



Avaya Definity G3 Version CM2.0 to Cisco IOS Voice Gateway using H.323 with T1 NI2

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Introduction

- This Application note provides basic call interoperability and documented steps and configurations necessary for H323 integration between Avaya Definity G3 Version CM 2.0 to Cisco IOS Voice Gateway providing T1 NI2 PSTN connectivity.
- The H323 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 T1 PRI with switch-type NI2 protocol.
- 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 H323 to ISDN 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 T1 NI2 ISDN.
- 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

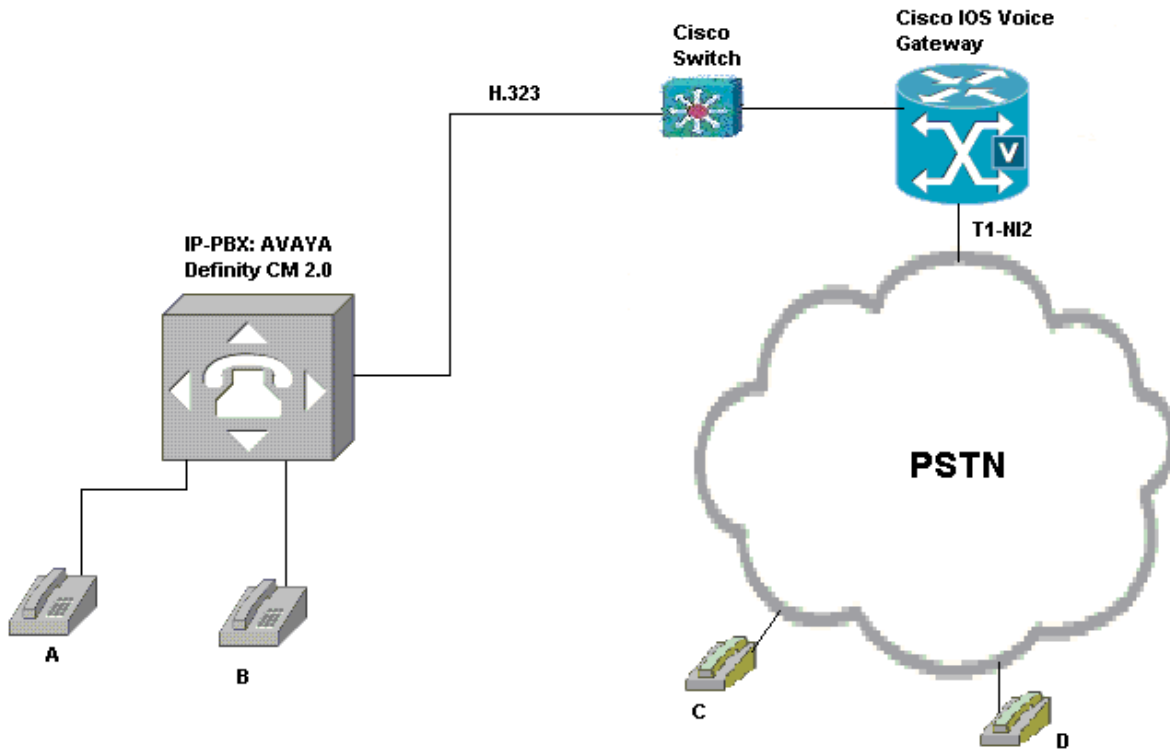


Figure 1. Network Topology

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/E1¹
 - 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

- Calling Name Identification Restriction
- Calling Number Identification Restriction
- Codec G.711 Ulaw
- Codec G.729
- Codec G.723
- Calling name
- Calling number
- 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 configuration interface for a Trunk Group in Avaya Definity G3. The window title is "Avaya_V7". The main content area shows the configuration for "TRUNK GROUP 91".

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

Calling Number - Delete: **Insert:** **Digital Loss Group:** 18

Bit Rate: 1200 **Synchronization:** async **Numbering Format:** unk-unk

Disconnect Supervision - In? y **Out?** n **Duplex:** full

Answer Supervision Timeout: 0

The interface includes a left-hand navigation pane with options like "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". At the bottom, there are buttons for "Tasks" and "Tree".



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 FEATURES

ACA Assignment? n Measured: none Wideband Support? n
 Internal Alert? n Maintenance Tests? y
 Data Restriction? n NCA-TSC Trunk Member: 1
 Send Name: y Send Calling Number: y

Used for DCS? n
 Suppress # Outpulsing? n Numbering Format: unknown
 Outgoing Channel ID Encoding: preferred UUI IE Treatment: service-provider

Replace Restricted Numbers? y
 Replace Unavailable Numbers? y
 Send Connected Number: y

Send UUI IE? y
 Send UCID? n
 Send Codeset 6/7 LAI IE? y

SBS? n Network (Japan) Needs Connect Before Disconnect? n

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

INCOMING CALL HANDLING TREATMENT

Service/ Feature	Called Len	Called Number	Del	Insert	Per Call CPN/BN	Night Serv



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:				

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



Node Name IP

The screenshot shows the Cisco Unified Communications Manager GUI. The left sidebar contains a navigation menu with options like 'Start GEDI', 'Add User', 'Change User Name', etc. The main content area is titled 'IP NODE NAMES' and displays a table of node names and their IP addresses.

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

IP Network Region 1

The screenshot shows the Cisco Unified Communications Manager GUI for the 'IP Network Region 1' configuration page. The left sidebar is the same as in the previous screenshot. The main content area displays various configuration parameters for the region.

Region: 1
Location: 1
Name: Default IP Stuff

AUDIO PARAMETERS
Codec Set: 1
UDP Port Min: 2048
UDP Port Max: 3028

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

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

AUDIO RESOURCE RESERVATION PARAMETERS
RSVP Enabled? n

RTCP MONITOR SERVER PARAMETERS
Use Default Server Parameters? y

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



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 IRS 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: cfwd-bsyda 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

ARS DIGIT ANALYSIS TABLE							
Location: all							
Percent Full: 9							
Dialed String	Total Min	Total Max	Route Pattern	Call Type	Node Num	ANI	Reqd
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	

Route Pattern 91

Pattern Number: 91 Pattern Name: H323															
Grp No	FRL	NPA	Pfx	Hop	Toll	No.	Inserted							DCS/ IXC	
		Mrk	Lmt	List	Del	Dgts	Digits							QSIG	
								Dgts							Intw
1:	91	0					0						n	user	
2:													n	user	
3:													n	user	
4:													n	user	
5:													n	user	
6:													n	user	

Grp No	BCC	VALUE	TSC	CA-TSC	ITC	BCIE	Service/Feature	BAND	No.	Numbering	LAR		
		0	1	2	3	4	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	



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 days, 17 hours, 59 minutes
System returned to ROM by reload at 22:51:20 UTC Thu Dec 6 2007
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 226304K/35840K bytes of memory.
Processor board ID FTX0946A1BV
2 Gigabit Ethernet interfaces
24 Serial interfaces
1 Channelized T1/PRI port
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 : 2044 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
```



```
!  
no logging buffered  
!  
no aaa new-model  
no network-clock-participate slot 1  
voice-card 0  
no dspfarm  
!  
voice-card 1  
dspfarm  
!  
ip cef  
!  
!  
!  
multilink bundle-name authenticated  
!  
isdn switch-type primary-ni  
!  
!  
!  
voice service voip  
h323  
!  
!  
!  
!  
voice translation-rule 13  
rule 1 /41/ /20\1/  
rule 2 /31477122/ /41\1/  
!  
voice translation-rule 2  
rule 1 /40/ /22\1/  
rule 2 /20/ /41\1/  
!  
!  
voice translation-profile pots  
translate calling 1  
translate called 1  
!  
voice translation-profile voip  
translate calling 2  
translate called 2  
!  
!  
!  
!  
!  
archive  
log config
```

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 1 instructs IOS gateway that when it receives 41xx, IOS gateway is to strip 41, and add digit 20 as leading number to the remaining digits xx (xx in this case are either 10 or 12) and send them to the appropriate dial-peer.



```
hidekeys
!  
!  
controller T1 1/0/0  
framing esf  
linecode b8zs  
pri-group timeslots 1-24  
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  
!  
interface Serial1/0/0:23  
no ip address  
encapsulation hdlc  
isdn switch-type primary-ni2c4  
isdn incoming-voice voice  
isdn supp-service name calling  
no cdp enable  
!  
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 0/0/1  
!  
voice-port 0/2/0  
!
```

⁴ This command specifies NI2 switch-type and enables Facility IE for Calling Name. The limitation is current IOS will not display this command under “show running-config”, it will display “primary-ni”.



```
voice-port 0/2/1
!
voice-port 1/0/0:23
!
!
!
!
dial-peer voice 2210 pots5
translation-profile incoming pots
destination-pattern 22..
incoming called-number 41..
direct-inward-dial
port 1/0/0:23
forward-digits all
!
dial-peer voice 4100 voip6
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-signal7
codec g711ulaw8
!
!
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 PSTN

⁶ Dial-peer voice toward PBX

⁷ 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.

⁸ Specify CODEC here when testing CODEC. Also change CODEC settings at the PBX end to match the specified codec at the IOS Media Gateway



Acronyms

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

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