



Cisco Catalyst 6000 Series Gateway-PBX Interoperability: Inter-Tel Axxess Key System with T1 PRI NI-2 Signaling

This document describes the interoperability and configuration of a Cisco Catalyst 6000 series voice gateway with an Inter-Tel Axxess Key System using T1 PRI NI-2 signaling. It includes the following sections:

- System Components
- Configuration Tasks
- Caveats

System Components

PBX Model	Inter-Tel Axxess 256 Key System
PBX Release	5.2
Telephony Signaling	T1 PRI NI-2
Voice Gateway	Cisco Catalyst 6608
Gateway Release	5.5(6)a
Call Manager Release	3.1.1
VoX Protocol	MGCP

Configuration Tasks

See the following sections for configuration tasks for this feature:

- Set Up
- Inter-Tel Key System Configuration
- Call Manager Configuration
- Cisco Catalyst 6608 Gateway Configuration

Set Up

This section includes the following information:

- Connectivity Diagrams
- Set Up Notes

Connectivity Diagrams

Figure 1: Test Configuration

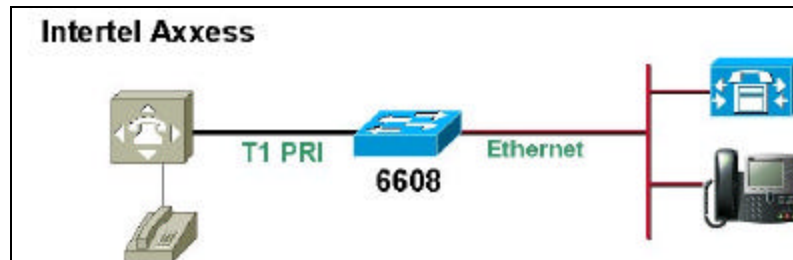


Figure 1 represents the configuration used for testing: an Inter-Tel KEY SYSTEM connected to a Cisco Catalyst 6608 voice gateway via a T1 PRI NI-2 connection.

Set Up Notes

- The Cisco 6608-T1 Gateway with an ISDN protocol type setting of PRI-NI2 supports both protocol sides by selecting "Network/User" in the protocol field when configuring the Gateway via the Cisco CallManager.
- The Inter-Tel T1 PRI, when set to NI2, supports "USER" protocol side only. Therefore Cisco 6608-T1 should be configured as Network side.

Inter-Tel Key System Configuration

Inter-Tel Key System Version Information

- Software: Version 5.2

Inter-Tel Key System Sample Configuration

Configure in the following sequence:

1. Configure T1 PRI Trunk
2. Configure B-Channel Circuits
3. Configure Reference Clock
4. Configure T1 PRI Timers
5. Configure Call Routing Table

Configure T1 PRI Trunk

The screenshot shows the DB Studio interface for configuring a T1 Primary Rate Interface Card. The tree view on the left shows the hierarchy: Inter-Tel 5.2F0 > System > Cabinets > 01:06 T1 Primary Rate Inter. The main configuration pane on the right displays the following settings:

Name	Value
T1 Circuits	
T1 Diagnostics	
Timers	
Call Type	
Description	T1 PRI Card
Framing Type	Extended Superframe
Zero Code Suppression	B8ZS
Line Build-Out	0 dB (DSX-1)
Central Office Switch Type	National ISDN 2
CO Provides Progress Tones	No
Connect on Call Proceeding	Yes
Operator System Access	No

The status bar at the bottom shows: Node 1 | Direct Cable | New Session

Configure B-Channel Circuits

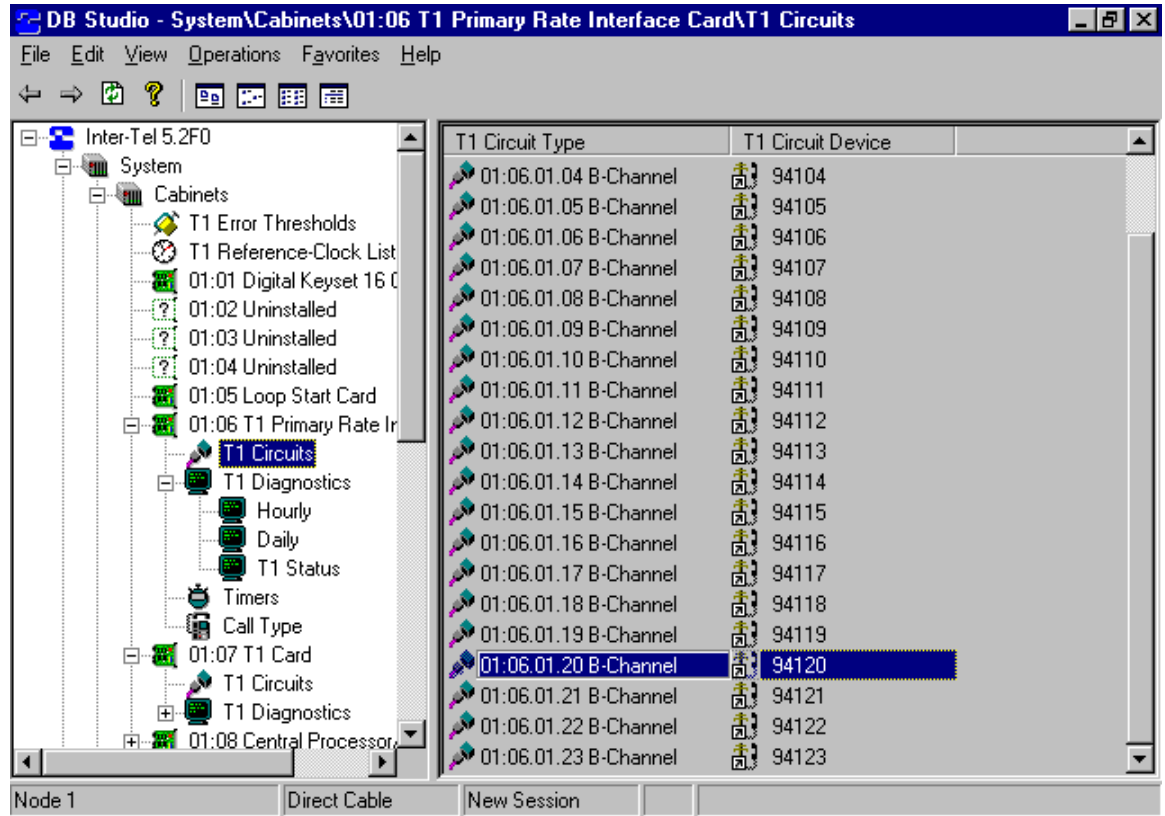
The screenshot shows the DB Studio interface. The title bar reads "DB Studio - System\Cabinets\01:06 T1 Primary Rate Interface Card\T1 Circuits". The menu bar includes File, Edit, View, Operations, Favorites, and Help. The left pane shows a tree view of the system structure:

- Inter-Tel 5.2F0
 - System
 - Cabinets
 - T1 Error Thresholds
 - T1 Reference-Clock List
 - 01:01 Digital Keypset 16 Carc
 - 01:02 Uninstalled
 - 01:03 Uninstalled
 - 01:04 Uninstalled
 - 01:05 Loop Start Card
 - 01:06 T1 Primary Rate Interf (selected)
 - T1 Circuits (selected)
 - T1 Diagnostics
 - Timers
 - Call Type
 - 01:07 T1 Card
 - 01:08 Central Processor/PC
 - 01:09 Uninstalled
 - 01:10 Uninstalled
 - 01:11 Uninstalled
 - 01:12 Uninstalled
 - 01:13 Uninstalled

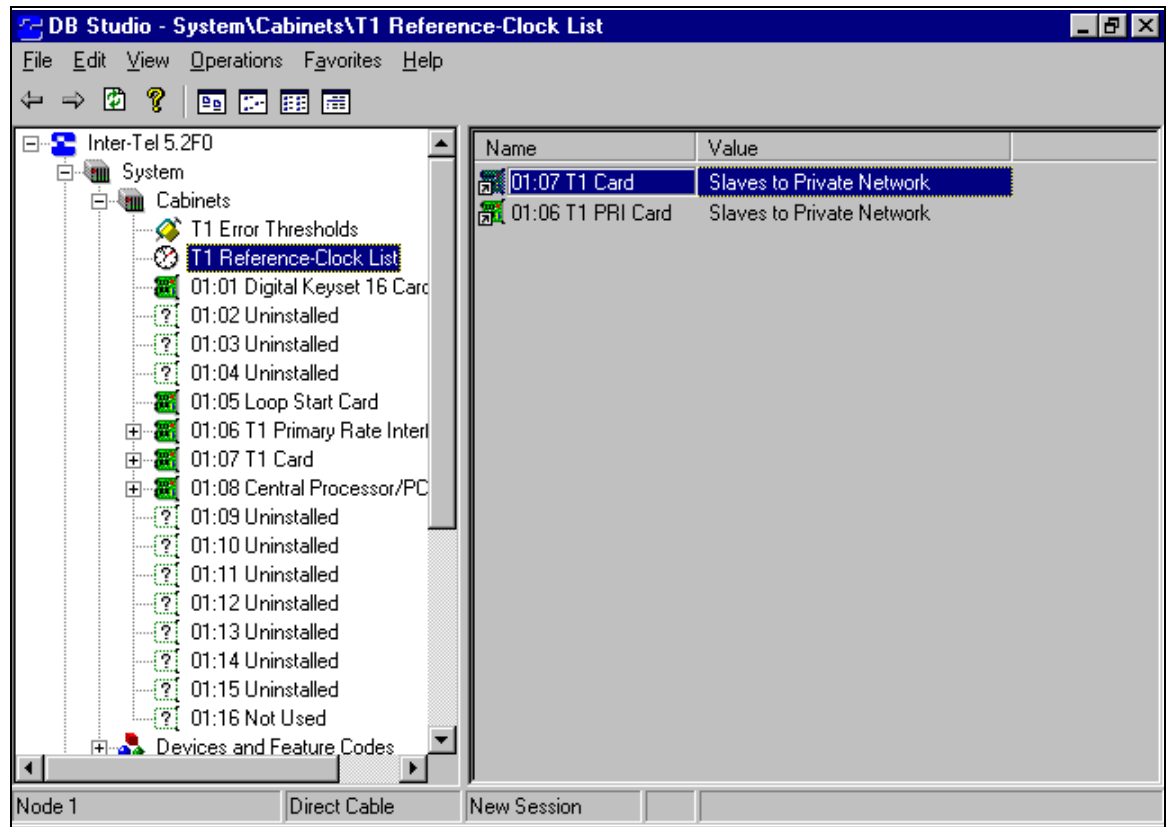
The right pane displays a table of T1 circuits:

T1 Circuit Type	T1 Circuit Device
01:06.01.01 B-Channel	94101
01:06.01.02 B-Channel	94102
01:06.01.03 B-Channel	94103
01:06.01.04 B-Channel	94104
01:06.01.05 B-Channel	94105
01:06.01.06 B-Channel	94106
01:06.01.07 B-Channel	94107
01:06.01.08 B-Channel	94108
01:06.01.09 B-Channel	94109
01:06.01.10 B-Channel	94110
01:06.01.11 B-Channel	94111
01:06.01.12 B-Channel	94112
01:06.01.13 B-Channel	94113
01:06.01.14 B-Channel	94114
01:06.01.15 B-Channel	94115
01:06.01.16 B-Channel	94116
01:06.01.17 B-Channel	94117
01:06.01.18 B-Channel	94118
01:06.01.19 B-Channel	94119
01:06.01.20 B-Channel	94120

At the bottom of the window, there are buttons for "Node 1", "Direct Cable", and "New Session".



Configure Reference Clock



Configure T1 PRI Timers

DB Studio - System\Cabinets\01:06 T1 Primary Rate Interface Card\Timers

File Edit View Operations Favorites Help

← → ? [Icons]

Inter-Tel 5.2F0

- System
 - Cabinets
 - T1 Error Thresh
 - T1 Reference-C
 - 01:01 Digital Ke
 - 01:02 Uninstall
 - 01:03 Uninstall
 - 01:04 Uninstall
 - 01:05 Loop Sta
 - 01:06 T1 Prima
 - T1 Circuits
 - T1 Diagnos
 - Timers**
 - Call Type
 - 01:07 T1 Card
 - 01:08 Central F
 - 01:09 Uninstall
 - 01:10 Uninstall
 - 01:11 Uninstall
 - 01:12 Uninstall
 - 01:13 Uninstall

Name	Value	Units	Range (Default)
Call Proceeding (T 310)	25	Seconds	1 - 255 (10)
Connect Acknowledge (T313)	9	Seconds	1 - 255 (9)
Data Link Disconnect (T 309)	90	Seconds	1 - 255 (90)
Disconnect (T305)	4	Seconds	1 - 255 (4)
Idle Link (T203)	100	Tenths	1 - 65535 (100)
Release (T308)	4	Seconds	1 - 255 (4)
Restart Acknowledge (T316)	5	Seconds	1 - 255 (120)
Re-Transmission (T200)	10	Tenths	1 - 65535 (10)
Setup Request Acknowledge (T303)	9	Seconds	1 - 255 (9)
XID Request (T204)	20	Tenths	1 - 65535 (20)

Node 1 Direct Cable New Session

Configure Call Routing Table

The screenshot shows the DB Studio interface for configuring call routing tables. The left pane shows a tree view with 'Call Routing Tables' expanded to show 15 tables. The main pane displays a table with the following data:

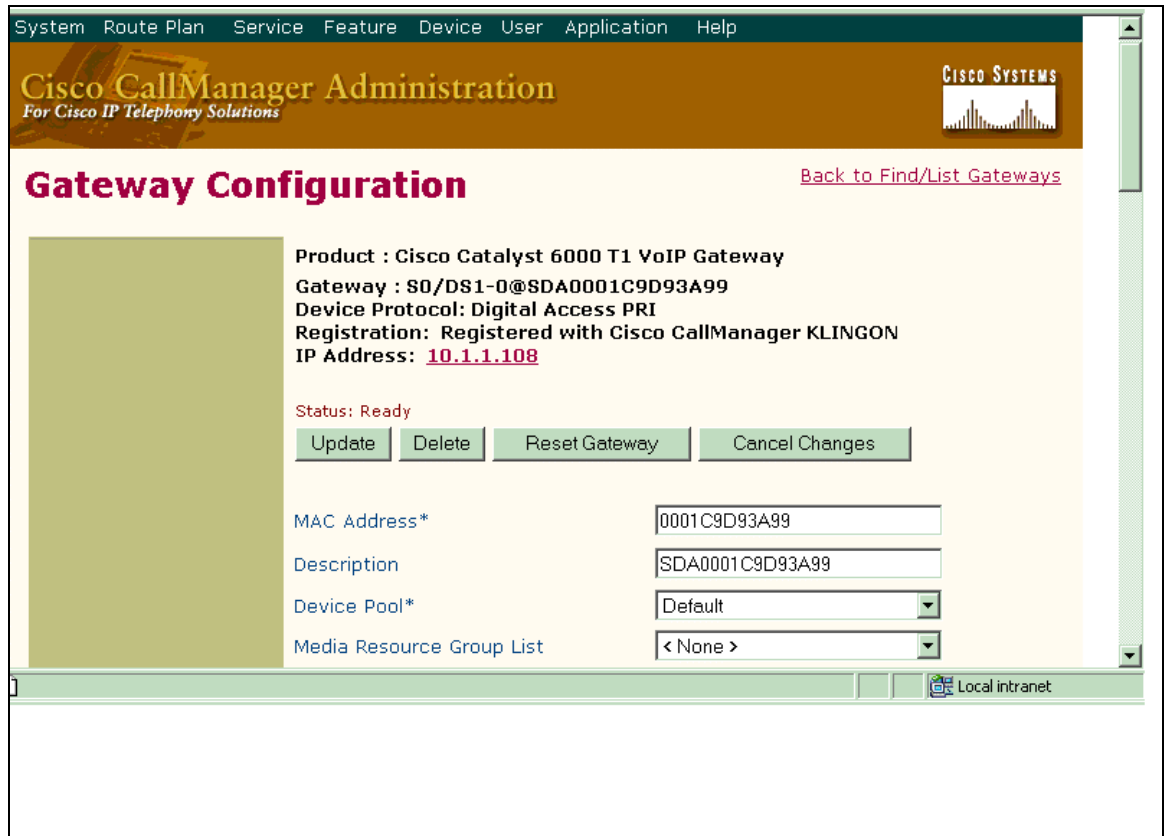
Pattern	Description	Ring-In Type	Ring-In Destination
2000	2000	Single	2000
2001	2001	Single	2001
2002	2002	Single	2002
2003	2003	Single	2003
2004	2004	Single	2004
2005	2005	Single	2005
2006	2006	Single	NONE
4000	4000	Single	4000
4001	4001	Single	4001
4002	4002	Single	4002
4003	4003	Single	4003
4004	4004	Single	NONE
4005	4005	Single	NONE
4006	4006	Single	NONE
5000	5000	Single	5000
5001	5001	Single	5001
5002	5002	Single	5002
5003	5003	Single	5003
5004	5004	Single	NONE

Call Manager Configuration

Call Manager Version Information



Cisco Catalyst 6608 Gateway Configuration



The screenshot shows the Cisco CallManager Administration interface for Gateway Configuration. The top navigation bar includes System, Route Plan, Service, Feature, Device, User, Application, and Help. The main header displays "Cisco CallManager Administration" with the tagline "For Cisco IP Telephony Solutions" and the Cisco Systems logo. The page title is "Gateway Configuration" with a link to "Back to Find/List Gateways".

The configuration details for the selected gateway are as follows:

- Product : Cisco Catalyst 6000 T1 VoIP Gateway
- Gateway : S0/DS1-0@SDA0001C9D93A99
- Device Protocol: Digital Access PRI
- Registration: Registered with Cisco CallManager KLINGON
- IP Address: [10.1.1.108](#)

The status is "Ready". Action buttons include Update, Delete, Reset Gateway, and Cancel Changes.

Configuration fields include:

- MAC Address*: 0001C9D93A99
- Description: SDA0001C9D93A99
- Device Pool*: Default
- Media Resource Group List: < None >

The bottom status bar shows "Local intranet".

Network Hold Audio Source	< None >
User Hold Audio Source	< None >
Calling Search Space	< None >
Location	< None >
Load Information	
Channel Selection Order*	Top Down
PCM Type*	µ-law
Protocol Side*	Network
Caller ID DN	
Calling Party Selection*	Originator
Channel IE Type*	Use Number when 1B
Interface Identifier Present**	<input type="checkbox"/>
Interface Identifier Value**	0
Display IE Delivery	<input type="checkbox"/>
Redirecting Number IE Delivery	<input checked="" type="checkbox"/>
Delay for first restart (1/8 sec ticks)	32

Local intranet

Delay between restarts (1/8 sec ticks)	4
Num Digits*	23
Sig Digits	<input checked="" type="checkbox"/>
Prefix DN	
Presentation Bit*	Allowed
Called party IE number type unknown*	Cisco CallManager
Calling party IE number type unknown*	Cisco CallManager
Called Numbering Plan*	Cisco CallManager
Calling Numbering Plan*	Cisco CallManager
PRI Protocol Type*	PRI NI2
Inhibit restarts at PRI initialization	<input checked="" type="checkbox"/>
Enable status poll	<input type="checkbox"/>
Number of digits to strip*	0
Country Code*	North America
Setup non-ISDN Progress Indicator IE Enable***	<input type="checkbox"/>

Local intranet

Product Specific Configuration

Clock Reference*	Internal
TX-Level CSU*	0dB
FDL Channel*	ATT 54016
Framing*	ESF
Audio Signal Adjustment into IP Network*	NoDbPadding
Audio Signal Adjustment from IP Network*	NoDbPadding
Yellow Alarm*	Bit2
Zero Suppression*	B8ZS

* indicates required item
** applicable to DMS-100 protocol only
*** may be required to force ringback from some PBXs

[Back to Find/List Gateways](#)

Local intranet

Route Pattern Configuration

The screenshot shows the Cisco CallManager Administration web interface. At the top, there is a navigation menu with links for System, Route Plan, Service, Feature, Device, User, Application, and Help. Below the menu is a header banner with the text "Cisco CallManager Administration For Cisco IP Telephony Solutions" and the Cisco Systems logo. The main heading is "Route Pattern Configuration".

On the right side, there are two links: "Add a New Route Pattern" and "Back to Find/List Route Patterns".

The configuration details for a route pattern are as follows:

- Route Pattern:** 6.XXXX
- Status:** Ready
- Note:** Any update to this route pattern automatically resets the associated gateway/route list
- Buttons:** Copy, Update, Delete, Cancel Changes
- Pattern Definition:**
 - Route Pattern*:** 6.XXXX
 - Partition:** < None >
 - Numbering Plan*:** North American Numbering Plk
 - Route Filter:** < None >
 - Gateway/Route List*:** S0/DS1-0@SDA0001C9D93A99 (Edit)
 - Route Option:** Route this pattern Block this pattern

The browser's address bar shows "Local intranet".

Route Pattern*	6XXXX
Partition	< None >
Numbering Plan*	North American Numbering Pl
Route Filter	< None >
Gateway/Route List*	S0/DS1-0@SDA0001C9D93A99 (Edit)
Route Option	<input checked="" type="radio"/> Route this pattern <input type="radio"/> Block this pattern
	<input checked="" type="checkbox"/> Provide Outside Dial Tone <input type="checkbox"/> Urgent Priority
Calling Party Transformations	
	<input type="checkbox"/> Use Calling Party's External Phone Number Mask
Calling Party Transform Mask	
Prefix Digits (Outgoing Calls)	
Called Party Transformations	
Discard Digits	PreDot
Called Party Transform Mask	
Prefix Digits (Outgoing Calls)	
* indicates required item.	

Cisco Catalyst 6608 Gateway Configuration

The following is the configuration of the Cisco Catalyst 6608 voice gateway connected to the Inter-Tel Key System T1 PRI NI-2 interface.

Cisco Catalyst 6608 Voice Gateway Version Information

```

Console> sh version
WS-C6006 Software, Version NmpSW: 5.5(6a)
Copyright (c) 1995-2001 by Cisco Systems
NMP S/W compiled on Feb 23 2001, 10:23:18

System Bootstrap Version: 5.3(1)

Hardware Version: 2.0 Model: WS-C6006 Serial #: TBA04511172

Mod Port Model Serial # Versions
-----
1 2 WS-X6K-SUP1A-2GE SAD05010NBK Hw : 7.0
Fw : 5.3(1)
Fw1: 5.4(2)
Sw : 5.5(6a)
Sw1: 5.5(6a)
3 48 WS-F6K-PFC SAD05020221 Hw : 1.1
WS-X6348-RJ-45 SAD04420N7B Hw : 1.4
Fw : 5.4(2)
Sw : 5.5(6a)

```

```

4 24 WS-F6K-VPWR WS-X6624-FXS SAD050203M8 Hw : 1.0
                                     Hw : 3.0
                                     Fw : 5.4(2)
                                     Sw : 5.5(6a)
5 8 WS-X6608-T1 SAD04400EM0 HP : A00203010007; DSP : A003C031 (3.3.30)
                                     Hw : 1.1
                                     Fw : 5.4(2)
                                     Sw : 5.5(6a)
                                     HP1: D00403010013; DSP1: D005C031 (3.3.30)
                                     HP2: D00403010013; DSP2: D005C031 (3.3.30)
                                     HP3: D00403010013; DSP3: D005C031 (3.3.30)
                                     HP4: D00403010013; DSP4: D005C031 (3.3.30)
                                     HP5: D00403010013; DSP5: D005C031 (3.3.30)
                                     HP6: D00403010013; DSP6: D005C031 (3.3.30)
                                     HP7: D00403010013; DSP7: D005C031 (3.3.30)
                                     HP8: D00403010013; DSP8: D005C031 (3.3.30)
6 8 WS-X6608-E1 SAD04380DW1 Hw : 1.1
                                     Fw : 5.4(2)
                                     Sw : 5.5(6a)
                                     HP1: D00403010013; DSP1: D005C031 (3.3.30)
                                     HP2: D00403010013; DSP2: D005C031 (3.3.30)
                                     HP3: D00403010013; DSP3: D005C031 (3.3.30)
                                     HP4: D00403010013; DSP4: D005C031 (3.3.30)
                                     HP5: D00403010013; DSP5: D005C031 (3.3.30)
                                     HP6: D00403010013; DSP6: D005C031 (3.3.30)
                                     HP7: D00403010013; DSP7: D005C031 (3.3.30)
                                     HP8: D00403010013; DSP8: D005C031 (3.3.30)

```

Module	DRAM			FLASH			NVRAM		
	Total	Used	Free	Total	Used	Free	Total	Used	Free
1	65408K	37527K	27881K	16384K	11546K	4838K	512K	198K	314K

Uptime is 22 days, 23 hours, 13 minutes
Console>

Cisco Catalyst 6608 Voice Gateway Sample Configuration

```

Console> sh module
Mod Slot Ports Module-Type Model Sub Status
-----
1 1 2 1000BaseX Supervisor WS-X6K-SUP1A-2GE yes ok
3 3 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
4 4 24 FXS WS-X6624-FXS no ok
5 5 8 T1 WS-X6608-T1 no ok
6 6 8 E1 WS-X6608-E1 no ok

```

```

Mod Module-Name Serial-Num
-----
1 SAD05010NBK
3 SAD04420N7B
4 SAD050203M8
5 SAD04400EM0
6 SAD04380DW1

```

```

Mod MAC-Address(es) Hw Fw Sw
-----
1 00-04-c0-f8-42-02 to 00-04-c0-f8-42-03 7.0 5.3(1) 5.5(6a)
  00-04-c0-f8-42-00 to 00-04-c0-f8-42-01
  00-04-9b-f0-78-00 to 00-04-9b-f0-7b-ff
3 00-02-fc-20-5e-50 to 00-02-fc-20-5e-7f 1.4 5.4(2) 5.5(6a)
4 00-03-32-ba-2e-35 3.0 5.4(2) 5.5(6a)
5 00-01-c9-d9-3a-98 to 00-01-c9-d9-3a-9f 1.1 5.4(2) 5.5(6a)
6 00-01-c9-d8-63-3e to 00-01-c9-d8-63-45 1.1 5.4(2) 5.5(6a)

```

```

Mod Sub-Type Sub-Model Sub-Serial Sub-Hw
-----
1 L3 Switching Engine WS-F6K-PFC SAD05020221 1.1
3 Inline Power Module WS-F6K-VPWR 1.0

```


Console>

Console> sh port 5

Port	Name	Status	Vlan	Duplex	Speed	Type
5/1		notconnect	1	full	1.544	T1
5/2		connected	1	full	1.544	T1
5/3		notconnect	1	full	1.544	T1
5/4		notconnect	1	full	1.544	T1
5/5		notconnect	1	full	1.544	T1
5/6		notconnect	1	full	1.544	T1
5/7		notconnect	1	full	1.544	T1
5/8		notconnect	1	full	1.544	T1

Port	DHCP	MAC-Address	IP-Address	Subnet-Mask
5/1	enable	00-01-c9-d9-3a-98	10.1.1.107	255.255.255.0
5/2	enable	00-01-c9-d9-3a-99	10.1.1.108	255.255.255.0
5/3	enable	00-01-c9-d9-3a-9a	10.1.1.109	255.255.255.0
5/4	enable	00-01-c9-d9-3a-9b	10.1.1.110	255.255.255.0
5/5	enable	00-01-c9-d9-3a-9c	10.1.1.111	255.255.255.0
5/6	enable	00-01-c9-d9-3a-9d	10.1.1.112	255.255.255.0
5/7	enable	00-01-c9-d9-3a-9e	10.1.1.113	255.255.255.0
5/8	enable	00-01-c9-d9-3a-9f	10.1.1.114	255.255.255.0

Port	Call-Manager(s)	DHCP-Server	TFTP-Server	Gateway
5/1	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/2	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/3	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/4	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/5	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/6	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/7	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7
5/8	10.1.1.2	10.1.1.2	10.1.1.2	10.1.1.7

Port	DNS-Server(s)	Domain
5/1	-	-
5/2	-	-
5/3	-	-
5/4	-	-
5/5	-	-
5/6	-	-
5/7	-	-
5/8	-	-

Port	CallManagerState	DSP-Type
5/1	registered	C549
5/2	registered	C549
5/3	registered	C549
5/4	registered	C549
5/5	registered	C549
5/6	registered	C549
5/7	registered	C549
5/8	registered	C549

Port	NoiseRegen	NonLinearProcessing
5/1	enabled	enabled
5/2	enabled	enabled
5/3	enabled	enabled
5/4	enabled	enabled
5/5	enabled	enabled
5/6	enabled	enabled
5/7	enabled	enabled
5/8	enabled	enabled

Console>

Caveats

- Inter-Tel Key System supports only User side PRI.
- Calling Name delivery and presentation features are not supported by the Inter-Tel Key System on a T1 PRI link.
- When calling from a Cisco 7960 IP phone to an Inter-Tel digital phone, Calling/Called Number is displayed on both phones after the call is answered.
- When calling from an Inter-Tel digital phone to a Cisco 7960 IP phone, the IP phone displays “Connected Number” after the call is answered. The Inter-Tel phone however does NOT get updated when the call is answered. It displays the numbers being dialed instead (i.e. Access Code, extension number).