

NEC 2400 ICS Rel J 5.8 PBX with CallManager using 6608-E1 PRI EURO Gateway

This application note illustrates connectivity for NEC 2400 ICS Rel J 5.8 PBX with CallManager using 6608-E1 PRI EURO Gateway.

Introduction

The network topology diagram presented in [Figure 1](#) illustrates the test set-up for end-to-end interoperability with the Cisco CallManager connected to the PBX via 6608-E1 PRI link as the Gateway

Key test environment parameters:

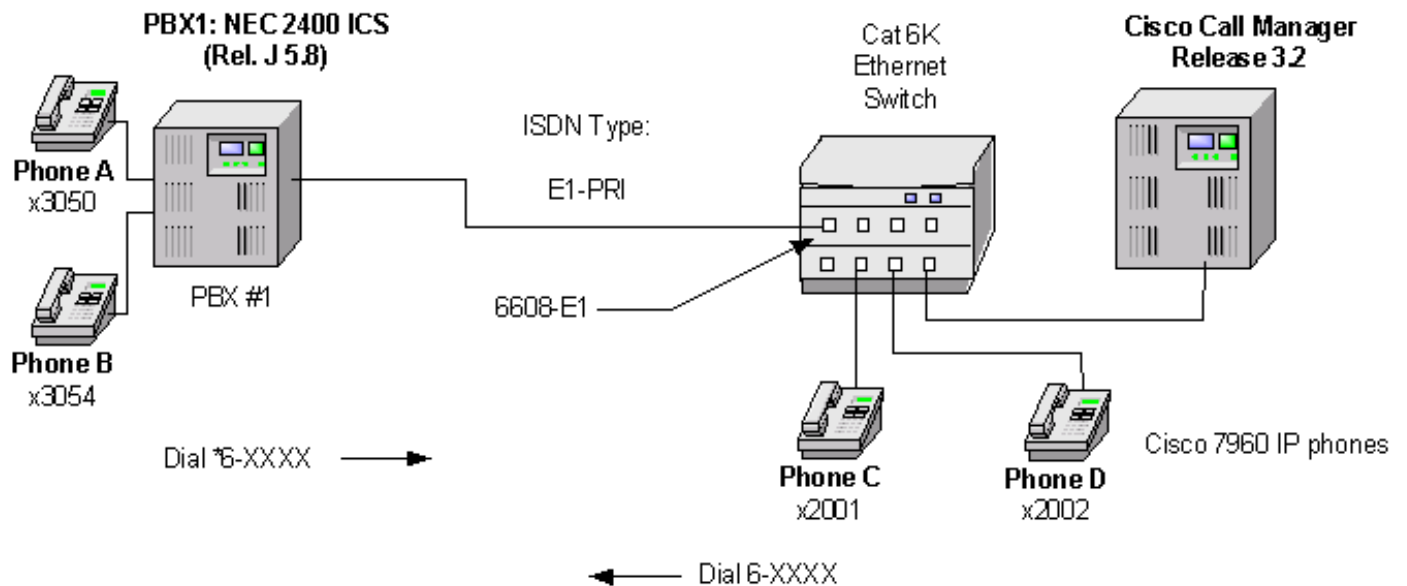
- Connectivity is achieved by using the PRI EURO protocol type on the gateway and NEC/ETSI switch type on the NEC 2400 PBX. Though the NEC 2400 can be configured as either NETWORK (Master) or USER (Slave) side, this is not recommended and the NEC TAC center will not resolve a case presented with NEC set as NETWORK side.
- Calling Name delivery and presentation features are not supported by the NEC 2400 PBX.
- CCM does not send "Connected Number" information in the CONNECT message back to PBX.



Network Diagram

Figure 1
Network Test Topology

Basic Call Setup End-to-End Configuration



Limitations

Calling Name and Number Feature

Calling Name delivery and presentation feature are not supported by the NEC 2400 ICS PBX.

When calling from Cisco 7960 IP phone to NEC digital phone, both phones display Calling Number after the call is answered as expected.

When calling from NEC digital phone to Cisco 7960 IP phone, the Cisco IP phone displays Connected Number after the call is answered. NEC 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 an ISDN protocol analyzer that the CCM was not sending "Connected Number" information in the CONNECT message back to PBX.

