Application Note

Cox Business SIP Trunk:

Connecting Cisco Unified Communication Manager Express (CME) v12.6 [IOS-XE 16.12.01a] using SIP

June 16, 2020

Table of Contents

Table of Figures

Introduction

Service Providers today, such as Cox Business, 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 a centralized IP to TDM gateway 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 via either analog or T1 lines. A demarcation device between these services and customer owned services is recommended.

- This application note describes how to configure a Cisco Unified Communications Manager Express (Cisco Unified CME) v12.6, Cisco Unity Connection 12.0.1 with connectivity to Cox SIP trunk service. The application note also covers support and configuration example of Cisco Unity Connection (CUC) messaging integrated into the Cisco Unified CME. The deployment model covered in this application note is Customer Premises Equipment (Cisco Unified CME/CUC) to PSTN (Cox). Cox provides inbound and outbound call service.

- Testing was performed in accordance to Cox test plan and all features were verified. Key features verified are: inbound and outbound basic call (including international calls), calling name delivery, calling number and name restriction, CODEC negotiation, intra-site transfers, intra-site conferencing, call hold and resume, call forward (forward all, busy and no answer), leaving and retrieving voicemail (Cisco Unity Connection), Cisco auto-attendant (Cisco Unity Connection), fax using T.38 and G.711.

- Consult your Cisco representative for the correct IOS-XE image and for the specific application and Device Unit License and Feature License requirements for all your Cisco Unified CME.

Network Topology

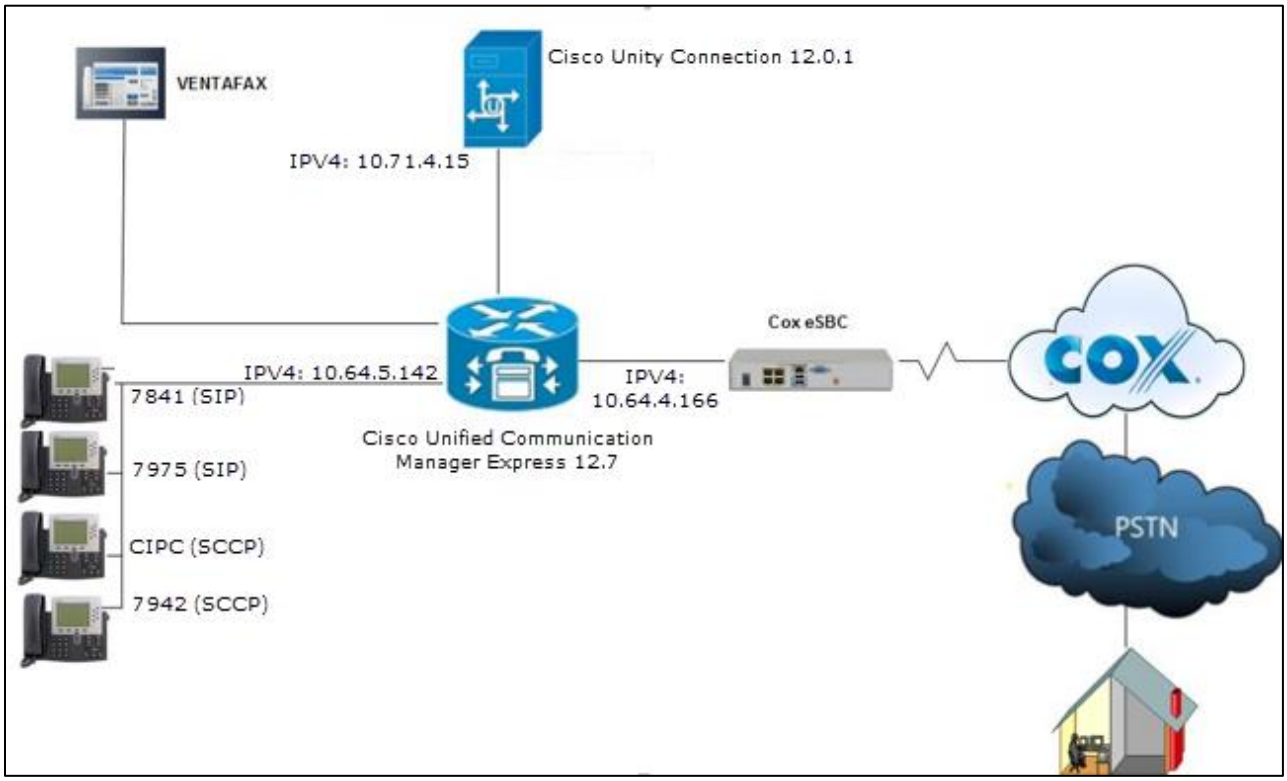

Figure 1 Network Topology

- The network topology includes the Cisco Unified CME, Unity Voicemail system and 4 Cisco Endpoints. Cisco Unified CME has a trunk configured to Cox IP Address. Cox was used as the service provider with SIP trunk to the Cox eSBC LAN IP Address.
- SIP Trunk transport type used between Cisco Unified CME to Cox eSBC is UDP.

