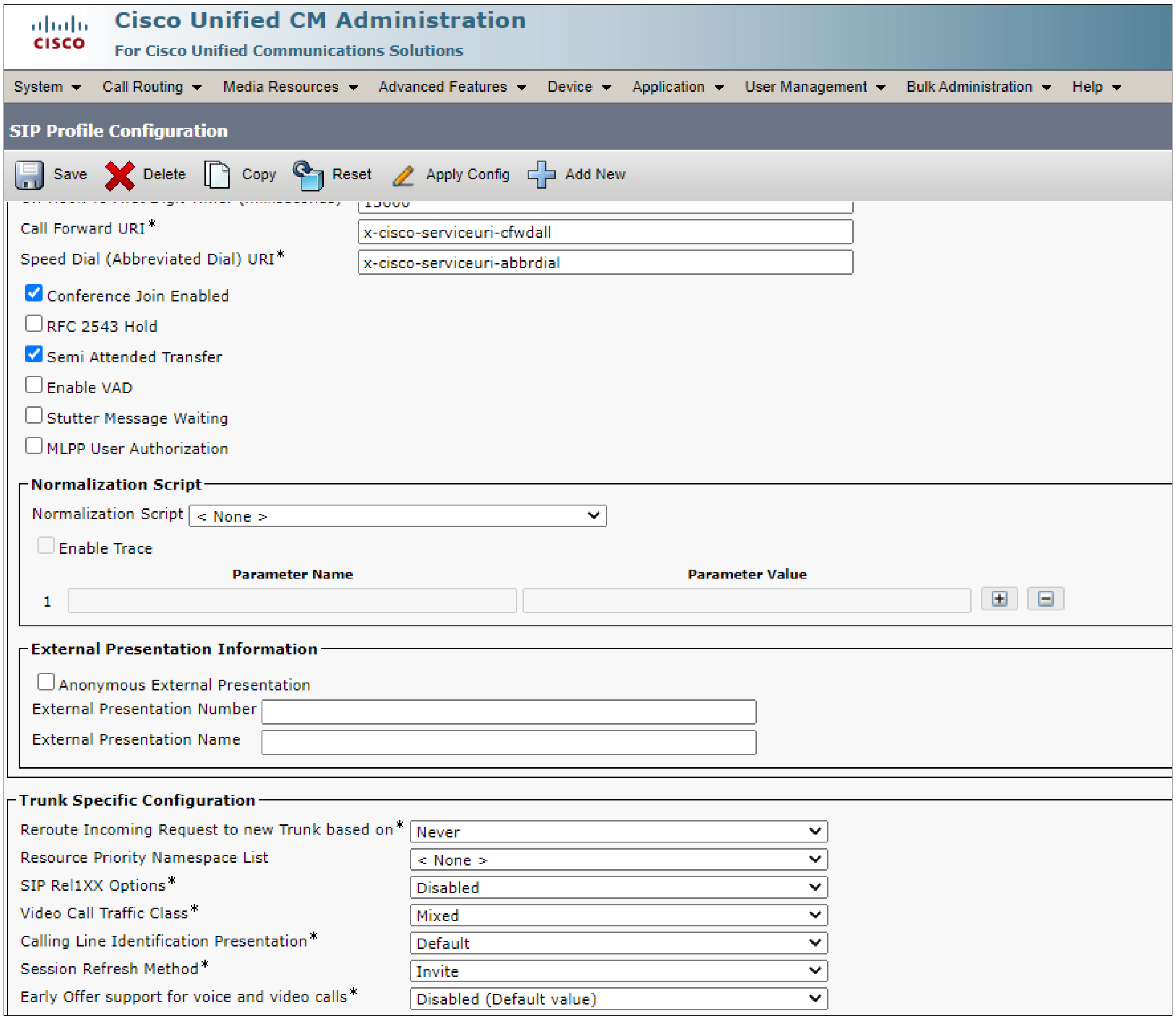

Figure 8: SIP Profile Contd.

