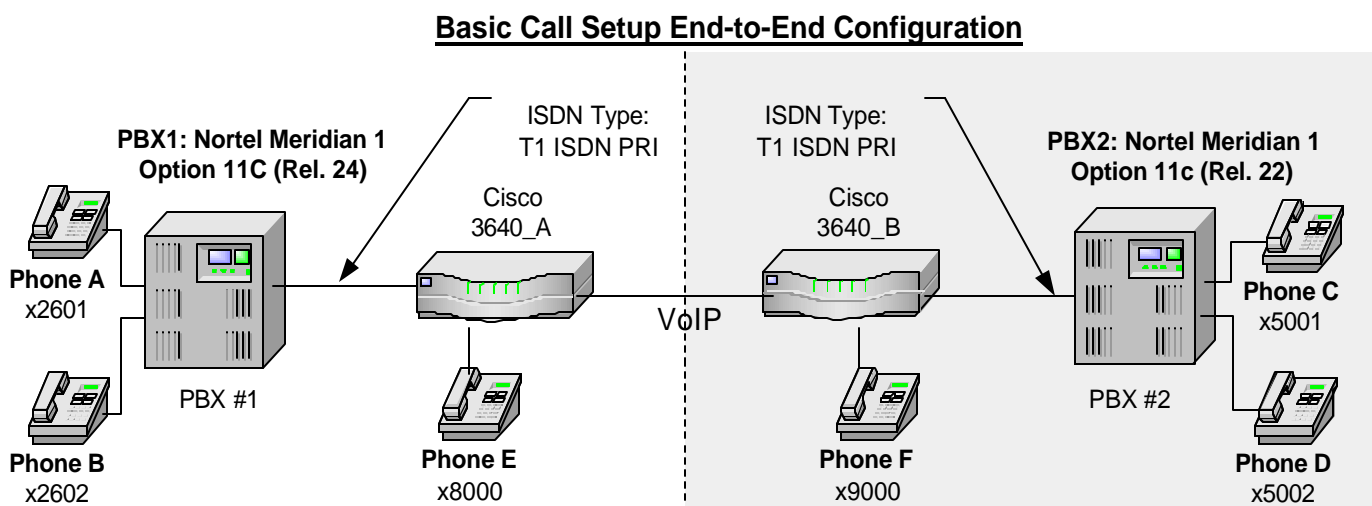


Cisco 3640 - PBX Interoperability: Nortel Meridian Option 11C using the Cisco VIC-2MFT-T1 Card with T1 ISDN PRI

Introduction

This document contains test results of PBX interoperability testing between Nortel Meridian 1 Option 11C via T1 ISDN PRI to Cisco 3640 via T1 ISDN PRI to Nortel Meridian 1 Option 11C.

Network Topology



The diagram above shows the test setup for the pair of Cisco 3640 routers. The Cisco 3640s are configured for back-to-back VoIP operation. Each Cisco 3640 is connected and configured for connection to a Nortel Meridian 1 Option 11C (Release 24) on one side and another Nortel Meridian 1 Option 11C (Release 22) on the other. This report covers end-to-end interoperability between the Cisco 3640 connected to the PBXs via T1 ISDN PRI link.

The Nortel configuration screen for the DS1 trunk interface is reached using LD 17, CEQU (Common Equipment). This is where framing and linecode is set. Clocking is configured under LD 73.

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

Layer 2 Q.921 packets were monitored to ensure that each PBX/Cisco 3640 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 3640s, and a check was made to ensure that there was an audio path in both directions for each call.

Limitations

- Neither the Cisco 3640 router nor the Nortel PBX has the option of being the “Network” side when the ISDN switch type is set to DMS-100, 5ESS, or 4ESS. Thus, they do not interoperate in this mode. The only ISDN PRI switch-type that supports both “Network” and “User” protocol side on both the Cisco 3640 router and Nortel PBX is primary-ni (NI2 for Nortel)
- Calling Name delivery and presentation features are not supported by the Nortel PBX as of Release 24. The only switch-types available on both the Nortel and the Cisco 3640 router with the calling name delivery/presentation feature are QSIG with GF platform (i.e. ESGF, ISGF and E4GF) and DMS100.
- When set to primary-ni (network side), the Cisco 3640 router accepts dialed numbers of less than 10 digits provided the Nortel trunk type is set for TIE, (TKTP=TIE under LD 16 & 14). When the trunk type is set for DID, the Nortel must send at least 10 digits for the Cisco 3640 to properly route the call. Otherwise, the Cisco 3640 router sends back a Release message containing a release cause of “Invalid Number Format.”
- NI2 compliance enhancement took effect on Release 24.24/24.25 of the Nortel PBX. This enhancement corrected the call state information contained in the Status message sent by the PBX in previous releases when it encounters a recoverable error. The Status message reports cause of error as: Unsupported IE, Unrecognized IE, etc. This bug caused calls from a Cisco 3640 router FXS station phone to the Nortel PBX to fail, depending on the User/Network side configuration.
- The Nortel PBX does not send the called number information in its CONNECT message. Thus the calling station phone does not get updated when the called station answers the call. The calling station phone displays the numbers dialed instead (for example, Access Code + extension number).

System Components

Hardware Requirements

- Cisco 3640
- Nortel Meridian 1 Option 11C PBX

Software Requirements

- Cisco IOS Software Release 12.2(1a)
- Nortel Meridian 1 Option 11C PBX Software Release 24



Configuration

Configuring the Nortel Meridian 1 Option 11C (Release 24)

D-Channel Configuration

LD 22PT2000

MARP NOT ACTIVATED

REQ PRT

TYPE ADAN DCH 4

ADAN DCH 4

CTYP MSDL

CARD 04

PORT 1

DES ni2_pstn

USR PRI

DCHL 4

OTBF 32

PARM RS422 DTE

DRAT 64KC

CLOK EXT

IFC NI2

ISDN_MCNT 300

CLID OPT0

CO_TYPE STD

SIDE NET

CNEG 1

RLS ID **

RCAP COLP

MBGA NO

OVLR NO



OVLS NO
T310 120
T200 3
T203 10
N200 3
N201 260
K 7

Configuring Common Equipment

REQ PRT

TYPE CEQU

CEQU

MPED 8D

SUPL 000 004 008 012

016 032 036 040

044 048 064 068

072

XCT 000

CONF 029 030 031 062

094 095

DLOP NUM DCH FRM LCMT YALM T1TE TRSH

PRI 003 24 ESF B8S FDL - 00

004 24 ESF B8S FDL - 00

005 24 ESF B8S FDL - 00

006 24 ESF B8S FDL - 00

DTI2

MISP

REQ ****

>

OVL000



Configuring the Route Data Block

>LD 21PT1000

REQ: PRT

YPE: RDB

CUST 0

ROUT 104

TYPE RDB

CUST 00

DMOD

ROUT 104

DES NI2

TKTP DID

M911_ANI NO

NPID_TBL_NUM 0

SAT NO

RCLS EXT

DTRK YES

BRIP NO

DGTP PRI

ISDN YES

MODE PRA

IFC NI2

CBCR NO

NCOS 0

SBN NO

PNI 00001

NCNA YES

NCRD YES

CHTY BCH



CPFXS YES
DAPC NO
BCOT 0
INTC NO
DSEL VCE
PTYP PRI
AUTO NO
DNIS NO
DCDR NO
ICOG IAO
RANX NO
SRCH RRB
TRMB YES
STEP
ACOD 704
TCPP NO
PII NO
TARG 01
CLEN 1
BILN NO
OABS
INST
ICIS YES
TIMR ICF 512
OGF 512
EOD 13952
NRD 10112
DDL 70
ODT 4096
RGV 640
FLH 510



GRD 896

SFB 3

NBS 2048

NBL 4096

TFD 0

DRNG NO

CDR NO

MUS NO

EQAR NO

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OHQ NO

OHQT 00

TTBL 0

PLEV 2

MCTS NO

ALRM NO

ART 0

SGRP 0

AACR NO

REQ: ****

>

OVL000

Configuring the Trunk

>LD 20

PT0000



MARP NOT ACTIVATED

REQ: PRT

TYPE: TNB

TN 4 1

DATE PAGE DES

TN 004 01

TYPE DID

CDEN SD

CUST 0

TRK PRI

PDCA 1

PCML MU

NCOS 0

RTMB 104 1

B-CHANNEL SIGNALING

NITE

STRI/STRO OWK OWK

AST NO

IAPG 0

CLS UNR DTN CND WTA LPR APN THFD HKD

P10 VNL

TKID

DATE 13 JUL 2001

NACT ****

>

OVL000



Configuring the Station Phone

>LD 11SL1000

MARP NOT ACTIVATED

MEM AVAIL: (U/P): 1283372 USED U P: 99627 91560 TOT: 1474559

DISK RECS AVAIL: 483

TNS AVAIL: 106 USED: 94 TOT: 200

ACD AGENTS AVAIL: 300 USED: 0 TOT: 300

AST AVAIL: 100 USED: 0 TOT: 100

DIGITAL TELEPHONES AVAIL: 2498 USED: 2 TOT: 2500

REQ: PRTTYPE: 2616

MARP NOT ACTIVATED

TN 001 0 00 00DATE PAGE DES

DES TEST1

TN 001 0 00 00

TYPE 2616

CDEN 8D

CUST 0

AOM 0

FDN

TGAR 0

LDN NO

NCOS 0

SGRP 0

RNPG 0

SCI 0

SSU

LNRS 16



XLST

CLS CTD FBA WTA LPR MTD FNA HTD ADD HFA

MWD LMPN RMMD SMWD AAD IMD XHD IRD NID OLD VCE DRG1

POD DSX VMD CMSD CCSD SWD LNA CNDA

CFTA SFD MRD DDV CNIA CDCA MSID DAPA BFED RCB

ICDD CDMA LLCN MCTD CLBD AUTU

GPUD DPUD DNDA CFXA ARHD CLTA ASCD

CPFA CPTA ABDD CFHD FICD NAID BUZZ AHD

DDGA NAMA

DRDD EXR0

USMD USRD ULAD RTDA RBDA RBHD PGND FLXD FTTC DNDY DNO3

CPND_LANG ENG

RCO 0

EFD

HUNT

EHT

PLEV 02

AST

IAPG 0

AACS NO

ITNA NO

DGRP

MLWU_LANG 0

DNDR 0

ARTO 0

ADAY 0

AFD

AHNT

AEFD

AEHT

KEY 00 SCR 2601 0 MARP



CPND

NAME BERT

XPLN 27

DISPLAY_FMT FIRST, LAST

01 SCR 2010 0 MARP

CPND

NAME Nortel Testphone 1B

XPLN 27

DISPLAY_FMT FIRST, LAST

02

03 CFW 12 2003

04 AO6

05 TRN

06 DSP

07

08 ADL 16 7055573500

09 ADL 16

10 ADL 16

11 ADL 16

12 ADL 16

13 ADL 16

14 ADL 16

15

DATE 15 JUN 2001

NACT ****

Software Packages Installed

>LD 22PT2000

MARP NOT ACTIVATED



REQ	PRTTYPE	PKGOPTF	1
CUST	2		
CDR	4		
CTY	5		
RAN	7		
TAD	8		
DNDI	9		
EES	10		
INTR	11		
ANI	12		
ANIR	13		
BRTE	14		
DNDG	16		
MSB	17		
SS25	18		
DDSP	19		
ODAS	20		
DI	21		
CHG	23		
CAB	24		
BAUT	25		
CASM	26		
CASR	27		
BQUE	28		
NTRF	29		
NCOS	32		
CPRK	33		
SSC	34		
IMS	35		



UST	35
UMG	35
ROA	36
NSIG	37
MCBQ	38
NSC	39
BACD	40
ACDB	41
ACDC	42
LMAN	43
MUS	44
ACDA	45
MWC	46
AAB	47
GRP	48
NFCR	49
ACDD	50
LNK	51
FCA	52
SR	53
AA	54
HIST	55
AOP	56
BARS	57
NARS	58
CDP	59
PQUE	60
FCBQ	61
OHQ	62
NAUT	63
SNR	64



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NXFR	67
HOT	70
DHLD	71
LSEL	72
SS5	73
DRNG	74
PBXI	75
DLDN	76
CSL	77
OOD	79
SCI	80
CCOS	81
CDRQ	83
TENS	86
FTDS	87
DSET	88
TSET	89
LNR	90
DLT2	91
PXLT	92
SUPV	93
CPND	95
DNIS	98
BGD	99
RMS	100
MR	101



AWU	102
PMSI	103
LLC	105
MCT	107
ICDR	108
APL	109
TVS	110
TOF	111
IDC	113
AUXS	114
DCP	115
PAGT	116
CBC	117
CCDR	118
EMUS	119
SCMP	121
FTC	125
BKI	127
DTI2	129
TBAR	132
ENS	133
FFC	139
DCON	140
MPO	141
ISDN	145
PRA	146
ISL	147
NTWK	148
IEC	149
DNXP	150
CDRE	151



IAP3P	153
PRI2	154
ACNT	155
THF	157
FGD	158
FNP	160
ISDN INTL SUP	161
SAR	162
LAPW	164
GPRI	167
ARIE	170
CPGS	172
ECCS	173
AAA	174
NMS	175
EOVF	178
HVS	179
DKS	180
SACP	181
OVLP	184
EDRG	185
POVR	186
SECL	191
ORC-RVQ	192
AINS	200
IPRA	202
XPE	203
XCT0	204



XCT1	205
MLWU	206
NACD	207
HSE	208
MLM	209
MAID	210
VAWU	212
EAR	214
ECT	215
BRI	216
IVR	218
MWI	219
MSDL	222
FC68	223
M911	224
CWNT	225
SSAU	229
BRIT	233
FCDR	234
BRIL	235
MCMO	240
MULTI_USER	242
ALRM_FILTER	243
VMBA	246
CALL ID	247
DPNA	250
SCDR	251
ARFW	253
PHTN	254
ADMINSET	256
ATX	258



QSIG 263
NI-2 291
MAT 296
MQA 297
CPP 301
QSIGGF 305
CPRKNET 306
PAGENET 307
CPCI 310
NGCC 311
TATO 312
OPEN ALARM 315
QSIG-SS 316
QTN 321
NGEN 324
RANBRD 327
MUSBRD 328
ESA 329
ESA_SUPP 330
ESA_CLMP 331
CNUMB 332
CNAME 333
NI-2 CBC 334
MEET 348
MC32 350
DBA 351
FDID 362
NMCE 364

REQ ****



Configuring the Nortel Meridian 1 Option 11C (Rel. 22)

Configuring the D-Channel

>LD 22

PT2000

MARP NOT ACTIVATED

REQ PRT

TYPE ADAN DCH 5

ADAN DCH 5

CTYP MSDL

CARD 05

PORT 1

DES NI2

USR PRI

DCHL 5

OTBF 32

PARM RS422 DTE

DRAT 64KC

CLOK EXT

NASA NO

IFC NI2

ISDN_MCNT 300

CLID OPT0

CO_TYPE STD

SIDE USR



CNEG 1
RLS ID **
RCAP COLP
MBGA NO
OVLR NO
OVLS NO
T310 120
T200 3
T203 10
N200 3
N201 260
K 7

Configuring Common Equipment

REQ PRT
TYPE CEQU

CEQU

MPED 8D
SUPL 000 004 008 012
016 032 036 040
048
XCT 000
CONF 029 030 031 062

DLOP	NUM	DCH	FRM	LCMT	YALM	TRSH
PRI	003	24	ESF	B8S	FDL	00
	004	24	ESF	B8S	FDL	00
	005	24	ESF	B8S	FDL	00
	006	24	ESF	B8S	FDL	00
	007	24	ESF	B8S	FDL	00



008 24 ESF B8S FDL 00

MISP

REQ ****

OVL000

Configuring the Route Data Block

>LD 21

PT1000

REQ: PRT

TYPE: RDB

CUST 0

ROUT 105

TYPE RDB

CUST 00

DMOD

ROUT 105

DES NI2_TIE

TKTP TIE

ESN NO

CNVT NO

SAT NO

RCLS EXT



DTRK YES
DGTP PRI
ISDN YES
MODE PRA
IFC NI2
SBN NO
PNI 00001
NCNA YES
NCRD YES
CHTY BCH
CTYP UKWN
INAC NO
ISAR NO
TGAR 0
DSEL VCE
PTYP PRI
AUTO NO
DNIS NO
DCDR NO
ICOG IAO
SRCH RRB
TRMB YES
STEP
ACOD 705
TCPP NO
TARG 01
BILN NO
OABS
INST
ANTK
SIGO STD



ICIS YES

TIMR ICF 512

OGF 512

EOD 13952

NRD 10112

DDL 70

ODT 4096

RGV 640

GRD 896

SFB 3

NBS 2048

NBL 4096

TFD 0

DRNG NO

CDR NO

MUS NO

EQAR NO

OHQ NO

OHQT 00

CBQ NO

AUTH NO

TTBL 0

PAGE 002

PLEV 2

ALRM NO

ART 0

SGRP 0

AACR NO



REQ: ****

OVL000

Configuring the Trunk

>LD 20

PT0000

MARP NOT ACTIVATED

REQ: PRT

TYPE: TNB

TN 05 1

DATE

PAGE

DES

TN 005 01

TYPE TIE

CDEN SD

CUST 0

NCOS 0



RTMB 105 1

B-CHANNEL SIGNALING

TGAR 1

CLS UNR DTN WTA LPR APN THFD HKD

P10 VNL

TKID

DATE 9 FEB 2001

NACT ****

OVL000

Configuring the Station Phone

REQ: PRT

TYPE: 2616

MARP NOT ACTIVATED

TN 001 0 00 00

DATE

PAGE

DES



DES TEST1
TN 001 0 00 00
TYPE 2616
CDEN 8D
CUST 0
AOM 0
FDN
TGAR 0
LDN NO
NCOS 0
SGRP 0
RNPG 0
SCI 0
SSU
LNRS 16
XLST
CLS CTD FBA WTA LPR MTD FNA HTD ADD HFA
MWD AAD IMD XHD IRD NID OLD VCE DRG1
POD DSX VMD CMSD CCSD SWD LNA CNDA
CFTA SFD MRD DDV CNIA
ICDD CDMD LLCN MCTD CLBD AUTU
GPUD DPUD DNDA CFXA ARHD CLTA ASCD
CPFA CPTA ABDD CFHD FICD NAID
DDGA NAMA
USMD USRD ULAD RTDD PGND FLXD
CPND_LANG ENG
RCO 0
EFD
HUNT
EHT



PLEV 02

AST

IAPG 0

AACS NO

ITNA NO

DGRP

MLWU_LANG 0

DNDR 0

KEY 00 SCR 5001 0 MARP

CPND

NAME BIG BIRD

XPLN 27

DISPLAY_FMT FIRST, LAST

01 SCR 5011 0 MARP

CPND

NAME BIG BIRD

XPLN 27

DISPLAY_FMT FIRST, LAST

02

03 CFW 12 7052602#

04 AO6

05 TRN

06 DSP

07

08 ADL 16

09 ADL 16

10 ADL 16

11 ADL 16

12 ADL 16

13 ADL 16

14 ADL 16



15

DATE 7 FEB 2001

NACT ****

OVL000

>



Configuring the Cisco 3640

The Cisco 3640 router with ISDN switch type setting of primary-ni supports both protocol sides by using the **isdn protocol-emulate network/user** command. Other available T1 ISDN switch-types on the Cisco 3640 such as primary-5ess, primary-4ess and dms-100 can only support “user” side at this time.

Configuring the Nortel Meridian 1 Option 11C operation to be Network side under LD 17 sets the Layers 2 & 3 protocol side setting to “network.” Therefore, the Cisco 3640 router should be set to the user protocol side by issuing the **isdn protocol-emulate user** command.

Similarly, if the Nortel Meridian 1 Option 11C operation is set for User side under LD 17, layers 2 & 3 protocol side are set for the user side. The Cisco 3640 router is set to the network protocol side by issuing the **protocol-emulate network** command.

When set to primary-ni (network side), the Cisco 3640 router accepts dialed numbers of less than 10 digits provided the trunk type is set for TIE, (TKTP=TIE under LD 16 & 14). When the trunk type is set for DID, the Nortel PBX must send at least 10 digits for the Cisco 3640 to properly route the call. Otherwise, the Cisco 3640 router sends back a Release message containing a release cause of “Invalid Number Format.”

Cisco 3640_A Configuration

The following is the configuration of the 3640_A router directly connected to Nortel Meridian 1 Option 11C PBX (Rel 24) ISDN T1 ISDN PRI interface.

```
3640_A# show running config
```

```
Building configuration...
```

```
Current configuration : 1695 bytes
```

```
!  
version 12.2  
no service single-slot-reload-enable  
service timestamps debug uptime  
service timestamps log uptime  
no service password-encryption  
!  
hostname 3640_A  
!  
logging rate-limit console 10 except errors  
enable secret 5 $1$MO.1$djDfp226W.PgF/0DpeuSn0  
enable password cisco
```



```
!  
voice-card 1  
  
!  
ip subnet-zero  
  
!  
!  
no ip finger  
no ip domain-lookup  
  
!  
no ip dhcp-client network-discovery  
isdn switch-type primary-ni  
call rsvp-sync  
  
!  
!  
!  
controller T1 1/0  
  framing esf  
  linecode b8zs  
  pri-group timeslots 1-24  
!  
controller T1 1/1  
  framing sf  
  linecode ami  
!  
!  
interface Ethernet0/0  
  bandwidth 100000  
  ip address 1.1.1.1 255.255.255.0  
  no ip mroute-cache  
  load-interval 30  
  no keepalive  
  full-duplex  
!  
interface Ethernet0/1  
  no ip address  
  shutdown  
  half-duplex  
  no cdp enable  
!  
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 T310 40000
no cdp enable
!
router rip
network 1.0.0.0
!
ip kerberos source-interface any
ip classless
ip http server
!
dialer-list 1 protocol ip permit
dialer-list 1 protocol ipx permit
!
snmp-server packetsize 4096
snmp-server manager
tftp-server nvram
!
voice-port 1/0:23
!
voice-port 2/0/0
!
voice-port 2/0/1
!
dial-peer cor custom
!
!
!
dial-peer voice 1 pots
destination-pattern 8000
port 2/0/0
```



```
!  
dial-peer voice 2 pots  
  destination-pattern 2...  
  direct-inward-dial  
  port 1/0:23  
  prefix 2  
!  
dial-peer voice 3 voip  
  destination-pattern 5...  
  session target ipv4:1.1.1.2  
!  
dial-peer voice 4 voip  
  destination-pattern 9000  
  session target ipv4:1.1.1.2  
!  
!  
line con 0  
  exec-timeout 0 0  
  transport input none  
line aux 0  
line vty 0 4  
  password lab  
  login  
!  
end
```




Cisco 3640_B Configuration

The following is the configuration of the [Cisco product name_B] router directly connected to Nortel Meridian 1 Option 11C PBX ISDN interface.

```
3640_B# show running config
```

```
Building configuration...
```

```
Current configuration : 1552 bytes
```

```
!  
version 12.2  
no service single-slot-reload-enable  
service timestamps debug uptime  
service timestamps log uptime  
no service password-encryption  
!  
hostname 3640_B  
!  
logging rate-limit console 10 except errors  
enable secret 5 $1$FrhE$oJQrLNZcCVHNS5cpvhOVr.  
enable password cisco  
!  
voice-card 1  
!  
ip subnet-zero  
!  
!  
no ip finger  
!
```



```
no ip dhcp-client network-discovery
isdn switch-type primary-ni
call rsvp-sync
!
!
controller T1 1/0
  framing esf
  linecode b8zs
  pri-group timeslots 1-24
!
controller T1 1/1
  framing sf
  linecode ami
!
!
interface Ethernet0/0
  ip address 1.1.1.2 255.255.255.0
  no ip mroute-cache
  load-interval 30
  no keepalive
  full-duplex
!
interface Ethernet0/1
  no ip address
  shutdown
  half-duplex
!
interface Serial1/0:23
  no ip address
  no logging event link-status
  isdn switch-type primary-ni
```



```
isdn protocol-emulate network
isdn incoming-voice voice
isdn T310 40000
no cdp enable
!
router rip
network 1.0.0.0
!
ip kerberos source-interface any
ip classless
ip http server
!
!
snmp-server packetsize 4096
snmp-server manager
!
voice-port 1/0:23
!
voice-port 2/0/0
!
voice-port 2/0/1
!
dial-peer cor custom
!
!
!
dial-peer voice 1 pots
destination-pattern 9000
port 2/0/0
!
dial-peer voice 2 pots
```



```
destination-pattern 5...
direct-inward-dial
port 1/0:23
prefix 5
!
dial-peer voice 3 voip
destination-pattern 2...
session target ipv4:1.1.1.1
!
dial-peer voice 4 voip
destination-pattern 8000
session target ipv4:1.1.1.1
!
!
line con 0
transport input none
line aux 0
line vty 0 4
password lab
login
!
end
```



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