System Components

Hardware Requirements

Cisco Hardware:

- Cisco Cat6K switch with 6608-E1 Gateway
- Cisco CM 3.2



NEC 2400 ICS PBX:

- Hardware: PA-30PRTB

Software Requirements

- PBX Software Release J 5.8.
- Cisco CM 3.2

Feature

Key features supported:

- Calling/Called Number Identification

Key features not supported:

- Updating Connected Number
- Calling/Called Name

Configuration

Sequence of configuration tasks:

1. [NEC 2400 ICS Configuration](#)
2. [Route \(ARTD\) Configuration](#)
3. [Cisco CallManager Configuration](#)

NEC 2400 ICS Configuration

The NEC requires a substantial amount of programming and circuit card switch settings to properly install E1 PRI. It is beyond the scope of this document to provide the entire configuration, therefore the NEC information below is mostly helpful for NEC techs. If further assistance is required, the entire configuration of our lab PBX can be found in EDCS document # EDCS-207455. The EDCS document provides the programs required for E1 ISDN circuit setup, all the switch settings for all cards on our Lab NEC and fairly complete configuration listings (*List Ups*).

Note: The switch settings and software references in the EDCS document assume a familiarity with the NEC 2400. It is highly recommended to have a NEC ISDN certified technician setup the NEC portion.

Configure in the following sequence:

1. Install circuit card.
2. Configure all software.

Table 1 Circuit Card Configuration (PA-30PRTB)

Switch	Position	Description	Setting
SW00		Make Busy	Down
SW01	0	All Channel Make Busy	Off
	1	External Loop Back	Off



Table 1 Circuit Card Configuration (PA-30PRTB)

Switch	Position	Description	Setting
	2	Internal Loop Back	Off
	3	Dch Handler Make Busy	Off
SW02 (SENSE - Rotary)		1 = AT&T 2 = Australia 3 = NTT Japan 4 = NEC/ETSI 5 = AT&T 6 = INS A = Q.SIG	4
SW10	Jumper	Off = Coax On = Twisted Pair	On
SW11	Jumper	Off = Coax On = Twisted Pair	On
SW12	Jumper	Off = Coax On = Twisted Pair	On
SW13	1	On = PAD ROM Special Version Off = PAD ROM Standard Version	Off
	2	On = ISDN BUS Not Used Off = ISDN BUS Used	On
	3	Not Used	Off
	4	Not Used	Off
SW14	1	On = CCITT Signaling Off = CEPT Signaling	On
	2	On = Alarm Release: 2sec (Aus) Off = Alarm Release 15 Sec.	On
	3	PAD	On
	4	PAD	On
	5	PAD	On
	6	PAD	On
	7	PAD	On
	8	Fixed Off	Off
SW15	1	Loopback Pattern Off = Loopback inhibited	Off
	2	Loopback Pattern Off = Loopback inhibited	Off



Table 1 Circuit Card Configuration (PA-30PRTB)

Switch	Position	Description	Setting
	3	Loopback Pattern Off = Loopback inhibited	Off
	4	Loopback Pattern Off = Loopback inhibited	Off
	5	TS16 Control: On = Data Through (CCIS/ISDN) Off = Signaling	On
	6	On = No CRC4 Off = CRC4	Off
	7	Firmware (CCITT/China/ Thailand/Aux)	On
	8	Firmware (CCITT/China/ Thailand/Aux)	On
SW16	1	Fixed Off	Off
	2	Fixed Off	Off
	3	All "1" Supervision On = To be controlled Off = Not to be controlled	Off
	4	On = Dch User Side Off = Dch Network Side	On
	5	On = Dch Negative Logic Off = Dch Positive Logic	Off
	6	On = Dch Packet Service On Off = Dch Packet Service Off	Off
	7	Fixed Off	Off
	8	Fixed Off	Off



38 FA 0 0 0 0 0

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* ROUTE CLASS DATA LIST *

CDN FUNCTION	R O U T E N U M B E R				
	11	12	13	14	15
39 BC	0	0	0	0	0
40 TCM	0	0	0	0	0
41 TDMQ	0	0	0	0	0
42 TRSC	0	0	0	0	0
43 BT	0	1	0	1	1
44 PRV	0	0	0	0	0
45 A/D	0	1	1	1	1
46 CW	0	0	0	0	0
47 TPQ	0	0	0	0	0
48 BL	0	0	0	0	0
49 TRKS	0	1	1	0	0
50 DPLY	0	1	1	1	1
51 ACD	0	0	0	0	0
52 2W/4W	1	0	0	0	0
53 FAAT	0	0	0	0	0
54 GW	0	0	0	0	0
55 TCMA	0	0	0	0	0
56 SMDR3	0	0	0	0	0
57 HDT	0	0	0	0	0
58 CD	0	0	0	0	0
59 CCH	0	0	0	0	0
60 TC/EC	0	0	0	0	0
61 IRE	0	0	0	0	0
62 SCR	0	0	0	0	0
63 LYER1	0	1	1	1	1
64 NET	0	1	0	0	0
65 INT	0	4	4	4	4
66 DC	0	4	4	4	4
67 HKS	0	0	0	0	0
68 SCF	0	0	0	0	0
69 SMDR4	0	0	0	0	0



Cisco CallManager Configuration

6608-E1 Gateway Configuration

Cisco CallManager Administration
For Cisco IP Telephony Solutions

Gateway Configuration [Back to Find/List Gateways](#)

Product : Cisco Catalyst 6000 E1 VoIP Gateway
Gateway : S0/DS1-0@SDA0001C9D8633E
Device Protocol: Digital Access PRI
Registration: Registered with Cisco CallManager 10.1.1.2
IP Address: 10.1.1.104

Status: Ready

MAC Address*	<input type="text" value="0001C9D8633E"/>
Description	<input type="text"/>
Device Pool*	<input type="text" value="Default"/>
Media Resource Group List	<input type="text" value="< None >"/>
Network Hold Audio Source	<input type="text" value="< None >"/>
User Hold Audio Source	<input type="text" value="< None >"/>
Calling Search Space	<input type="text" value="< None >"/>
Location	<input type="text" value="< None >"/>
Load Information	<input type="text"/>
Channel Selection Order*	<input type="text" value="Top Down"/>
PCM Type*	<input type="text" value="A-law"/>
Protocol Side*	<input type="text" value="Network"/>
Caller ID DN	<input type="text"/>
Calling Party Selection*	<input type="text" value="Originator"/>



Cisco CallManager 3.2 Administration - Gateway Configuration - Microsoft Internet Explorer

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Address <http://kingon/CCMAdmin/gate> Go Links

Channel IE Type*	Use Number when 1B
MCDN Channel Number Extension Bit Set to Zero**	<input type="checkbox"/>
Interface Identifier Present**	<input type="checkbox"/>
Interface Identifier Value**	0
Display IE Delivery	<input checked="" type="checkbox"/>
Redirecting Number IE Delivery - Outbound	<input checked="" type="checkbox"/>
Redirecting Number IE Delivery - Inbound	<input type="checkbox"/>
Delay for first restart (1/8 sec ticks)	32
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 EURO
Inhibit restarts at PRI initialization	<input checked="" type="checkbox"/>
Enable status poll	<input type="checkbox"/>
Number of digits to strip*	0
Network Locale	United States
Setup non-ISDN Progress Indicator IE Enable*****	<input type="checkbox"/>

Local intranet



Cisco CallManager 3.2 Administration - Gateway Configuration - Microsoft Internet Explorer

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Address http://kingon/CCMAdmin/gate

Product Specific Configuration

Clock Reference*	Network
Framing*	CRC4
Audio Signal Adjustment into IP Network*	NoDbPadding
Audio Signal Adjustment from IP Network*	NoDbPadding
Zero Suppression*	HDB3
Digit On Duration(50-500ms)*	100
Interdigit Duration(50-500msec)*	100
Adaptive Gain Control Enable*	<input type="checkbox"/>
SNMP Community String	public

Fax Parameters

Fax Relay Enable*	<input checked="" type="checkbox"/>
Fax Error Correction Mode Override*	<input checked="" type="checkbox"/>

* indicates required item
** applicable to DMS-100 protocol only
*** applicable to DMS-100 protocol and DMS-250 protocol only
**** may be required to force ringback from some PBXs

[Back to Find/List Gateways](#)

Local intranet



Route Pattern Configuration

Cisco CallManager 3.2 Administration - Route Pattern Configuration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Address 6-482E-82A5-26FFF0723031 Go Links

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*	6.XXXX
Partition	< None >
Numbering Plan*	North American Numbering Plan
Route Filter	< None >
Gateway/Route List*	S0/DS1-0@SDA0001C9D8633E (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

Use Calling Party's External Phone Number Mask

Calling Party Transform Mask

Prefix Digits (Outgoing Calls)

Called Party Transformations

Discard Digits

Called Party Transform Mask

Prefix Digits (Outgoing Calls)

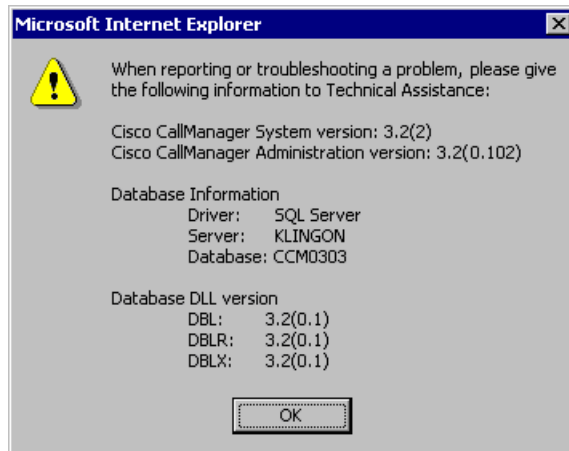
* indicates required item.

Done Local intranet



Appendix A

Cisco CallManager Software Release



NEC 2400 ICS Software Release

Software Release:

VERSION	ISSUE	DATE	
J	05.80	00/06/20	Generic
F	01.00	96/04/26	Boot ROM



Catalyst 6000 Switch Configuration

```

Console> (enable) 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 WS-X6348-RJ-45	SAD05020221 SAD04420N7B	Hw : 1.1 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) HP : A00203010038; DSP : A003Q031 (3.6.
15)				
6	8	WS-X6608-E1	SAD04380DW1	Hw : 1.1 Fw : 5.4(2) Sw : 5.5(6a) HP1: D00403010044; DSP1: D005Q031 (3.6.
15)				HP2: D00403010044; DSP2: D005Q031 (3.6.
15)				HP3: D00403010044; DSP3: D005Q031 (3.6.
15)				HP4: D00403010044; DSP4: D005Q031 (3.6.
15)				HP5: D00403010044; DSP5: D005Q031 (3.6.
15)				HP6: D00403010044; DSP6: D005Q031 (3.6.
15)				HP7: D00403010044; DSP7: D005Q031 (3.6.
15)				HP8: D00403010044; DSP8: D005Q031 (3.6.

Module	DRAM			FLASH			NVRAM		
	Total	Used	Free	Total	Used	Free	Total	Used	Free
1	65408K	37340K	28068K	16384K	11546K	4838K	512K	198K	314K

```
Uptime is 127 days, 7 hours, 31
```

```
Console> (enable)
```

```
Console> (enable) 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
6 6 8 E1 WS-X6608-E1 no ok
```

```
Mod Module-Name Serial-Num
-----
1 SAD05010NBK
3 SAD04420N7B
4 SAD050203M8
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)
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> (enable)

Console> (enable) **sh port 6/1**

```
Port Name Status Vlan Duplex Speed Type
-----
6/1 connected 1 full 2.048 E1
```

```
Port DHCP MAC-Address IP-Address Subnet-Mask
-----
6/1 enable 00-01-c9-d8-63-3e 10.1.1.104 255.255.255.0
```

```
Port Call-Manager(s) DHCP-Server TFTP-Server Gateway
-----
6/1 10.1.1.2 10.1.1.2 10.1.1.2 10.1.1.7
```

```
Port DNS-Server(s) Domain
-----
6/1 - -
```

```
Port CallManagerState DSP-Type
-----
6/1 registered C549
```

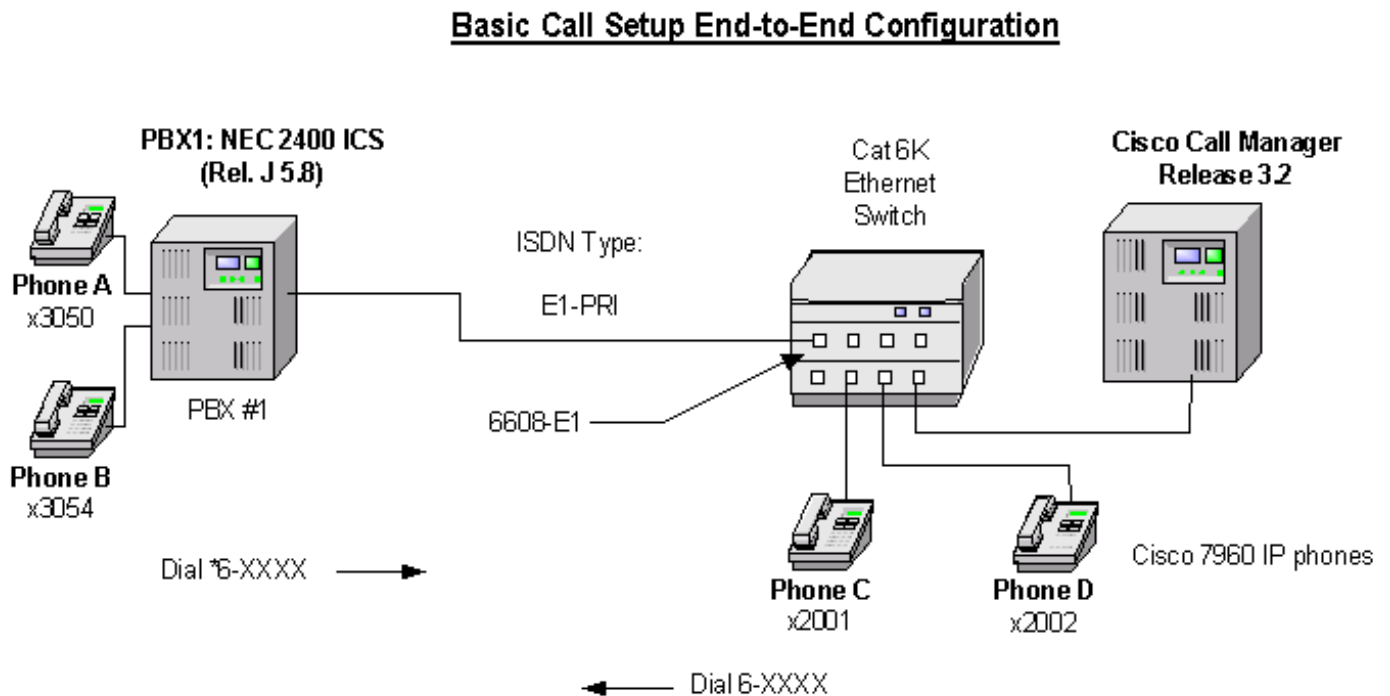
```
Port NoiseRegen NonLinearProcessing
-----
6/1 enabled enabled
```

Console> (enable)



Test Configuration

Figure 2
Test Topology



As shown in the diagram above, an NEC 2400 ICS PBX was connected via an ISDN E1 PRI link to a Cisco 6608-E1 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-E1 and the PBX.

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/6608-E1 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-E1 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-E1 Gateway with ISDN protocol type setting of PRI EURO supports both protocol sides by selecting “Network/User” in the Protocol Side field when configuring the Gateway via CCM. The NEC 2400 ICS PBX supports “USER” protocol side.

Appendix B

Test Results

Testing was performed by Test Engineer(s): Samir Batio and Bob Graves, March 11, 2002

Test Setup

Test configuration:

- PBX1 configured as ETSI, emulates User
- Cisco 6608-E1 Gateway configured as PRI EURO, emulates Network

Table 2 Test Setup Switch and Gateway Settings

NEC 2400 ICS Switch-type / Protocol-side Setting	Cisco 6608-E1 ISDN Protocol-type/ Protocol-side Setting
ETSI / User	PRI EURO / Network

Table 3 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. CCM does not support sending “Connected Number” information in the connect message back to PBX.

2. The NEC 2400 with switch-type setting of ETSI for the PRI interface does not support “Calling Name” presentation feature.



Table 4 Basic Calls with Overlap Sending/Receiving: (check trace to verify Overlap mode)

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	N/A					1
Phone C to Phone A	N/A					

1. NEC 2400 ICS PBX does not support Overlap sending/Receiving mode.

Table 5 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 6 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 7 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?	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	



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

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