



Avaya Definity G3 Version CM2.0 to Cisco IOS Voice Gateway using H.323 with E1 NET5

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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 E1 NET5 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 E1 with switch-type NET5 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 E1 NET5 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 Multiservice Access Routers](#)

[Cisco 3800 Series Integrated Services Routers](#)

[Cisco AS5350XM Universal Gateway](#)

[Cisco AS5400XM Universal Gateway](#)

Network Topology

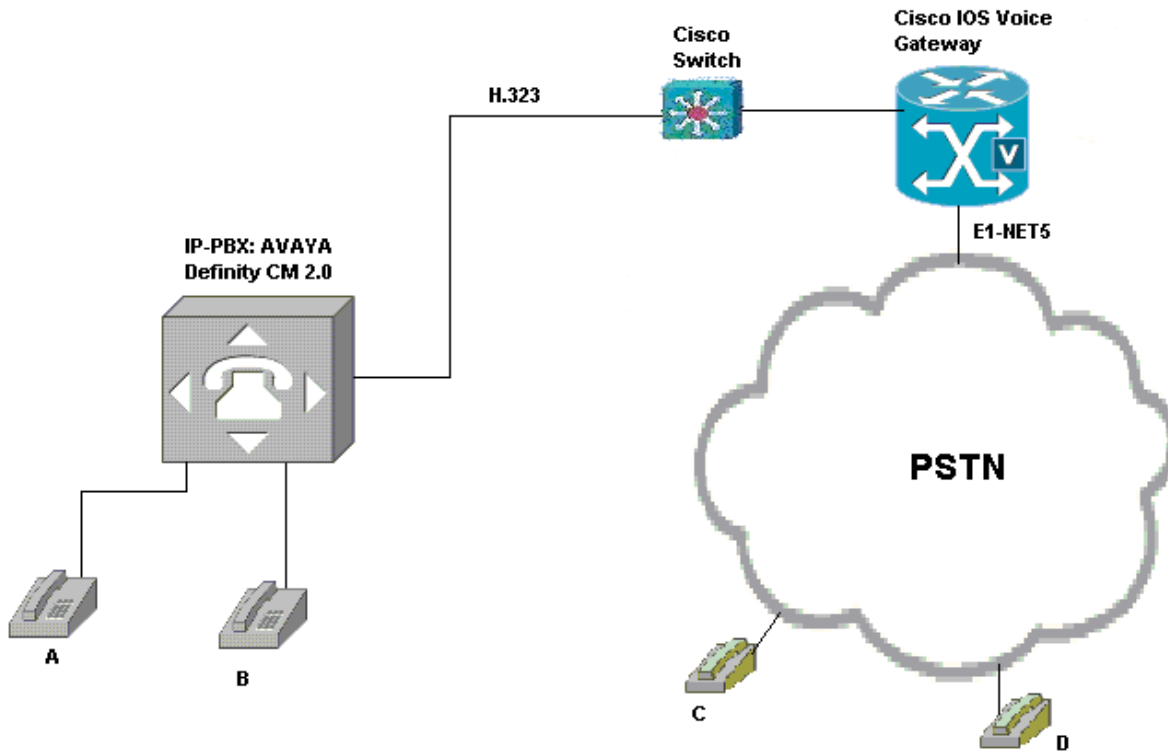


Figure 1. Network Topology

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 G723
- 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 Avaya V7 configuration interface for a Trunk Group. 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
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 interface includes a left-hand navigation pane with options like "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", and "Tree". The top of the window has a menu bar with "display trunk-group 91" and various function keys like "send (return)", "help (f5)", "cancel (esc)", "enter (f3)", "schedule (f9)", "next (f7)", "previous (f8)", and "next form (f6)".



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



Node Name IP

The screenshot shows the Cisco Unified Communications Manager GUI. The left sidebar contains a 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