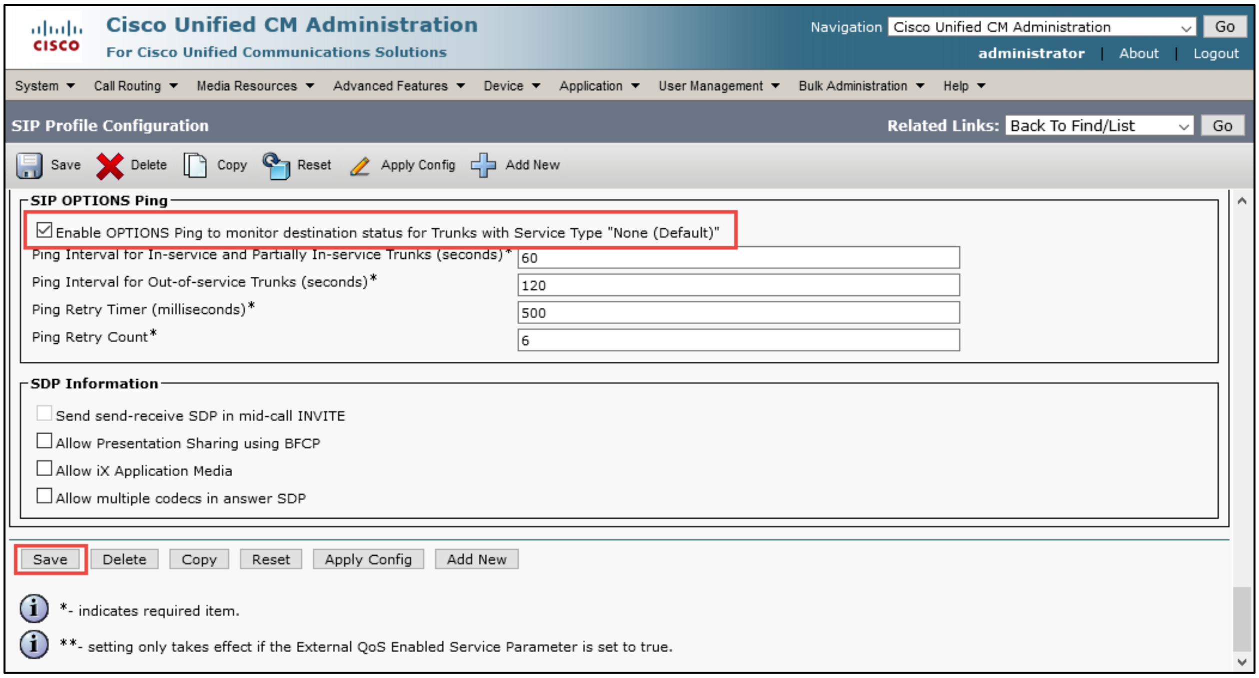

Figure 9: SIP Profile Contd.

Trunk configuration

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

Navigation: Device → Trunk

- Device Name= **Coxtrunk**
- Description = **Coxtrunk**
- Device Pool **= G711_codec**

