Application Note

Inter-Tel Key System with CallManager using 6608-T1 PRI NI-2 Gateway

This application note illustrates for connectivity of Inter-Tel Key System with CallManager using 6608-T1 PRI NI-2 Gateway.

Integration Description

Connectivity is achieved by using the industry standard PRI NI-2 protocol. The Inter-Tel system can be configured as USER side only.

Cisco Systems Equipment needed

Hardware (Gateway): 6608 T1 Port

Software: CallManager Release 3.1

Inter-Tel Hardware and Software Requirements

Hardware: Axxess 256

Software: Version 5.2

Features Supported

Key features supported:

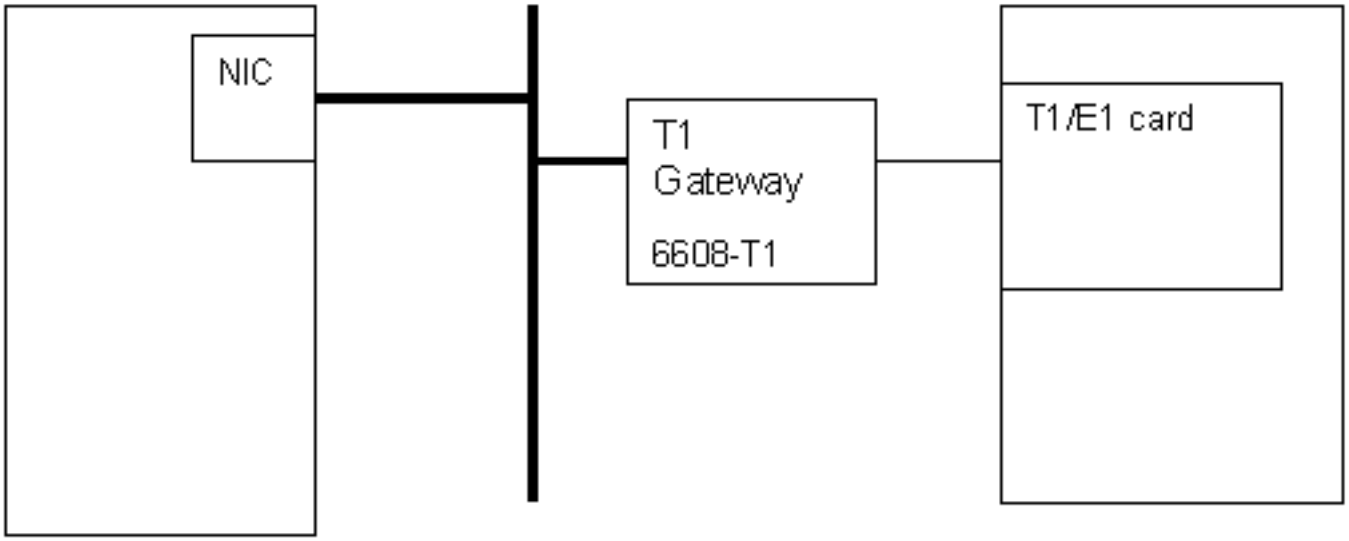
Calling/Called Number

Key features not supported:

