



Alcatel 4400 Rel 3.2 PBX with CallManager using 2621-E1 PRI-NET5 Gateway

This application note illustrates connectivity for Alcatel 4400 Release 3.2 PBX with Cisco CallManager using Cisco 2621-E1 PRI-TE5 Gateway.

Integration Description

Connectivity is achieved using the ETSI standard PRI protocol. The Alcatel 4400 can be configured as either NETWORK or USER side.

Cisco Systems Equipment needed

Hardware (Gateway): Cisco 2621 with 2MFT E1 Port

Software: CallManager Release 3.1

PBX Hardware and Software Requirements

Hardware: PRA2, 3BA23076

Software: Version R3.2

Features Supported

Key features supported:

- Calling/Called Number

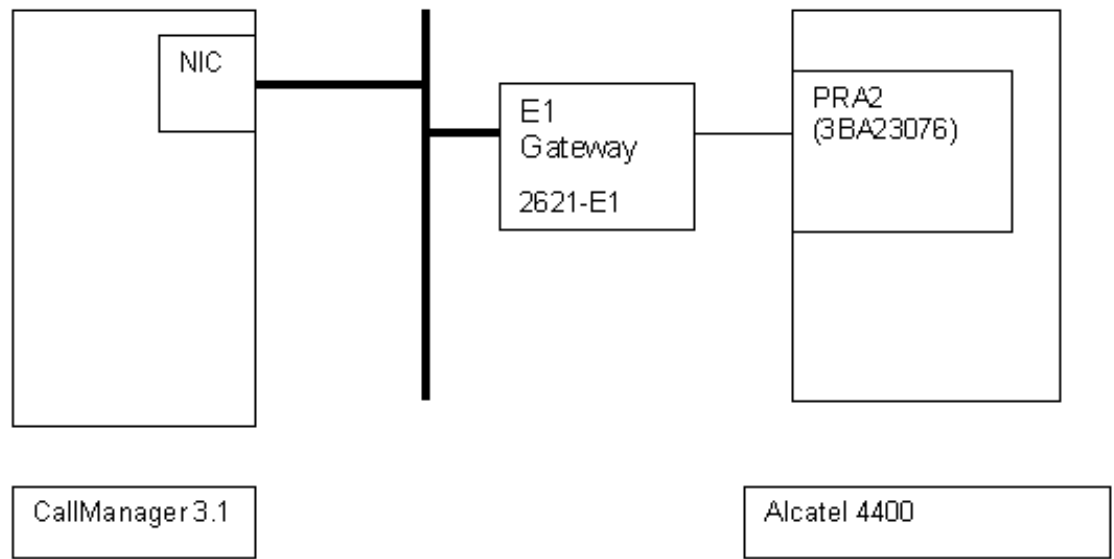
Key features not supported:

- Calling/Called Name



Network Diagram

Figure 1
Network Test Topology



Configuring the Alcatel 4400 PBX

Configure in the following sequence:

1. ["Configure Board" on page 3](#)
2. ["Configure Digital Access Options" on page 3](#)
3. ["Configure Trunk Group" on page 4](#)
4. ["Configure Trunk Detail" on page 5](#)



Configure Board

Interface type must be set to PRA2.

\compidea\Shelf::0\Board::3

Board Address	3
Interface Type	PRA2
Usage State	Busy
Operational State	Enabled
Main/Standby State	Main (Master)
Number Of Sets Being Connect.	1
CRC4	YES
Country Protocol Type	USA
Incidents Teleservice	YES
ISDN Board Layer 2 Parameters	
Retransmission Timer	100
TEI Identity Check Timer	100
Polling Timer	1000
Nb_Of_Retransmission	3
Max Frame Size (Bytes)	260
Window Size In Frames SAPI S T0	1
Window Size In Frames SAPI P T0	3
Window Size In Frames SAPI S T2	7
Window Size In Frames SAPI P T2	7
Passive board	NO
SS7 signalling	NO

Configure Digital Access Options

Network mode must be set to Yes for (Master/Network) or No - (Slave/User).

Access Type must be set to T2.

\compidea\Shelf::0\Board::3\Digital Access::0

T0/T2 Access No.	0
Access Type	T2
Synchronisation Priority	255
Network Mode	YES
Max Nb Of Used B Channels	30
Max_Nb_Of_Compressed_B_Channels	0
TieLine Mode	NO
With Alarm	NO
Reserved1	YES
Reserved2	YES
Network Date Time Update	NO
CRC4	



Configure Trunk Group

Q931 signal variant is used to set the protocol type to ISDN all countries.

```
\compidea\Trunk Groups::0
```

Trunk Group Id	0
Trunk Group Type	T2
Trunk Group Name	PRA2_EURO
Node number	1
Transcom Trunk Group	False
Auto.reserv.by Attendant	False
Overflow trunk group No.	-1
Tone on seizure	True
Private Trunk Group	False
Q931 signal variant	ISDN all countries
Number Compatible With	-1
Number Of Digits To Send	4
Channel selection type	Quantum
Remote Network	15
Shared Trunk Group	False
auto.DTMF dialing on outgoing call	NO
T2 Specificity	None
Public Network Category	0
DDI transcoding	False
Special Services	Nothing
Can support UUS in SETUP	True



Configure Trunk Detail

\compidea\Trunk Groups::0\Trunk Group::1

Instance (reserved)	1
Trunk Group Type	T2
Public Network Ref.	
Dialling end to end	NO
DTMF end to end signal.	NO
Trunk group used in DISA	NO
DISA Secret Code	
VG for non-existent No.	YES
Routing To Executive	NO
Trunk Category Id	19
Nb of digits unused (ISDN)	0
B Channel Choice	YES
Channels Reserved By Attend.	0
Dissuasion For ACD	NO
DTO joining	NO
Enquiry Call On B Channel	NO
Automated Attendant	NO
Calling party Rights category	0
Entity Number	0
TS Overflow	YES
Number To Be Added	
Supervised by Routing	NO
VPN Cost Limit for Incom.Calls	0
Immediat Trk Listening For VPNCall	YES
VPN TS %	50
Csta Monitored	NO
Max.% of trunks out CCD	0
Charge Calling And ADN Creation	NO
Ratio analog.to ISDN tax	
LogicalChannel	1__15 & 17__31
TS Distribution on Accesses	YES
Use Split Acces	NO
Heterogeneous Remote Network	NO
Barring mode	Not barred
ARS class of service	31
Quality profile for voice on IP	Profile #1
IP compression type	Default
Use of volume in system	YES



Configuring Cisco CallManager

H.323 (Cisco 2621) Gateway 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 Cisco CallManager Administration logo and the Cisco Systems logo. The main content area is titled "Gateway Configuration" and includes a "Back to Find/List Gateways" link. The configuration details for an H.323 Gateway are displayed, including the Gateway IP address (10.1.1.129), Device Protocol (H.225), Registration status (Unknown), and IP Address (10.1.1.129). A status message indicates that the update is completed and suggests resetting the gateway. Below this, there are four buttons: Update, Delete, Reset Gateway, and Cancel Changes. At the bottom, there are four input fields: Device Name* (10.1.1.129), Description (Cisco 2621), Device Pool* (Default), and Media Resource Group List (<None >). A status bar at the very bottom shows "Restart succeeded." and "Local intranet".

System Route Plan Service Feature Device User Application Help

Cisco CallManager Administration
For Cisco IP Telephony Solutions

CISCO SYSTEMS

Gateway Configuration

[Back to Find/List Gateways](#)

Product : H.323 Gateway
Gateway : 10.1.1.129
Device Protocol: H.225
Registration: Unknown
IP Address: 10.1.1.129

Status: Update completed. Reset the gateway to have the changes take affect.

Device Name*

Description

Device Pool*

Media Resource Group List

Restart succeeded. Local intranet



Cisco CallManager 3.1 Administration - Gateway Configuration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Print

Address n/CCMAdmin/gatewayconfig.asp?pkid={E014BCF6-F6EA-48AA-A39B-C7E3082EED18}&Status=L5&Action=Update&Type=17 Go Links

Network Hold Audio Source	< None >
User Hold Audio Source	< None >
Calling Search Space	< None >
Location	< None >
Caller ID DN	
Calling Party Selection*	Originator
Presentation Bit*	Allowed
Display IE Delivery	<input type="checkbox"/>
Gatekeeper Name	< None >
Media Termination Point Required	<input type="checkbox"/>
Num Digits*	23
Sig Digits	<input type="checkbox"/>
Prefix DN	
Run H225D On Every Node	<input checked="" type="checkbox"/>
Called party IE number type unknown*	Cisco CallManager

Reset succeeded. Local intranet



Required	
Num Digits*	<input type="text" value="23"/>
Sig Digits	<input type="checkbox"/>
Prefix DN	<input type="text"/>
Run H225D On Every Node	<input checked="" type="checkbox"/>
Called party IE number type unknown*	<input type="text" value="Cisco CallManager"/>
Calling party IE number type unknown*	<input type="text" value="Cisco CallManager"/>
Called Numbering Plan*	<input type="text" value="Cisco CallManager"/>
Calling Numbering Plan*	<input type="text" value="Cisco CallManager"/>
* indicates required item	
Back to Find/List Gateways	

Restart succeeded. Local intranet



Route Pattern Configuration

System Route Plan Service Feature Device User Application Help

Cisco CallManager Administration
For Cisco IP Telephony Solutions

CISCO SYSTEMS

Route Pattern Configuration

[Add a New Route Pattern](#)
[Back to Find/List Route Patterns](#)

Route Pattern: 6.XXXX
Status: Ready
Note: Any update to this route pattern automatically resets the associated gateway/route list

Copy Update Delete Cancel Changes

Pattern Definition

Route Pattern*	<input type="text" value="6.XXXX"/>
Partition	< None >
Numbering Plan*	North American Numbering Plan
Route Filter	< None >
Gateway/Route List*	10.1.1.129 (Edit)
Route Option	<input checked="" type="radio"/> Route this pattern <input type="radio"/> Block this pattern

Local intranet



Partition	< None >
Numbering Plan*	North American Numbering Pl
Route Filter	< None >
Gateway/Route List*	10.1.1.129 (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	<input type="text"/>
Prefix Digits (Outgoing Calls)	<input type="text"/>
Called Party Transformations	
Discard Digits	PreDot
Called Party Transform Mask	<input type="text"/>
Prefix Digits (Outgoing Calls)	<input type="text"/>

* indicates required item.

Considerations

Calling Name and Number Feature

Calling Name delivery and presentation features are not supported by the Alcatel 4400 PBX.

When configuring Cisco 2621 (H.323) Gateway to emulate User side (Alcatel emulate Network side), make sure that the "Display IE Delivery" box is NOT checked in CallManager H.323 Gateway Configuration, otherwise calls will not be completed. Alcatel PBX complains about the Caller ID Display information being sent in the "SETUP" message from CallManager by sending STATUS message with cause of "IE non-existent/unimplemented".

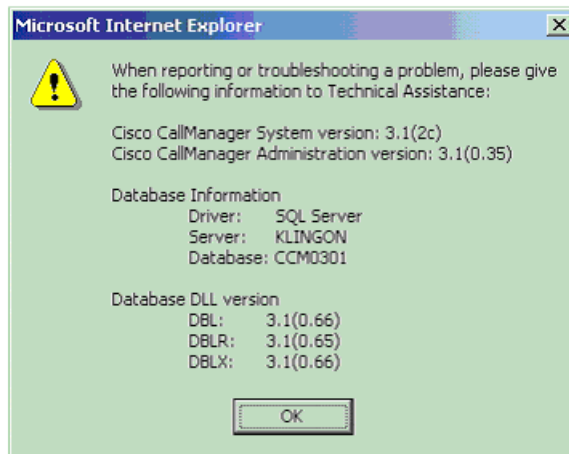
When calling from Cisco 7960 IP phone to Alcatel digital phone, Calling/Called Number is displayed on both phones after the call is answered as expected.

When calling from Alcatel digital phone to Cisco 7960 IP phone, IP phone displays Connected Number after the call is answered. Alcatel phone however does NOT get updated when the call is answered. It displays the trunk name. It was verified using ISDN protocol analyzer that the CallManager was not sending "Connected Number" information in the connect message back to PBX.



Appendix A

CallManager Software Release



Alcatel 4400 Software Version

Version Information

\compidea\Node

```
Node Number (reserved) 1
Software Version        R3.2
Version name            c1.712
Patch No.                5
Notes
Object Identity
Node Number (reserved) 1
Ethernet Notes
  Netmask
  Local CPU
    Name                 x000000_tun
    IP Address           172.30.253.253
  Twin Cpu
    Name
    IP Address
  Main Cpu
    Name                 xm000000
    IP Address           10.253.253.3
  StandBy Cpu
    Name
    IP Address
SL Notes
IP/X25 Tunnel Notes
  Netmask                255.255.0.0
  Local Node
    Name                 x000000_tun
    IP Address           172.30.253.253
```

Cisco Systems, Inc.

All contents are Copyright © 1992–2002 Cisco Systems, Inc. All rights reserved. Important Notices and Privacy Statement.



Cisco 2621 Router Configuration

2621_B#sh version

Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-JS-M), Version 12.2(3.5)T, MAINTENANCE INTERIM S
SOFTWARE

TAC Support: <http://www.cisco.com/tac>

Copyright (c) 1986-2001 by cisco Systems, Inc.

Compiled Fri 03-Aug-01 22:45 by ccai

Image text-base: 0x80008088, data-base: 0x81631DD8

ROM: System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)

2621_B uptime is 16 hours, 6 minutes
System returned to ROM by power-on
System image file is "flash:c2600-js-mz.122-3.5.T"

cisco 2621 (MPC860) processor (revision 0x200) with 56320K/9216K bytes of memory

.
Processor board ID JAD051516TX (503811939)
M860 processor: part number 0, mask 49
Channelized E1, Version 1.0.
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
Primary Rate ISDN software, Version 1.1.
2 FastEthernet/IEEE 802.3 interface(s)
31 Serial network interface(s)
2 Channelized E1/PRI port(s)
32K bytes of non-volatile configuration memory.
16384K bytes of processor board System flash (Read/Write)

Configuration register is 0x2102

2621_B#

2621_B#sh diag

Slot 0:

C2621 2FE Mainboard Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware Revision : 2.0
PCB Serial Number : JAD051516TX (503811939)
Part Number : 73-3200-08
RMA History : 00
RMA Number : 0-0-0-0
Board Revision : A0
Deviation Number : 0-21249
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 00 A2 41 02 00 C1 17 4A 41 44 30 35 31
0x10: 35 31 36 54 58 20 28 35 30 33 38 31 31 39 33 39
0x20: 29 82 49 0C 80 08 04 00 81 00 00 00 00 42 41 30
0x30: 80 00 00 53 01 FF FF FF FF FF FF FF FF FF FF



```
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

Slot 1:

```
High Density Voice Port adapter
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware Revision      : 1.1
Top Assy. Part Number  : 800-03567-01
Board Revision         : F1
Deviation Number       : 0-0
Fab Version            : 02
PCB Serial Number      : JAB05080LU9
RMA Test History       : 00
RMA Number             : 0-0-0-0
RMA History            : 00
```

EEPROM format version 4

EEPROM contents (hex):

```
0x00: 04 FF 40 00 CC 41 01 01 C0 46 03 20 00 0D EF 01
0x10: 42 46 31 80 00 00 00 02 02 C1 8B 4A 41 42 30
0x20: 35 30 38 30 4C 55 39 03 00 81 00 00 00 04 00
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

VIC Slot 0:

```
E1 (2 Port) Multi-Flex Trunk WAN Daughter Card
Hardware revision 1.0      Board revision B0
Serial number 18801733    Part number 800-04479-01
Test history 0x0          RMA number 00-00-00
Connector type PCI
```

EEPROM format version 1

EEPROM contents (hex):

```
0x20: 01 23 01 00 01 1E E4 45 50 11 7F 01 00 00 00 00
0x30: 58 00 00 00 00 03 09 00 FF FF FF FF FF FF FF FF
```

```
HDV firmware: Compiled Fri 23-Mar-01 00:20 by miriyala
HDV memory size 524280 heap free 175065
```

2621_B#

2621_B#sh controllers e1 1/0

E1 1/0 is up.

Applique type is Channelized E1 - balanced

No alarms detected.

alarm-trigger is not set

Version info Firmware: 20010710, FPGA: 15

Framing is CRC4, Line Code is HDB3, Clock Source is Line.

Data in current interval (71 seconds elapsed):

0 Line Code Violations, 0 Path Code Violations

0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins

Cisco Systems, Inc.

All contents are Copyright © 1992–2002 Cisco Systems, Inc. All rights reserved. Important Notices and Privacy Statement.

Page 13 of 22



0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
2621_B#

2621_B#**sh configuration**

Using 1813 out of 29688 bytes

```
!  
version 12.2  
no parser cache  
service timestamps debug datetime msec localtime show-timezone  
service timestamps log uptime  
no service password-encryption  
!  
hostname 2621_B  
!  
no logging buffered  
enable password cisco  
!  
!  
memory-size iomem 15  
voice-card 1  
  dspfarm  
!  
ip subnet-zero  
!  
!  
no ip domain-lookup  
!  
isdn switch-type primary-net5  
!  
!  
voice class codec 1  
  codec preference 1 g729r8  
  codec preference 2 g711ulaw  
  codec preference 3 g711alaw  
!  
!  
!  
!  
!  
!  
controller E1 1/0  
  pri-group timeslots 1-31  
!  
controller E1 1/1  
!  
!  
!  
!  
interface FastEthernet0/0  
  ip address 192.168.100.2 255.255.255.0  
  no ip mroute-cache  
  load-interval 30  
  no keepalive  
  speed auto
```



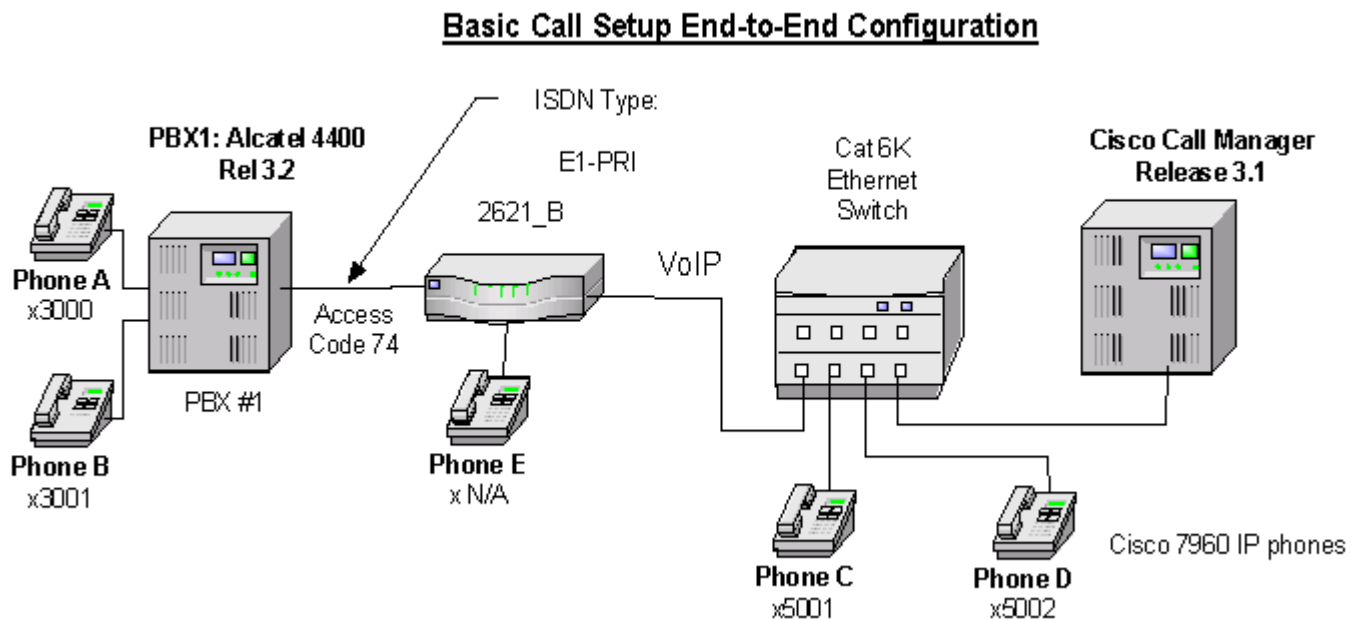
```
half-duplex
!
interface FastEthernet0/1
 ip address 10.1.1.129 255.255.255.0
 no ip mroute-cache
 duplex auto
 speed auto
!
interface Serial1/0:15
 no ip address
 no logging event link-status
 isdn switch-type primary-net5
 isdn incoming-voice voice
 isdn T321 40000
 isdn T203 30000
 isdn T306 60000
 isdn T310 30000
 isdn bchan-number-order ascending
 no cdp enable
!
router rip
 network 1.0.0.0
 network 192.168.100.0
!
ip classless
no ip http server
ip pim bidir-enable
!
dialer-list 1 protocol ip permit
dialer-list 1 protocol ipx permit
!
!
snmp-server packetsize 4096
snmp-server manager
tftp-server nvram
call rsvp-sync
!
voice-port 1/0:15
!
!
mgcp profile default
!
dial-peer cor custom
!
!
!
dial-peer voice 1 pots
 destination-pattern 3...
 direct-inward-dial
 port 1/0:15
 prefix 3
!
dial-peer voice 3 voip
 destination-pattern 5...
 progress_ind setup enable 1
 voice-class codec 1
 session target ipv4:10.1.1.2
```



```
dtmf-relay h245-alphanumeric
!  
!  
line con 0  
  exec-timeout 0 0  
line aux 0  
  exec-timeout 0 0  
line vty 0 4  
  exec-timeout 0 0  
  password cisco  
  login  
line vty 5 15  
  exec-timeout 0 0  
  login  
!  
scheduler allocate 3996 1000  
!  
end  
  
2621_B#
```

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 Alcatel 4400 PBX was connected via an ISDN E1 PRI link to a Cisco 2621 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 2621 and the PBX.



Layer 1 (Physical Layer)

The Alcatel 4400 PBX configuration screen for the E1 trunk interface is reached using both Alcatel Board and Board\Digital Access menus, setting the E1 physical layer parameters.

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 PBX/2621 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 2621 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 2621 Gateway with ISDN switch type setting of primary-net5 supports both protocol sides by using the isdn protocol-emulate network/user command.

The Alcatel 4400, supports both "USER" (slave) and "NETWORK" (master) protocol sides.

The following options are of particular interest:

- Trunk interface type must be set to PRA2.
- Network/User options are set in the Board/Digital Access Options menu. Network mode must be set to Yes for (Master/Network) or No - (Slave/User).
- Access Type must be set to T2.
- Q931 signal variant is used to determine Protocol type. This option was set to ISDN all countries.

Test Results

Testing was performed by Test Engineer(s): Samir Batio, October 18, 2001

Test Setup 1

Test configuration:

- PBX1 configured as ETSI, emulates Network
- Cisco 2621 Gateway configured as primary-net5, emulates User



Table 1 Test Setup 1 Switch and Gateway Settings

Alcatel 4400 Switch-type / Protocol-side Setting	Cisco 2621_B ISDN switch-type/ Protocol-side Setting
ETSI/Network	isdn switch-type primary-net5 / isdn protocol-emulate user

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. Calling Name delivery and presentation features are not supported by the Alcatel ISDN PRI Link.

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. " Connec ted Number" updated at orig. side?	Final dest. " Connec ted Name" updated at orig. side?	Notes
Phone C to Phone A fwd to Phone B	Yes	Yes	No	No	No	No	No	
Phone A to Phone C fwd to Phone D	Yes	Yes	No	No	No	No	No	



Test Setup 2

Test configuration:

- PBX1 configured as ETSI, emulates User
- Cisco 2621 Gateway configured as primary-net5, emulates Network

Table 6 Test Setup 2 Switch and Gateway Settings

Alcatel 4400 Switch-type/ Protocol side setting	Cisco 2621_B ISDN Switch-type/ Protocol-side Settings
ETSI / User	isdn switch-type primary-net5 / isdn protocol-emulate network

The test results are identical as in [Test Setup 1](#). Refer to the tables in [Test Setup 1](#) for details.





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

All contents are Copyright © 1992-2002, Cisco Systems, Inc. All rights reserved. CCIP, the Cisco Arrow logo, the Cisco Powered Network mark, the Cisco Systems Verified logo, Cisco Unity, Follow Me Browsing, FormShare, Internet Quotient, iQ Breakthrough, iQ Expertise, iQ FastTrack, the iQ logo, iQ Net Readiness Scorecard, Networking Academy, ScriptShare, SMARTnet, TransPath, and Voice LAN are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn, Discover All That's Possible, The Fastest Way to Increase Your Internet Quotient, and iQuick Study are service marks of Cisco Systems, Inc.; and Aironet, ASIST, BPX, Catalyst, CCDA, CCDP, CCIE, CCNA, CCNP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, the Cisco IOS logo, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Empowering the Internet Generation, Enterprise/Solver, EtherChannel, EtherSwitch, Fast Step, GigaStack, IOS, IP/TV, LightStream, MGX, MICA, the Networkers logo, Network Registrar, Packet, PIX, Post-Routing, Pre-Routing, RateMUX, Registrar, SlideCast, StrataView Plus, Stratum, SwitchProbe, TeleRouter, and VCO are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0206R)