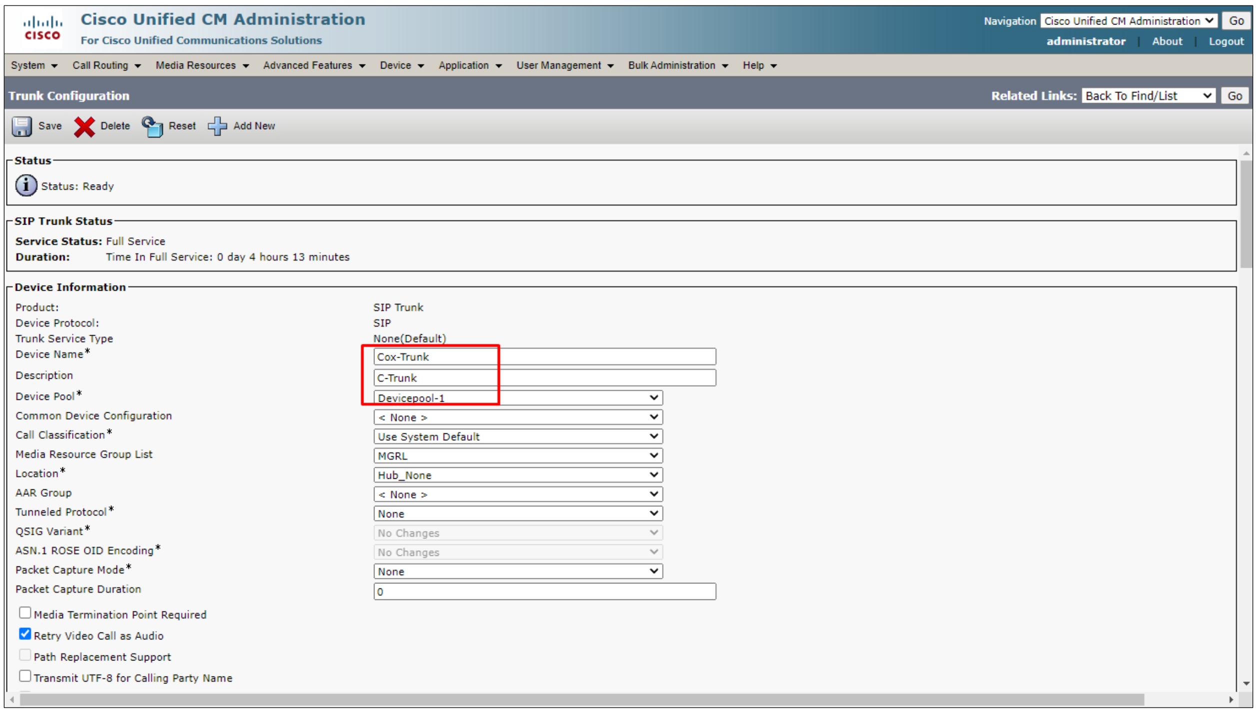

Figure 10: SIP Trunk

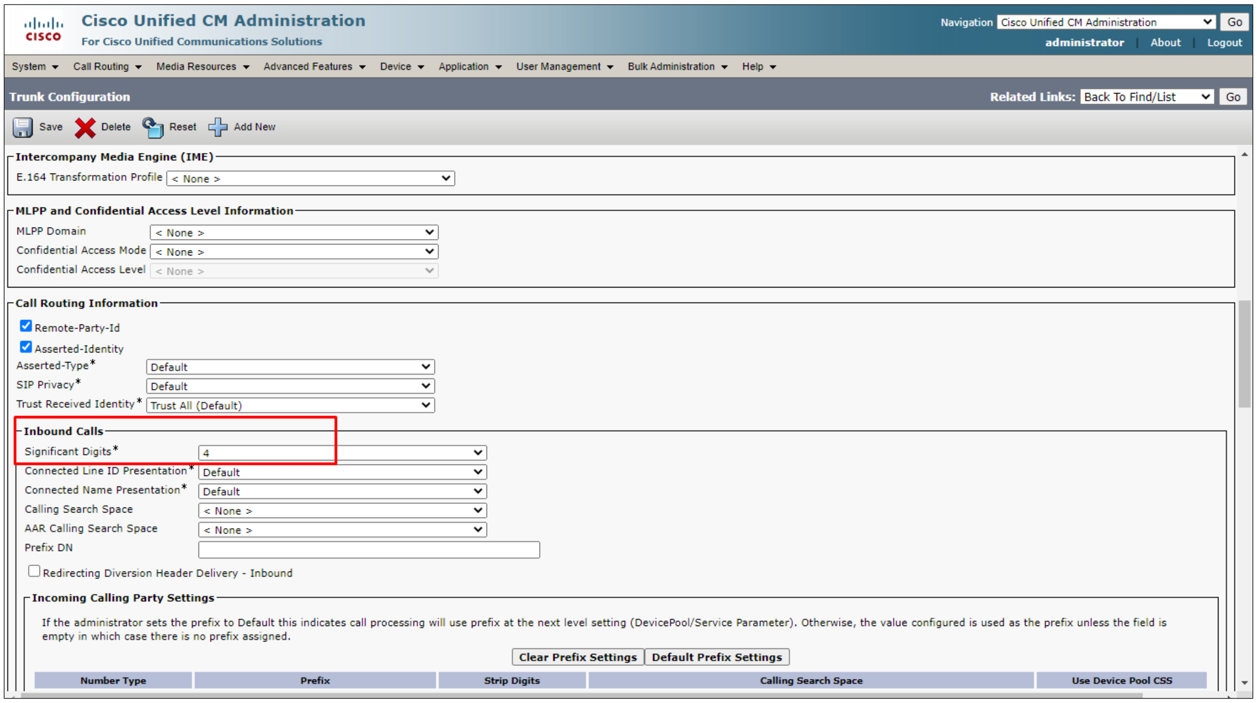

Figure 11 SIP Trunk Contd.