Calling/Called Name

Network Diagram

Figure 1
Network Test Topology

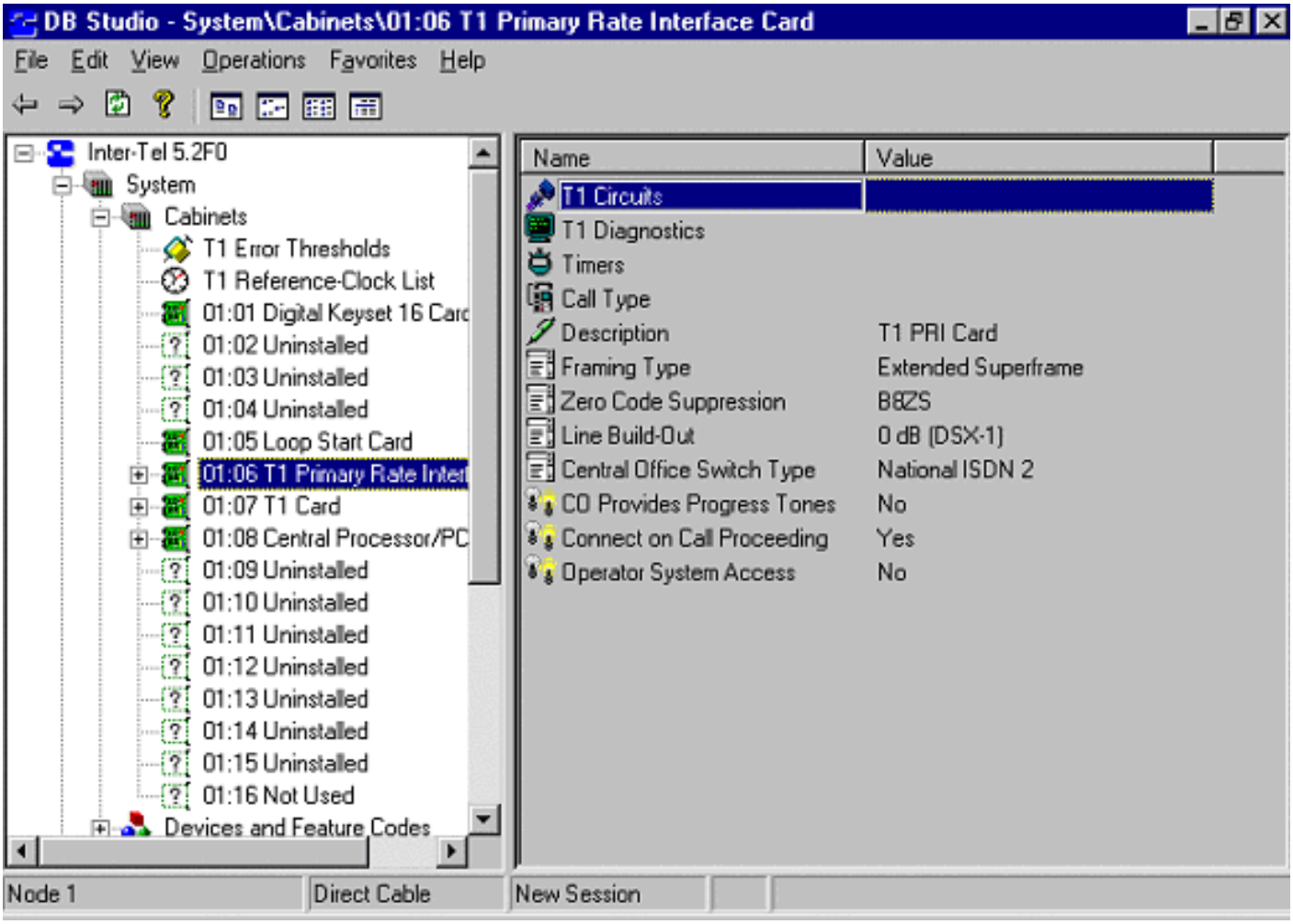


Configuring the Inter-Tel Key System

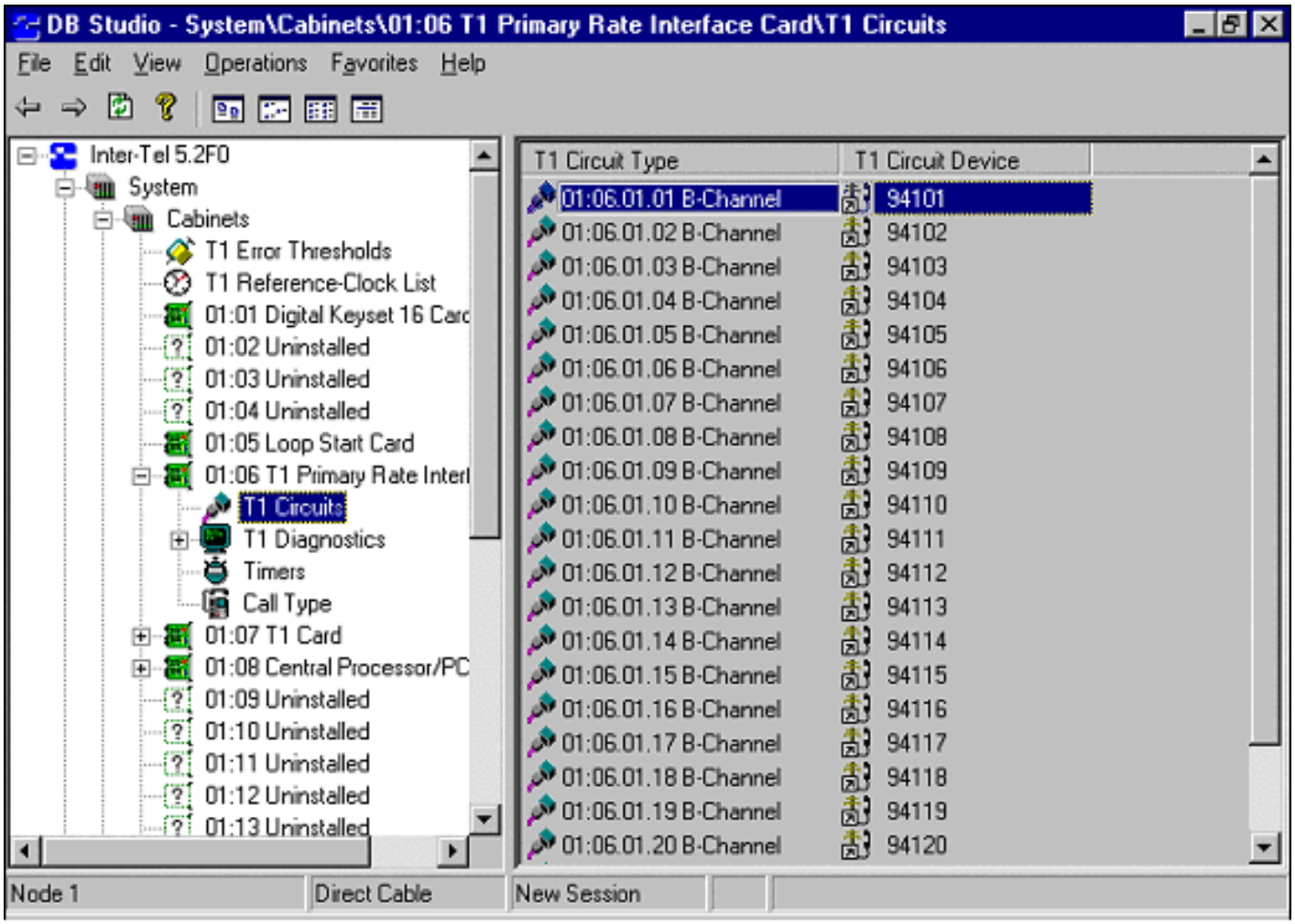
Configure in the following sequence:

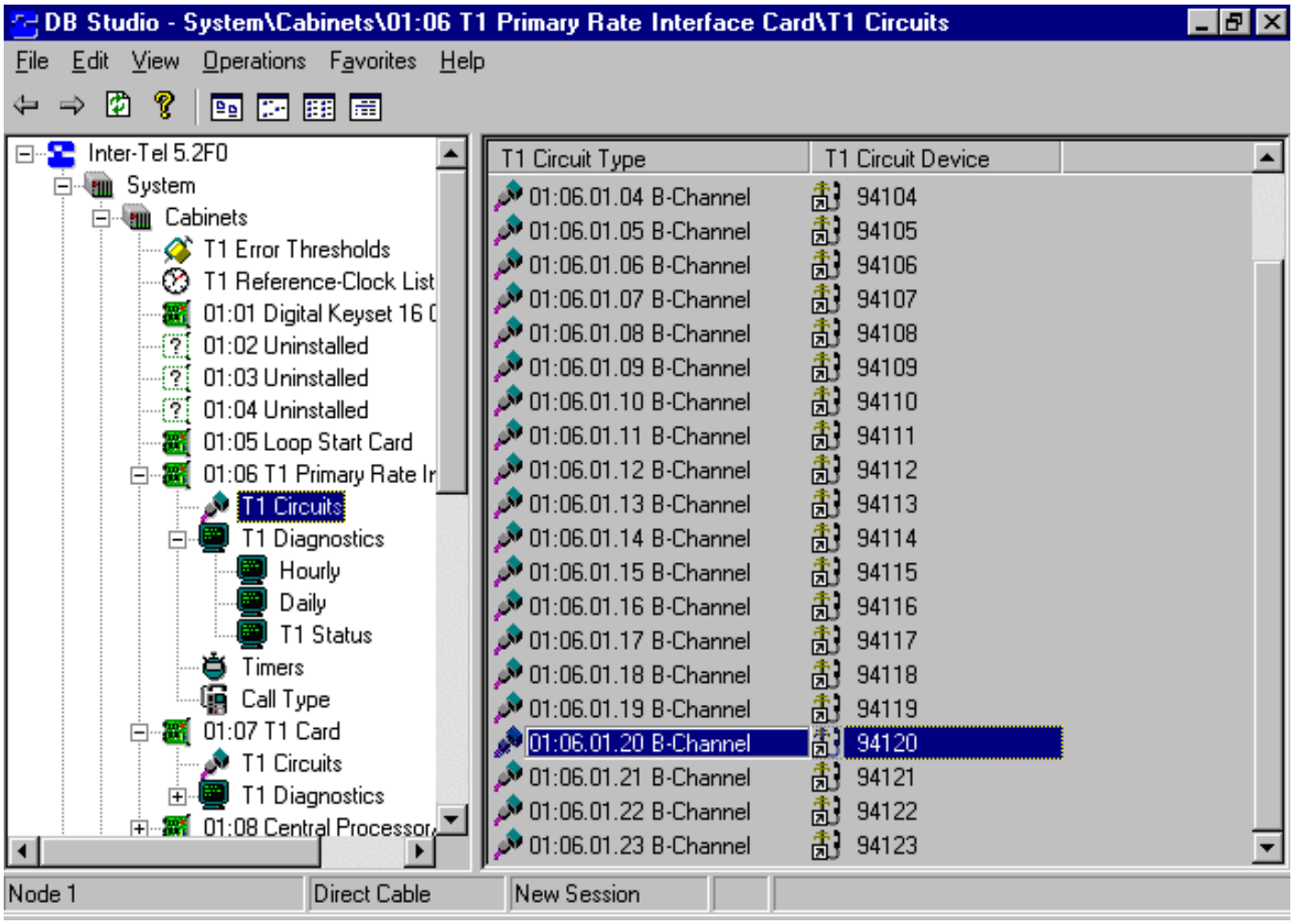
1. “Configure T1 Trunk” on page 3
2. “Configure B-Channels Circuits” on page 4
3. “Configure Reference Clock” on page 6
4. “Configure T1 PRI Timers” on page 7
5. “Configure Call Routing Table” on page 8