Cisco Unified CME Settings:

Setting	Value
Transport from Cisco Unified CME to Cox eSBC	UDP with RTP
Voice Mail Support	YES
Session Refresh	YES

System Components

Hardware Requirements

- Cisco ISR4321
- Cisco IP Phones: 7841, 7975, CIPC and 7942 phones, but any Cisco IP Phone model supporting RFC2833 can be used
- Cisco ISR4321/K9 (1RU) processor with 3743802K/3071K bytes of memory. Processor board ID FLM2201V1AX
- 2 Gigabit Ethernet interfaces and 2 Voice FXS interfaces
- Cisco Unity Connection - VMware - 1 vCPU: Intel(R) Xeon(R) CPU X5675 @ 3.07GHz
- HDD 160 GB, Memory 4096 Mbytes RAM

Software Requirements

- Cisco IOS gateway running Cisco Unified CME 12.6 Version 16.12.01a, RELEASE SOFTWARE (fc2). Cisco IOS image: "bootflash:isr4300-universalk9.16.12.01a.SPA.bin"
- Cisco Unity Connection version 12.0.1.22900-14

Features

Features Supported

- Incoming and Outgoing off-net calls using G711ulaw
- Call Conference
- Voice Mail support
- Call Hold & Resume with and without MOH
- Unattended and Attended Call Transfer
- Call Forward (all, busy and no answer)
- DTMF (RFC2833)
- Fax (T.38 and g711ulaw pass-through)
- Calling Party Number Presentation and Restriction
- Auto Attendant

Features Not Supported

- G.729 codec
- Blind Call Transfer
- SG3 speed for Fax

Caveats

- None

Configuration

Cisco Unified Communication Manager Express

Cisco IOS Version

```
COXCME#sh version
Cisco IOS XE Software, Version 16.12.01a
Cisco IOS Software [Gibraltar], ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-
M),
Version 16.12.1a, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
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Compiled Sun 04-Aug-19 06:12 by mcpre


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documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.


ROM: IOS-XE ROMMON

COXCME uptime is 2 days, 11 hours, 49 minutes
Uptime for this control processor is 2 days, 11 hours, 51 minutes
System returned to ROM by PowerOn at 06:27:44 UTC Thu May 14 2020
System restarted at 20:55:13 UTC Mon May 18 2020
System image file is "bootflash:isr4300-universalk9.16.12.01a.SPA.bin"
Last reload reason: PowerOn



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export@cisco.com.



Suite License Information for Module:'esg'
```

```
------------------------------------------------------------------------------
---
Suite                 Suite Current         Type           Suite Next reboot
------------------------------------------------------------------------------
---
FoundationSuiteK9     None                  Smart License  None
securityk9
appxk9

AdvUCSuiteK9          AdvUCSuiteK9          Smart License  AdvUCSuiteK9
uck9
cme-srst
cube


Technology Package License Information:

------------------------------------------------------------------
Technology    Technology-package           Technology-package
              Current       Type           Next reboot
------------------------------------------------------------------
appxk9           appxk9           Smart License    appxk9
uck9             None             Smart License    None
securityk9       securityk9       Smart License    securityk9
ipbase           ipbasek9         Smart License    ipbasek9

The current throughput level is 50000 kbps

cisco ISR4321/K9 (1RU) processor with 3743802K/3071K bytes of memory.
Processor board ID FLM2201V1AX
2 Gigabit Ethernet interfaces
2 Voice FXS interfaces
32768K bytes of non-volatile configuration memory.
8388608K bytes of physical memory.
7057407K bytes of flash memory at bootflash:.
0K bytes of WebUI ODM Files at webui:.

Configuration register is 0x2012

COXCME#sh cube status
CUBE-Version : 12.7.0
SW-Version : 16.12.1a, Platform ISR4321/K9
```

Global Cisco Unified CME Settings

In order to enable Cisco Unified CME IP2IP functionality, following command has to be entered:

```
voice service voip
 no ip address trusted authenticate
 mode border-element license capacity 20
 allow-connections sip to sip
 no supplementary-service sip moved-temporarily
 redirect ip2ip
 fax protocol pass-through g711ulaw
 sip
  session refresh
  registrar server  expires max 600 min 60
  asserted-id pai
!
```

Explanation

Command	Description
allow-connections sip to sip	Allow IP2IP connections between two SIP call legs
fax protocol	Specifies the fax protocol
asserted-id	Specifies the privacy header in the outgoing SIP requests and response messages

Codecs

G711ulaw codec is used 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 g711alaw
 codec preference 3 g722-64
!
```

Dial Peer

Outbound Dial-peer to Cox:

```
dial-peer voice 100 voip
 description Outbound Call to Cox
 translation-profile outgoing To-10Dig
 destination-pattern .T
 session protocol sipv2
 session target sip-server
 session transport udp
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
!
```

Inbound Dial-peer from Cox:

```
dial-peer voice 101 voip
 description inbound from Cox
 translation-profile incoming to_ext
 session protocol sipv2
 session transport udp
 incoming called-number 402.......
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
```

Configuration Example

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

Cisco Unified CME:

```
COXCME#sh run

version 16.12
service timestamps debug datetime msec
service timestamps log datetime msec
service call-home
platform qfp utilization monitor load 80
no platform punt-keepalive disable-kernel-core
!
hostname COXCME
!
boot-start-marker
boot system bootflash:isr4300-universalk9.16.12.01a.SPA.bin
boot-end-marker
!
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
!
enable secret 9
$14$mYRH$jxCCJz1tcdpWoE$Pbxxg7R2/qNJYJCA.lzbFo8gPeDZw93ZgDTB4Rso8yI
!
no aaa new-model
```

```
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
  no destination transport-method email
!
ip name-server 8.8.8.8
login on-success log
subscriber templating
multilink bundle-name authenticated
!
voice service voip
 no ip address trusted authenticate
 mode border-element license capacity 20
 allow-connections sip to sip
 no supplementary-service sip moved-temporarily
 redirect ip2ip
 fax protocol pass-through g711ulaw
 sip
  session refresh
  registrar server  expires max 600 min 60
  asserted-id pai
!
voice class codec 1
 codec preference 1 g711ulaw
 codec preference 2 g711alaw
 codec preference 3 g722-64
!
voice class sip-profiles 10
```

```
 request INVITE sip-header Privacy add "Privacy:id"
!
voice class sip-profiles 11
 request INVITE sip-header Diversion add "Diversion:
<sip:6329@10.64.5.142>;privacy=off;reason=unconditional;screen=no"
!
voice register global
 mode cme
 source-address 10.64.5.142 port 2000
 max-dn 20
 max-pool 10
 load 7942 SIP42.9-2-1S
 load 7841 sip78xx.12-0-1-11
 mwi stutter
 tftp-path flash:
 file text
 create profile  sync 0013901297582157
 auto-register
 !
!
voice register dn  1
 number 6329
 name CoxUser1
 mwi
!
voice register dn  2
 number 6374
 name CoxUser2
!
!
voice register pool  1
 busy-trigger-per-button 1
 id mac 0008.3031.F49B
```

```
 type 7975
 number 1 dn 1
 voice-class codec 1
 username 6329 password 1234
 call-forward b2bua all 7777
 !
voice register pool  2
 busy-trigger-per-button 2
 id mac 2C86.D276.FCC2
 type 7841
 number 1 dn 2
 voice-class codec 1
 username 6374 password 1234
!
!
voice translation-rule 1
 rule 1 /\(^8...\)/ /402932\1/
 rule 2 /\(^6...\)/ /402401\1/
!
voice translation-rule 2
 rule 1 /402932\(....\)/ /\1/
 rule 2 /402401\(....\)/ /\1/
!
!
voice translation-profile To-10Dig
 translate calling 1
!
voice translation-profile to_ext
 translate called 2
!
voice-card 0/1
 no watchdog
!
```

```
voice-card 0/4
 no watchdog
!
no license feature hseck9
license udi pid ISR4321/K9 sn FDO21422BVW
license accept end user agreement
license boot suite AdvUCSuiteK9
license boot level appxk9
license boot level securityk9
memory free low-watermark processor 67123
!
diagnostic bootup level minimal
!
spanning-tree extend system-id

et-analytics
!
redundancy
 mode none
!
interface GigabitEthernet0/0/0
 ip address 10.64.5.142 255.255.0.0
 negotiation auto
!
interface GigabitEthernet0/0/1
 ip address 192.65.x.x 255.255.0.0
 shutdown
 negotiation auto
!
interface Service-Engine0/1/0
 no ip address
!
interface Service-Engine0/4/0
```

```
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 ip address 10.1.1.58 255.255.255.0
 negotiation auto
!
ip forward-protocol nd
no ip http server
ip http secure-server
ip tftp source-interface GigabitEthernet0/0/0
ip route 0.0.0.0 0.0.0.0 10.64.1.1
ip route 172.16.0.0 255.255.0.0 10.64.1.1
ip route 172.17.0.0 255.255.0.0 10.64.1.1
!
tftp-server flash:kern2.78xx.12-0-1-11.sbn
tftp-server flash:kern78xx.12-0-1-11.sbn
tftp-server flash:rootfs2.78xx.12-0-1-11.sbn
tftp-server flash:rootfs78xx.12-0-1-11.sbn
tftp-server flash:sboot2.78xx.12-0-1-11.sbn
tftp-server flash:sboot78xx.12-0-1-11.sbn
tftp-server flash:sip78xx.12-0-1-11.loads
tftp-server flash:apps42.9-2-1TH1-13.sbn
tftp-server flash:cnu42.9-2-1TH1-13.sbn
tftp-server flash:cvm42sip.9-2-1TH1-13.sbn
tftp-server flash:dsp42.9-2-1TH1-13.sbn
tftp-server flash:jar42sip.9-2-1TH1-13.sbn
tftp-server flash:SIP42.9-2-1S.loads
tftp-server flash:term42.default.loads
tftp-server flash:term62.default.loads
tftp-server flash:music-on-hold.wav
!
control-plane
!
```

```
voice-port 0/1/0
 cptone IN
 station-id number 4024016374
 caller-id enable
!
voice-port 0/1/1
 cptone IN
 station-id number 4029328367
 caller-id enable
!
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
!
telephony-service
 no privacy
 conference transfer-pattern
 max-ephones 20
 max-dn 20
 ip source-address 10.64.5.142 port 2000
 time-zone 39
 voicemail 7777
 max-conferences 8 gain -6
 call-forward pattern .T
 moh enable-g711 "flash:music-on-hold.wav"
 transfer-system full-consult
 transfer-pattern .T
 create cnf-files version-stamp 7960 May 19 2020 12:02:00
!
!
```

```
dial-peer voice 100 voip
 description Outbound Call to Cox
 translation-profile outgoing To-10Dig
 destination-pattern .T
 session protocol sipv2
 session target sip-server
 session transport udp
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 101 voip
 description inbound from Cox
 translation-profile incoming to_ext
 session protocol sipv2
 session transport udp
 incoming called-number 402.......
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 102 voip
 description towards CUC
 destination-pattern 7777
 session protocol sipv2
 session target ipv4:10.71.4.15:5060
 session transport udp
 voice-class codec 1
 voice-class sip profiles 11
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 103 pots
```

```
 preference 2
 service session
 destination-pattern 8367
 no digit-strip
 port 0/1/1
!
dial-peer voice 104 pots
 preference 2
 service session
 destination-pattern 6374
 no digit-strip
 port 0/1/0
!
sip-ua
 credentials number 402506**** username 402506**** password 7
022E3D0E093F2D116F443F2F5C realm cox
 authentication username 402506**** password 7 022E3D0E093F2D116F443F2F5C
realm cox
 mwi-server ipv4:10.71.4.15 expires 3600 port 5060 transport udp unsolicited
 registrar ipv4:10.64.4.166 expires 3600
 sip-server ipv4:10.64.4.166:5060
!
ephone-dn  1  dual-line
 number 6459
 label 6459
!
ephone-dn  2  octo-line
 number 6476
 label 6476
 caller-id block
!
ephone  1
 device-security-mode none
 mac-address CCAF.78D2.3E6D
```

```
 username "6459" password 1234
 type CIPC
 button  1:1
!
ephone  2
 privacy on
 device-security-mode none
 mac-address 0CD9.9690.038C
 username "6476" password 1234
 type 7942
 button  1:2
!
line con 0
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 0 0
 password ***********
 login
!
ntp server 10.10.10.5
!
end

COXCME#
```

Cisco Unity Connection

Cisco Unity Connection Version

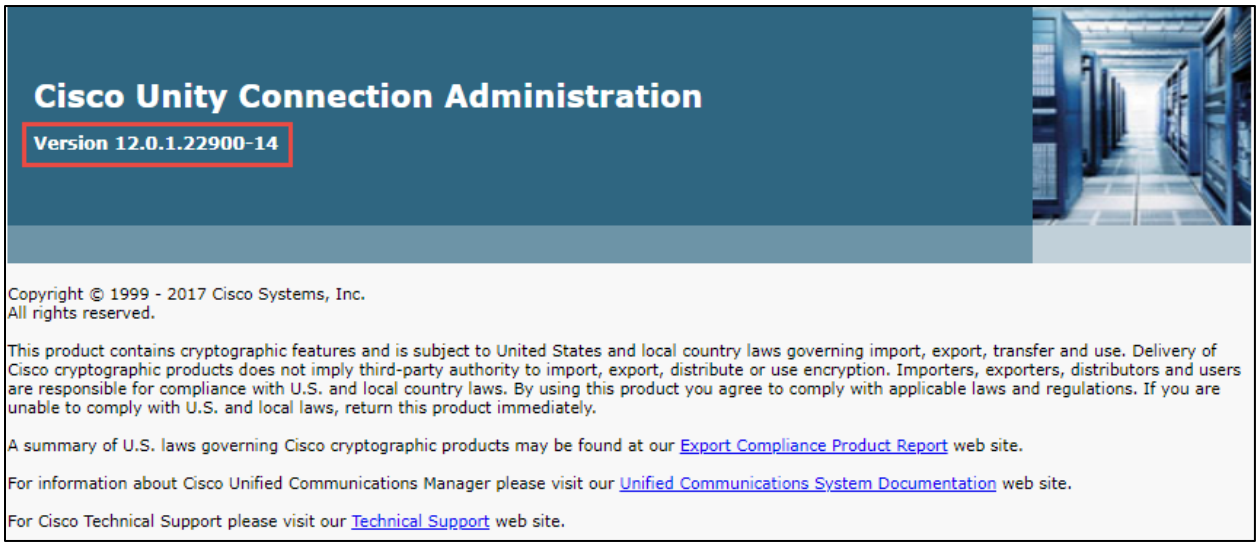

Figure 2: Cisco Unity Connection Version

Cisco Unity Connection User Configuration

Navigation: Cisco Unity Connection → Users → Users

- Set Alias= **6329** is used for this example
- Set First Name = **cisco** is used to identify this User
- Set Last Name = **cisco** is used for this example
- Set Display Name = **6329** is used in this example
- Set SMTP Address = **6329** is used in this example
- Set Extension = **6329** is used in this example
- Set Phone System = **Cox_CME** is used in this example

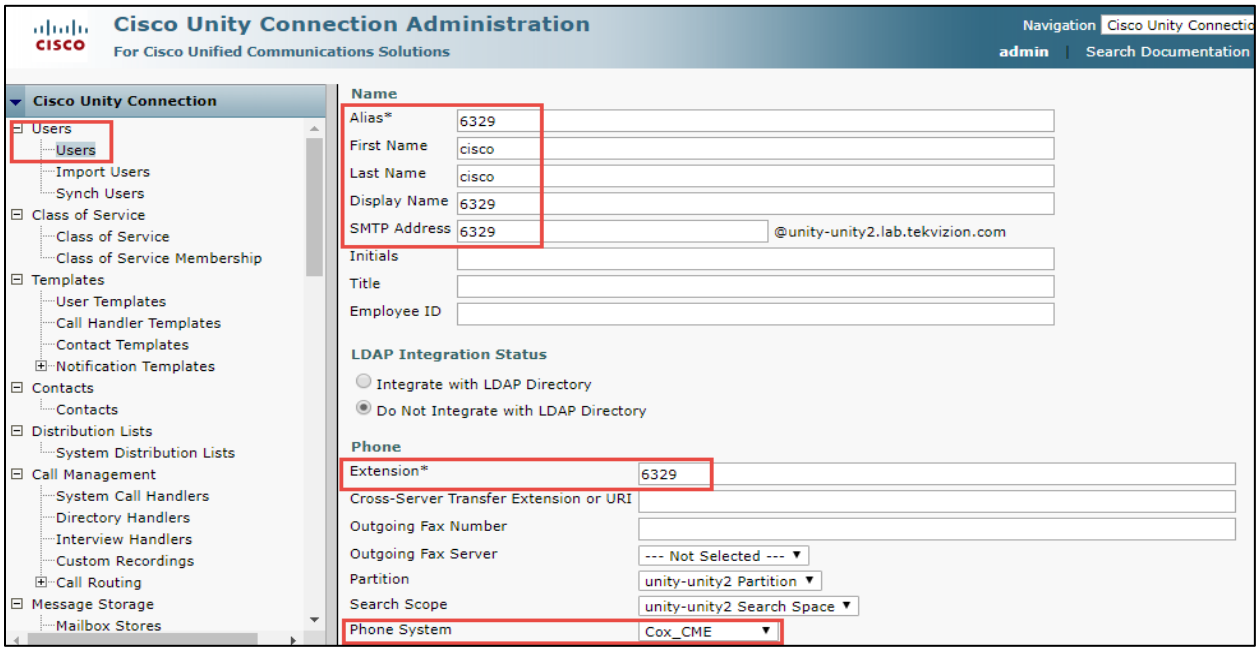

Figure 3: Cisco Unity Connection User Configuration

- All other values are set to default

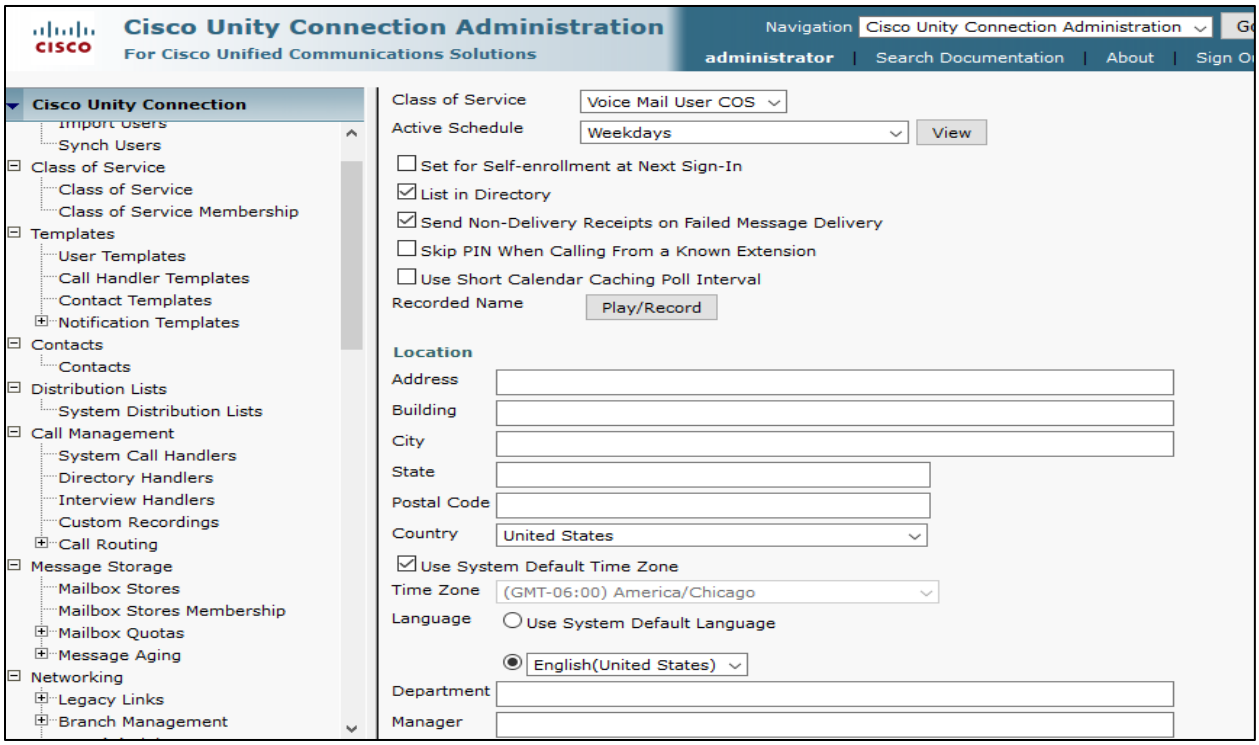

Figure 4: Cisco Unity Connection User Configuration (Cont.)

Cisco Unity Connection Telephony Integration

Navigation: Telephony Integrations → Phone system

- Set Phone System Name = **Cox_CME** is used for this example

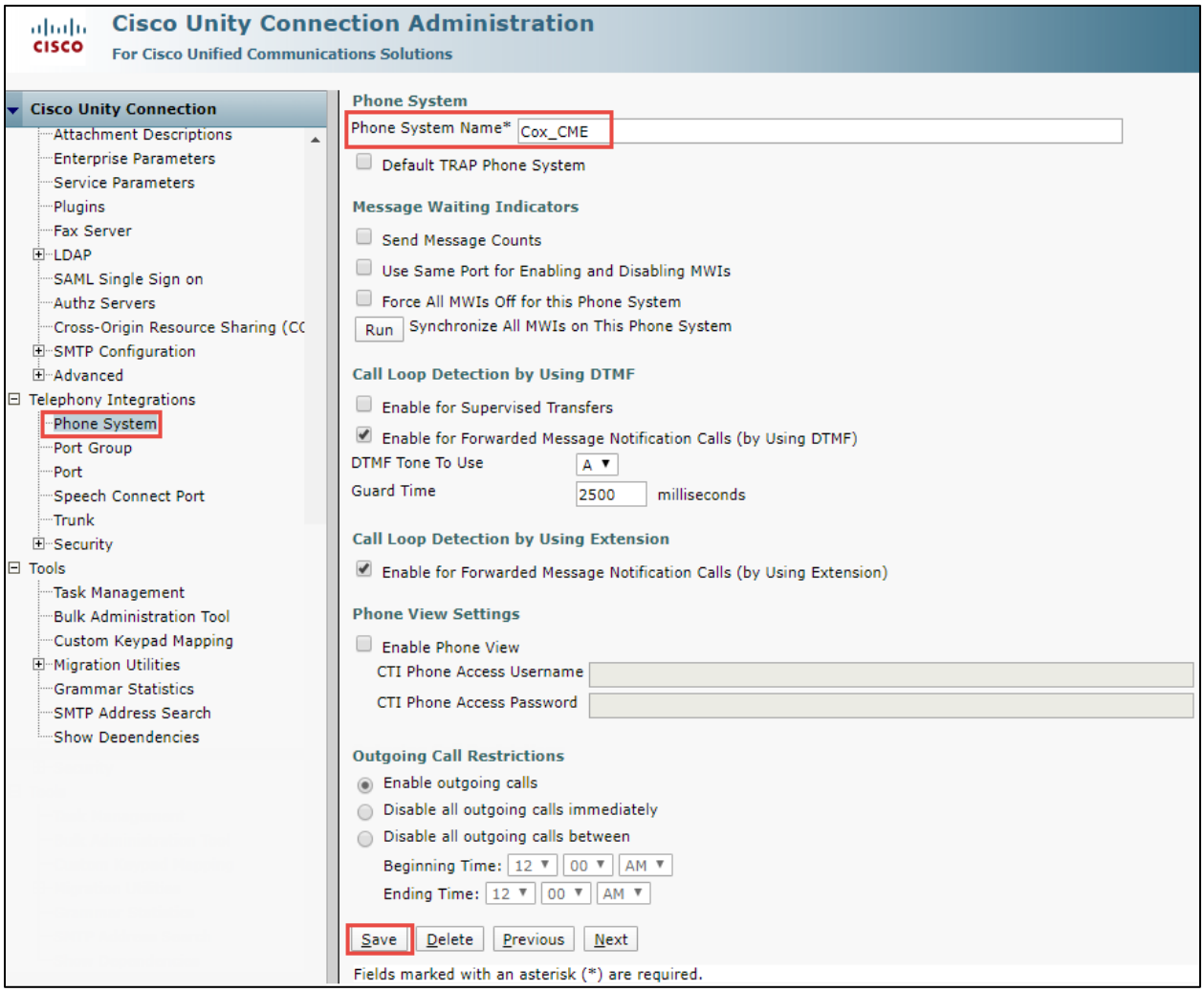

Figure 5: Cisco Unity Connection Telephony Integration

Port Group

Navigation: Telephony Integration → Port Group