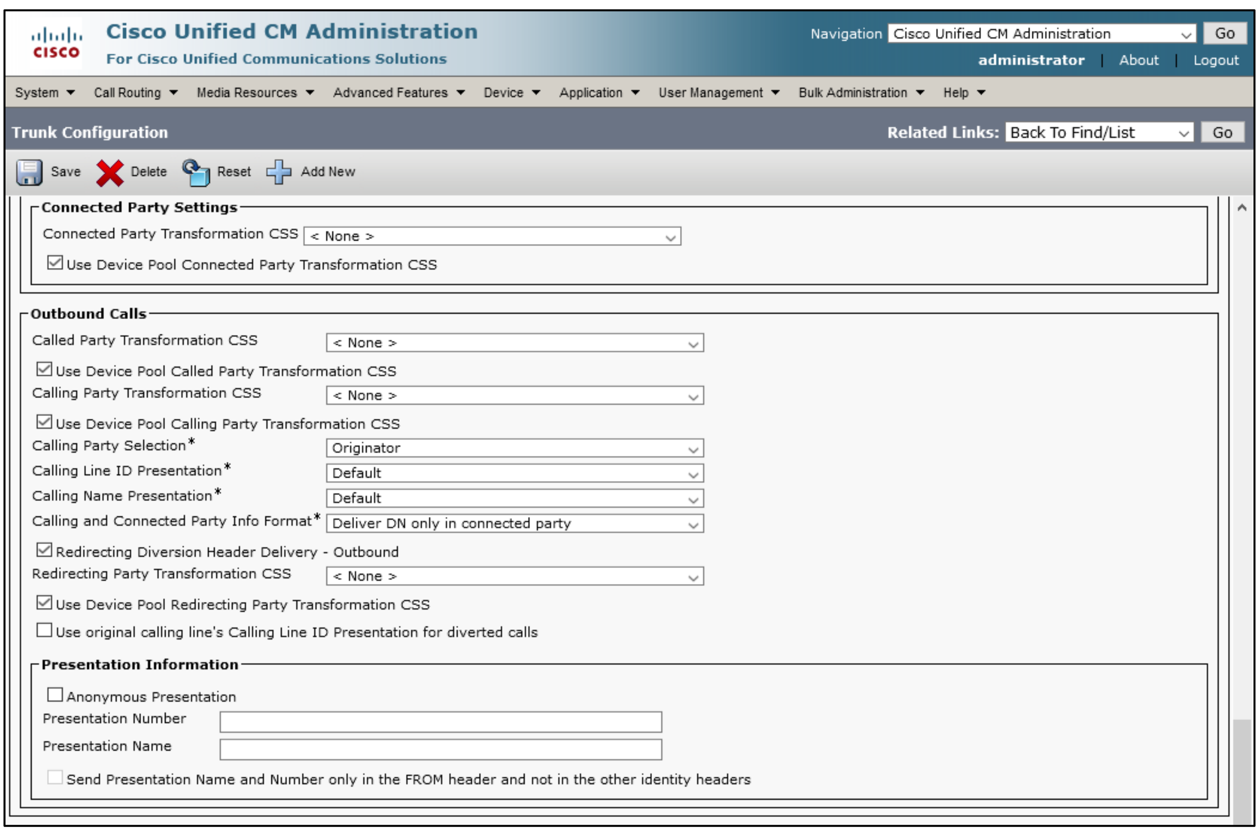

Figure 12 SIP Trunk Contd.

- 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

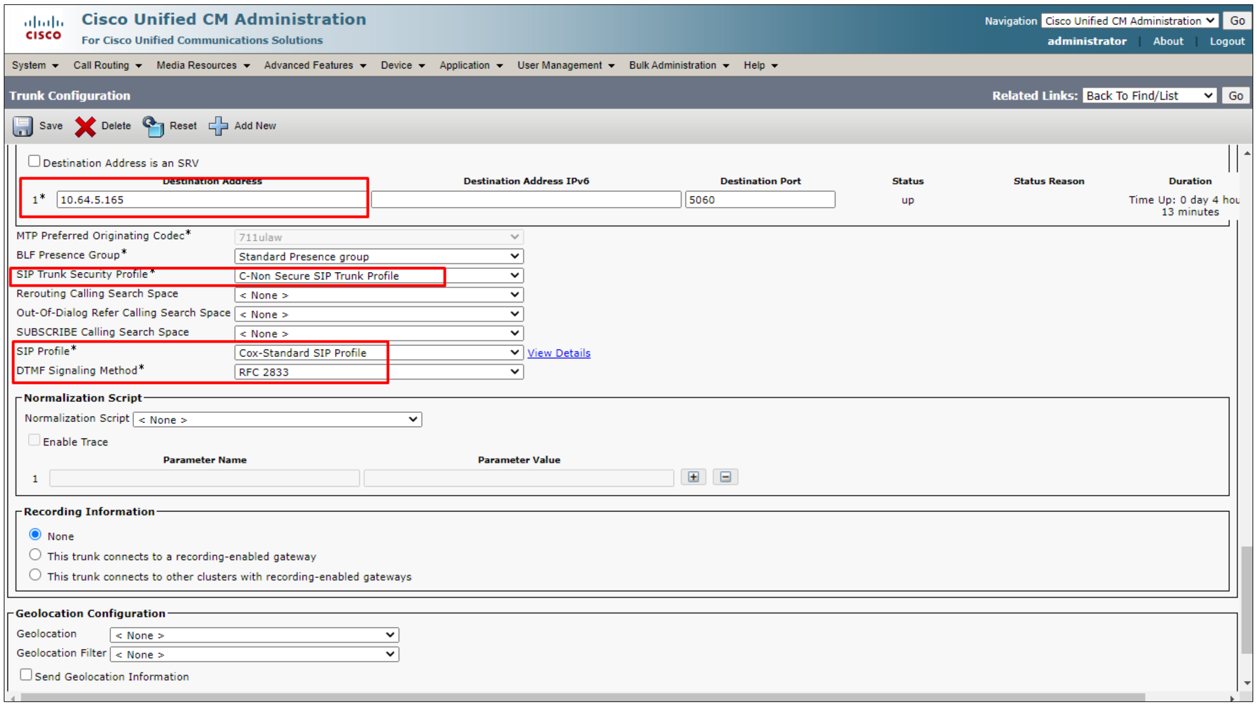

Figure 13 SIP Trunk Contd.

Routing configuration

Route Pattern for Cisco UBE:

Navigation: Call Routing → Route/Hunt → Route Pattern

- Route Pattern= **7.[0-9]![0-9#]** (Create Route patterns based on the dial plan requirement)
- Gateway/Route List **= Coxtrunk**(Associate the SIP Trunk created earlier)

