



Ericsson MD-110 Rel BC9 PBX with CallManager using 6608-T1 PRI NI2 Gateway

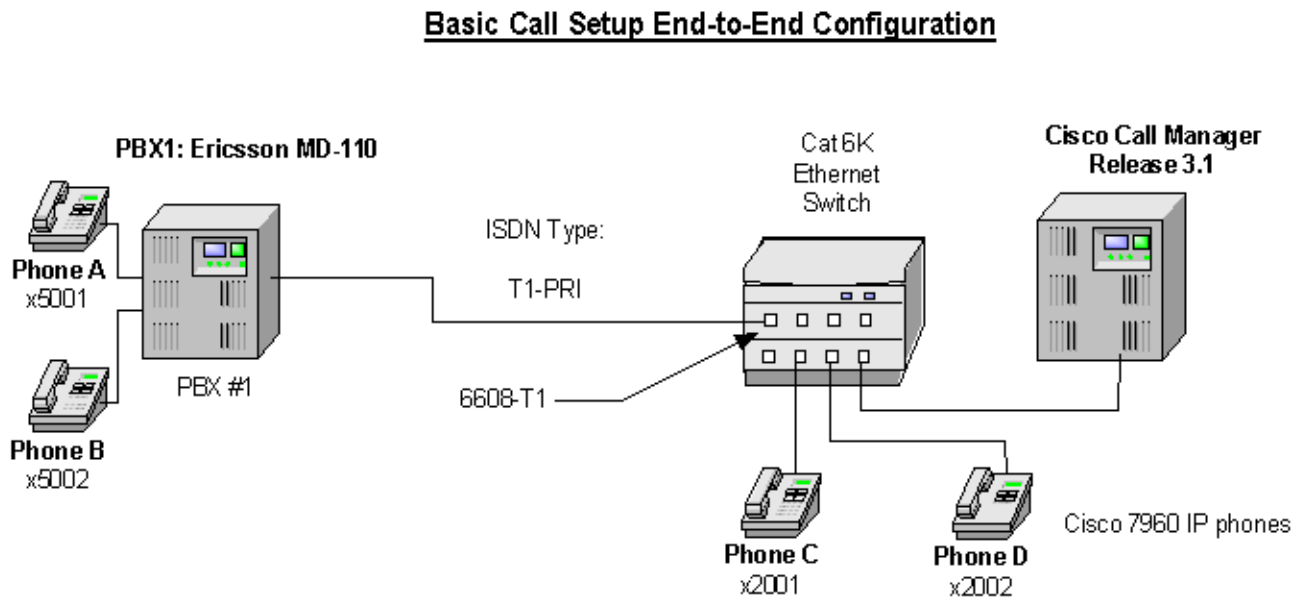


Integration Description

Connectivity is achieved by using the industry standard PRI NI-2 protocol. You can configure the Ericsson MD-110 as either NETWORK or USER side.

Network Topology

Figure 1 Network Topology or Test Setup



Limitations

Calling Name and Number Feature

- Calling Name delivery and presentation features are not supported by the Ericsson MD-110 PBX.
- When calling from Cisco 7960 IP phone to Ericsson digital phone, Calling/Called Number is displayed on both phones after the call is answered as expected.
- When calling from Ericsson digital phone to Cisco 7960 IP phone, IP phone displays Connected Number after the call is answered. Ericsson 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.

System Components

Cisco Hardware and Software Requirements

- Hardware (Gateway): 6608 T1 Port
- Software: CallManager Release 3.1

PBX Hardware and Software Requirements

- Hardware: TLU77/1

- Software: Version BC9

Features

Calling/Called Number

Configuration

Configuration Sequence and Tasks

Configure in the following sequence:

Step 1. ROCAI Route Category Initiate

Setup internal characteristics for the route. Ex. Traffic direction, services, Bearer capabilities.

```
<_ROCAP:ROU=20;
```

```
ROUTE CATEGORY DATA
```

ROU SEL	TRM SERV	NODG	DIST	DISL	TRAF	SIG	BCAP
20	711000000000	7	3110000010	0	5	20	03151515 211100000031 111111

```
END
```

Step 2. RODAI Route Data Initiate

```
<_RODAP:ROU=20;
```

```
ROUTE DATA
```

ROU	TYPE	VARC	VARI	VARO	FILTER
20	SL63	H'00001110	H'00000002	H'00000037	NO

```
END
```

T1-PRI Route Protocol Characteristics, protocol side "User"

```
<_RODAP:ROU=20;
```

```
ROUTE DATA
```

ROU	TYPE	VARC	VARI	VARO	FILTER
20	SL63	H'00001110	H'00000002	H'00000027	NO

```
END
```

Step 3. ROEQI Route Equipment Initiate

T1-PRI trunk lines (B-channels)

```
<_ROEDP:ROU=20,TRU=ALL;  
ROUTE EQUIPMENT DATA
```

ROU	TRU	EQU	SQU	INDDAT
20	001-1	001-0-00-00	0-00-3	H'000000000000
20	001-2	001-0-00-01	0-00-3	H'000000000000
20	001-3	001-0-00-02	0-00-3	H'000000000000
20	001-4	001-0-00-03	0-00-3	H'000000000000
20	001-5	001-0-00-04	0-00-3	H'000000000000
20	001-6	001-0-00-05	0-00-3	H'000000000000
20	001-7	001-0-00-06	0-00-3	H'000000000000
20	001-8	001-0-00-07	0-00-3	H'000000000000
20	001-9	001-0-00-08	0-00-3	H'000000000000
20	001-10	001-0-00-09	0-00-3	H'000000000000
20	001-11	001-0-00-10	0-00-3	H'000000000000
20	001-12	001-0-00-11	0-00-3	H'000000000000
20	001-13	001-0-00-12	0-00-3	H'000000000000
20	001-14	001-0-00-13	0-00-3	H'000000000000
20	001-15	001-0-00-14	0-00-3	H'000000000000
20	001-16	001-0-00-15	0-00-3	H'000000000000
20	001-17	001-0-00-16	0-00-3	H'000000000000
20	001-18	001-0-00-17	0-00-3	H'000000000000
20	001-19	001-0-00-18	0-00-3	H'000000000000
20	001-20	001-0-00-19	0-00-3	H'000000000000
20	001-21	001-0-00-20	0-00-3	H'000000000000
20	001-22	001-0-00-21	0-00-3	H'000000000000
20	001-23	001-0-00-22	0-00-3	H'000000000000

END

Step 4. RODDI Route External Destination Data Initiate

Route and Access Code for the trunk Information- Note PRI uses Route 20

```
<_RODDP:DEST=ALL;  
EXTERNAL DESTINATION ROUTE DATA
```

DEST	DRN	ROU	CHO	CUST	ADC	TRC	SRT	NUMACK	PRE
2	20				100500000000025000	0	1	0	
30	1				100500000000025000	0	3	0	
31	2				100500000000025000	0	3	0	
32	3				100500000000025000	0	3	0	
33	4				100500000000025000	0	3	0	
34	5				100500000000025000	0	3	0	
35	6				000500000000025000	0	3	0	
36	7				000500000000025000	0	3	0	
37	8				000500000000025000	0	3	0	
39	21				100500000000025000	0	3	0	
40	11				100500000000025000	0	3	0	
41	12				000500000000025000	0	3	0	
42	13				000500000000025000	0	3	0	

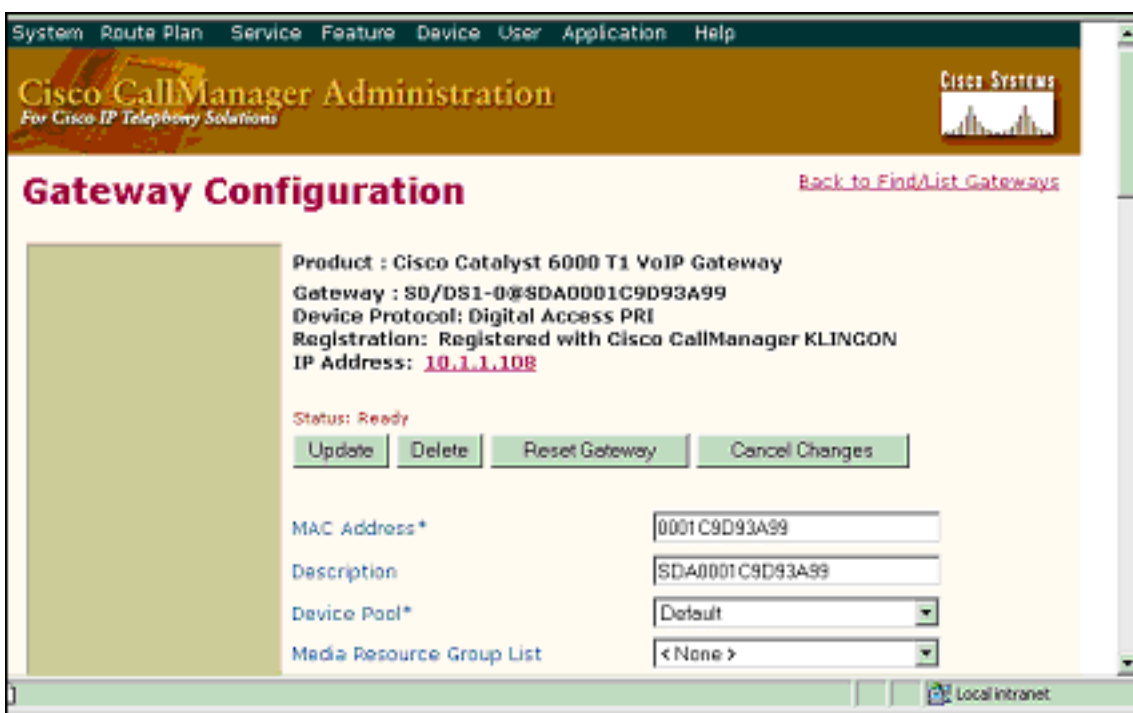
END

Note: The Ericsson MD-110 PBX user interface is very cryptic. All parameters and options are mapped to position-dependent numeric fields within the various commands listed above. You must have the correct revision of the Ericsson MD-110 PBX Administration manual to be able to decipher each field position to determine its meaning. Therefore, it is advised not to make changes to an MD-110 PBX unless you know exactly what you are doing. A single number out of place in a command string can cause unusual behavior on the PBX.

Configuration Menus and Commands

Configuring the Cisco Call Manager

Figure 2 6608 Gateway Configuration



The screenshot displays the Cisco Call Manager Administration web interface. At the top, there is a navigation menu with options: System, Route Plan, Service, Feature, Device, User, Application, and Help. Below the menu is the Cisco Call Manager Administration logo and the Cisco Systems logo. The main heading is "Gateway Configuration" with a link "Back to Find/List Gateways". The configuration details for a gateway are as follows:

Product :	Cisco Catalyst 6000 T1 VoIP Gateway
Gateway :	SD/DS1-0@SDA0001C9D93A99
Device Protocol:	Digital Access PRI
Registration:	Registered with Cisco CallManager KLINGON
IP Address:	10.1.1.108

Status: Ready

Buttons: Update, Delete, Reset Gateway, Cancel Changes

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

Local intranet

Figure 3 6608 Gateway Configuration, cont.

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*	User
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

Restart succeeded. Local intranet

Figure 4 More 6608 Gateway Configuration

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 N12
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

Figure 5 6608 Gateway Configuration - Product Specific Configuration

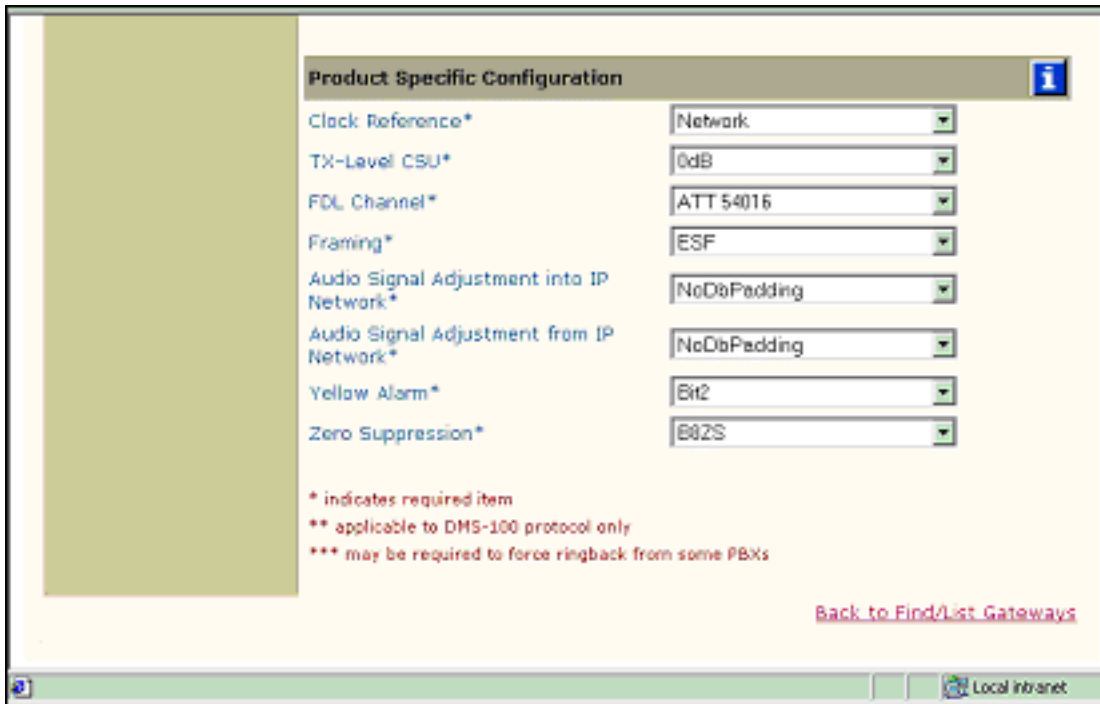


Figure 6 Route Pattern Configuration

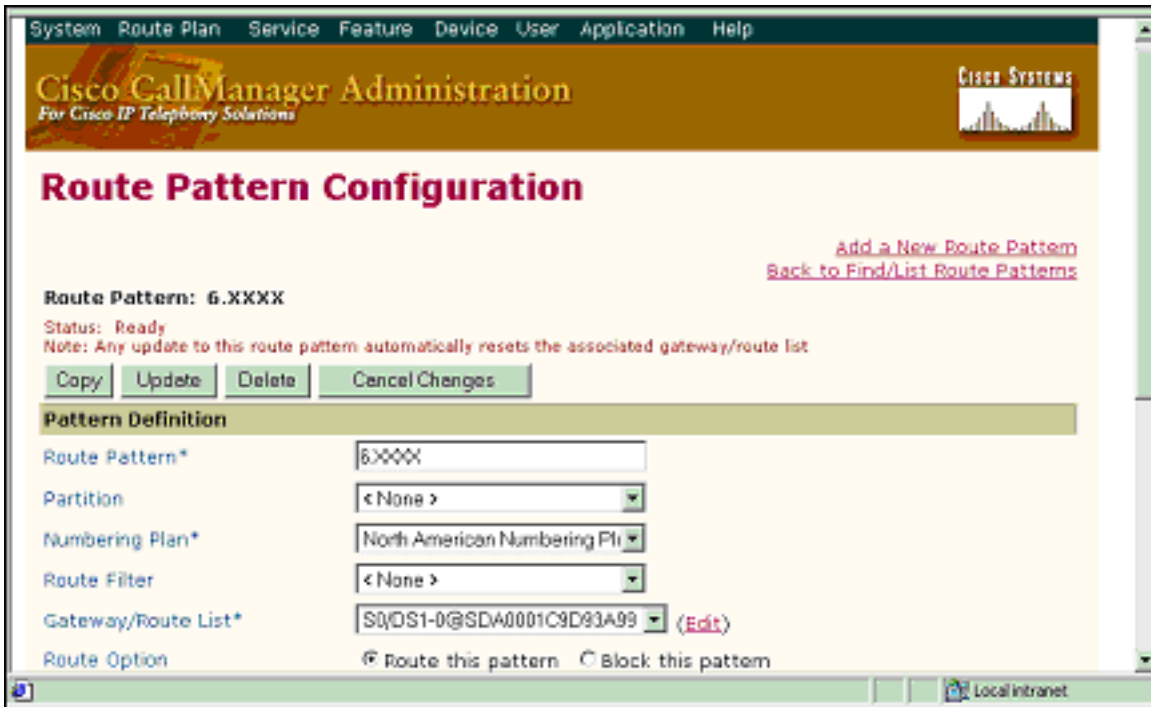


Figure 7 Route Pattern Configuration, Cont.

The screenshot displays the 'Route Pattern Configuration' window. The fields are as follows:

- Route Pattern*: 6XXXX
- Partition: <None >
- Numbering Plan*: North American Numbering Plx
- Route Filter: <None >
- Gateway/Route List*: S0/DS1-0@SDA0001CSD93A99 (Edit)
- Route Option: Route this pattern Block this pattern
- Provide Outside Dial Tone 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: PreDot
 - Called Party Transform Mask: []
 - Prefix Digits (Outgoing Calls): []

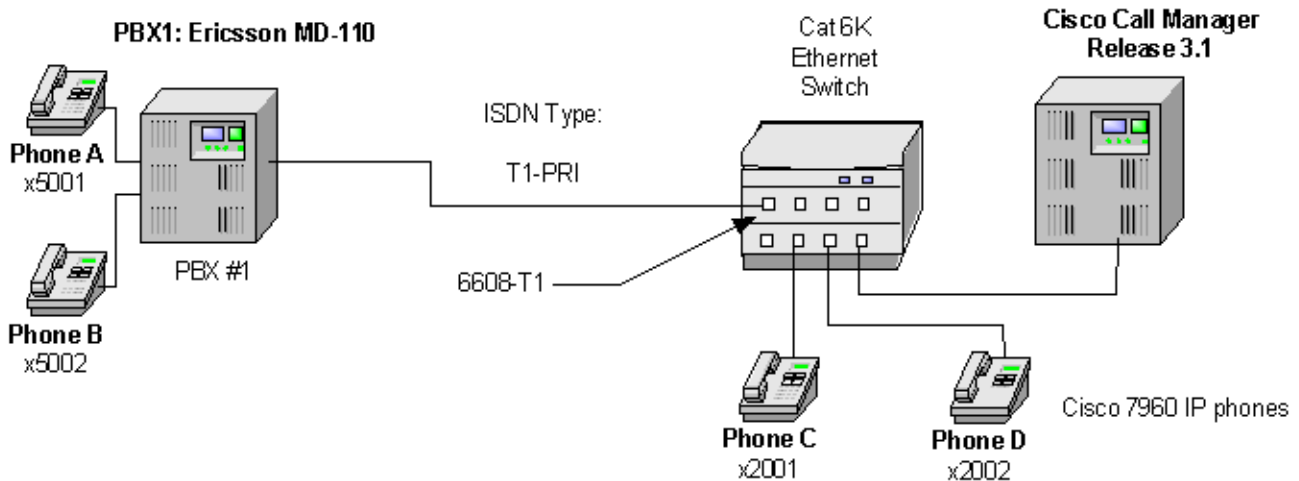
* indicates required item.

Test Configuration

As shown in Figure 8 below, an Ericsson MD-110 PBX was connected via an ISDN T1 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-T1 and the PBX.

Figure 8 Test Configuration

Basic Call Setup End-to-End Configuration



Layer 1 (Physical Layer)

The Ericsson MD-110 uses a command line interface which allows you to change many switch features with a single command. The PBX documentation must be consulted to make changes. Physical layer parameters (along with many other features) are controlled by using RODAI command.

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-T1 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 (IE) 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. 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 Ericsson MD-110, supports both "USER" (peer-slave) and "NETWORK" (peer-master) protocol sides by using RODAI command.

Test Results

Testing was performed by Test Engineer(s): Samir Batio, September 26, 2001

PBX1 configured as National ISDN, emulate Network and Cisco 6608-T1 Gateway configured as PRI NI2, emulate User.

Ericsson MD-110 Switch-type/ Protocol side setting	Cisco 6608-T1 ISDN protocol-type/ Protocol side setting
National ISDN/Network	PRI NI2/User

)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 Ericsson ISDN PRI Link.

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	

Call Conferencing (Local)

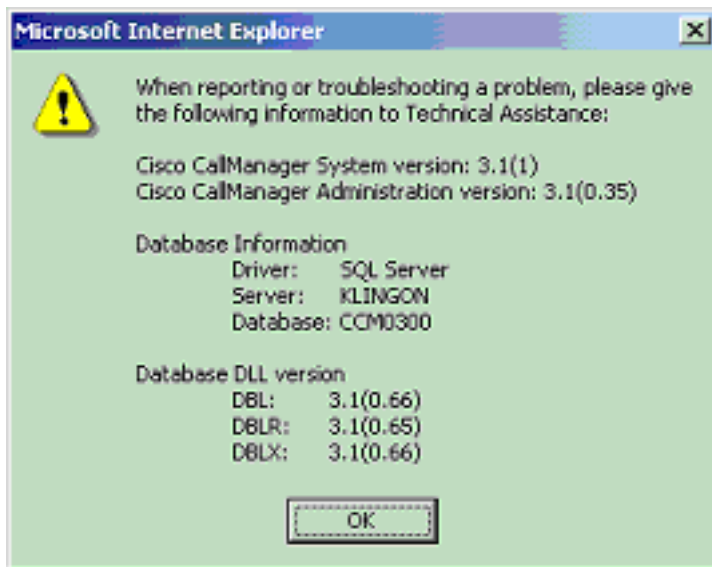
Calls Made	Call Comp?	" Calling Number" passed to remaining conferee when the conferencing phone drops out?	" Calling Name" passed to remaining conferee when the conferencing phone drops out?	" Connected Number" updated on Orig. Caller phone display when a conferee drops out?	" Connected Name" updated 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	

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	Yes	No	No	No	
Phone A to Phone C fwd to Phone D	Yes	Yes	No	No	No	No	No	

Appendix

Figure 9 CallManager Software Release:



Ericsson MD-110 Software Version

```
<_CADAP;  
CALENDAR DATA  
  
IDENTITY=DANDS-EURO-TEST  
VERSION=ASB50104-R6-SES-R9-BC90D/CNI80  
  
CALENDAR TIME NOT VALID  
16:28:45  
TUE 11 SEP 2001  
END
```

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 : A00203010010; DSP : A003E031 (3.3.
32)				
5	8	WS-X6608-T1	SAD04400EM0	Hw : 1.1 Fw : 5.4(2) Sw : 5.5(6a) HP1: D00403010017; DSP1: D005E031 (3.3.
32)				
32)				HP2: D00403010017; DSP2: D005E031 (3.3.
32)				HP3: D00403010017; DSP3: D005E031 (3.3.
32)				HP4: D00403010017; DSP4: D005E031 (3.3.
32)				HP5: D00403010017; DSP5: D005E031 (3.3.
32)				HP6: D00403010017; DSP6: D005E031 (3.3.
32)				HP7: D00403010017; DSP7: D005E031 (3.3.
32)				HP8: D00403010017; DSP8: D005E031 (3.3.
32)				
6	8	WS-X6608-E1	SAD04380DW1	Hw : 1.1 Fw : 5.4(2) Sw : 5.5(6a) HP1: D00403010017; DSP1: D005E031 (3.3.
32)				
32)				HP2: D00403010017; DSP2: D005E031 (3.3.
32)				HP3: D00403010017; DSP3: D005E031 (3.3.
32)				HP4: D00403010017; DSP4: D005E031 (3.3.
32)				HP5: D00403010017; DSP5: D005E031 (3.3.

```

32)
                                     HP6: D00403010017; DSP6: D005E031 (3.3.
32)
                                     HP7: D00403010017; DSP7: D005E031 (3.3.
32)
                                     HP8: D00403010017; DSP8: D005E031 (3.3.
32)

```

Module	DRAM			FLASH			NVRAM		
	Total	Used	Free	Total	Used	Free	Total	Used	Free
1	65408K	37863K	27545K	16384K	11546K	4838K	512K	198K	314K

```

Uptime is 83 days, 2 hours, 34 minutes
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
5	5	8	T1	WS-X6608-T1	no	ok
6	6	8	E1	WS-X6608-E1	no	ok

```

Mod Module-Name Serial-Num

```

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

```

Mod MAC-Address(es) Hw Fw Sw

```

Mod	MAC-Address(es)	Hw	Fw	Sw
1	00-04-c0-f8-42-02 to 00-04-c0-f8-42-03 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	7.0	5.3(1)	5.5(6a)
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

```

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 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> (enable)

```

