Comcast: Connecting Cisco Unified Communication Manager Express (CME) 12.3 (IOS-XE 16.9.3) using SIP

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Note: Testing was conducted in tekVizion labs

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Introduction

Service Providers today, such as Comcast, 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. Comcast 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) version 12.3 (IOS-XE 16.9.3), Cisco Unity Connection version 12.0.1, and Adtran ESG R12.3.4.V with connectivity to Comcast SIP trunk service. The deployment model covered in this application note is Customer Premises Equipment (Cisco Unified CME) to PSTN (Comcast). Comcast provides inbound and outbound call service.

- Testing was performed in accordance to Comcast 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).

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

Network Topology

Figure 1. Basic Call Setup
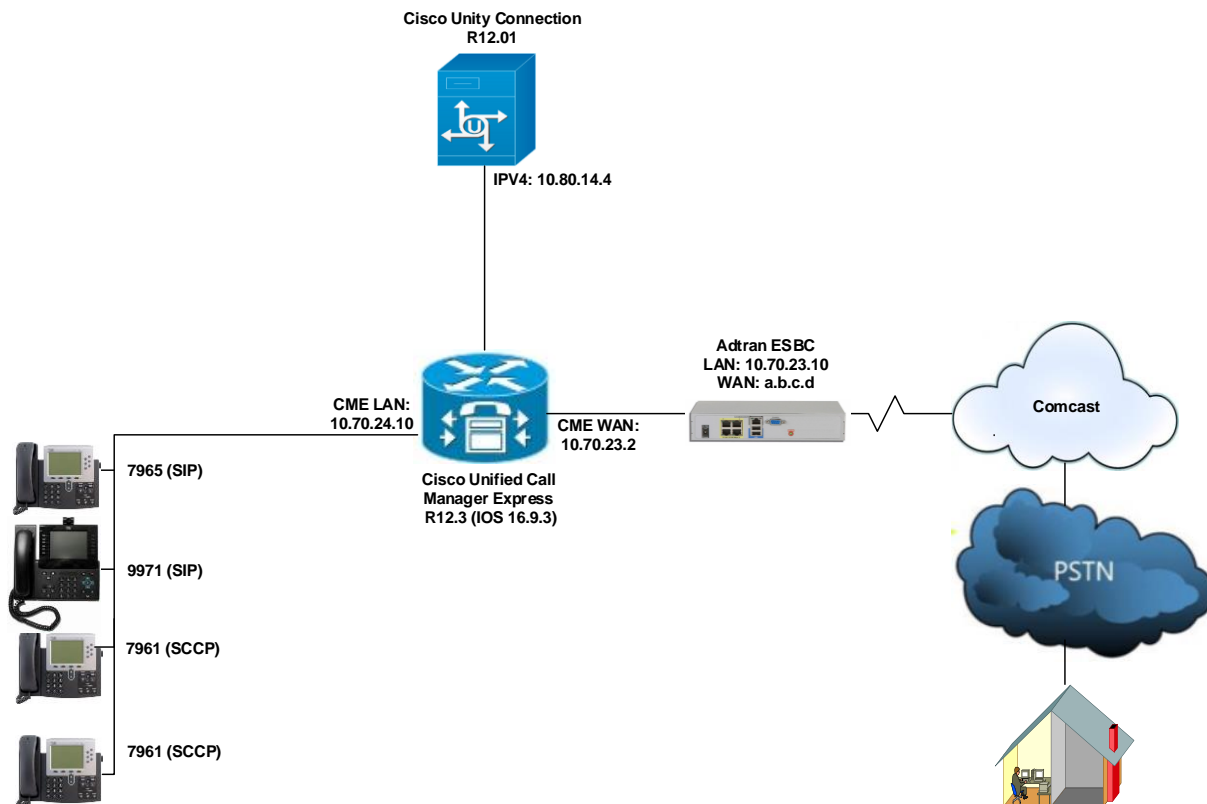
The Cisco Unified CME in Figure 1

Hardware Components

- This solution was tested with Cisco ISR4321.
- Cisco IP Phones. This solution was tested with 7965, 9971, and 7961 phones, but any Cisco IP Phone model supporting RFC2833 can be used.
- Cisco ISR4321/K9 (1RU) processor with 1784679K/6147K bytes of memory. Processor board ID FLM1925D0WZ.
- 3 Gigabit Ethernet 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-XE gateway running Cisco Unified CME Version 12.3 (IOS-XE 16.9.3), RELEASE SOFTWARE (fc2). This solution was tested with Cisco IOS image: "bootflash:isr4300-universalk9.16.09.03.SPA.bin" .
- This solution was tested with Cisco Unity Connection version (Version 12.0.1.21900-10).

Features

Features - Supported

- Basic Call using G711ulaw.
- Calling Party Number Presentation and Restriction.
- Calling Name.
- Call Transfer.
- Conference.
- Call Hold and Resume (See Caveat section for details).
- Call Forward All, Busy and No Answer.
- Incoming DID Translation and Routing.
- Outbound calls and Inbound calls.
- Voicemail.
- Auto-attendant

Features Not Supported

- Cisco IP phones used in this test do not support Blind Transfer, only Semi-attendant and Attendant transfers were tested.
- Comcast does not support G729 codec.

Caveats

Fax:

- Comcast does not support Fax with VoIP service.

Configuration Considerations

- None.

Note: Testing was conducted in tekVizion labs

Configuration

Cisco IOS Version

Comcast_CME#sh version
Cisco IOS XE Software, Version 16.09.03
Cisco IOS Software [Fuji], ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 16.9.3, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
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Compiled Wed 20-Mar-19 08:02 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

Comcast_CME uptime is 1 week, 5 days, 18 hours, 37 minutes
Uptime for this control processor is 1 week, 5 days, 18 hours, 39 minutes
System returned to ROM by Reload Command at 14:39:18 CDT Thu Sep 5 2019
System image file is "bootflash:isr4300-universalk9.16.09.03.SPA.bin"
Last reload reason: Reload Command

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
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http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Suite License Information for Module:'esg'

```
--------------------------------------------------------------------------------
Suite            Suite Current       Type          Suite Next reboot
--------------------------------------------------------------------------------
FoundationSuiteK9    FoundationSuiteK9    EvalRightToUse FoundationSuiteK9
securityk9
appxk9


AdvUCSuiteK9        AdvUCSuiteK9        EvalRightToUse AdvUCSuiteK9
uck9
cme-srst
cube
```

Technology Package License Information:

```
-----------------------------------------------------------------
Technology    Technology-package         Technology-package
              Current    Type          Next reboot
-----------------------------------------------------------------
appxk9         None       None           None
uck9           None       None           uck9
securityk9     None       None           securityk9
ipbase         ipbasek9   Permanent      ipbasek9
```

The current throughput level is 50000 kbps

Smart Licensing Status: Smart Licensing is DISABLED

cisco ISR4321/K9 (1RU) processor with 1784679K/6147K bytes of memory.
Processor board ID FLM1925D0WZ
3 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
3223551K bytes of flash memory at bootflash:.
0K bytes of WebUI ODM Files at webui:.

Configuration register is 0x2102

Note: Testing was conducted in tekVizion labs

Cisco Unified CME

Comcast_CME#sh run

version 16.9
service timestamps debug datetime msec
service timestamps log datetime msec
platform qfp utilization monitor load 80
no platform punt-keepalive disable-kernel-core
!
hostname Comcast_CME
!
boot-start-marker
boot system flash isr4300-universalk9.16.09.03.SPA.bin
boot-end-marker
!
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
 !
no logging console
enable secret 5 1Rrx8$nm82keZ4yvW0V88d7JHI.0
enable password XXXXX
!
no aaa new-model
clock timezone CST -6 0
clock summer-time CDT recurring
!
ip admission watch-list expiry-time 0
!
login on-success log
!
subscriber templating
!
multilink bundle-name authenticated
!
crypto pki trustpoint TP-self-signed-1270583006
 enrollment selfsigned
 subject-name cn=IOS-Self-Signed-Certificate-1270583006
 revocation-check none
 rsakeypair TP-self-signed-1270583006
!

Note: Testing was conducted in tekVizion labs

```
crypto pki certificate chain TP-self-signed-1270583006
 certificate self-signed 01
 !
voice service voip
 ip address trusted list
 no ip address trusted authenticate
 media disable-detailed-stats
 allow-connections h323 to h323
 allow-connections h323 to sip
 allow-connections sip to h323
 allow-connections sip to sip[1]
 no supplementary-service sip moved-temporarily
 no supplementary-service sip refer
 no supplementary-service sip handle-replaces
 redirect ip2ip
 fax protocol pass-through g711ulaw
 sip
  session refresh[2]
  registrar server expires max 600 min 60[3]
  asserted-id pai
!
voice class codec 1[4]
 codec preference 1 g711ulaw
!
voice register global
 mode cme[5]
 source-address 10.70.24.10 port 5060[6]
 max-dn 20[7]
 max-pool 10[8]

 load 7965 SIP45.9-2-1S.loads[9]
 load 9971 sip9971.9-3-1-33.loads
 mwi stutter
 voicemail 7777
 tftp-path flash:[10]
 file text
```

---

[1] This command enables Cisco Unified CME to perform basic SIP to SIP voice communication.

[2] Use the SIP session refresh command to send the session refresh request.

[3] Enable Local SIP Registrar which is required for SIP phones in Cisco Unified CME.

[4] This command enables multiple codec support and performs codec filtering required for correct interoperability between Comcast SIP network and Cisco Unified CME.

[5] Enables the mode for configuring SIP IP phones in Cisco Unified CME.

[6] This is the source address for SIP phone registration.

[7] Configuration for maximum extensions.

[8] Configuration for maximum phones.

[9] Specify phone loads for each phone type.

[10] Setup path for tftp files.

Note: Testing was conducted in tekVizion labs

```
create profile sync 0055440594117554[11]
auto-register
!
voice register dn  1
 number 0425
 name Comcast Phone 1
 mwi
!
voice register dn  2
 number 0426
 name Comcast Phone 2
 mwi
!
voice register pool  1
 id mac 1C17.D337.D08D
 type 9971
 number 1 dn 1
 dtmf-relay rtp-nte
 voice-class codec 1
!
voice register pool  2
 id mac 001D.452C.D981
 type 7965
 number 1 dn 2
 dtmf-relay rtp-nte
 voice-class codec 1
!
voice moh-group 1
 moh enable-g711 "flash:music-on-hold.au"
!
voice translation-rule 1[12]
 rule 1 /\(^0...\)/ /856333\1/
!
voice translation-rule 2[13]
 rule 1 /856333\(....\)/ /\1/
!
voice translation-profile to_Comcast
 translate calling 1
!
voice translation-profile to_ext
 translate called 2
!
license udi pid ISR4321/K9 sn FDO19220WQ8
license accept end user agreement
```

---

[11] Create configuration files for phones.

[12] This translation rule/profile is used to modify the calling number.

[13] This translation rule/profile is used to modify the called number.

Note: Testing was conducted in tekVizion labs

license boot suite FoundationSuiteK9
license boot suite AdvUCSuiteK9
no license smart enable
diagnostic bootup level minimal
!
spanning-tree extend system-id
!
redundancy
 mode none
!
interface GigabitEthernet0/0/0
 description WAN
 ip address 10.70.23.2 255.255.255.0
 negotiation auto
!
interface GigabitEthernet0/0/1
 description LAN
 ip address 10.70.24.10 255.255.255.0
 negotiation auto
!
interface GigabitEthernet0/1/0
 no ip address
 shutdown
 negotiation auto
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 shutdown
 negotiation auto
!
ip forward-protocol nd
ip http server
ip http authentication local
ip http secure-server
ip http client source-interface GigabitEthernet0/0/1
ip tftp source-interface GigabitEthernet0/0/1
ip route 10.64.0.0 255.255.0.0 10.70.24.1
ip route 10.80.0.0 255.255.0.0 10.70.24.1
!
tftp-server flash:sip9971.9-3-1-33.loads
tftp-server flash:kern9971.9-3-1-33.sebn
tftp-server flash:rootfs9971.9-3-1-33.sebn
tftp-server flash:sboot9971.031610R1-9-3-1-33.sebn
tftp-server flash:skern9971.022809R2-9-3-1-33.sebn
tftp-server flash:dkern9971.100609R2-9-3-1-33.sebn
tftp-server flash:apps45.9-2-1TH1-13.sbn
tftp-server flash:cnu45.9-2-1TH1-13.sbn

Note: Testing was conducted in tekVizion labs

```
tftp-server flash:cvm45sip.9-2-1TH1-13.sbn
tftp-server flash:dsp45.9-2-1TH1-13.sbn
tftp-server flash:jar45sip.9-2-1TH1-13.sbn
tftp-server flash:SIP45.9-2-1S.loads
tftp-server flash:term45.default.loads
tftp-server flash:term65.default.loads
tftp-server flash:apps41.9-2-1TH1-13.sbn
tftp-server flash:cnu41.9-2-1TH1-13.sbn
tftp-server flash:cvm41sccp.9-2-1TH1-13.sbn
tftp-server flash:dsp41.9-2-1TH1-13.sbn
tftp-server flash:jar41sccp.9-2-1TH1-13.sbn
tftp-server flash:SCCP41.9-2-1S.loads
tftp-server flash:term41.default.loads
tftp-server flash:term61.default.loads
tftp-server flash:P0030801SR02.bin
tftp-server flash:P0030801SR02.loads
tftp-server flash:P0030801SR02.sb2
tftp-server flash:P0030801SR02.sbn
tftp-server flash:P0030801SR02.txt
tftp-server flash:music-on-hold.au
!
control-plane
!
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
 conference transfer-pattern
 max-ephones 20
 max-dn 20
 ip source-address 10.70.24.10 port 2000
 load 7960-7940 P0030801SR02.loads
 load 7961 SCCP41.9-2-1S.loads
 load 7975 SCCP75.9-4-2SR3-1S
 time-zone 8
 voicemail 7777[14]
 max-conferences 8 gain -6
 call-forward pattern .T
 moh enable-g711 "music-on-hold.au"[15]
 transfer-system full-consult
 transfer-pattern .T
```

---

[14] 7777 - Voice mail pilot number used in this example.
[15] This is Music on Hold file configured in this example.

Note: Testing was conducted in tekVizion labs

```
create cnf-files version-stamp Jan 01 2002 00:00:00
!
dspfarm profile 1 transcode universal[16]
 codec g711ulaw
!
dial-peer voice 100 voip
 description Outbound Call to Comcast
 translation-profile outgoing to_Comcast
 destination-pattern .T
 session protocol sipv2
 session target ipv4:10.70.23.10:5060[17]
 session transport udp
 voice-class codec 1[18]
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 101 voip
 description inbound from Comcast
 translation-profile incoming to_ext
 session protocol sipv2
 session transport udp
 incoming called-number 856333....
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 102 voip[19]
 description to UnityConnection
 destination-pattern 7777
 session protocol sipv2
 session target ipv4:10.80.14.4:5060[20]
 session transport udp
 voice-class codec 1
 dtmf-relay rtp-nte
 no vad
!
sip-ua
 mwi-server ipv4:10.80.14.4 expires 3600 port 5060 transport udp unsolicited
!
ephone-dn  1
 number 0427
 label 0427
```

---

[16] Transcoding profile used in this example.

[17] This command sets the SIP server target for outgoing SIP calls.

[18] This command assigns the voice class codec setting to this dial-peer.

[19] Dial peer used to route the calls to Cisco unity connection server for Voicemail access.

[20] This command sets the Cisco unity connection server target for voicemail calls.

Note: Testing was conducted in tekVizion labs

```
 name SCCP
 moh-group 1
 !
ephone-dn  2
 number 0428
 label 0428
 name SCCP
 mwi sip
 moh-group 1
 !
ephone  1
 device-security-mode none
 mac-address 001C.5856.CFE6
 type 7961
 mwi-line 1
 button  1:1
 !
ephone  2
 device-security-mode none
 mac-address FCFB.FBCA.533F
 type 7960
 mwi-line 1
 button  1:2
 !
line con 0
 password XXXXX
 transport input none
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 0 0
 privilege level 15
 password XXXXXX
 login
 transport input telnet ssh
line vty 5 15
 exec-timeout 0 0
 privilege level 15
 password XXXXXX
 login
 transport input telnet ssh
 !
ntp server 10.10.10.5
 !
end
```

Note: Testing was conducted in tekVizion labs

Cisco Unity Connection

Version Details

Cisco Unity Connection Administration

Version 12.0.1.21900-10

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For information about Cisco Unified Communications Manager please visit our Unified Communications System Documentation web site.

For Cisco Technical Support please visit our Technical Support web site.

Cisco Unity Connection User Configuration

Navigation: Cisco Unity Connection → Users → Users

Set Alias*= 0425. This is used for this example.

Set First Name = 0425 is used to identify this User.

Set Last Name* = 0425. This is used for this example

Set Display Name= 0425. This is used in this example.

Set SMTP Address =0425. This is used in this example.

Set Extension = 0425. This is used in this example.

Set Phone System= Comcast_CME_10.70.24.10. This is used in this example.

All other values are default.

Note: Testing was conducted in tekVizion labs

Cisco Unity Connection User Configuration (Continued)

All other values are default.

Cisco Unity Connection Telephony Integration

Navigation: Telephony Integrations → Phone system

Set System Name* = CME. This Name used for this example.

Port Group

Navigation: Telephony Integration → Port Group.

Set Display Name* = CME-1. This Name used for this example.

Check Register with SIP server.

Navigation Path: Telephony Integration→ Port Group → Edit → Servers.

Port

Set Port Name = CME-1-001. This Name used for this example.

Phone System = CME.

Port Group = CME-1.

Server = unity-unity2.lab.tekvizion.com. This Name used for this example.

Note: Testing was conducted in tekVizion labs

Acronyms

SIP	Session Initiation Protocol
MGCP	Media Gateway Control Protocol
SCCP	Skinny Client Control Protocol
Cisco Unified CME	Cisco Unified Communications Manager Express
SP	Service Provider
PSTN	Public switched telephone network
DTMF	Dual Tone Multi-Frequency
CUC	Cisco Unity Connection
VOIP	Voice Over Internet Protocol
IP	Internet Protocol
TDM	Time-division multiplexing
BTN	Billed (or Billing) Telephone Number
CODEC	Coder-Decoder (in this document a device used to digitize and un digitize voice signals)

Note: Testing was conducted in tekVizion labs

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