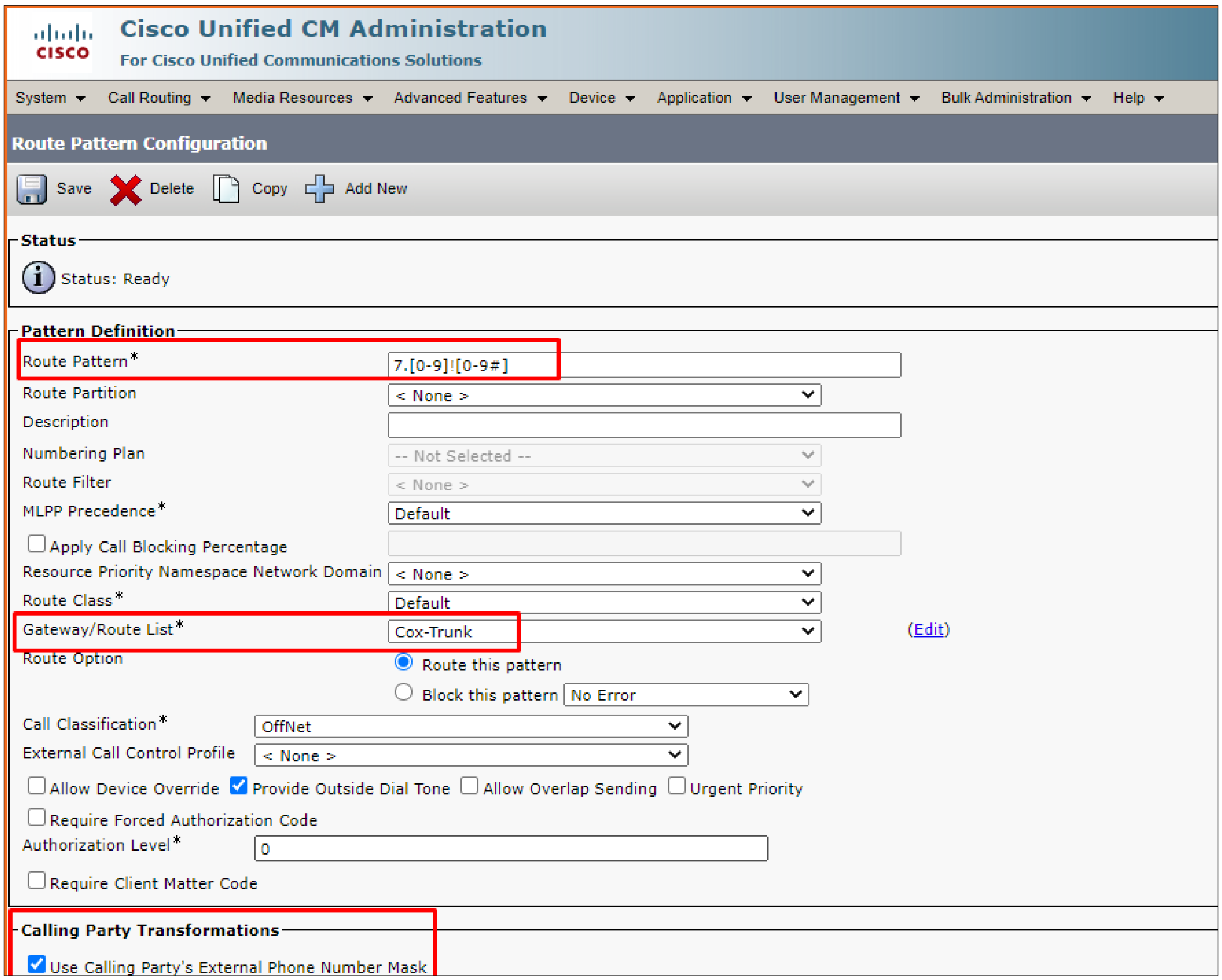

Figure 14: Route Pattern

- Discard Digits **PreDot**

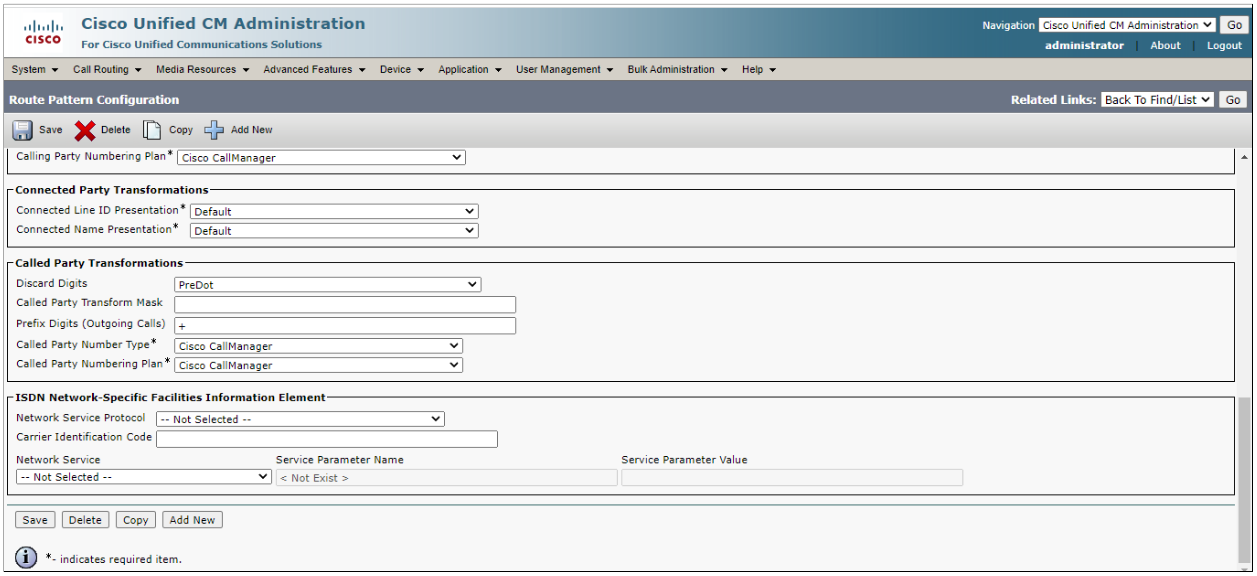

Figure 15 Route Pattern Contd.

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
SP	Service Provider

Important Information

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS. IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES

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
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

AsiaPacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 317 7777
Fax: +65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the Cisco Web site at http://www.cisco.com/go/offices.

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe