



Avaya Definity G3 CM2.0 to Cisco IOS Voice Gateway using H323 with T1-CAS

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Introduction

- This Application note provides basic call interoperability and documented steps and configurations necessary for H323 integration between Avaya G3 CM2.0 to Cisco IOS Voice Gateway providing PSTN (T1 CAS) connectivity.
- The H323 protocol is used between Cisco IOS Voice gateway and Avaya G3 CM2.0. The connection between Cisco IOS gateway and PSTN uses T1-CAS (E&M-immediate start).
- Features tested include Basic call, Call Transfer supervised, Call Transfer blind, Call Forward (All, Busy and No Answer), Three-way Conference, DTMF tones between Avaya G3 CM2.0 users and PSTN.
- The Cisco IOS Voice Gateway offers the advantage of providing connectivity between Avaya G3 CM2.0 and PSTN by offering H323 to T1-CAS (robbed-bit signaling) 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 G3 CM2.0 (10/100baseT) and connected to the PSTN via T1-CAS (robbed-bit signaling).
- This Application Notes uses the C2432 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 IAD2430 Integrated Access Device](#)

[Cisco 2800 Series Integrated Services Routers](#)

[Cisco 3700 Series Multiservice Access Routers](#)

[Cisco 3800 Series Integrated Services Routers](#)

[Cisco AS5350XM Universal Gateway](#)

[Cisco AS5400XM Universal Gateway](#)

Network Topology

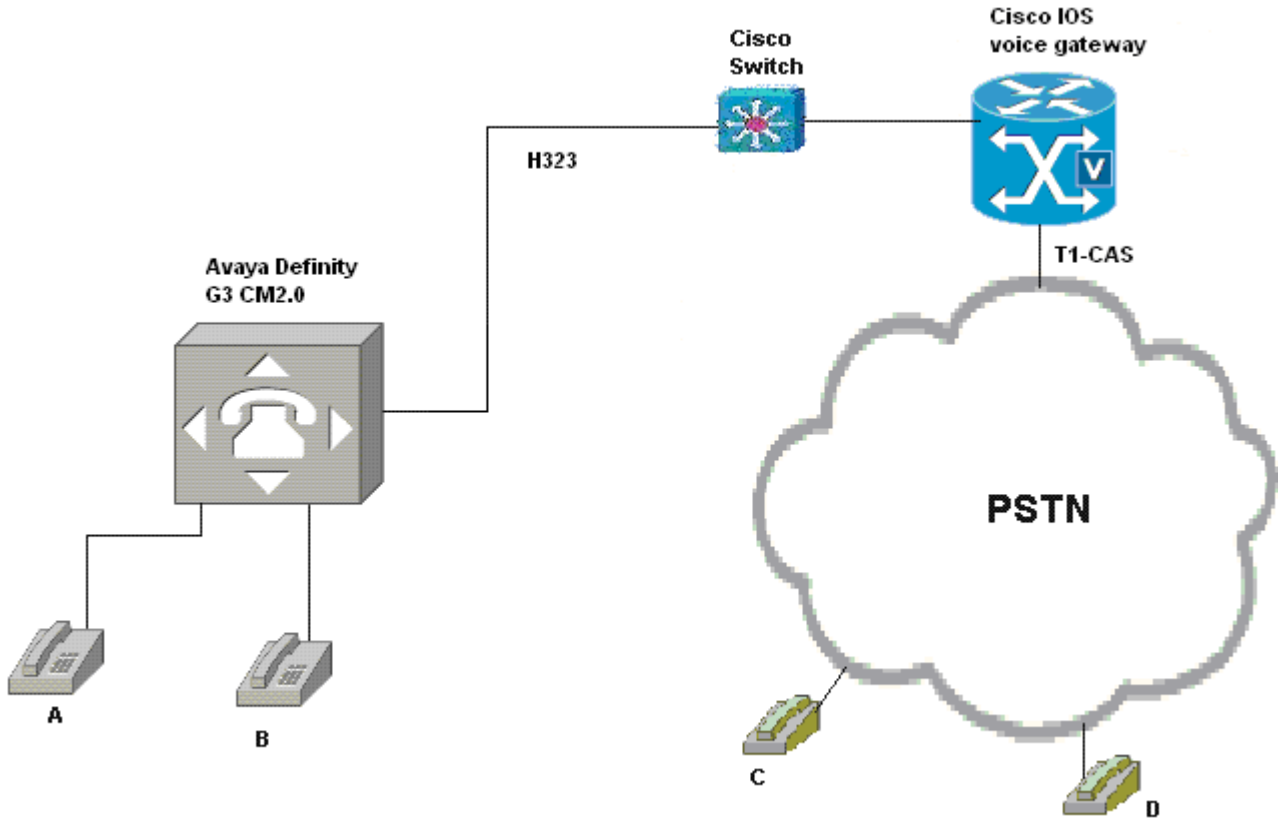


Figure 1. Network Topology



Limitations

- The signaling between both IOS Gateway and Avaya PBX fails to establish DTMF tones using RFC2833 and ends as an interoperability limitation.
- On a call initiated from the PSTN (ie. Phone A calls Phone C), the originating PSTN caller does not hear H.245 DTMF tones. This is an issue due to a lack of an optional feature on the Avaya PBX. This optional feature, Special Application SA8507 – H245 Support With Other Vendors, will address this issue.

System Components

Hardware requirements

Cisco equipment

- Cisco 2432 (Cisco IOS Voice Gateway)
- Cisco 3560 powered Ethernet switch

Avaya equipment

- Avaya Definity G3 CM2.0
- TN2312BP IPSI
- TN799DP C-LAN
- TN2302AP IP Media Processor
- TN2224B 2-wire Digital
- 2 - Digital stations 8410D

Software Requirements

- IOS Gateway: Cisco IOS Release – c2432: c2430-ik9o3s-mz.124-15.T1.bin
- Avaya Definity G3 CM2.0

Features

Features Supported

- Basic Call with G.711alaw, G.711ulaw, G.723 (5.3K and 6.3K), G.729(A and B)
- Call Transfer blind and Call Transfer Supervised
- Call Conference
- Call Forward All
- Call Forward No Reply
- Call Forward Busy
- Digit Translation
- DTMF tones using inband (G711)

Features Not Supported

- DTMF tones using RFC 2833



- DTMF tones using H245 (Alphanumeric or Signaling)
- T1-CAS does not support Calling name/number and Connected name/number



Configuration

Avaya Configuration

Signaling group (in band DTMF).

The screenshot shows a Cisco configuration window titled "Avaya_V7" with a toolbar at the top containing icons for save, copy, paste, and other functions. Below the toolbar is a navigation bar with buttons for "change signaling-group 98", "send (return)", "help (F5)", "cancel (esc)", "enter (F3)", "schedule (F9)", "next (F7)", "previous (F8)", and "next form (F6)".

The main configuration area is titled "SIGNALING GROUP" and contains the following fields:

- Group Number: 98
- Group Type: h.323
- Remote Office? n
- SBS? n
- Max number of NCA TSC:
- Max number of CA TSC:
- Trunk Group for NCA TSC:
- Trunk Group for Channel Selection:
- Supplementary Service Protocol:
- Near-end Node Name:
- Far-end Node Name:
- Near-end Listen Port:
- Far-end Listen Port:
- Far-end Network Region:
- LRQ Required? n
- RRQ Required? n
- Calls Share IP Signaling Connection? n
- Bypass If IP Threshold Exceeded? n
- DTMF over IP:
- Direct IP-IP Audio Connections? n
- IP Audio Hairpinning? n
- Interworking Message:

At the bottom of the window, there are buttons for "Tasks" and "Tree", and a footer note: "Right-click in a field to see a list of valid entries or help text".



Trunk group – p1 of 2

Avaya_V7

change trunk-group 98 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

Group Number: 98 Group Type: isdn CDR Reports:
Group Name: Cecily h323 COR: 1 TN: 1 TAC: 698
Direction: two-way Outgoing Display? Carrier Medium: IP
Dial Access? Busy Threshold: 99 Night Service:
Queue Length: 0
Service Type: tie Auth Code? TestCall ITC: rest
Far End Test Line No:
TestCall BCC:

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: cyclical QSIG Value-Added?
Digital Loss Group: 13
Calling Number - Delete: Insert: Numbering Format:
Bit Rate: 1200 Synchronization: async Duplex: full
Disconnect Supervision - In? Out?
Answer Supervision Timeout: 0

Advanced
Fault & Performance

Tasks Tree

Select an entry from the list



Trunk group – p2 of 2

Avaya_V7

change trunk-group 98 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? Measured: none Wideband Support?
Internal Alert? Maintenance Tests?
Data Restriction? NCA-TSC Trunk Member: 1
Send Name: Send Calling Number:

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

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

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

SBS? Network (Japan) Needs Connect Before Disconnect?

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

Tasks Tree

Right-click in a field to see a list of valid entries or help text



Node-names IP

The screenshot shows the Cisco Unified Communications Manager GUI. The left sidebar is set to 'General' and lists various tasks like 'Start GEDI', 'Add User', etc. The main content area displays the 'IP NODE NAMES' configuration page. At the top, there is a toolbar with buttons for 'send (return)', 'help (F5)', 'cancel (esc)', 'enter (F3)', 'schedule (F9)', 'next (F7)', 'previous (F8)', and 'next form (F6)'. Below the toolbar, the page title is 'IP NODE NAMES'. A table lists the configured node names and their IP addresses. Below the table, a message states '(12 of 12 administered node-names were displayed)' and provides instructions on how to view all administered node-names and how to change or add a node-name. At the bottom of the sidebar, there are buttons for 'Advanced', 'Fault & Performance', 'Tasks', and 'Tree'.

Name	IP Address
CCM	172.20 .245.254
Cecily-GW	172.20 .174.40
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

(12 of 12 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

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

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

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

DIFFSERU/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

Advanced
Fault & Performance
Tasks Tree



IP codec set

change ip-codec-set 1 | send (return) | help (F5) | cancel (esc) | enter (F3) | schedule (F9) | next (F7) | previous (F8) | next form (F6)

1

IP Codec Set

Codec Set: 1

Audio Codec	Silence Suppression	Frames Per Pkt	Packet Size(ms)
1: G.723-5.3K	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	30
2: G.711A	<input type="checkbox"/>	<input type="checkbox"/>	
3: G.711MU	<input type="checkbox"/>	<input type="checkbox"/>	
4: G.723-5.3K	<input type="checkbox"/>	<input type="checkbox"/>	
5: G.723-6.3K	<input type="checkbox"/>	<input type="checkbox"/>	
6: G.729	<input type="checkbox"/>	<input type="checkbox"/>	
7: G.729A	<input type="checkbox"/>	<input type="checkbox"/>	
G.729AB	<input type="checkbox"/>	<input type="checkbox"/>	

Advanced
Fault & Performance
Tasks Tree

Select an entry from the list



Uniform dialing plan

Avaya_V7

display uniform-dialplan 3 send (return) help (F5) cancel (esc) enter (F3) schedule (F9) next (F7) previous (F8) next form (F6)

1 2

UNIFORM DIAL PLAN TABLE

Percent Full: 0

Matching						Insert						Node									
Pattern	Len	Del	Digits	Net	Conv	Node	Pattern	Len	Del	Digits	Net	Conv	Node	Pattern	Len	Del	Digits	Net	Conv	Node	
3011	4	0	615	aar	n		3317	4	0	608	aar	n									
3012	4	0	615	aar	n		3318	4	0	608	aar	n									
3013	4	0	615	aar	n		4	4	0	668	aar	n									
3014	4	0	615	aar	n		4000	4	0	668	aar	n									
3020	4	0	615	aar	n		4001	4	0	616	aar	n									
31	4	0	310	aar	n		4002	4	0	616	aar	n									
311	4	0	612	aar	n		4003	4	0	555	aar	n									
3115	4	0	681	aar	n		4004	4	0	612	aar	n									
3116	4	0	681	aar	n		4005	4	0	555	aar	n									
3117	4	0	681	aar	n		4006	4	0	555	aar	n									
3118	4	0	681	aar	n		4007	4	0	678	aar	n									
3130	4	0	691	aar	n		41	4	0	698	aar	n									
321	4	0	615	aar	n		500	4	0	555	aar	n									
331	4	0	616	aar	n		5005	4	0	613	aar	n									
3315	4	0	608	aar	n		5017	4	0	616	aar	n									
3316	4	0	608	aar	n		5018	4	0	616	aar	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

Tasks Tree



AAR analysis

Avaya_V7

display aar analysis 668 send (return) help (f5) cancel (esc) enter (f3) schedule (f9) next (f7) previous (f8) next form (f6)

1 | 2

AAR DIGIT ANALYSIS TABLE Percent Full: 9

Dialed String	Total		Route Pattern	Call Type	Node Num	ANI Req'd
	Min	Max				
668	7	7	8	aar	n	
678	7	7	199	aar	n	
681	7	7	81	aar	n	
691	4	4	91	aar	n	
698	7	7	98	aar	n	
7	7	7	254	aar	n	
716	7	7	26	aar	n	
8	7	7	9	aar	n	
9	7	7	253	aar	n	
972	6	10	12	aar	n	
999	7	7	99	aar	n	
					n	
					n	
					n	
					n	

General

- Start GEDI
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Advanced

Fault & Performance

Tasks Tree



Route Pattern

Avaya_V7

send (return) help (F5) cancel (esc) enter (F3) schedule (F3) next (F7) previous (F8) next form (F6)

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

Tasks Tree

Pattern Number: 98 Pattern Name: H323-CC

Grp No	FRL	NPA	Pfx	Hop	To11	No. Del	Inserted Digits	DCS/ IXC	Intw
1:	98	0					3	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. Dgts	Numbering Format	LAR Subaddress
	0	1	2	3	4	W	Request							
1:	y	y	y	y	y	n	y	as-needed	rest					none
2:	y	y	y	y	y	n	n		rest					none
3:	y	y	y	y	y	n	n		rest					none
4:	y	y	y	y	y	n	n		rest					none
5:	y	y	y	y	y	n	n		rest					none
6:	y	y	y	y	y	n	n		rest					none



Cisco IOS configuration

Cisco 2432 voice gateway configuration

```
c2432-voice#sh ver
Cisco IOS Software, 2400 Software (C2430-IK9O3S-M), Version 12.4(15)T1, RELEASE
SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 05:05 by prod_rel_team
```

ROM: System Bootstrap, Version 12.3(7r)T2, RELEASE SOFTWARE (fc1)

```
c2432-voice uptime is 1 week, 23 hours, 17 minutes
System returned to ROM by reload
System image file is "flash:c2430-ik9o3s-mz.124-15.T1.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.

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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.

```
Cisco IAD2432 (R527x) processor (revision 4.1) with 119808K/11264K bytes of memo
ry.
Processor board ID FHK1013F23V
R527x CPU at 225MHz, Implementation 40, Rev 3.1
1 On-Board Twenty-Four FXS Analog Voice Module V1.3
2 FastEthernet interfaces
42 Serial interfaces
2 Channelized E1/PRI ports
1 Virtual Private Network (VPN) Module
DRAM configuration is 64 bits wide with parity disabled.
63K bytes of non-volatile configuration memory.
System fpga version is 250027
System readonly fpga version is 250025
Option for system fpga is 'system'.
62720K bytes of ATA System CompactFlash (Read/Write)
```

Configuration register is 0x2102

```
=====
T1-CAS#sho run
Building configuration...
```

```
Current configuration : 2540 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
```



```
no service password-encryption
!
hostname T1-CAS
!
boot-start-marker
boot system flash:c2430-ik9o3s-mz.124-15.T1.bin
boot-end-marker
!
card type t1 1
logging buffered 1000000
!
no aaa new-model
network-clock-participate T1 1/0
network-clock-participate T1 1/1
!
!
no ip domain lookup
!
!
multilink bundle-name authenticated
!
voice-card 0
!
!
voice rtp send-recv
!
voice service voip
!
voice translation-rule 11
rule 1 /23/ /20\1/
!
voice translation-profile rule12
translate called 1
!
!
archive
log config
hidekeys
!
!
controller T1 1/0
mode cas
framing esf
linecode b8zs
ds0-group 0 timeslots 1-4 type e&m-immediate-start3
!
controller T1 1/1
framing esf
linecode b8zs
!
!
interface FastEthernet0/0
no ip address
```

¹ This individual rule translate the number that starts with “23” and replaces the first two digits with “20”, then copy the rest of the dialed digits.

² The voice translation rules are applied to voice translation profile, which can then applied to dial peers.

³ This defines T1 channels for compressed voice calls and the CAS method by which the router connects to the PBX.



```
shutdown
duplex half
speed 100
!
interface FastEthernet0/1
ip address 172.20.174.40 255.255.255.0
duplex auto
speed auto
!
ip default-gateway 172.20.174.1
ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 172.20.174.1
!
!
control-plane
!
!
voice-port 1/0:0
!
dial-peer voice 4000 pots
translation-profile incoming rule14
destination-pattern 41..
incoming called-number 23..
supplementary-service pass-through
port 1/0:0
forward-digits all
!
dial-peer voice 2000 voip
destination-pattern 20..
rtp payload-type nte 127
session target ipv4:172.20.232.254
dtmf-relay rtp-nte5
supplementary-service pass-through
!
!
!
gateway
timer receive-rtp 1200
!
sip-ua
no remote-party-id
!
!
line con 0
exec-timeout 0 0
password cisco
login
line aux 0
line vty 0 4
exec-timeout 0 0
password cisco
login
```

⁴ This specifies a digit string that can be matched by an incoming call to associate the call with a dial peer.

⁵ This command is for testing DTMF RFC2833; removing this command will do DTMF in-band. **NOTE:** this command “dtmf-relay h245-alphanumeric h245-signal” will also need to test DTMF tones when using H323 trunk.



!
End

Acronyms

Acronym	Definitions
codec	Coder- Decoder
PBX	Private Branch Exchange
PSTN	Public Switched Telephone Network
IOS	Internetworking Operating System

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