Configure T1 Trunk

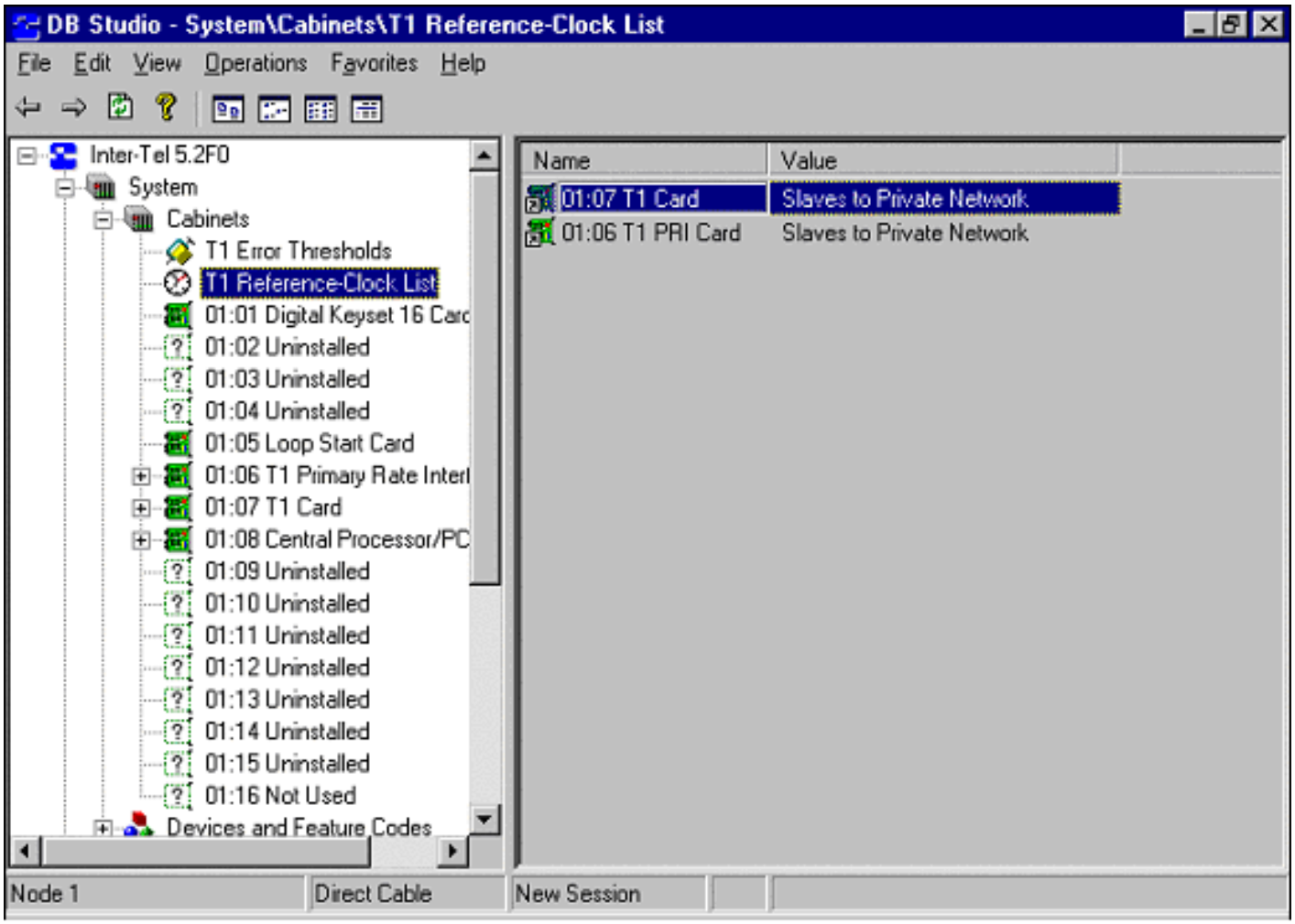


Configure B-Channels Circuits

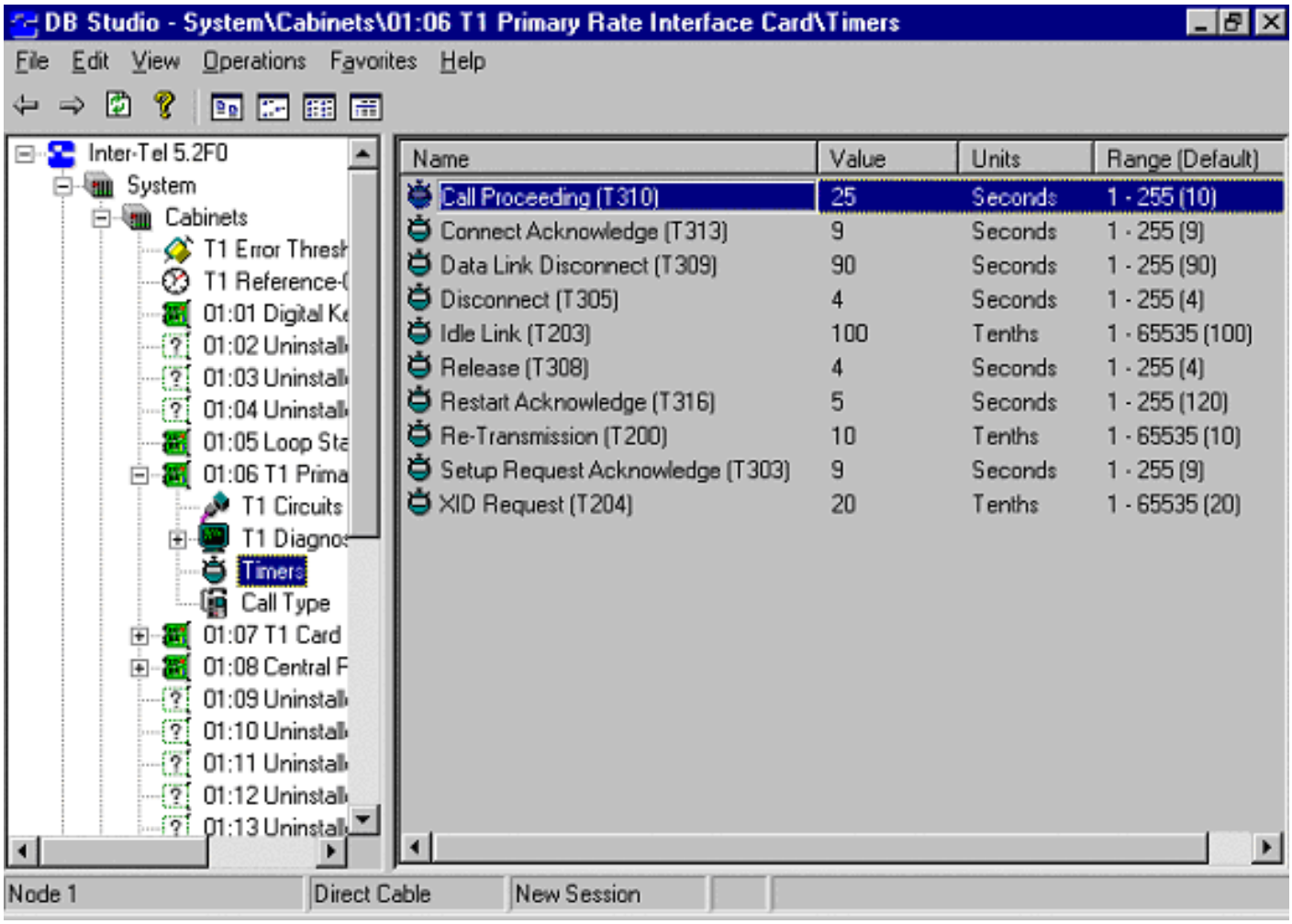




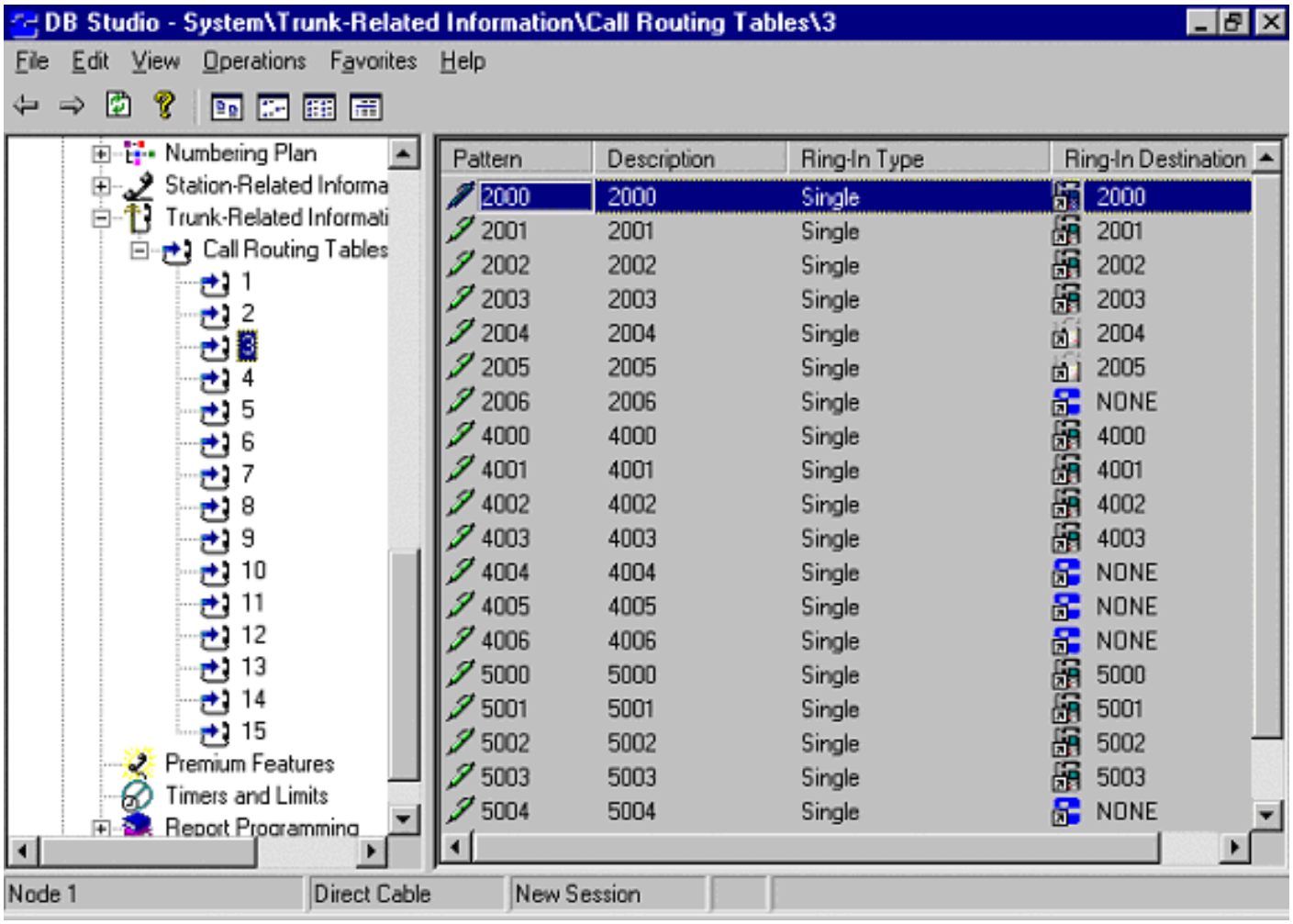
Configure Reference Clock



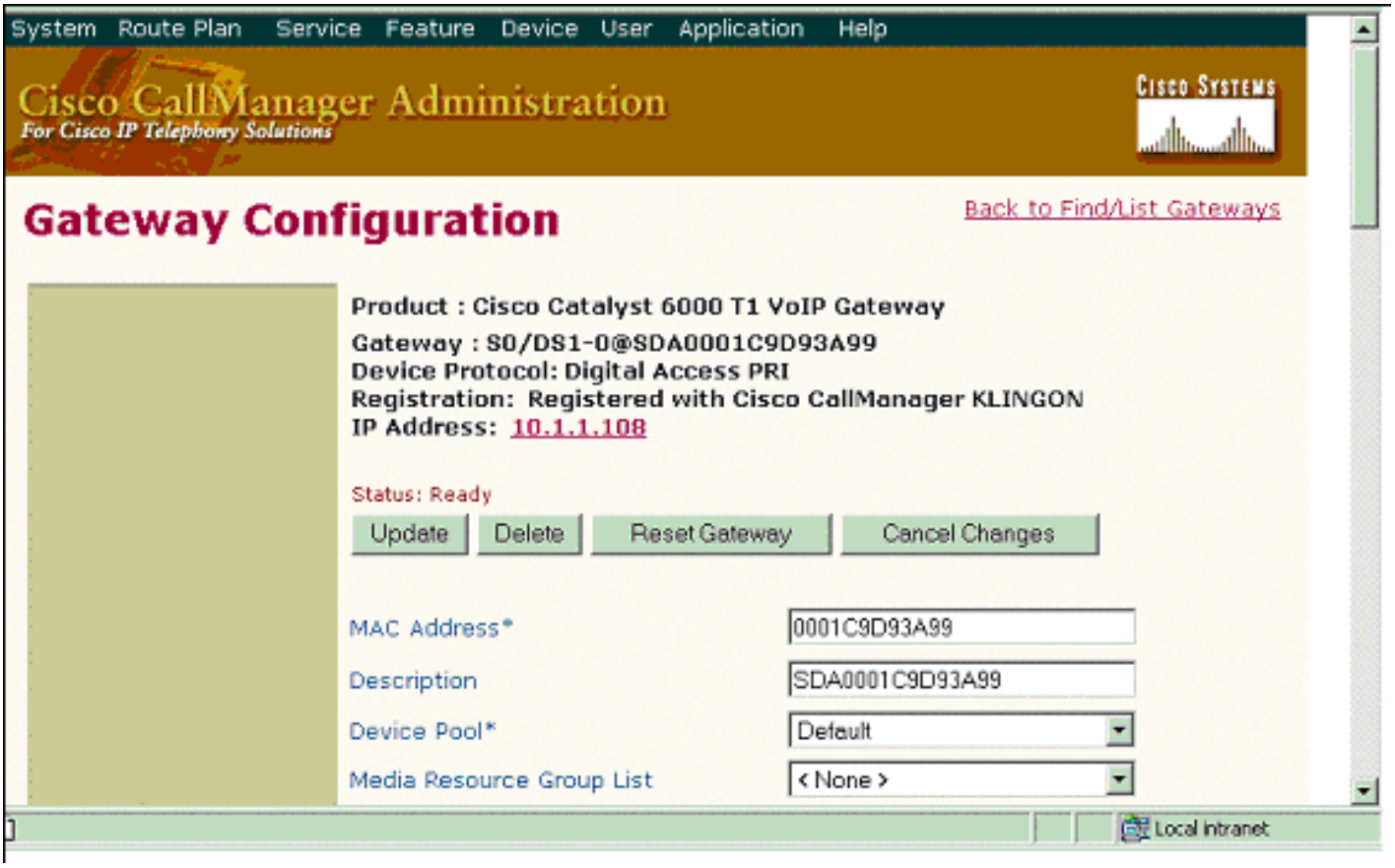
Configure T1 PRI Timers

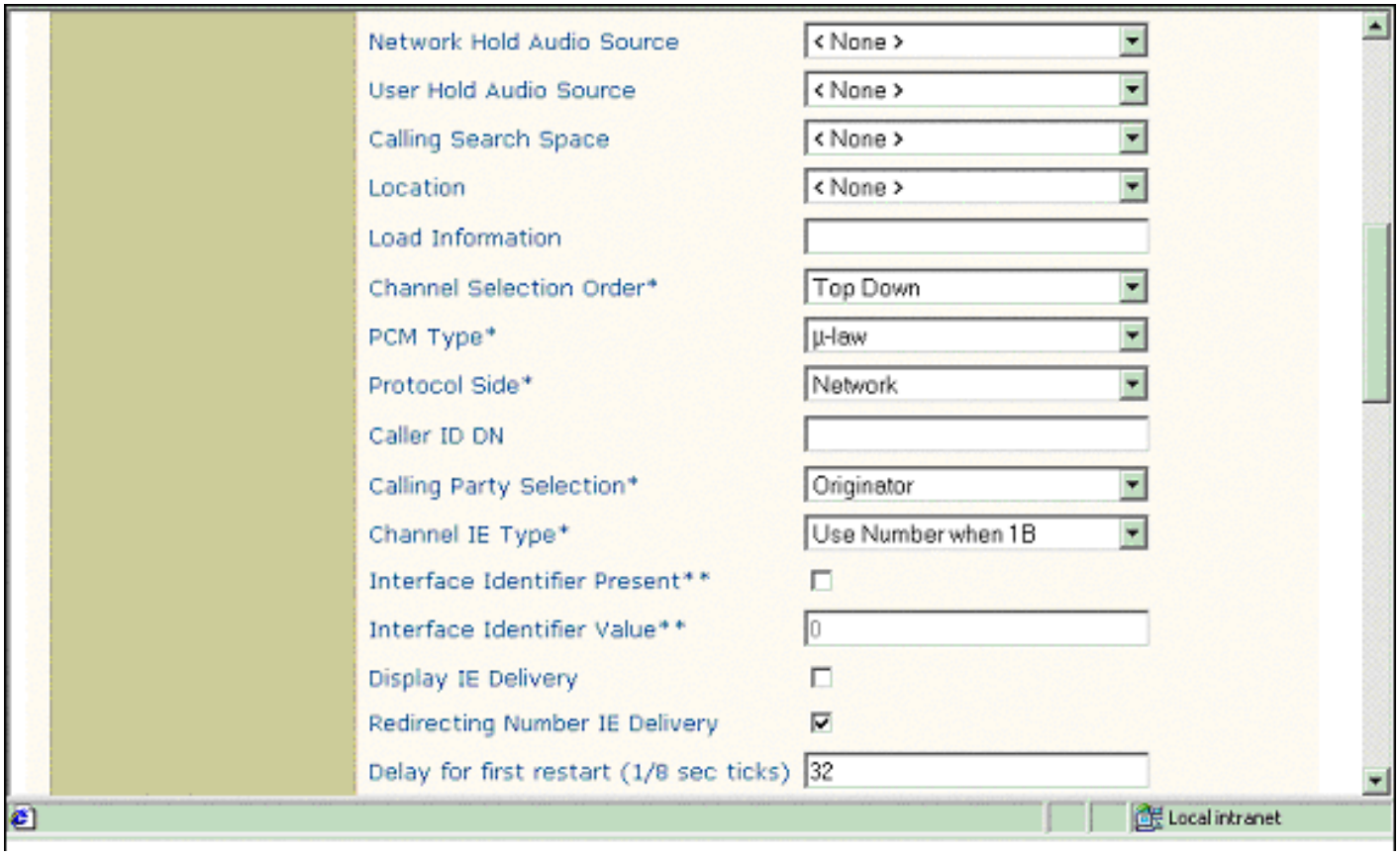


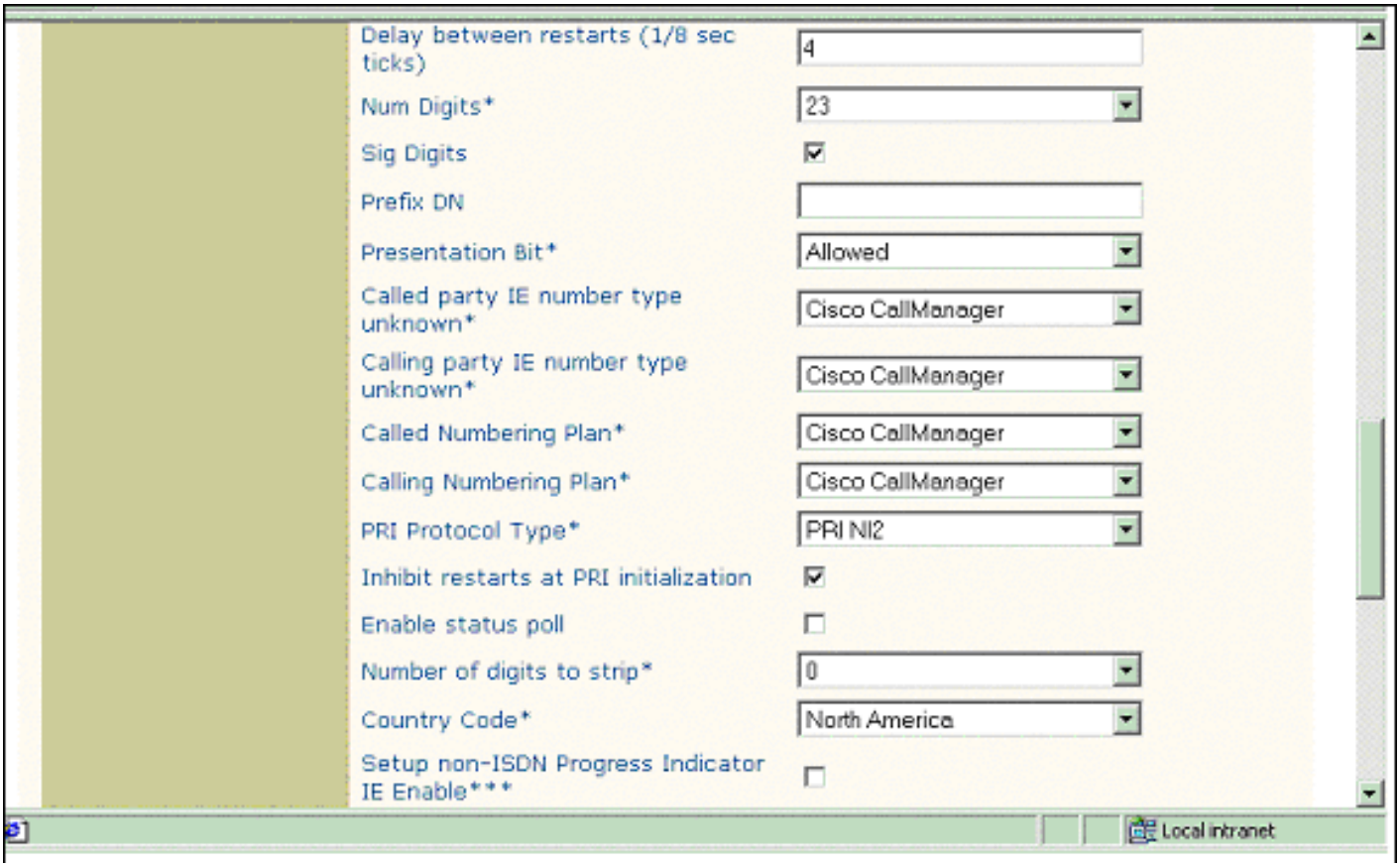
Configure Call Routing Table

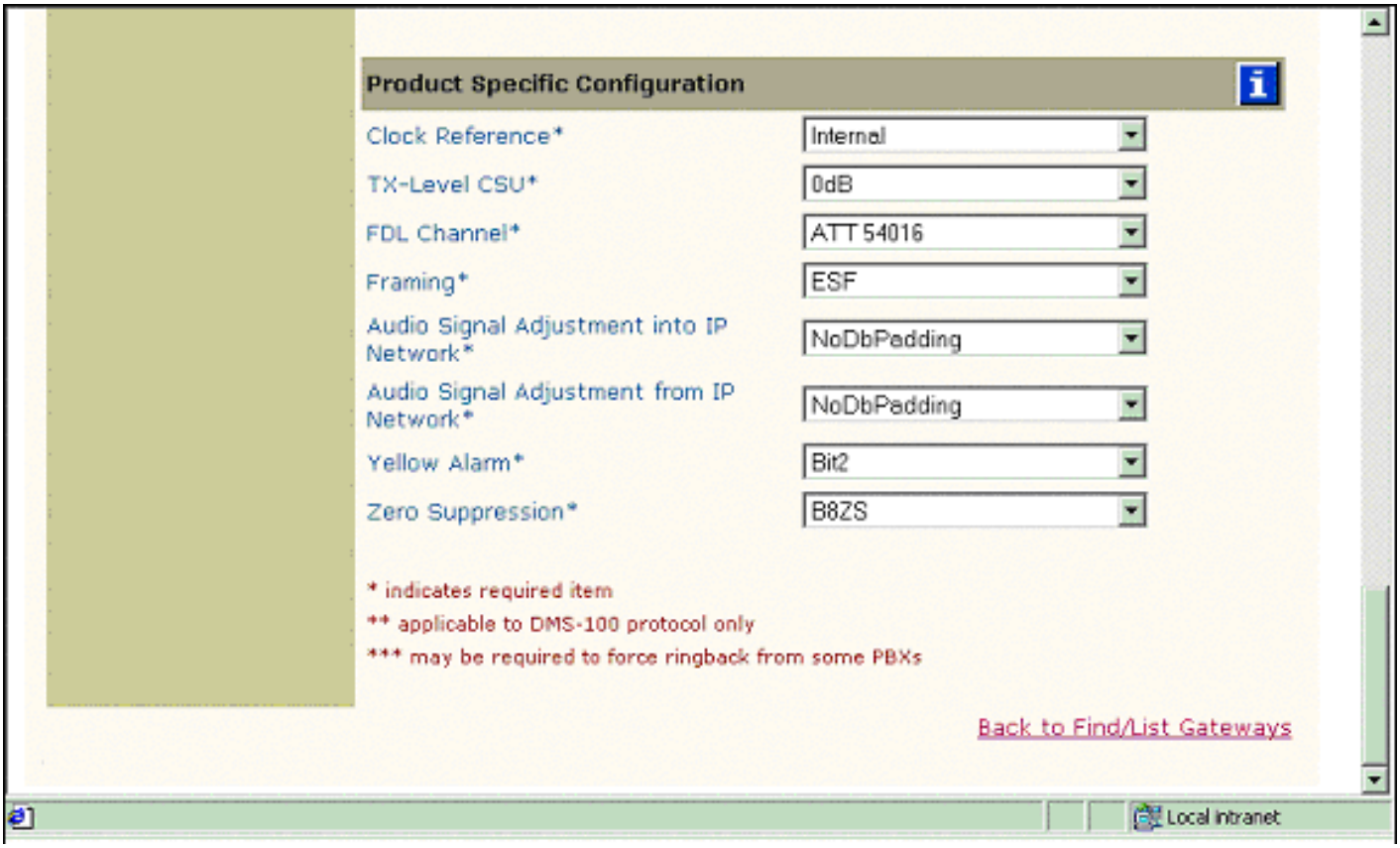


6680 Gateway Configuration

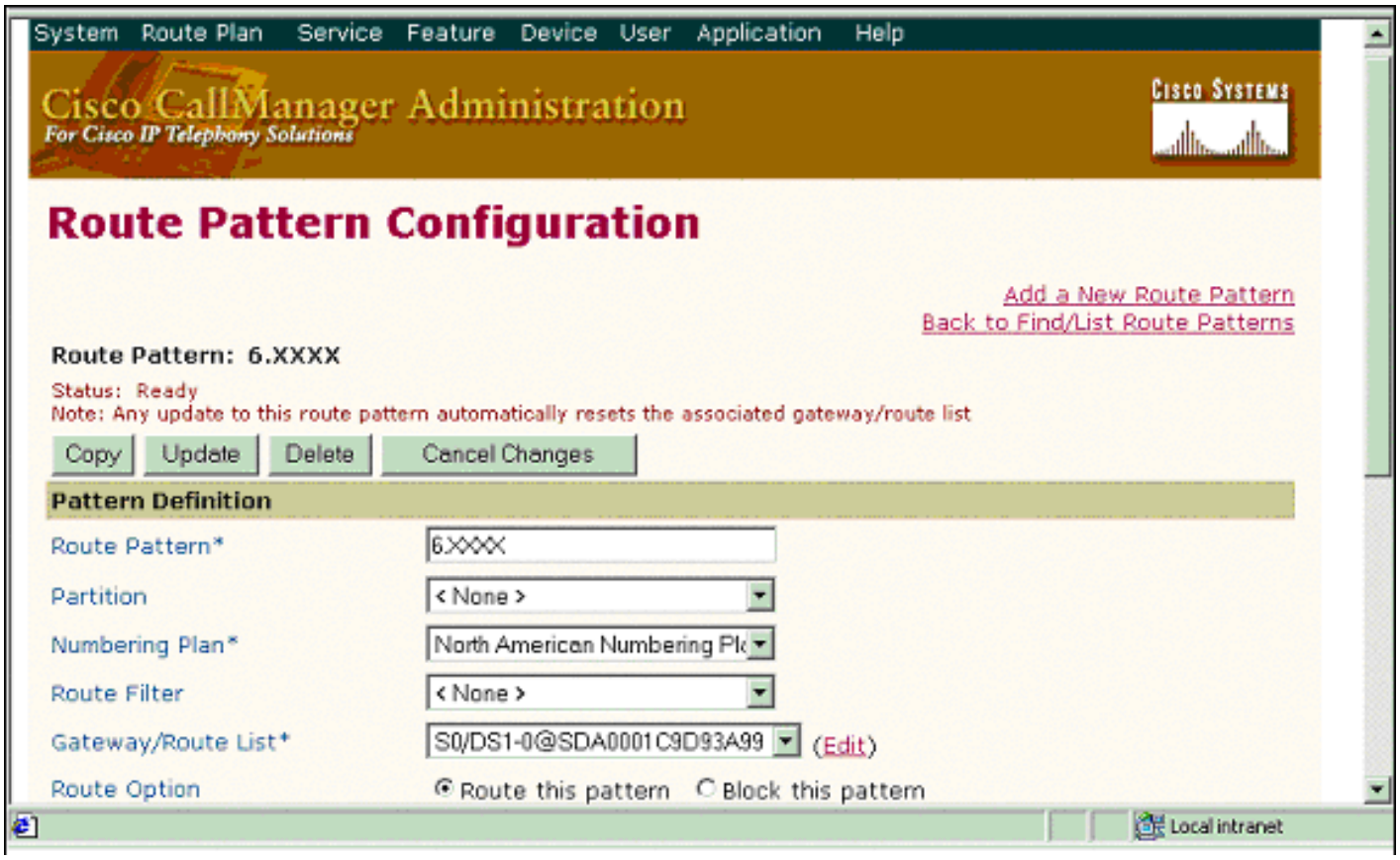


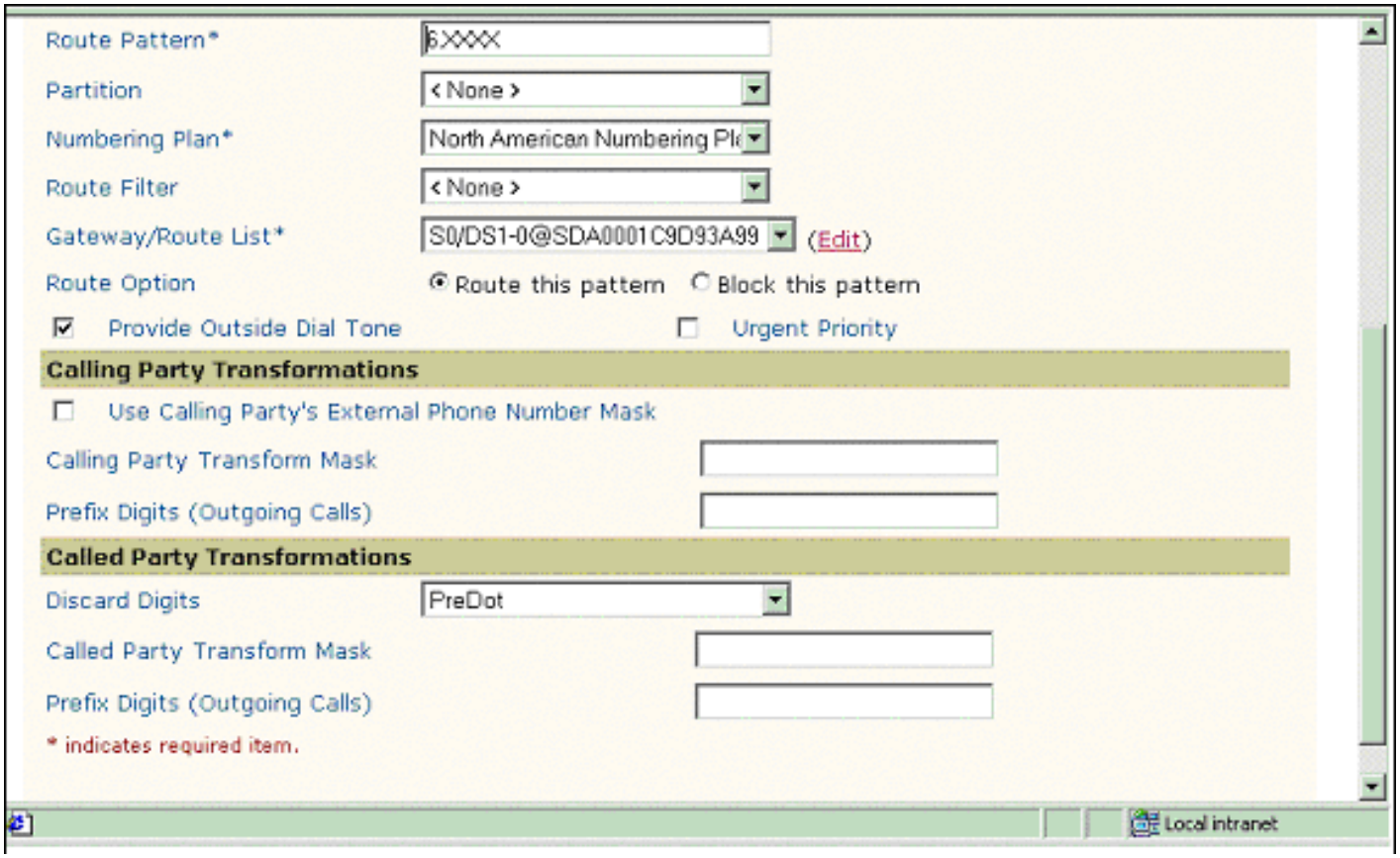






Route Pattern Configuration





Considerations

Calling Name and Number Feature

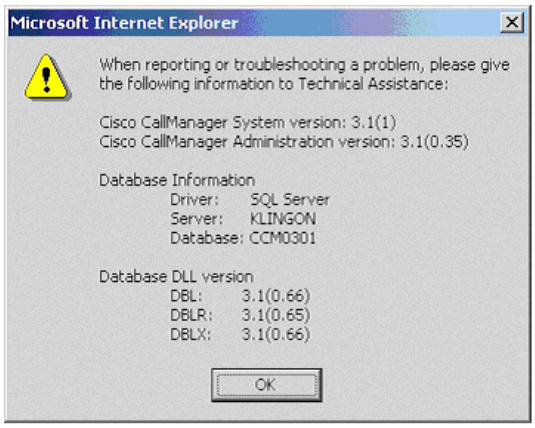
Calling Name delivery and presentation features are not supported by the Inter-Tel Key System for PRI link.

When calling from Cisco 7960 IP phone to Inter-Tel digital phone, Calling/Called Number is displayed on both phones after the call is answered as expected.

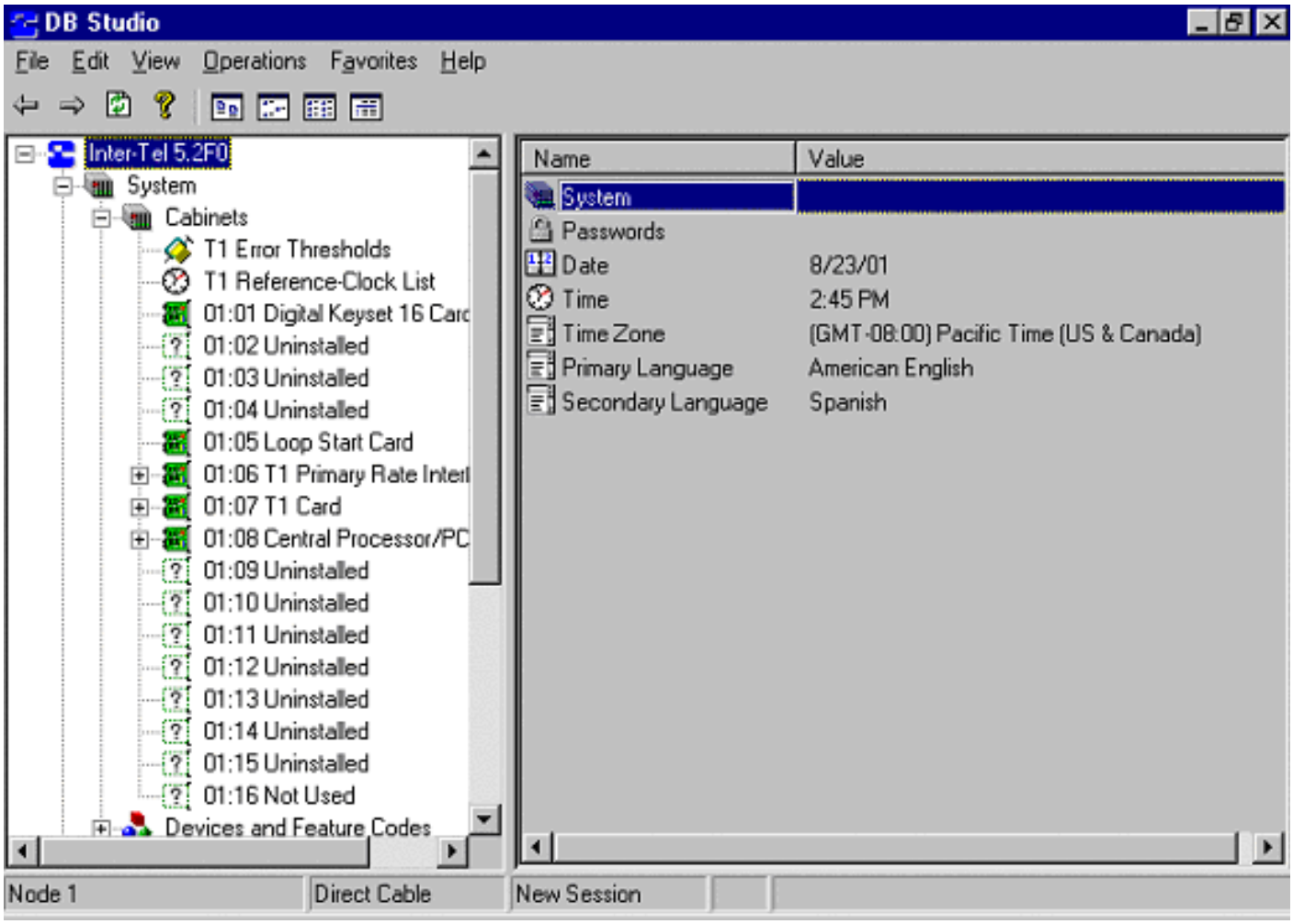
When calling from Inter-Tel digital phone to Cisco 7960 IP phone, IP phone displays Connected Number after the call is answered. Inter-Tel phone however does NOT get updated when the call is answered. It displays the numbers being dialed instead. (i.e. Access Code, extension number). It was verified using ISDN protocol analyzer that the CallManager was not sending “Connected Number” information in the connect message back to Inter-Tel Key System.

Appendix A

CallManager Software Release



Inter-Tel Software Release



Catalyst 6000 Switch Configuration

```
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)
         WS-F6K-PFC          SAD05020221 Hw : 1.1
3   48   WS-X6348-RJ-45      SAD04420N7B Hw : 1.4
                                         Fw : 5.4(2)
                                         Sw : 5.5(6a)
         WS-F6K-VPWR                     Hw : 1.0
4   24   WS-X6624-FXS        SAD050203M8 Hw : 3.0
                                         Fw : 5.4(2)
                                         Sw : 5.5(6a)
                                         HP : A00203010007; DSP : A003C031 (3.3.30)
5   8    WS-X6608-T1         SAD04400EM0 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)

       DRAM                    FLASH                   NVRAM
Module 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>
```

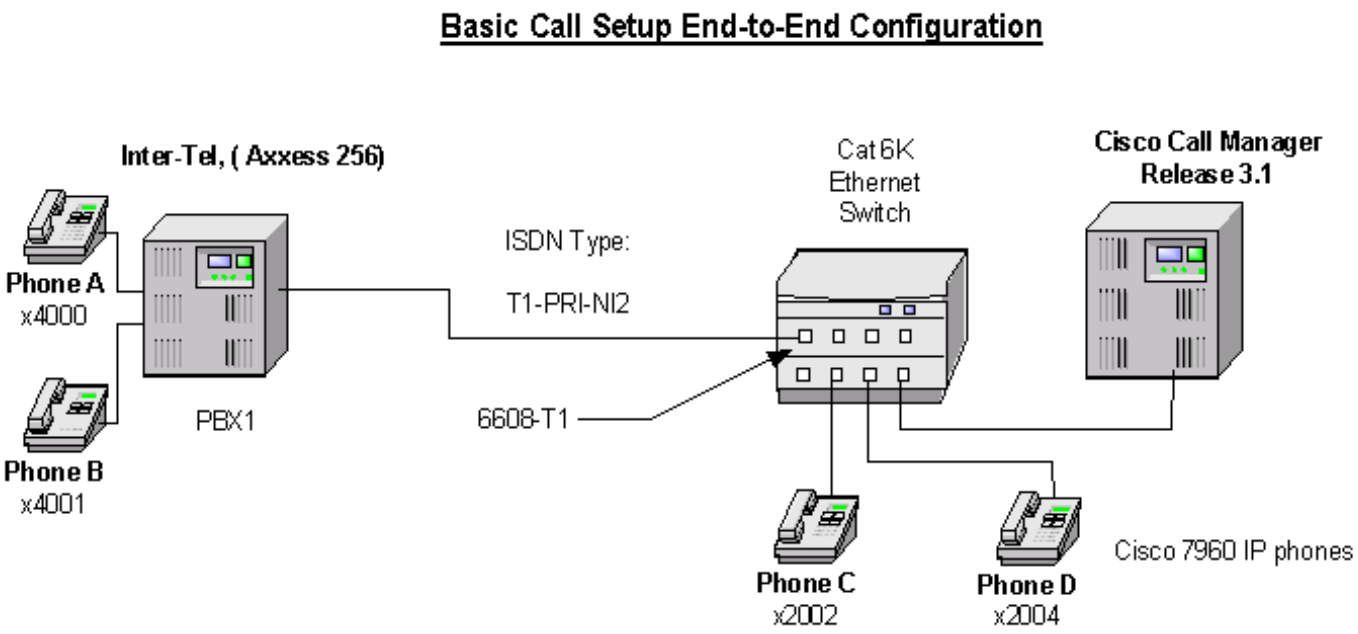
```
Console> sh module
Mod Slot Ports Module-Type               Model               Sub Status
--- ---- ----- ------------------------- ------------------- --- --------
1   1    2     1000BaseX Supervisor      WS-X6K-SUP1A-2GE    yes ok
3   3    48    10/100BaseTX Ethernet     WS-X6348-RJ-45      yes 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>
```

Test Configuration

Figure 2
Test Topology



The above diagram is representative of the various configurations used for testing.

As shown in the diagram above, an Inter-Tel Axxess 256 Key System was connected via an ISDN T1 PRI link to a Cisco 6608-T1 Gateway, which in turn, was connected to an Ethernet switch. The interoperability testing involved Layers 1, 2 and 3 on the ISDN PRI link between a Cisco 6608-T1 and the Key System.

Layer 1 (Physical Layer)

The Inter-Tel configuration screen for the T1 PRI trunk's physical layer parameters are under System ->Cabinets -> T1 Primary Rate Interface screen.

Layers 2 & 3 (Q.921 and Q.931)

Layer 2 and 3 packet exchanges were monitored using an Acacia Clarinet protocol analyzer, bridged across the PRI link in high impedance mode.

Layer 2 Q.921 packets were monitored to ensure that each Inter-Tel/6608 software configuration properly exchanged SABME/UA packets to initialize the ISDN link, and then RR packets were exchanged every 30 seconds.

Layer 3 Q.931 packets were monitored to ensure that the appropriate call setup/teardown packets were exchanged for each configuration, and that the SETUP packets contained the mandatory Information Elements with the necessary details, as well as optional IEs such as Calling Name and Number.

Telephone calls were made end-to-end in both directions through the Cisco 6608-T1 Gateway, and a check was made to ensure that there was an audio path in both directions for each call.

User/Network Settings

The Cisco 6608-T1 Gateway with ISDN protocol type setting of PRI-NI2 supports both protocol sides by selecting "Network/User" in the protocol side field when configuring the Gateway via 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.

Test Results

Testing was performed by Test Engineer(s): Samir Batio, August 24, 2001

Test Setup 1

Test configuration:

- PBX1 configured as NI2, emulates User
- Cisco 6608-T1 Gateway configured as PRI NI2, emulates Network

Table 1 Test Setup 1 Switch and Gateway Settings

Inter-Tel Axxess 256 Switch-type/ Protocol -side Setting	Cisco 6608-T1 ISDN Protocol/Protocol-side Setting
NI2/User	PRI NI2/Network

Table 2 Basic Calls: (Enbloc Sending)

Calls Made	Call Comp?	"Calling Number" Passed to Final Destination?	"Calling Name" Passed to Final Destination?	"Called Number" Passed to Orig. Side?	"Called Name" Passed to Orig. Side?	Notes
Phone A to Phone C	Yes	Yes	No	No[1]	No[2]	
Phone C to Phone A	Yes	Yes	No	Yes	No	

1. CallManager is not sending "Connected Number" information in the connect message back to PBX.
2. The Inter-Tel PRI interface with NI2 setting does not support "Calling Name" presentation Feature.

Table 3 Call Transfers: (Supervised Local Transfers)

Calls Made	Call Comp?	Orig. "Calling Number" displayed on Final Dest. phone?	Orig. "Calling Name" displayed on Final Dest. phone?	"Called Number" display on Orig. phone updated after transfer?	"Called Name" display on Orig. phone updated after transfer?	Notes
Phone C to Phone A Xfr to Phone B	Yes	Yes	No	No	No	
Phone A to Phone C Xfr to Phone D	Yes	Yes	No	No	No	

Table 4 Call Conferencing (Local)

Calls Made	Call Comp?	"Calling Number" passed to remaining conferee when the conferencing phone drops out?	"Calling Name" passed to remaining conferee when the conferencing phone drops out?	"Connected Number" updated on Orig. Caller phone display when a conferee drops out?	"Connected Name" updated on Orig. Caller phone display when a conferee drops out?	Notes
Phone C to Phone A, Phone A conf Phone B	Yes	(A Drops out) Yes	(A Drops out) No	(A Drops out) No	(A Drops out) No	
Phone C to Phone A, Phone C conf Phone D	Yes	(C Drops out) No	(C Drops out) No	(D Drops out) No	(D Drops out) No	
Phone A to Phone C, Phone C conf Phone D	Yes	(C Drops out) No	(C Drops out) No	(C Drops out) No	(C Drops out) No	
Phone A to Phone C, Phone A conf Phone B	Yes	(A Drops out) No	(A Drops out) No	(B Drops out) No	(B Drops out) No	

Table 5 Call Forward (Local)

Calls Made	Call Comp?	Original "Calling Number" passed to Final Dest.?	Original "Calling Name" passed to Final Dest.?	Forwarding "Called Number" passed to Final Dest.?	Forwarding "Called Name" passed to Final Dest.?	Final dest. "Connected Number" updated at orig. side?	Final dest. "Connected Name" updated at orig. side?
Phone C to Phone A fwd to Phone B	Yes	Yes	No	No	Yes	No	No
Phone A to Phone C fwd to Phone D	Yes	Yes	No	No	No	No	No

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 317 7777
Fax: +65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the

Cisco Web site at www.cisco.com/go/offices

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia
Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland
Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland
Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden
Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe