



Avaya Definity G3 Version CM2.0 to Cisco IOS Voice Gateway using H.323 with E1 R2

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Introduction

- This Application note provides basic call interoperability and documented steps and configurations necessary for H.323 integration between Avaya Definity G3 Version CM 2.0 to Cisco IOS Voice Gateway providing E1 R2 PSTN connectivity.
- The H.323 protocol is used between Cisco IOS Voice gateway and Avaya Definity G3 Version CM 2.0. The connection between Cisco IOS gateway and PSTN uses E1 R2 signaling.
- Features tested include Basic call, Call Transfer supervised, Call Transfer blind, Call Forward (All, Busy and No Answer), Three-way Conference, DTMF tones, Caller ID functionality between Avaya Definity G3 Version CM 2.0 users and PSTN users.
- The Cisco IOS Voice Gateway offers the advantage of providing connectivity between Avaya Definity G3 Version CM 2.0 and PSTN by offering H.323 to E1 R2 inter-working functionality.
- The network topology diagram (Figure 1) shows the test setup for end-to-end interoperability with the Cisco IOS Voice Gateway connected to the Avaya Definity G3 Version CM 2.0 and connected to the PSTN via E1 R2.
- This Application Notes uses the C3825 IOS-voice-gateway, however other Cisco voice gateways are also an option to use since the voice gateway implementation does not depend on the platform. Below is a list of Cisco platforms capable of voice gateway functionality: Care must be taken when selecting a voice gateway platform depending on the capacity and capability required for the intended deployment.

[Cisco 1861 Integrated Services Router](#)

[Cisco IAD2400 Series Integrated Access Device](#)

[Cisco 2800 Series Integrated Services Routers](#)

[Cisco 3700 Series Multi-service Access Routers](#)

[Cisco 3800 Series Integrated Services Routers](#)

[Cisco AS5350XM Universal Gateway](#)

[Cisco AS5400XM Universal Gateway](#)

Network Topology

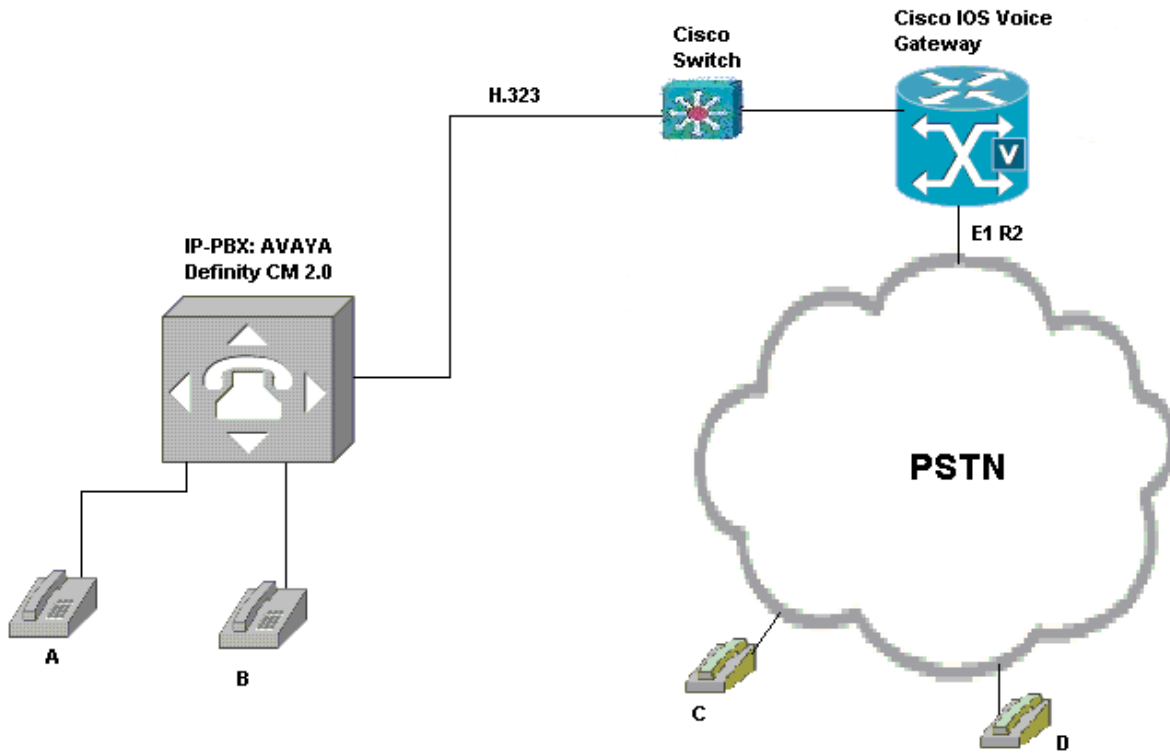


Figure 1. Network Topology

Limitations

- DTMF tones using RFC2833 feature does not interoperate due to signaling inconsistencies between the Avaya Definity CM2.0 PBX and the Cisco IOS Voice Gateway.



System Components

Hardware requirements

- Cisco Hardware
 - Cisco 3825 Gateway
 - DSP Mod. NM-HDV2-2T1/E1
 - Cisco Cat 3550 Power Ethernet switch
- Avaya Definity CM Hardware
 - Avaya Definity G3 Version CM 2.0.

Software Requirements

- IOS Software releases: c3825-ipvoiceek9-mz.124-11.xj.bin
- PBX Software: Avaya Definity G3 Version CM 2.0

Features

Features Supported

- Codec G.711(alaw, ulaw)
- Codec G.729(a, b)
- Codec G723(r53 and r63) ¹
- Call Transfer blind
- Call Transfer Supervised
- Call Conference
- Call on-hold
- Call Forward No Reply
- Call Forward all
- Call Forward Busy
- DTMF tones using In-Band and Out-Of-Band (DTMF with H245 signaling) signaling
- Digit translation – The voice gateway can modify the digits of the called 4-digit number sent by Avaya Definity G3 Version CM 2.0 and PSTN

Features Not Supported

- DTMF tones using RFC2833

¹ G.723 Codec does not work with DSP module NM-HDV and work with NM-HDV2-2T1/E1.



Configuration

Configuring Avaya Definity G3 Version CM 2.0

Trunk Group

The screenshot displays the Avaya V7 configuration interface for a Trunk Group. The window title is "Avaya_V7" and the active command is "display trunk-group 91". The interface includes a toolbar with various icons and a menu bar with options like "send (return)", "help (F5)", "cancel (esc)", "enter (F3)", "schedule (F9)", "next (F7)", "previous (F8)", and "next form (F6)".

The configuration details for Trunk Group 91 are as follows:

```
1 2 3 4 5 6 7 8 9 10
TRUNK GROUP
Group Number: 91          Group Type: isdn          CDR Reports: y
Group Name:  OUTSIDE CALL   COR: 1          TN: 1          TAC: 691
Direction: two-way        Outgoing Display? n    Carrier Medium: IP
Dial Access? y            Busy Threshold: 99     Night Service:
Queue Length: 0
Service Type: tie          Auth Code? n          TestCall ITC: rest
                          Far End Test Line No:

TestCall BCC: 4
TRUNK PARAMETERS
  Codeset to Send Display: 0    Codeset to Send National IEs: 6
  Max Message Size to Send: 260 Charge Advice: none
  Supplementary Service Protocol: a  Digit Handling (in/out): enbloc/enbloc

  Trunk Hunt: ascend          QSIG Value-Added? n
                              Digital Loss Group: 18
  Calling Number - Delete:      Insert:              Numbering Format: unk-unk
  Bit Rate: 1200                Synchronization: async Duplex: full
  Disconnect Supervision - In? y Out? n
  Answer Supervision Timeout: 0
```

The left sidebar contains a "General" section with the following options: Start GEDI, Add User, Change User Name, Remove User, Add Bridged Appearance, Browse Dial Ranges, Browse Stations, Browse Unused Ports, Find Unused Extension, and Print Button Labels. Below this are sections for "Advanced" and "Fault & Performance". At the bottom of the sidebar are "Tasks" and "Tree" buttons.



Trunk Group Cont'd

display trunk-group 91 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

TRUNK GROUP
 Administered Members (min/max): 1/4
 Total Administered Members: 4

GROUP MEMBER ASSIGNMENTS

Port	Code Sfx	Name	Night	Sig Grp
1:	T00025			91
2:	T00027			91
3:	T00038			91
4:	T00039			91
5:				
6:				
7:				
8:				
9:				
10:				
11:				
12:				
13:				
14:				
15:				

General
 Start GEDI
 Add User
 Change User Name
 Remove User
 Add Bridged Appearance
 Browse Dial Ranges
 Browse Stations
 Browse Unused Ports
 Find Unused Extension
 Print Button Labels
 Advanced
 Fault & Performance

Signaling Group

display signaling-group 91 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2 | 3 | 4 | 5

SIGNALING GROUP

Group Number: 91 **Group Type: h.323**
 Remote Office? n Max number of NCA TSC: 2
 SBS? n Max number of CA TSC: 2
 Trunk Group for NCA TSC: 91

Trunk Group for Channel Selection: 91
 Supplementary Service Protocol: a

Near-end Node Name: clan **Far-end Node Name: Ri-GW**
 Near-end Listen Port: 1720 Far-end Listen Port: 1720
 Far-end Network Region: 1

LRQ Required? n Calls Share IP Signaling Connection? n
 RRQ Required? n Bypass If IP Threshold Exceeded? n

DTMF over IP: in-band Direct IP-IP Audio Connections? n
 IP Audio Hairpinning? n
 Interworking Message: PROGRESS

General
 Start GEDI
 Add User
 Change User Name
 Remove User
 Add Bridged Appearance
 Browse Dial Ranges
 Browse Stations
 Browse Unused Ports
 Find Unused Extension
 Print Button Labels
 Advanced
 Fault & Performance



Node Name IP

send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

IP NODE NAMES	
Name	IP Address
CCM	172.20 .245.254
MultiVantage	172.20 .7 .252
Ri-GW	172.20 .192.102
Tony-GW	172.20 .228.31
U.10	172.20 .233.254
Webswitch	172.20 .3 .245
ccm4-1	172.20 .231.254
clan	172.20 .232.254
default	0 .0 .0 .0
gateway	172.20 .232.1
medpro	172.20 .232.253

(11 of 11 administered node-names were displayed)
 Use 'list node-names' command to see all the administered node-names
 Use 'change node-names ip xxx' to change a node-name 'xxx' or add a node-name

General
 Start GEDI
 Add User
 Change User Name
 Remove User
 Add Bridged Appearance
 Browse Dial Ranges
 Browse Stations
 Browse Unused Ports
 Find Unused Extension
 Print Button Labels
 Advanced
 Fault & Performance

IP Network Region 1

display ip-network-region 1 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2 | 3 | 4 | 5 | 6 | 7 |

IP NETWORK REGION

Region: 1
 Location: 1
 Name: Default IP Stuff

Intra-region IP-IP Direct Audio: no
 Inter-region IP-IP Direct Audio: no
 IP Audio Hairpinning? y

AUDIO PARAMETERS
 Codec Set: 1
 UDP Port Min: 2048
 UDP Port Max: 3028
 RTCP Reporting Enabled? y

RTCP MONITOR SERVER PARAMETERS
 Use Default Server Parameters? y

DIFFSERV/TOS PARAMETERS
 Call Control PHB Value: 34
 Audio PHB Value: 46

802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 7
 Audio 802.1p Priority: 6

AUDIO RESOURCE RESERVATION PARAMETERS
 RSVP Enabled? n

H.323 IP ENDPOINTS
 H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
 Keep-Alive Interval (sec): 5
 Keep-Alive Count: 5

General
 Start GEDI
 Add User
 Change User Name
 Remove User
 Add Bridged Appearance
 Browse Dial Ranges
 Browse Stations
 Browse Unused Ports
 Find Unused Extension
 Print Button Labels
 Advanced
 Fault & Performance



IP Network Region cont'd

display ip-network-region 1 | send (return) | help (f5) | cancel (esc) | enter (f3) | schedule (f9) | next (f7) | previous (f8) | next form (f6)

1 | 2 | 3 | 4 | 5 | 6 | 7

Inter Network Region Connection Management

src rgn	dst rgn	codec-set
1	1	1
1	2	
1	3	
1	4	
1	5	
1	6	
1	7	
1	8	
1	9	
1	10	
1	11	
1	12	
1	13	
1	14	
1	15	

General

- Start GEDI
- Add User
- Change User Name
- Remove User
- Add Bridged Appearance
- Browse Dial Ranges
- Browse Stations
- Browse Unused Ports
- Find Unused Extension
- Print Button Labels

Advanced

Fault & Performance

IP Codec Set 1²

send (return) | help (f5) | cancel (esc) | enter (f3) | schedule (f9) | next (f7) | previous (f8) | next form (f6)

IP Codec Set

Codec Set: 1

Audio Codec	Silence Suppression	Frames Per Pkt	Packet Size(ms)
1: G.711MU	n	2	20
2: G.729	n	2	20
3:			
4:			
5:			
6:			
7:			

General

- Start GEDI
- Add User
- Change User Name
- Remove User
- Add Bridged Appearance
- Browse Dial Ranges
- Browse Stations
- Browse Unused Ports
- Find Unused Extension
- Print Button Labels

Advanced

Fault & Performance

² Change Audio Codec to match with the IOS Media Gateway when testing Codecs.



Station Configuration cont'd

display station 2010 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2 | 3 | 4 |

STATION

SITE DATA

Room:	Headset? n
Jack:	Speaker? n
Cable:	Mounting: d
Floor:	Cord Length: 0
Building:	Set Color:

ABBREVIATED DIALING

List1:	List2:	List3:
--------	--------	--------

BUTTON ASSIGNMENTS

1: call-appr	6:
2: call-appr	7:
3: cfw-d-bsd Ext:	8:
4:	9:
5:	10: last-numb

General

- Start GEDI
- Add User
- Change User Name
- Remove User
- Add Bridged Appearance
- Browse Dial Ranges
- Browse Stations
- Browse Unused Ports
- Find Unused Extension
- Print Button Labels

Advanced

Fault & Performance

Station Configuration cont'd

display station 2010 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2 | 3 | 4 |

STATION

SOFTKEY BUTTON ASSIGNMENTS

1: lwc-store
2: lwc-cancel
3: auto-cback
4: timer
5: call-fwd Ext:
6: call-park
7: date-time
8: priority
9: abr-prog
10: abr-spchar Char: ~p
11: abr-spchar Char: ~m
12: abr-spchar Char: ~w

General

- Start GEDI
- Add User
- Change User Name
- Remove User
- Add Bridged Appearance
- Browse Dial Ranges
- Browse Stations
- Browse Unused Ports
- Find Unused Extension
- Print Button Labels

Advanced

Fault & Performance



ARS Analysis 4

display ars analysis 4 | send (return) | help (f5) | cancel (esc) | enter (f3) | schedule (f9) | next (f7) | previous (f8) | next form (f6)

1 2 |

ARS DIGIT ANALYSIS TABLE
Location: all Percent Full: 9

Dialed String	Total		Route Pattern	Call Type	Node Num	ANI Reqd
	Min	Max				
4	4	4	12	loc1		n
40	4	4	91	lput		n
408	10	10	16	lput		n
410	5	5	16	lput		n
411	3	3	deny	svcl		n
469	10	10	34	fnpa		n
5	4	4	16	nat1		n
555	7	7	deny	hnpa		n
6	7	7	2	hnpa		n
603	7	7	3	hnpa		n
606	7	7	11	hnpa		n
608	3	3	8	svcl		n
611	3	3	1	svcl		n
7	7	7	2	hnpa		n
70	4	4	91	loc1		n

General | Start GEDI | Add User | Change User Name | Remove User | Add Bridged Appearance | Browse Dial Ranges | Browse Stations | Browse Unused Ports | Find Unused Extension | Print Button Labels | Advanced | Fault & Performance

Route Pattern 91

send (return) | help (f5) | cancel (esc) | enter (f3) | schedule (f9) | next (f7) | previous (f8) | next form (f6)

Pattern Number: 91 Pattern Name: H323

Grp No	FRL	NPA	Pfx	Hop	Toll	No.	Inserted	DCS/ IXC
	Mrk			Lmt	List	Del	Digits	QSIG
					Request		Dgts	Intw
1:	91	0					0	n user
2:								n user
3:								n user
4:								n user
5:								n user
6:								n user

BCC	VALUE	TSC	CA-TSC	ITC	BCIE	Service/Feature	BAND	No.	Numbering	LAR
0	1	2	3	4	W	Request		Dgts	Format	Subaddress
1:	y	y	y	y	n	y	as-needed	rest	unk-unk	none
2:	y	y	y	y	n	n		rest		none
3:	y	y	y	y	n	n		rest		none
4:	y	y	y	y	n	n		rest		none
5:	y	y	y	y	n	n		rest		none
6:	y	y	y	y	n	n		rest		none

General | Start GEDI | Add User | Change User Name | Remove User | Add Bridged Appearance | Browse Dial Ranges | Browse Stations | Browse Unused Ports | Find Unused Extension | Print Button Labels | Advanced | Fault & Performance



Cisco 3825 configuration

```
Router#sh ver
Cisco IOS Software, 3800 Software (C3825-IPVOICEK9-M), Version 12.4(11)XJ, RELEA
SE SOFTWARE (fc1)
Synched to technology version 12.4(11)T
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Fri 22-Dec-06 04:46 by prod_rel_team
```

```
ROM: System Bootstrap, Version 12.3(11r)T2, RELEASE SOFTWARE (fc1)
```

```
Router uptime is 4 weeks, 6 days, 4 hours, 16 minutes
System returned to ROM by power-on
System image file is "flash:c3825-ipvoicek9-mz.124-11.XJ.bin"
```

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at: <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.

```
Cisco 3825 (revision 1.0) with 222208K/39936K bytes of memory.
Processor board ID FTX0946A1BV
2 Gigabit Ethernet interfaces
22 Serial interfaces
4 Channelized E1/PRI ports
2 Voice FXO interfaces
2 Voice FXS interfaces
DRAM configuration is 64 bits wide with parity enabled.
479K bytes of NVRAM.
62720K bytes of ATA System CompactFlash (Read/Write)
```

```
Configuration register is 0x2102
```

Router#sh run

```
Building configuration...
```

```
Current configuration : 2781 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
```



```
!  
card type e1 2 1  
logging buffered 1000000  
no logging console  
!  
no aaa new-model  
no network-clock-participate slot 1  
network-clock-participate slot 2  
network-clock-select 1 E1 2/1  
voice-card 0  
no dspfarm  
!  
voice-card 1  
dspfarm  
!  
voice-card 2  
no dspfarm  
!  
ip cef  
!  
!  
!  
multilink bundle-name authenticated  
!  
isdn gateway-max-interworking  
!  
!  
!  
voice service voip  
h323  
!  
!  
!  
voice translation-rule 1  
rule 1 /41/ /20\1/  
!  
voice translation-rule 23  
rule 1 /40/ /42\1/  
!  
!  
voice translation-profile pots  
translate called 1  
!  
voice translation-profile voip  
translate called 2  
!  
!  
archive  
log config  
hidekeys  
!  
!
```

³ The voice gateway manipulates the called and calling digits to match configured dial-peers and to route calls appropriately. For example: Digit manipulation rule 1 of voice translation rule 2 instructs IOS gateway that when it receives 40xx, IOS gateway is to strip 40, and add digit 42 as leading number to the remaining digits xx (xx in this case are either 04 or 05) and send them to the appropriate dial-peer.



```
controller E1 1/0/0
!
controller E1 1/0/1
!
controller E1 2/0
!
controller E1 2/1
framing NO-CRC4
clock source line bits
ds0-group 1 timeslots 1-15,17-31 type r2-digital r2-compelled ani4
vlan internal allocation policy ascending
!
!
!
interface GigabitEthernet0/0
ip address 172.20.192.102 255.255.255.0
duplex auto
speed auto
media-type rj45
no keepalive
!
interface GigabitEthernet0/1
no ip address
shutdown
duplex auto
speed auto
media-type rj45
no keepalive
!
!
ip default-gateway 172.20.192.1
ip route 0.0.0.0 0.0.0.0 172.20.192.1
!
!
ip http server
no ip http secure-server
!
!
!
control-plane
!
!
!
voice-port 0/0/0
!
voice-port 0/2/0
!
voice-port 0/2/1
!
voice-port 1/0/0:15
!
voice-port 2/0:15
!
voice-port 2/1:1
```

⁴ Specify E1 R2 interface



```
!  
!  
!  
dial-peer voice 4100 voip5  
description call in H323 voip  
translation-profile incoming voip  
destination-pattern 20..  
session target ipv4:172.20.232.254  
session transport tcp  
incoming called-number 40..  
dtmf-relay h245-alphanumeric h245-signal6  
codec g711ulaw7  
!  
dial-peer voice 4000 pots8  
translation-profile incoming pots  
destination-pattern 42..  
direct-inward-dial  
port 2/1:1  
forward-digits all  
!  
!  
!  
line con 0  
stopbits 1  
line aux 0  
stopbits 1  
line vty 0 4  
login  
!  
scheduler allocate 20000 1000  
!  
end  
  
Router#
```

⁵ Dial-peer voice toward IP PBX

⁶ Insert this command for DTMF using Out-Of-Band (DTMF with H245 signaling) signaling. This command specified the IOS gateway to transports DTMF tones generated after call establishment out of band using a standard H.245 out-of-band method.

⁷ Specify CODEC here when testing CODEC. Also change CODEC settings at the PBX end to match the specified codec at the IOS Media Gateway

⁸ Dial-peer voice toward PSTN



Acronyms

Acronym	Definitions
Cisco IOS	Cisco Internetwork Operating System
PSTN	Public switched Telephone Network

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