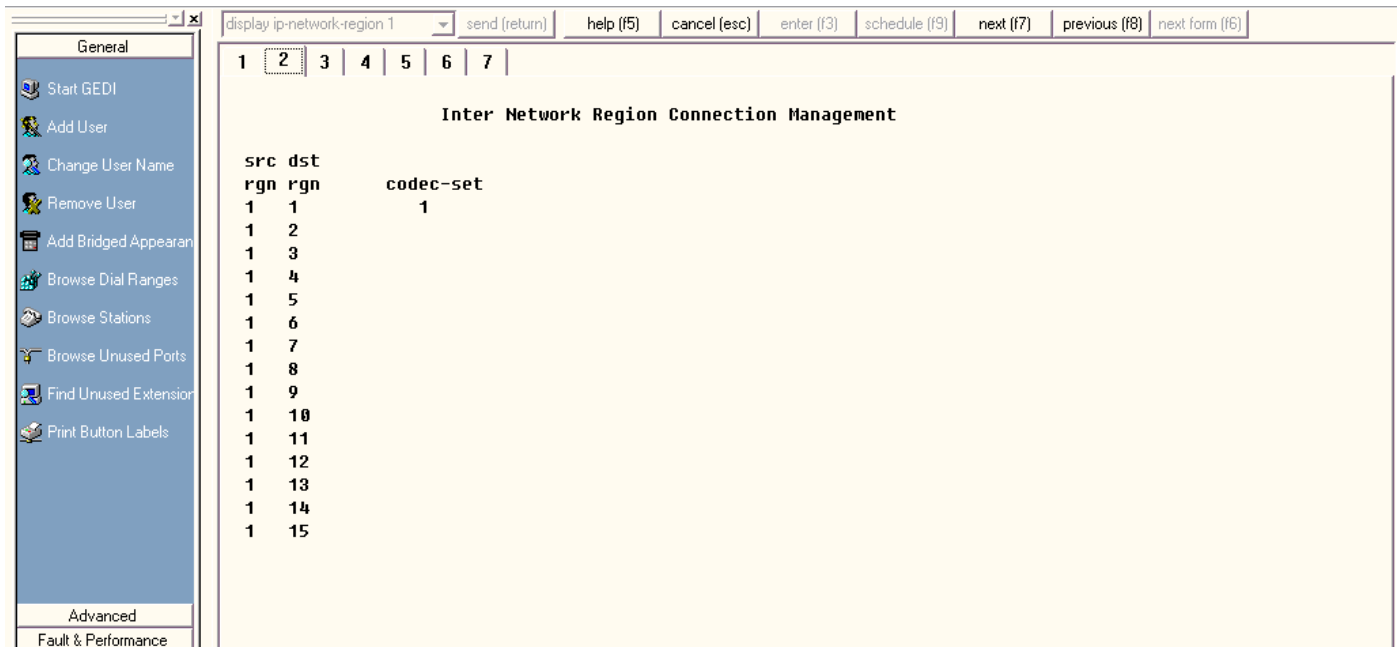
AUDIO RESOURCE RESERVATION PARAMETERS
RSVP Enabled? n

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



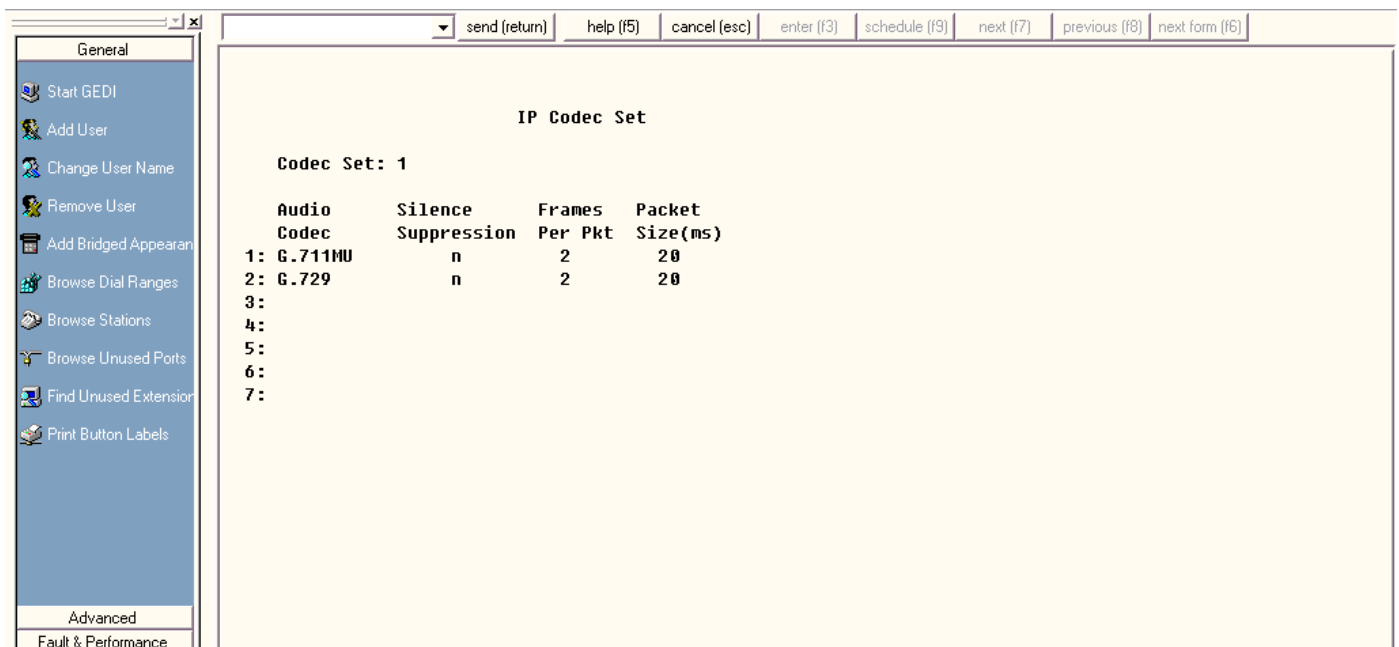
display ip-network-region 1

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	

IP Codec Set 1²



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:			

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



Station 2010 Configuration

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

Extension: 2010	Lock Messages? n	BCC: 0
Type: 8410D	Security Code:	TN: 1
Port: 01A0603	Coverage Path 1:	COR: 1
Name: PBX-Sean1	Coverage Path 2:	COS: 1
	Hunt-to Station:	

STATION OPTIONS

Loss Group: 2	Personalized Ringing Pattern: 1
Data Module? n	Message Lamp Ext: 2010
Speakerphone: 2-way	Mute Button Enabled? y
Display Language: english	
	Media Complex Ext:
	IP SoftPhone? n

General
Start GEDI
Add User
Change User Name
Remove User
Add Bridged Appearance
Browse Dial Ranges
Browse Stations
Browse Unused Ports
Find Unused Extensions
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

FEATURE OPTIONS

LWC Reception: spe	Auto Select Any Idle Appearance? n
LWC Activation? y	Coverage Msg Retrieval? y
LWC Log External Calls? n	Auto Answer: none
CDR Privacy? n	Data Restriction? n
Redirect Notification? y	Idle Appearance Preference? n
Per Button Ring Control? n	Restrict Last Appearance? y
Bridged Call Alerting? n	
Active Station Ringing: single	
H.320 Conversion? n	Per Station CPN - Send Calling Number?
Service Link Mode: as-needed	Audible Message Waiting? y
Multimedia Mode: basic	Display Client Redirection? y
MWI Served User Type:	Select Last Used Appearance? n
	Coverage After Forwarding? s
	Multimedia Early Answer? n
	Direct IP-IP Audio Connections? y
	IP Audio Hairpinning? y

Emergency Location Ext: 2010

General
Start GEDI
Add User
Change User Name
Remove User
Add Bridged Appearance
Browse Dial Ranges
Browse Stations
Browse Unused Ports
Find Unused Extensions
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

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

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
							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 5 days, 4 hours, 20 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 : 2462 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 10000000  
!  
no aaa new-model  
no network-clock-participate slot 1  
no network-clock-participate slot 2  
voice-card 0  
no dspfarm  
!  
voice-card 1  
dspfarm  
!  
voice-card 2  
no dspfarm  
!  
ip cef  
!  
!  
!  
multilink bundle-name authenticated  
!  
isdn switch-type primary-net5  
isdn gateway-max-interworking  
!  
!  
voice service voip  
h323  
!  
!  
!  
voice translation-rule 13  
rule 1 /41/ /20\1/  
!  
!  
voice translation-profile pots  
translate called 1  
!  
!  
archive  
log config  
hidekeys  
!  
!  
controller E1 1/0/0  
pri-group timeslots 1-10,16  
!  
controller E1 1/0/1  
!  
controller E1 2/0
```

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.



```
pri-group timeslots 1-10,16
!  
controller E1 2/1  
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 Serial1/0/0:15  
no ip address  
encapsulation hdlc  
isdn switch-type primary-net5  
isdn incoming-voice voice  
isdn supp-service name calling  
isdn bchan-number-order ascending  
no cdp enable  
!  
interface Serial2/0:15  
no ip address  
encapsulation hdlc  
isdn switch-type primary-net54  
isdn incoming-voice voice  
isdn supp-service name calling  
isdn bchan-number-order ascending  
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
```

⁴ Specify E1-NET5 interface.



```
!  
voice-port 0/2/0  
!  
voice-port 0/2/1  
!  
voice-port 1/0/0:15  
!  
voice-port 2/0:15  
!  
!  
!  
dial-peer voice 2210 pots  
shutdown  
destination-pattern 22..  
incoming called-number 41..  
direct-inward-dial  
port 1/0/0:15  
forward-digits all  
!  
dial-peer voice 4100 voip5  
description call in H323 voip  
translation-profile incoming voip  
destination-pattern 20..  
rtp payload-type nte 127  
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 40..  
incoming called-number ....  
direct-inward-dial  
port 2/0:15  
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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