- Set Display Name = **Cox_CME-1** is used for this example
- Check **Register with SIP server**

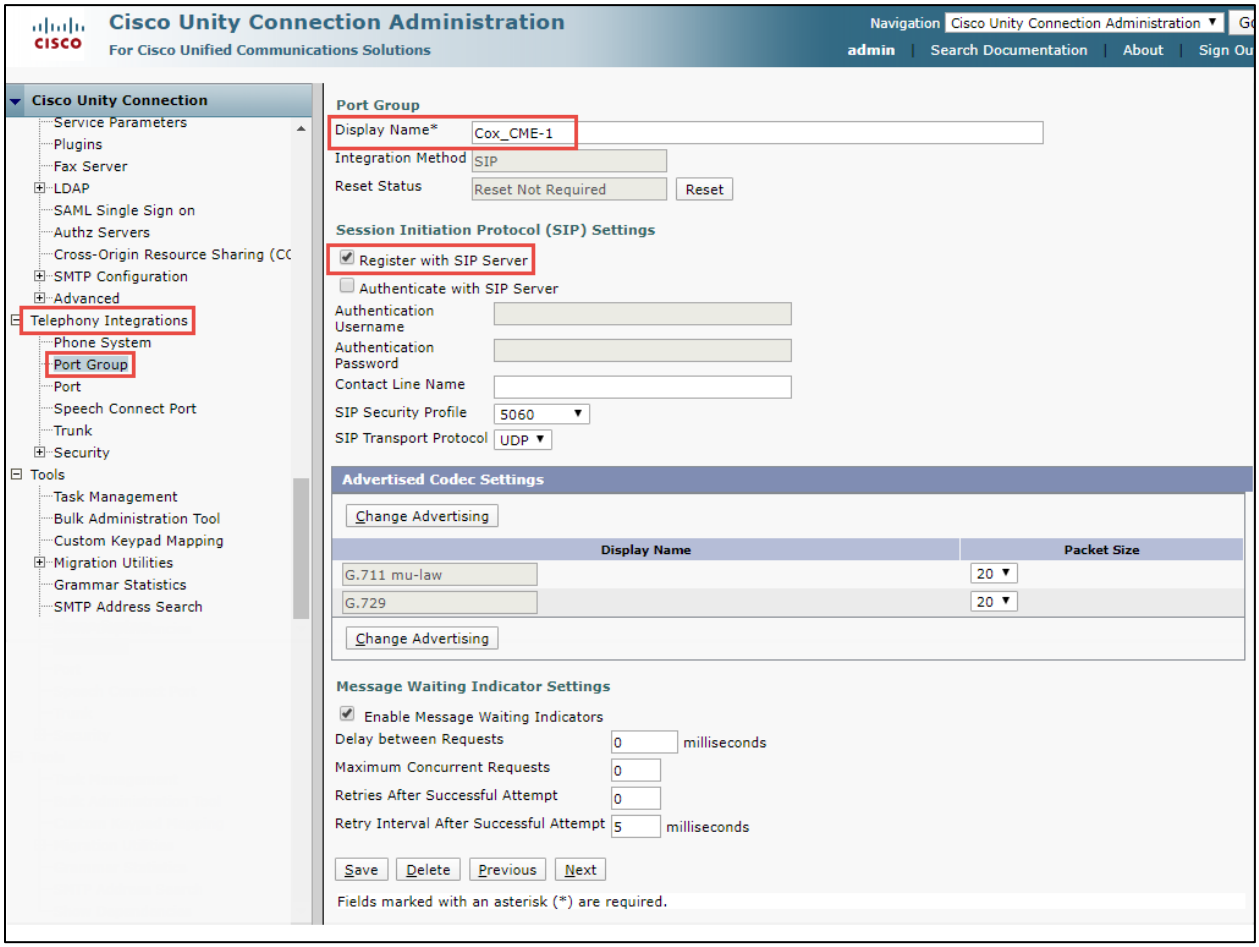

Figure 6: Port Group

Navigation: Telephony Integration → Port Group → Edit → Servers

- Set IPv4 Address or Host Name = **10.64.5.142**, Cisco unified CME's IP address is used for this example
- Set Port = **5060**
- Click on **Save**

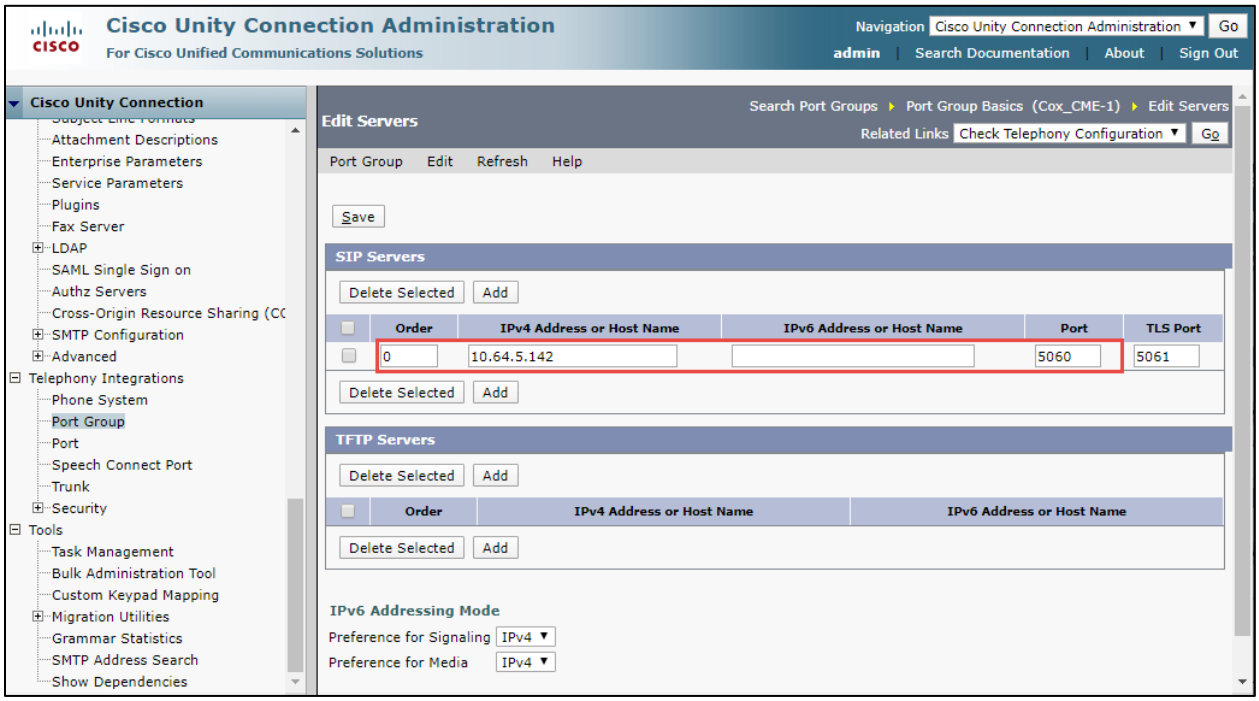

Figure 7: Port Group (Cont.)

Port

Navigation: Telephony Integration → Port

- Set Port Name = **Cox_CME-1-001** is used for this example
- Set Phone System = **Cox_CME**
- Set Port Group = **Cox_CME-1**
- Set Server = **unity-unity2.lab.tekvizion.com** is used for this example

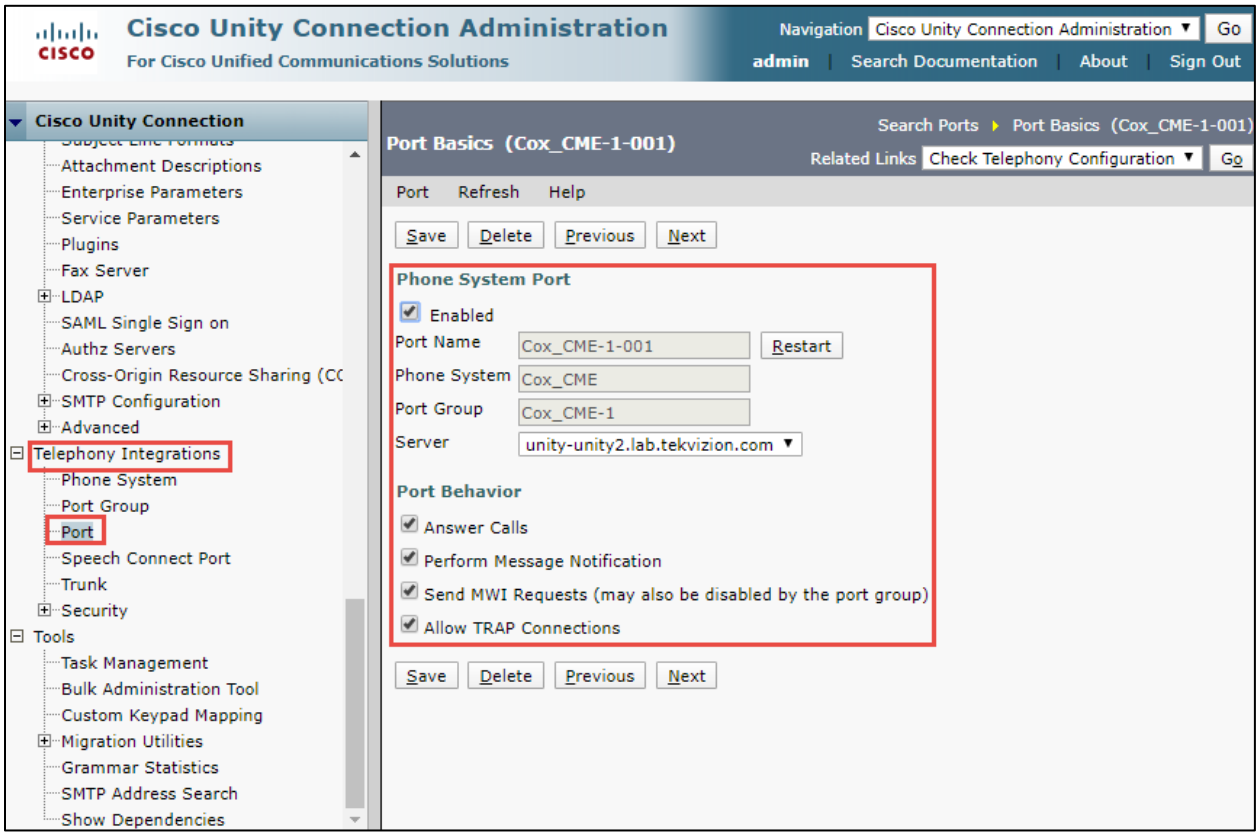

Figure 8: Port

Acronyms

Acronym	Definitions
CME	Communications Manager Express
CPE	Customer Premise Equipment
CUC	Cisco Unity Connection
DTMF	Dual Tone Multi-Frequency
eSBC	Enterprise Session Border Controller
HA	High Availability
PSTN	Public Switched Telephone Network
SCCP	Skinny Client Control Protocol
SG3	Super Group 3
SIP	Session Initiation Protocol
SP	Service Provider

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