Ericsson MD-110 Rel BC9 PBX with CallManager using 2621-T1 PRI NI-2 Gateway
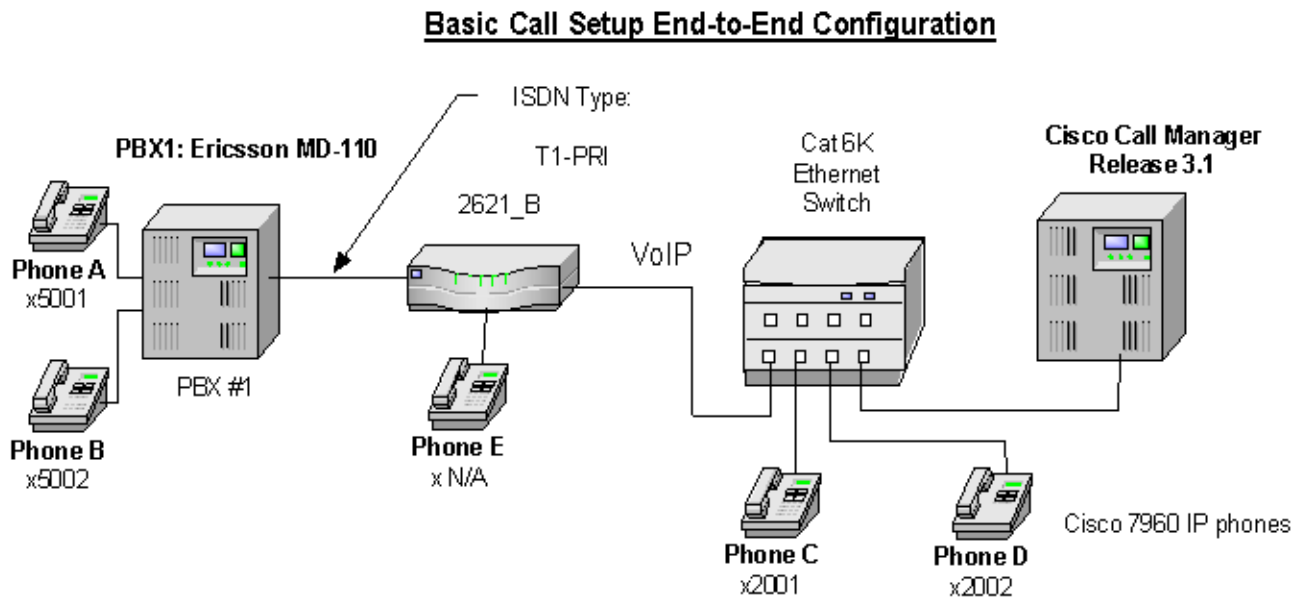
Integration Description

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

Network Topology

Figure 1   Test Setup

Basic Call Setup End-to-End Configuration

Limitations

User/Network Settings

The Cisco 2621 router with ISDN switch type setting of primary-ni supports both protocol sides by using the "isdn protocol-emulate network/user" command.

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 word "PRIVATE" instead. 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 (Cisco 2621 Gateway): 2MFT T1 Port

- Software: CallManager Release 3.1

PBX Hardware and Software Requirements

- Hardware: TLU77/1
- Software: Version BC9

Features Supported

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
```

Step 2.   RODAI Route Data Initiate

```
T1-PRI Route Protocol Characteristics,  protocol side "Network"
```

```
<_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 below. 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 H323 (Cisco 2621) Gateway Configuration

Figure 3 H323 (Cisco 2621) Gateway Configuration, cont.

Figure 4 More H323 (Cisco 2621) Gateway Configuration

**Figure 5**   Route Pattern Configuration

Figure 6   Route Pattern Configuration, Cont.
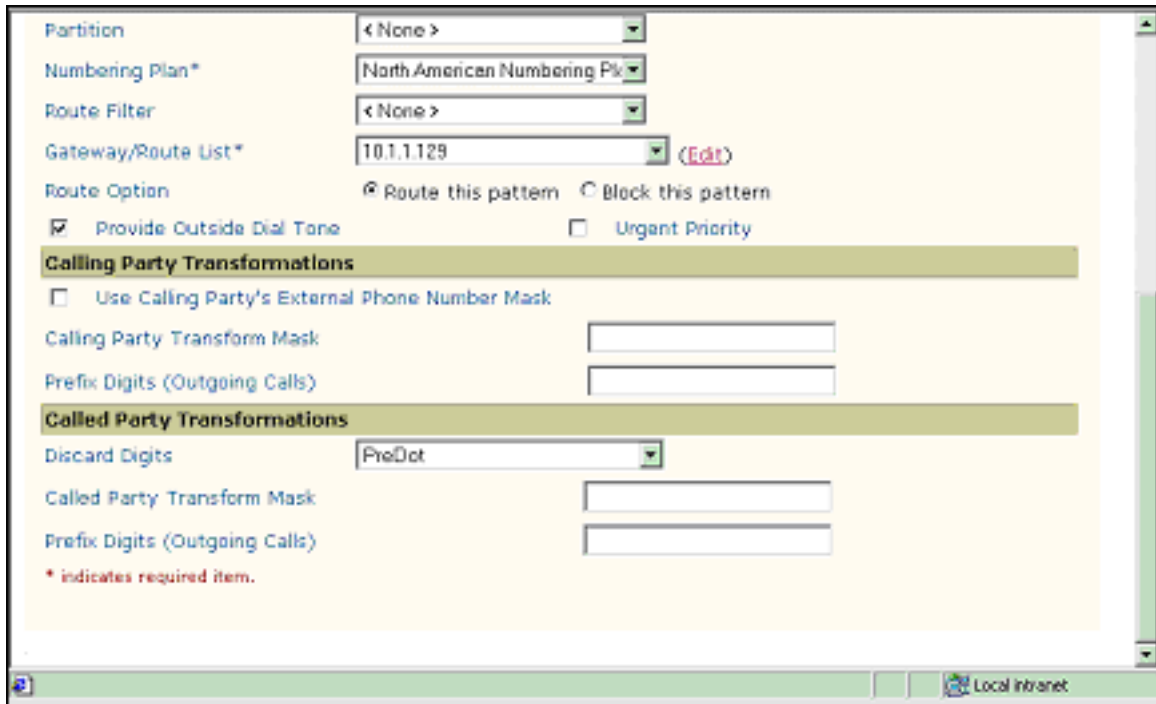
Test Configuration

As shown in Figure 7 below, an Ericsson MD-110 PBX was connected via an ISDN T1 PRI link to a Cisco 2621, 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.

Figure 7   Test Configuration
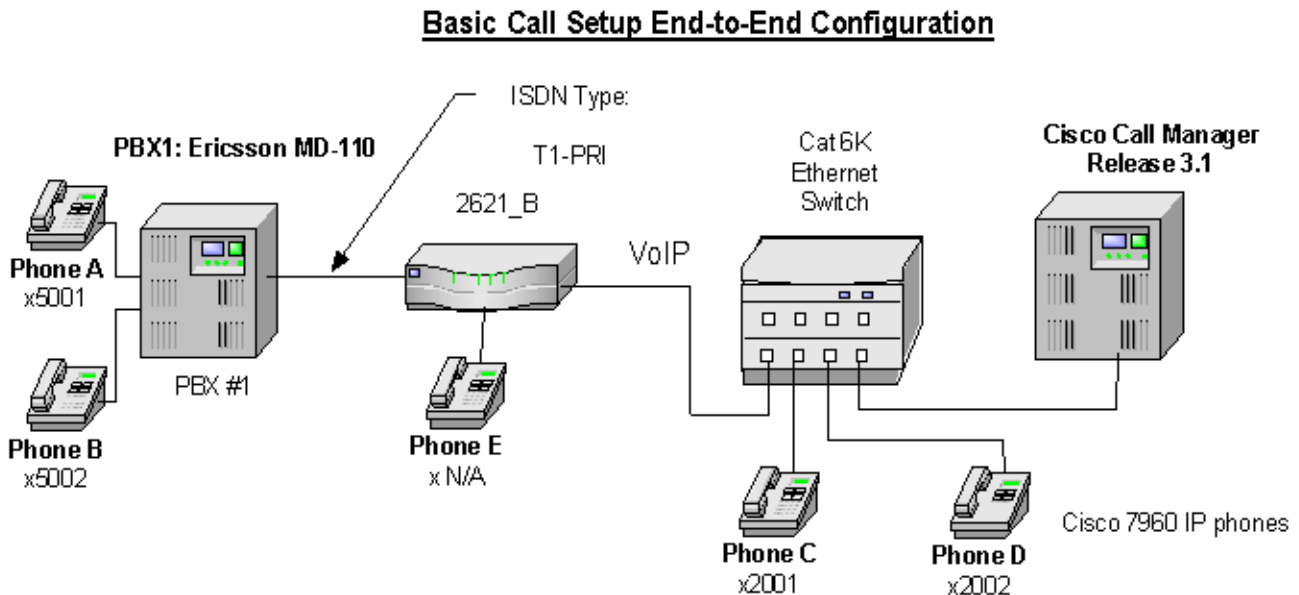
Layer 1 (Physical Layer)

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/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/trade-in packets were exchanged for each configuration, and that the SETUP packets contained the mandatory Information Elements (IEs) 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. 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 protocol type setting of primary-ni supports both protocol sides by using the"isdn protocol-emulate network/user" command.

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

Test Results

PBX1 configured as National ISDN (emulate Network) and Cisco 2621 Gateway configured as primary-NI2 (emulate User).

Ericsson MD-110 Switch-type/ Protocol side setting	Cisco 2621_B ISDN protocol-type/ Protocol side setting
National ISDN/Network	isdn switch-type primary-NI2 /isdn protocol-emulate 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 8 CallManager Software Release:
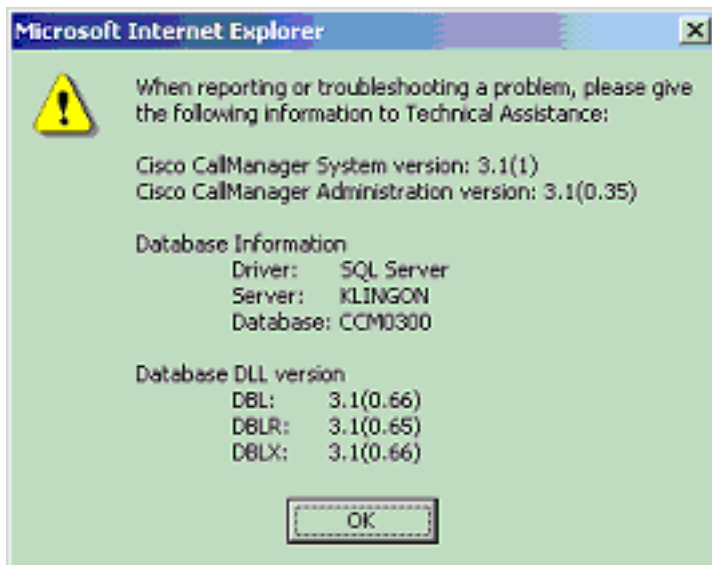
Ericsson MD-110 Software Version

```
<_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
```

Cisco 2621 Router Configuration

```
2621_B#sh ver
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-JS-M), Version 12.2(3.5)T,  MAINTENANCE INTERIM S
OFTWARE
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 1 week, 4 days, 3 hours, 15 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
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)
24 Serial network interface(s)
2 Channelized T1/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 FF
          0x40: FF 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 FF
          0x60: FF 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 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 00 02 02 C1 8B 4A 41 42 30
          0x20: 35 30 38 30 4C 55 39 03 00 81 00 00 00 00 04 00
          0x30: FF 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 FF
          0x50: FF 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 FF
          0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

        VIC Slot 0:
        T1 (2 Port) Multi-Flex Trunk (Drop&Insert) WAN Daughter Card
        Hardware revision 1.0          Board revision B0
        Serial number     17759676     Part number     800-04614-01
        Test history      0x0          RMA number      00-00-00
        Connector type    PCI
        EEPROM format version 1
        EEPROM contents (hex):
          0x20: 01 24 01 00 01 0E FD BC 50 12 06 01 00 00 00 00
          0x30: 58 00 00 00 00 01 15 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 t1 1/0
T1 1/0 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20010710, FPGA: 15
  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  Data in current interval (184 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
2621_B#
_____
```

```
2621_B#sh conf
2621_B#sh configuration
Using 1824 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-ni
!
!
voice class codec 1
 codec preference 1 g729r8
 codec preference 2 g711ulaw
 codec preference 3 g711alaw
!
!
!
!
!
!
!
controller T1 1/0
 framing esf
 linecode b8zs
 pri-group timeslots 1-24
!
controller T1 1/1
 shutdown
 framing esf
 linecode b8zs
!
!
!
!
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 Serial1/0:23
 no ip address
 no logging event link-status
 isdn switch-type primary-ni
 isdn incoming-voice voice
 isdn T309-enable
 isdn T306 30000
 isdn T310 40000
 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 1/0:23
!
!
mgcp profile default
!
dial-peer cor custom
!
!
!
dial-peer voice 1 pots
 destination-pattern 5...
 direct-inward-dial
 port 1/0:23
 prefix 5
!
dial-peer voice 3 voip
 destination-pattern 2...
 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#
```