Application Note

Nortel Communication Server 1000M Release 4.0 to Cisco IOS Voice Gateway Using SIP with E1 NET5

September 02, 2008 Initial Version

Table of Contents

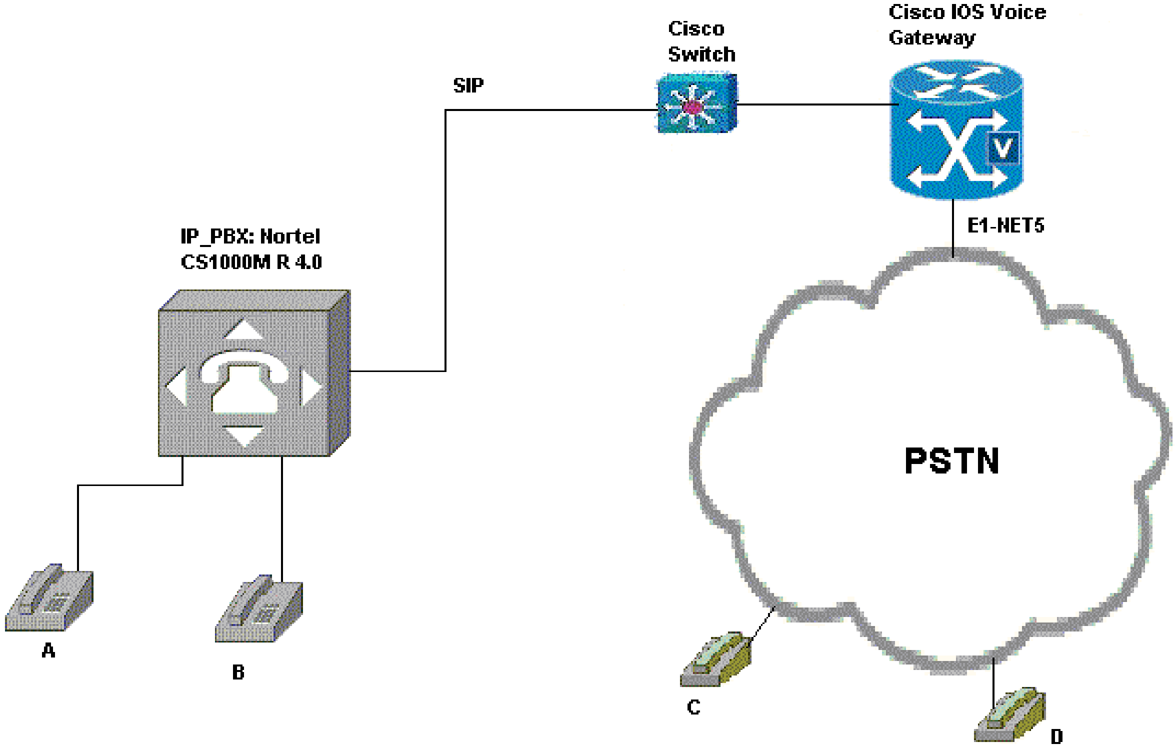
Introduction

- This application note describes basic call interoperability and the documented steps and configurations necessary for SIP integration between Nortel Communication Server (CS) 1000M version 4.0 and a Cisco IOS voice gateway providing E1 NET5 PSTN connectivity.
- The SIP protocol is used between the Cisco IOS voice gateway and Nortel CS 1000M version 4.0. The connection between the Cisco IOS gateway and PSTN uses E1 with a switch-type NET5 protocol.
- Features tested include basic call; call transfer supervised; call transfer blind; call forward (all, busy, and no answer); three-way conference; DTMF tones; and caller ID functionality between Nortel CS1000M version 4.0 users and PSTN users.
- The Cisco IOS voice gateway offers the advantage of providing connectivity between Nortel CS 1000M version 4.0 and PSTN by offering SIP to ISDN inter-working functionality.
- The network topology diagram (Figure 1) shows the test setup for end-to-end interoperability with the Cisco IOS voice gateway connected to the Nortel CS 1000M version 4.0 and connected to the PSTN via E1 NET5 ISDN.
- This application note uses the C3825 IOS voice gateway. However, other Cisco voice gateways are also an option to use since the voice gateway implementation does not depend on the platform. Below is a list of Cisco platforms capable of voice gateway functionality. Be careful when you select a voice gateway platform; consider the capacity and capability required for the intended deployment.

Cisco 1861 Integrated Services Router
Cisco IAD2400 Series Integrated Access Device
Cisco 2800 Series Integrated Services Routers
Cisco 3700 Series Multiservice Access Routers
Cisco 3800 Series Integrated Services Routers
Cisco AS5350XM Universal Gateway
Cisco AS5400XM Universal Gateway

Network Topology

Figure 1. Basic Call Setup



Limitations

These are the known limitations, caveats, or integration issues.

- Calling name and number are not updated consistently.
- Calling number cannot be restricted on network calls from PSTN. For example, restrict calling number and name on PSTN phone C. Place a call from phone C to PBX phone A. Calling number (phone C's number) is displayed on phone A.
- On network/external conference calls, the third party on the conference call does not have a talk path when a conference call is accomplished by a network/external call followed by a network/external call. For example, phone C calls phone A, phone A calls phone D. When phone D answers, activate "conference" on phone A; phone D can hear but has no talk path to C and A phones, while C phone and A phone can talk to all conference members.

System Components

Hardware Requirements

The following hardware is required:

Cisco equipment

- Cisco 3825 Gateway
- DSP Mod NM-HDV2-1T1E1
- Cisco Catalyst 3550 Power Ethernet switch

Nortel equipments

- Nortel CS1000M

Software Requirements

The following software is required:

- IOS Software releases: c3825-ipvoice ivs-mz.12.4 (15)xz.bin
- PBX Software: Nortel CS 1000M version 4.0

Features

This section lists supported and unsupported features.

Features Supported

- Calling Name Identification Restriction (see Limitations on page 3)
- Calling Number Identification Restriction (see Limitations)
- Codec G.711 Ulaw
- Codec G.729
- Codec G.723
- Calling name (see Limitations)
- Calling number (see Limitations)
- Call transfer blind
- Call transfer supervised
- Call conference (see Limitations)
- Call on hold
- Call forward no reply
- Call forward all
- Call forward busy
- Digit translation—The voice gateway can modify the digits of the called four-digit number sent by Nortel CS 1000M version 4.0 and PSTN.

Features Not Supported

- DTMF tones using RFC2833
- DTMF tones using inband signaling

Configuration

This section contains configuration menus and commands and describes configuration sequences and tasks.

Configuring Nortel CS 1000M Version 4.0

Nortel Communication Server 1000 (CS1000) Configuration

Call Server Setup:

LD 17 – Configure the D-channel (signaling channel) between the Call Server and the Signaling Server

```
>ld 22
PT2000
REQ  prt
TYPE adan dch 0
DCH 0  IS UNDEFINED
REQ  prt
TYPE adan
ADAN   HIST
  SIZE    5000
  USER MTC SCH BUG
ADAN     DCH 3
  CTYP DCIP
  DES  IP_Trunk_DCH
  USR  ISLD
  ISLM 4000
  SSRC 1800
  OTBF 32
  NASA YES
  IFC  SL1
  CNEG 1
  RLS  ID  4
  RCAP ND2 MWI CPK
  MBGA NO
  H323
    OVLR NO
    OVLS NO
```

LD 97 – Configure the Super-loop for the Virtual Trunks

```
>ld 97
SCSYS000
MEM AVAIL: (U/P): 2717255    USED U P: 344386 51318    TOT: 3112959
DISK RECS AVAIL: 1152
REQ  prt
TYPE supl
SUPL

SUPL  SUPT SLOT XPEC0   XPEC1

 000  STD  LEFT 01 0 1  -- - -
 004  STD  LEFT 02 0 1  -- - -
 008  STD  LEFT 03 0 1  -- - -
```

```
 012  STD  LEFT 04 0 1  -- - -
 016  STD  LEFT 05 0 1  -- - -
 032  STD  LEFT 06 0 1  -- - -
 036  STD  LEFT 07 0 1  -- - -
 040  STD  LEFT 08 0 1  -- - -
 044  STD  LEFT 10 0 3  -- - -
 048  STD  LEFT 09 0 3  -- - -
 064  STD  LEFT 11 0 3  -- - -
 068  STD  LEFT 12 0 3  -- - -
 072  STD  LEFT 13 0 3  -- - -
ARDS 61 - 64  81 - 84
 128  STD  LEFT 32 0 1  33 2 3
 132  STD  LEFT 34 0 1  35 2 3
 136  STD  LEFT 36 0 1  37 2 3
 140  STD  LEFT 38 0 1  39 2 3
 144  STD  LEFT 40 0 1  41 2 3
 148  STD  LEFT 42 0 1  43 2 3
 152  STD  LEFT 44 0 1  45 2 3
 156  STD  LEFT 46 0 1  47 2 3
```

LD 14 – Configure the SIP Virtual Trunks to the Signaling Server (One trunk = one line connection)

```
>ld 20
PT0000
REQ: prt
TYPE: tnb
TN   000 0 00 00
CDEN
CUST
DATE
PAGE
DES

TN   000 0 00 00
TYPE DTR
CDEN 8D
DATE NO DATE

DES  SIP_IP_VTRK
TN   062 0 00 00  VIRTUAL
TYPE IPTI
CDEN 8D
CUST 0
XTRK VTRK
ZONE 000
LDOP BOP
TIMP 600
BIMP 600
AUTO_BIMP NO
TRK  ANLG
NCOS 0
RTMB 10 1
CHID 1
```

TGAR 1
STRI/STRO IMM IMM
SUPN YES
AST NO
IAPG 0
CLS CTD DTN WTA LPR APN THFD
    P10 NTC MID
TKID
AACR NO
DATE 25 FEB 2005

LD 11 – Configure for the Nortel 2616 phones

```
>ld 11
SL1000
MEM AVAIL: (U/P): 2717255    USED U P: 344386 51318    TOT: 3112959
DISK RECS AVAIL: 1152
DIGITAL TELEPHONES AVAIL:     0    USED:     8    TOT:     8
IP USERS AVAIL:     1    USED:     7    TOT:     8
BASIC IP USERS AVAIL:     7    USED:     1    TOT:     8
ACD AGENTS AVAIL:    10    USED:     0    TOT:    10
PCA AVAIL:     0    USED:     0    TOT:     0
AST     AVAIL:     1    USED:     0    TOT:     1
TNS     AVAIL:  2303    USED:   197    TOT:  2500
DATA PORTS AVAIL:  2500    USED:     0    TOT:  2500

REQ: prt
TYPE: 2616

TN   1 0
DATE
PAGE
DES

DES  CS102
TN   001 0 00 00
TYPE 2616
CDEN 8D
CUST 0
AOM  0
FDN  5216
TGAR 1
LDN  NO
NCOS 0
SGRP 0
RNPG 0
SCI  0
SSU
XLST
CLS  CTD FBA WTA LPR MTD FNA HTA ADD HFD
    MWA LMPN RMMD SMWD AAD IMD XHD IRD NID OLD VCE DRG1
    POD DSX VMD CMSD SLKD CCSD SWD LND CNDA
    CFTA SFD MRD DDV CNIA CDCA MSID DAPA BFED RCBD
```

```
    ICDD CDMD LLCN MCTD CLBD AUTU
    GPUD DPUD DNDA CFXA ARHD CLTD ASCD
    CPFA CPTA ABDD CFHD FICD NAID BUZZ AGRD MOAD AHD
    DDGA NAMA
    DRDD EXR0
    USRD ULAD RTDD RBDD RBHD PGND FLXD FTTC DNDY DNO3 MCBN CDMR
CPND_LANG ENG
RCO  0
EFD  5216
HUNT 5216
EHT  5216
LHK  0
PLEV 02
CSDN
AST
IAPG 0
AACS NO
ITNA NO
DGRP
MLWU_LANG 0
DNDR 0
KEY  00 SCR 5213 0     MARP
      CPND
        NAME ATHENA
        XPLN 13
        DISPLAY_FMT FIRST,LAST
    01 PRK
    02 MCR 5215 0     MARP
      CPND
        NAME ATHENA_5215
        XPLN 13
        DISPLAY_FMT FIRST,LAST
    03 CFW 4  2324
    04 AO6
    05 TRN
    06
    07
    08
    09
    10
    11
    12 MIK
    13 MIK
    14 MCK
    15 RGA
DATE 17 JUN 2008


NACT
REQ: prt
TYPE: 2616
TN   1 2
DATE
```

```
PAGE
DES

DES  CS102
TN   001 0 00 02
TYPE 2616
CDEN 8D
CUST 0
AOM  0
FDN  2321
TGAR 1
LDN  NO
NCOS 0
SGRP 0
RNPG 0
SCI  0
SSU
XLST
CLS  CTD FBA WTA LPR MTD FNA HTA ADD HFD
     MWA LMPN RMMD SMWD AAD IMD XHD IRD NID OLD VCE DRG1
     POD DSX VMD CMSD SLKD CCSD SWD LND CNDA
     CFTA SFD MRD DDV CNID CDCA MSID DAPA BFED RCBD
     ICDD CDMD LLCN MCTD CLBD AUTU
     GPUD DPUD DNDA CFXA ARHD CLTD ASCD
     CPFA CPTA ABDD CFHD FICD NAID BUZZ AGRD MOAD AHD
     DDGA NAMA
     DRDD EXR0
     USRD ULAD RTDD RBDD RBHD PGND FLXD FTTU DNDY DNO3 MCBN CDMR
CPND_LANG ENG
RCO  0
EFD  2321
HUNT 2321
EHT  2321
LHK  0
PLEV 02
CSDN
AST
IAPG 0
AACS NO
ITNA NO
DGRP
MLWU_LANG 0
DNDR 0
KEY  00 SCR 5216 0     MARP
        CPND
          NAME ATHENA_5216
          XPLN 13
          DISPLAY_FMT FIRST,LAST
     01
     02
     03 CFW 4  3502
     04 AO6
     05 TRN
```

06
07
08
09
10
11
12
13 MIK
14 MCK
15 TRN
DATE 17 JUN 2008

LD 16 – Configure the SIP route

```
>ld 21
PT1000

REQ: prt
TYPE: rdb
CUST 0
ROUT 10

TYPE RDB
CUST 00
DMOD
ROUT 10
DES  SIP_TIE
TKTP TIE
NPID_TBL_NUM   0
ESN  NO
CNVT NO
SAT  NO
RCLS EXT
VTRK YES
ZONE 000
PCID SIP
CRID YES
NODE 102
DTRK NO
ISDN YES
   MODE ISLD
   DCH  3
   IFC  SL1
   PNI  00001
   NCNA YES
   NCRD YES
   TRO  NO
   FALT NO
   CTYP UKWN
   INAC NO
   ISAR NO
   DAPC NO
PTYP ATT
```

AUTO NO
DNIS NO
DCDR NO
ICOG IAO
SRCH LIN
TRMB YES
STEP
ACOD 710
TCPP NO
TARG 01
CLEN 1
BILN NO
OABS
INST
ANTK
SIGO STD
STYP SDAT
ICIS YES
TIMR ICF 512
    OGF 512
    EOD 13952
    DSI 34944
    NRD 10112
    DDL 70
    ODT 4096
    RGV 640
    GRD 896
    SFB 3
    NBS 2048
    NBL 4096

    IENB 5

PAGE 002

    TFD 0
    VSS 0
    VGD 6
SST 5 0
NEDC ORG
FEDC ORG
CPDC NO
DLTN NO
HOLD 02 02 40
SEIZ 02 02
SVFL 02 02
DRNG NO
CDR NO
VRAT NO
MUS NO
MANO NO
OHQ NO

OHQT 00
CBQ NO
AUTH NO
TTBL 0
ATAN NO
OHTD NO
PLEV 2
ALRM NO
ART 0
SGRP 0
AACR NO

LD 86 – Configure the Route List Block for the Virtual Trunk route

```
>ld 86
ESN000

MEM AVAIL: (U/P): 2717255    USED U P: 344386 51318    TOT: 3112959
DISK RECS AVAIL: 1152
REQ  prt
CUST 0
FEAT rlb
RLI  10

RLI  10
ENTR 0
LTER NO
ROUT 10
TOD  0 ON  1 ON  2 ON  3 ON
     4 ON  5 ON  6 ON  7 ON
VNS  NO
SCNV NO
CNV  NO
EXP  NO
FRL  0
DMI  0
ISDM 0
FCI  0
FSNI 0
SBOC NRR
IDBB DBD
IOHQ NO
OHQ  NO
CBQ  NO

ISET 0
NALT 5
MFRL 0
OVLL 0
```

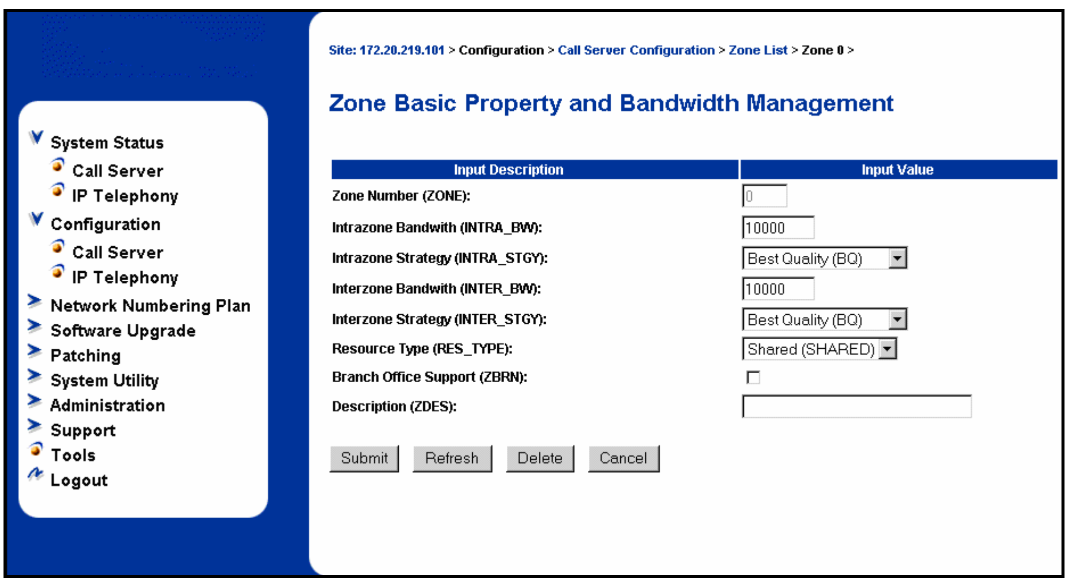
LD 87 – Configure CDP steering codes

>ld 87
ESN000

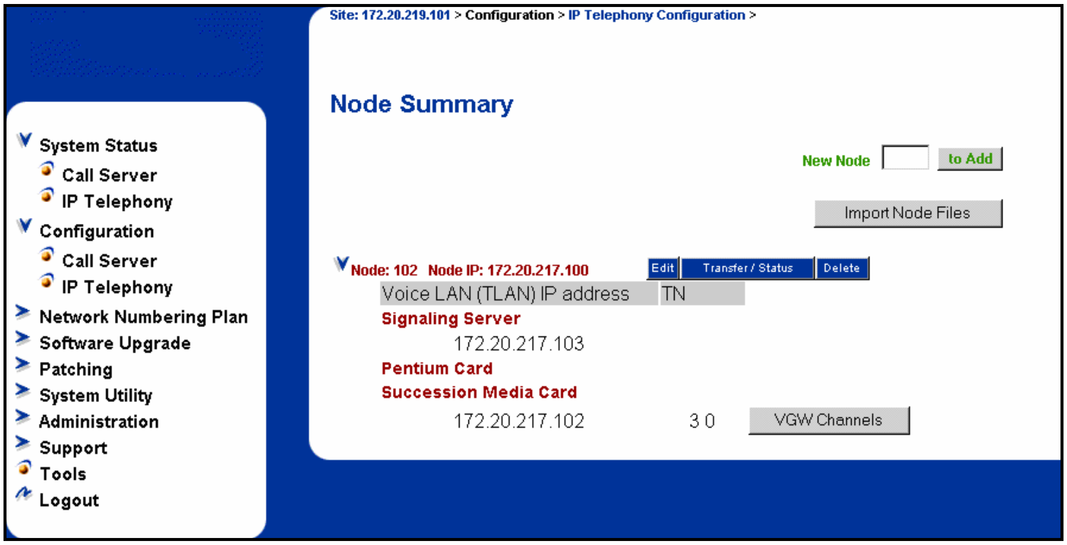
MEM AVAIL: (U/P): 2717255   USED U P: 344386 51318   TOT: 3112959
DISK RECS AVAIL: 1152
REQ prt
CUST 0
FEAT cdp
TYPE dsc
DSC 232
DSC 232
FLEN 0
DSP LSC
RLI 10
NPA
NXX
OVL000

Signaling Server Setup

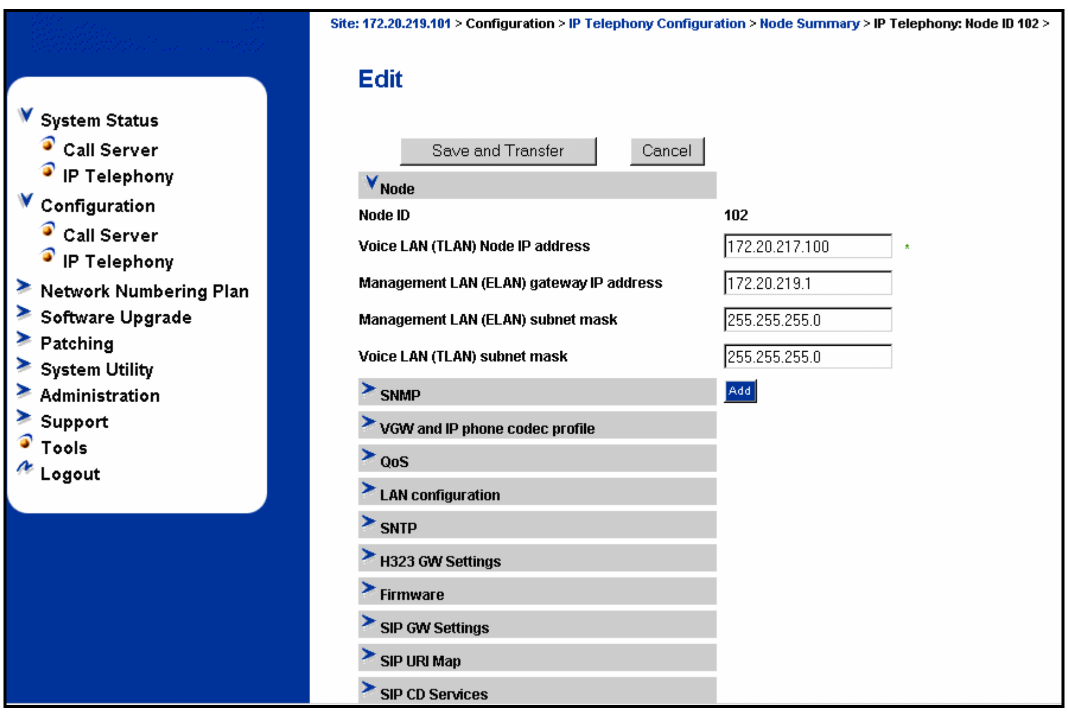
Configure the Zones



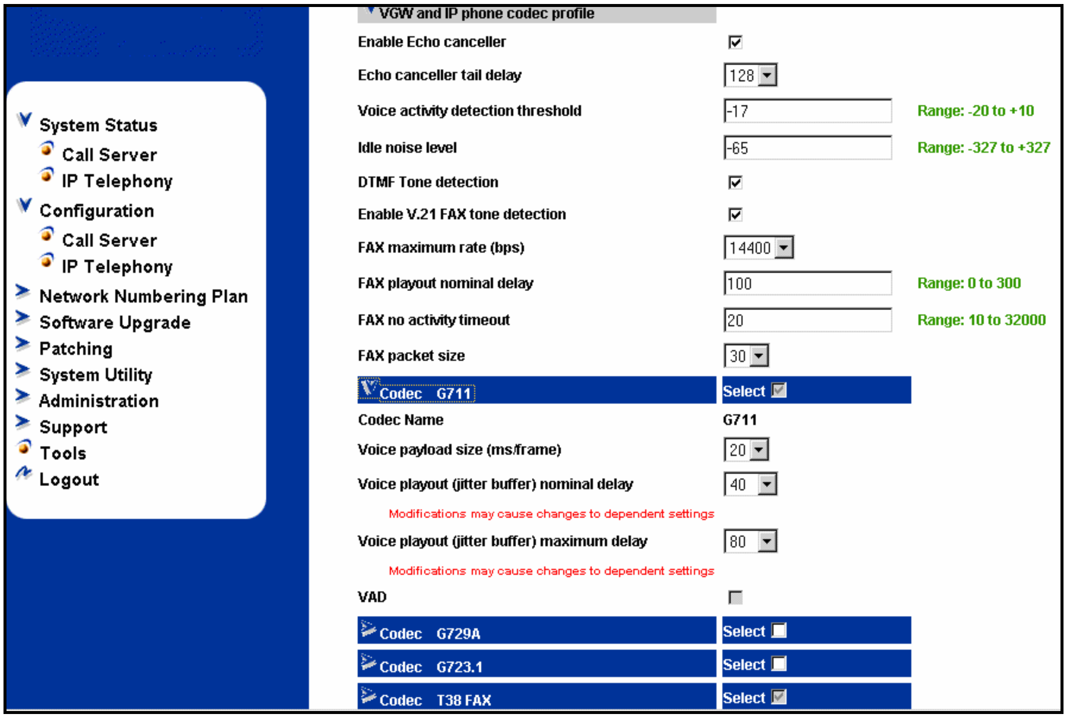
Configure a New IP Telephony Node Summary

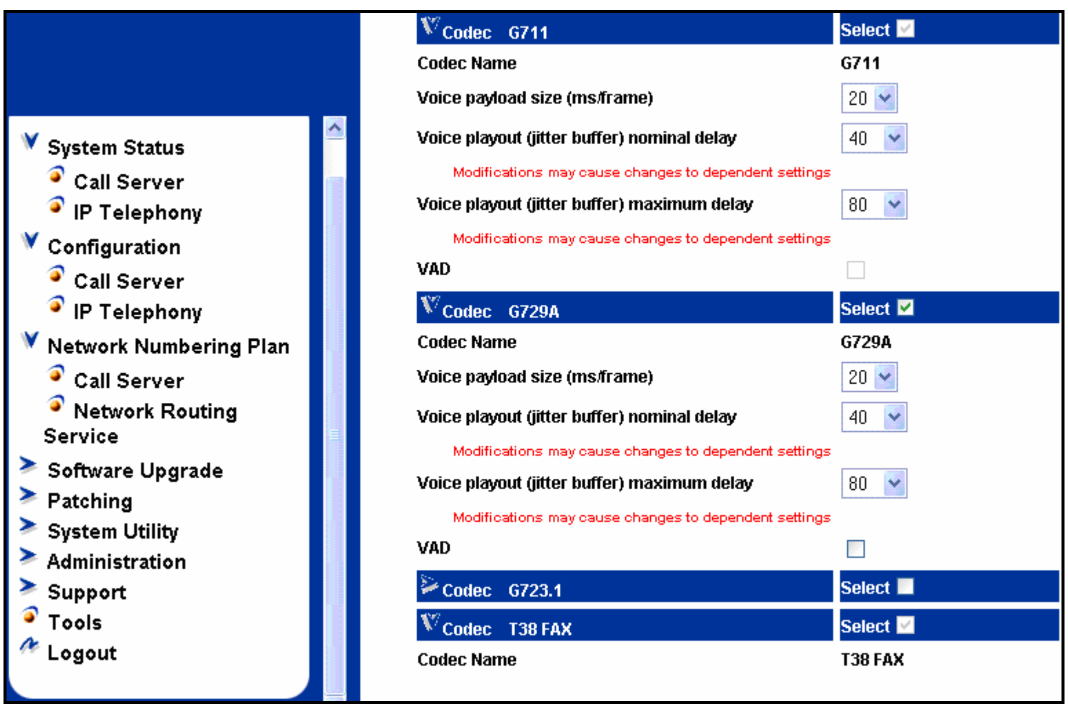


Configure the Node Section



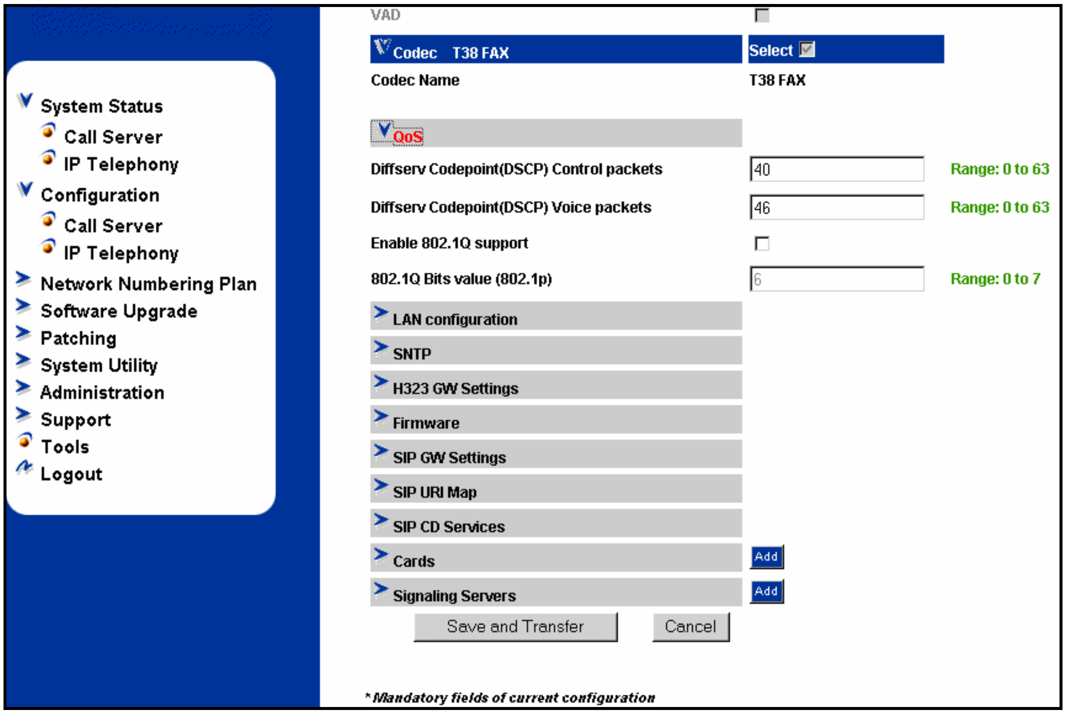
Configure the VGW and IP Phone Codec Profile Section[1]



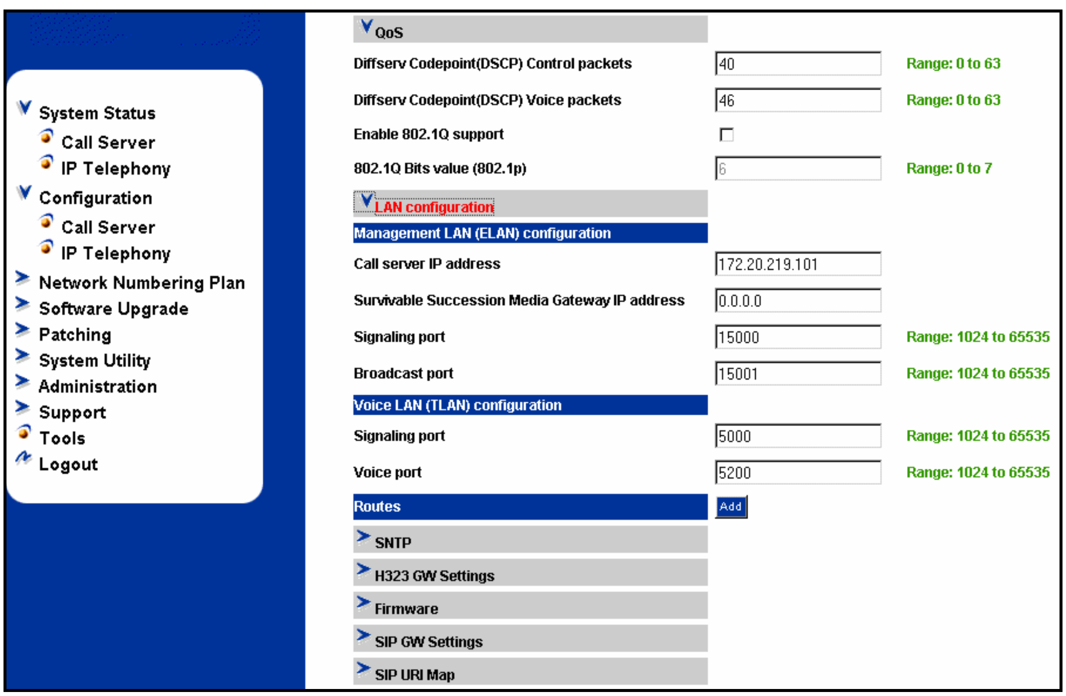


[1] Change audio codec to match the ISR media gateway when testing codec.

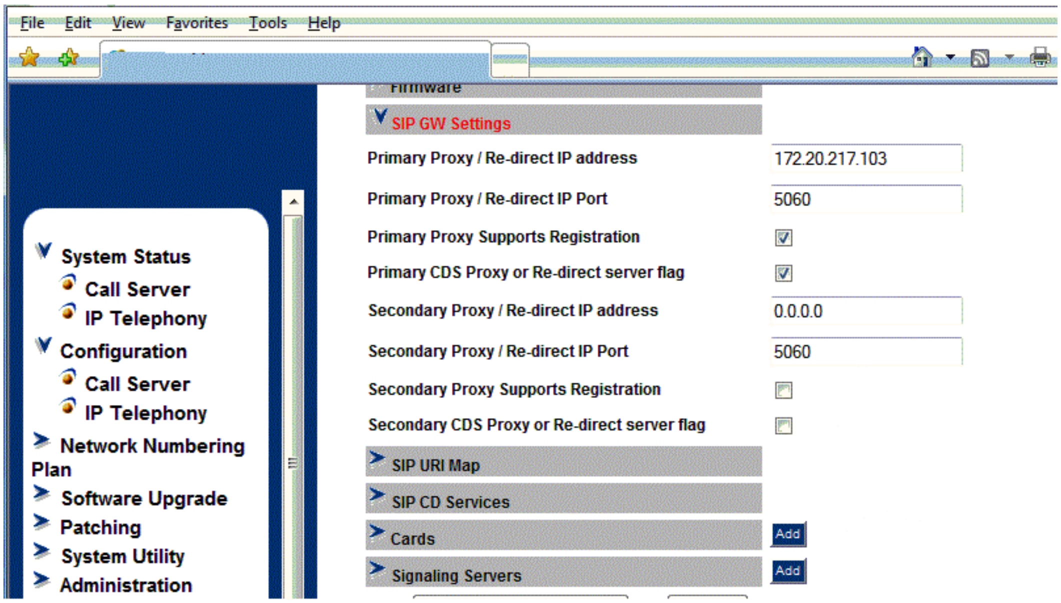
Configure the QoS Section



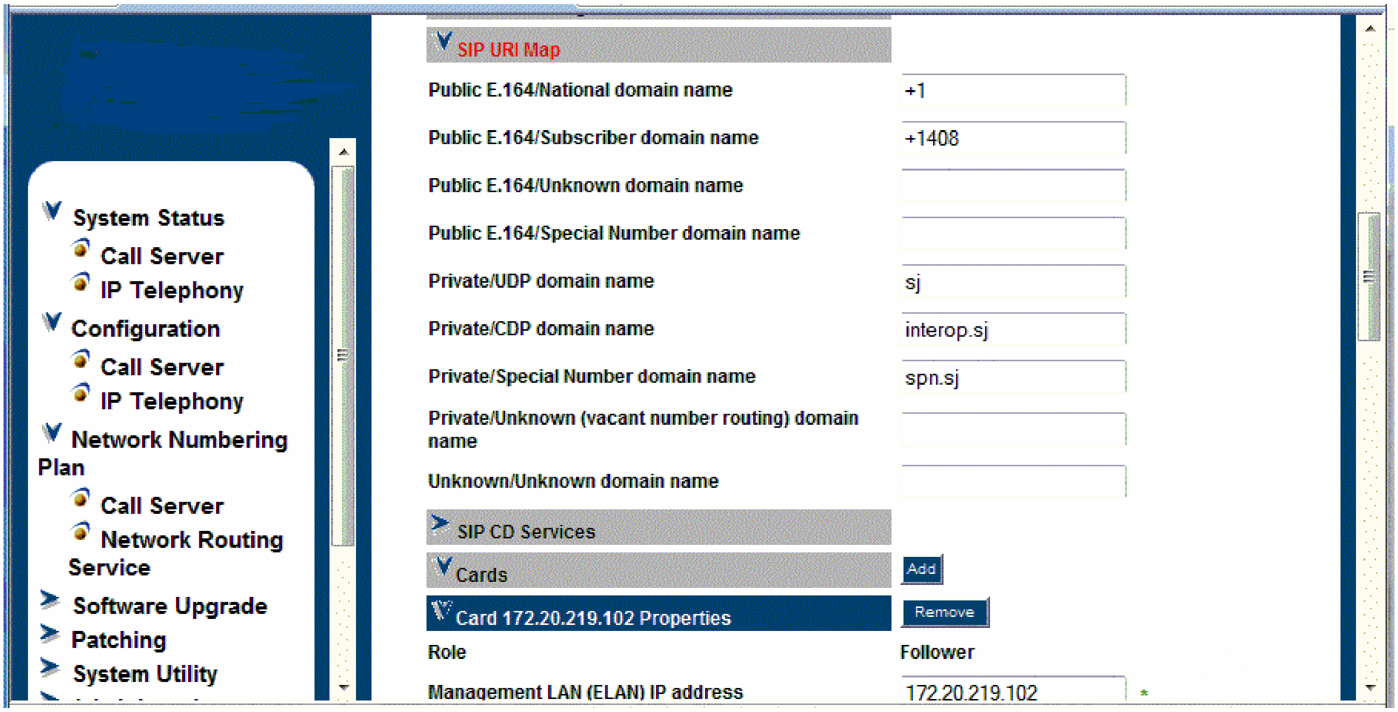
Configure the LAN Configuration Section



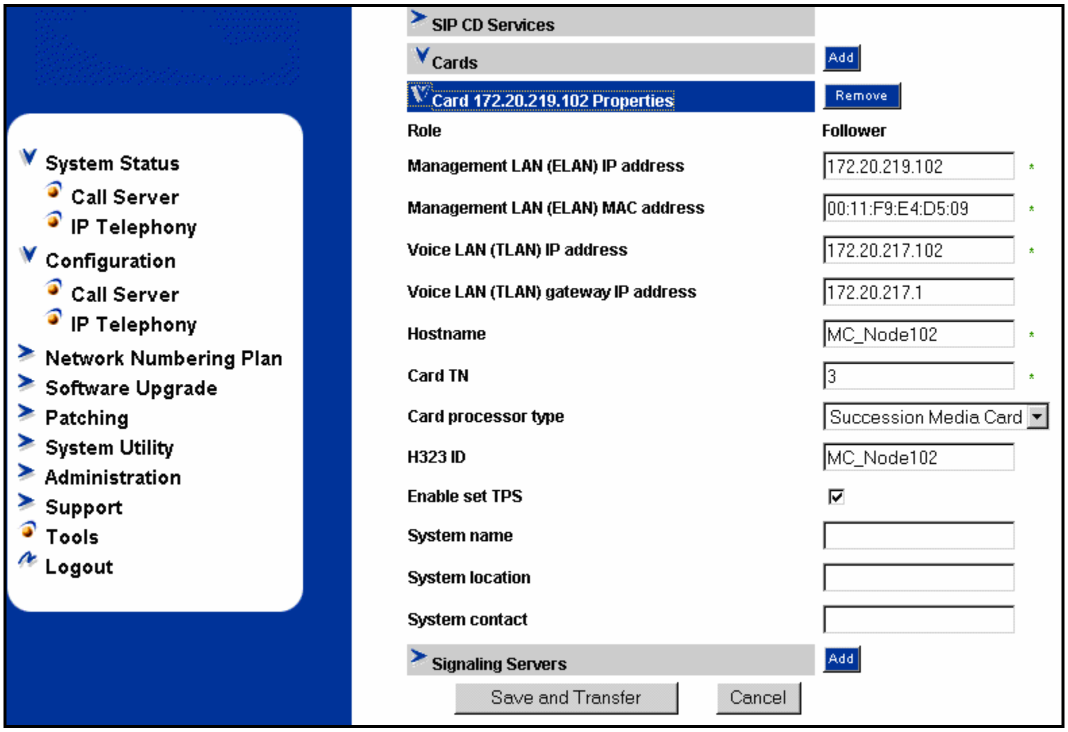
Configure the SIP GW Setting Section



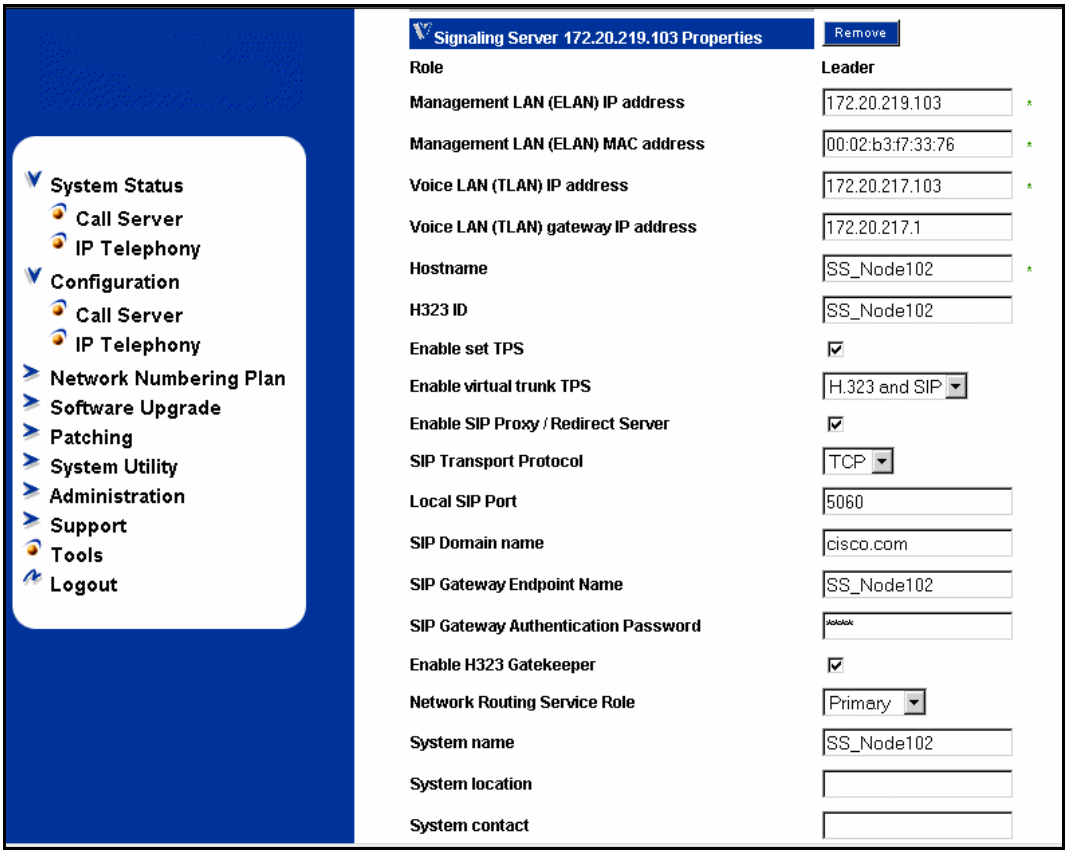
SIP URL Setting



Configure the Card Section for the MC-32 VGMC Card Section

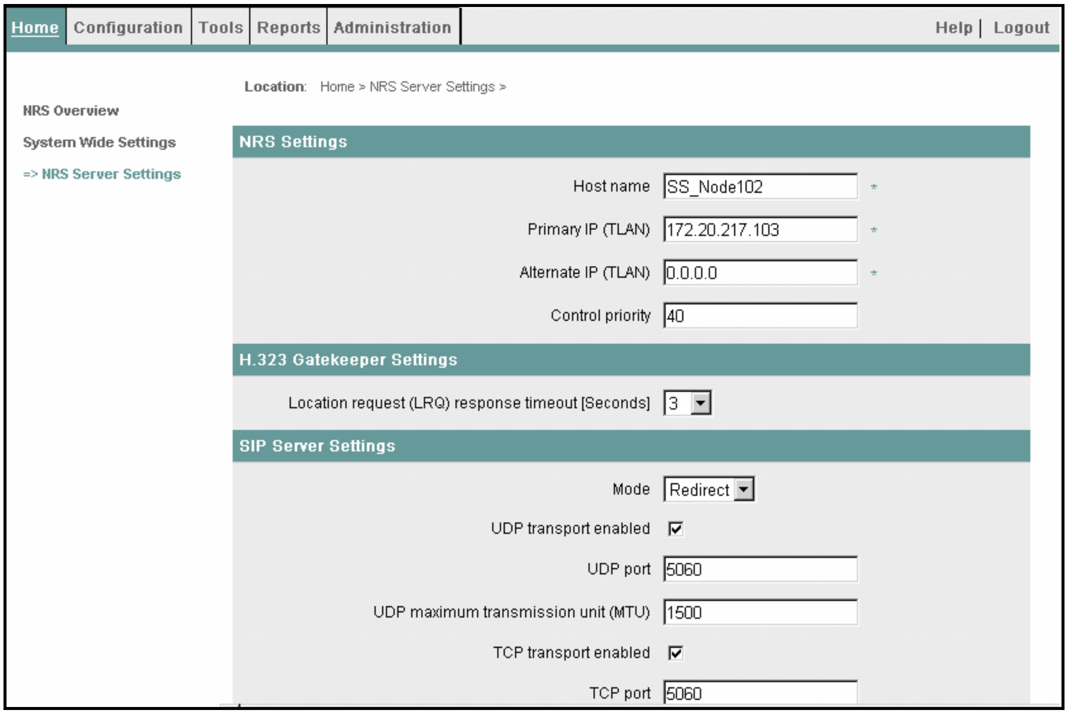


Configure the Signaling Server Section

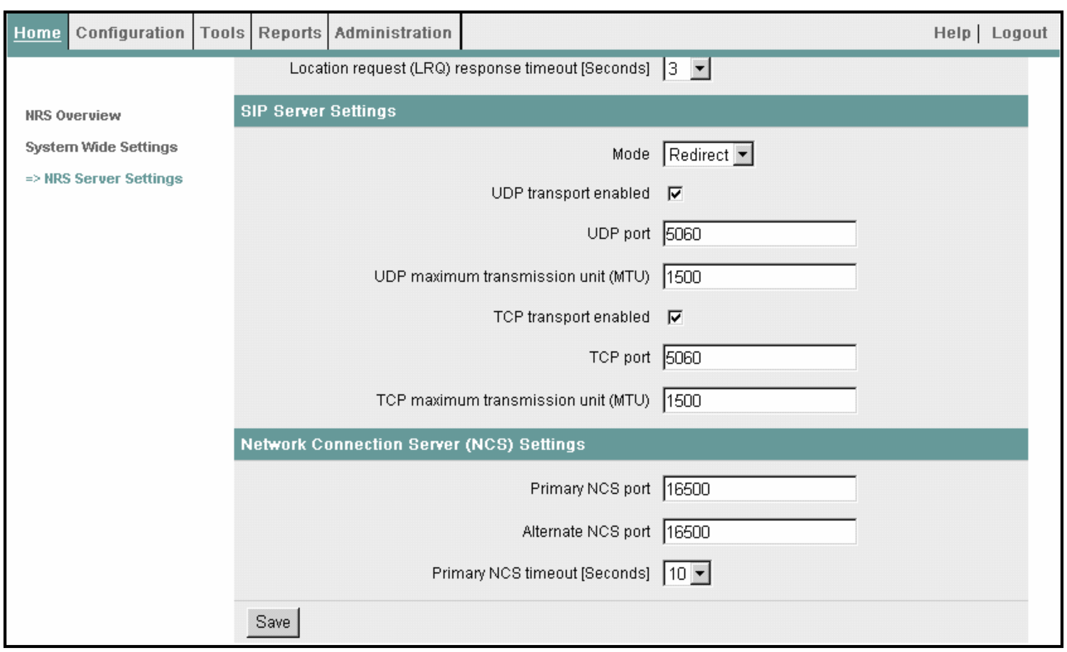

Signaling Server 172.20.219.103 Properties
Remove
Role
Leader
Management LAN (ELAN) IP address
172.20.219.103
Management LAN (ELAN) MAC address
00:02:b3:f7:33:76
Voice LAN (TLAN) IP address
172.20.217.103
Voice LAN (TLAN) gateway IP address
172.20.217.1
Hostname
SS_Node102
H323 ID
SS_Node102
Enable set TPS
Enable virtual trunk TPS
H.323 and SIP
Enable SIP Proxy / Redirect Server
SIP Transport Protocol
TCP
Local SIP Port
5060
SIP Domain name
cisco.com
SIP Gateway Endpoint Name
SS_Node102
SIP Gateway Authentication Password
Enable H323 Gatekeeper
Network Routing Service Role
Primary
System name
SS_Node102
System location
System contact
System Status
Call Server
IP Telephony
Configuration
Call Server
IP Telephony
Network Numbering Plan
Software Upgrade
Patching
System Utility
Administration
Support
Tools
Logout

Network Routing Server Setup

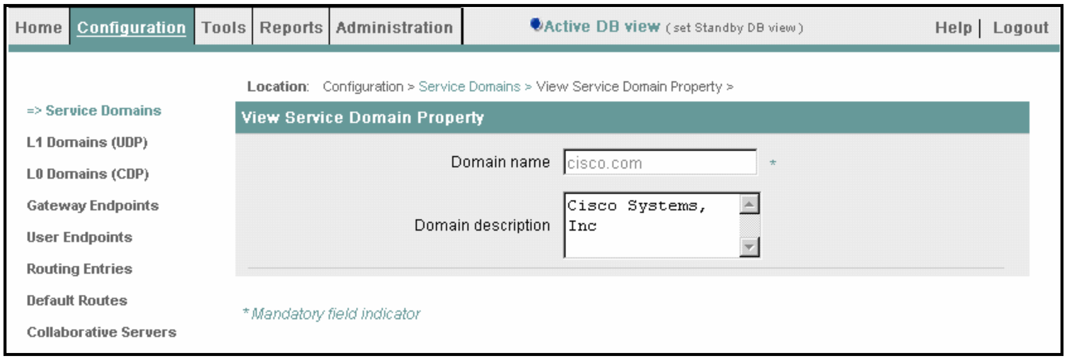
Configure the NRS Server Settings



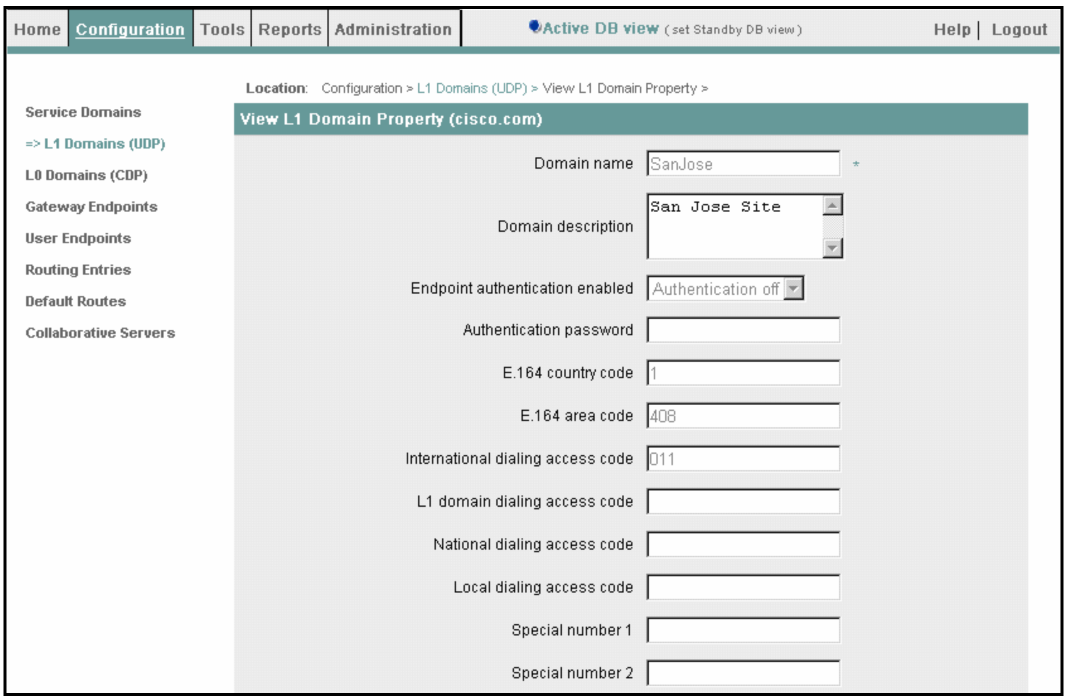
SIP Server Setting



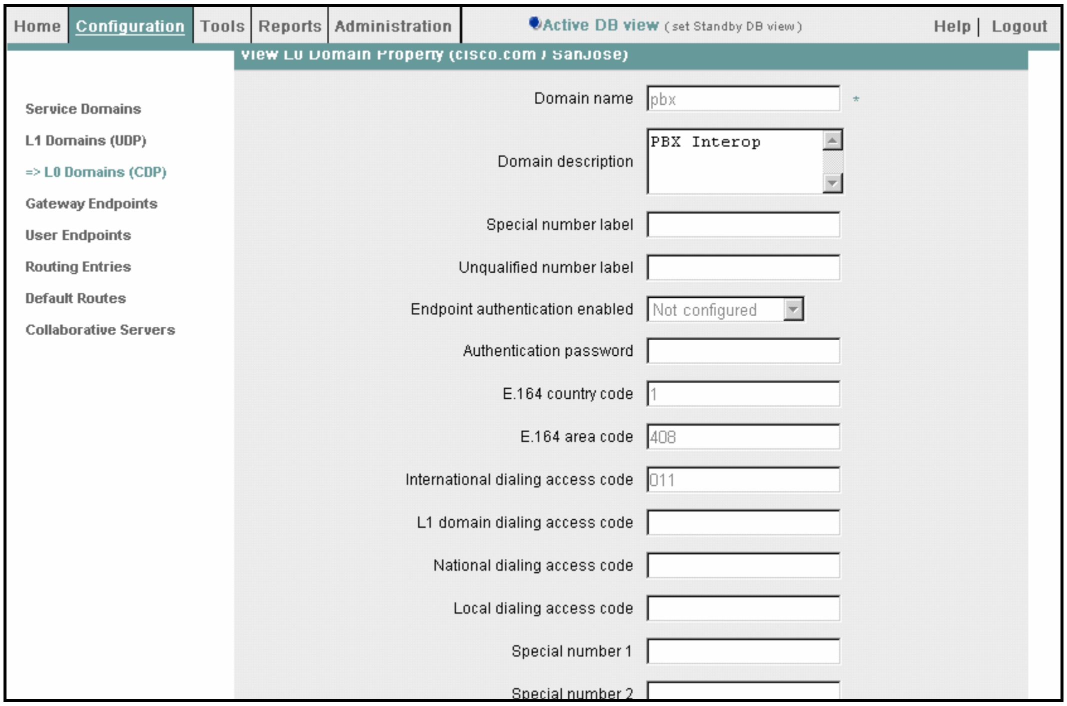
Configure a Service Domain



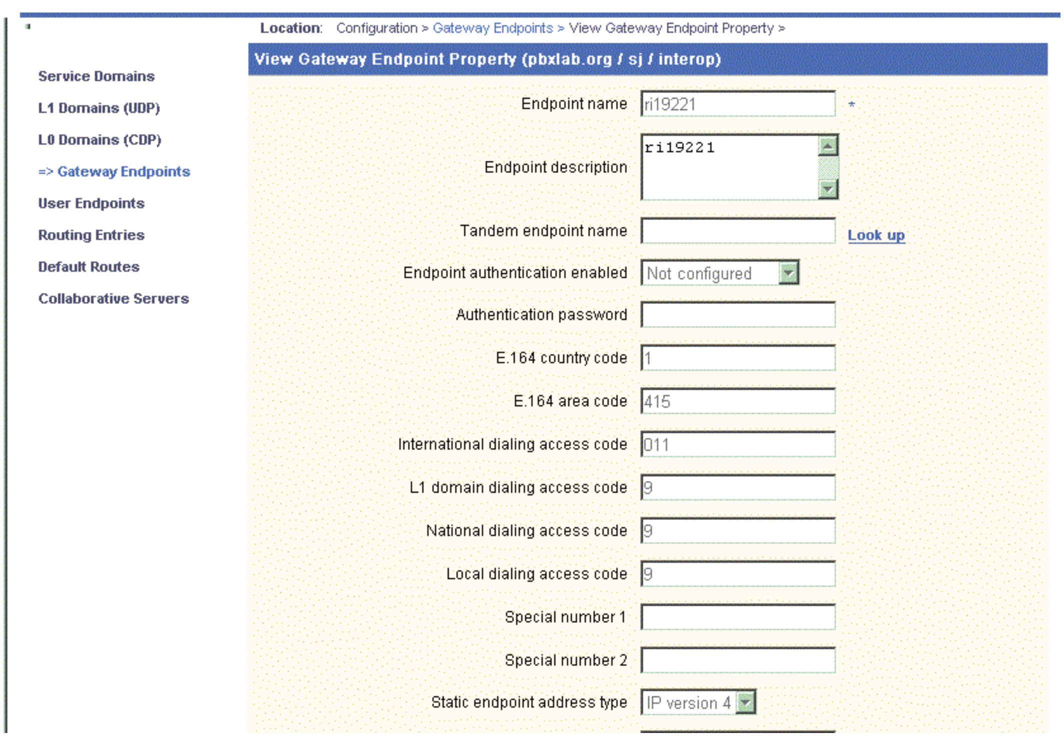
Configure an L1 Domain (UDP)

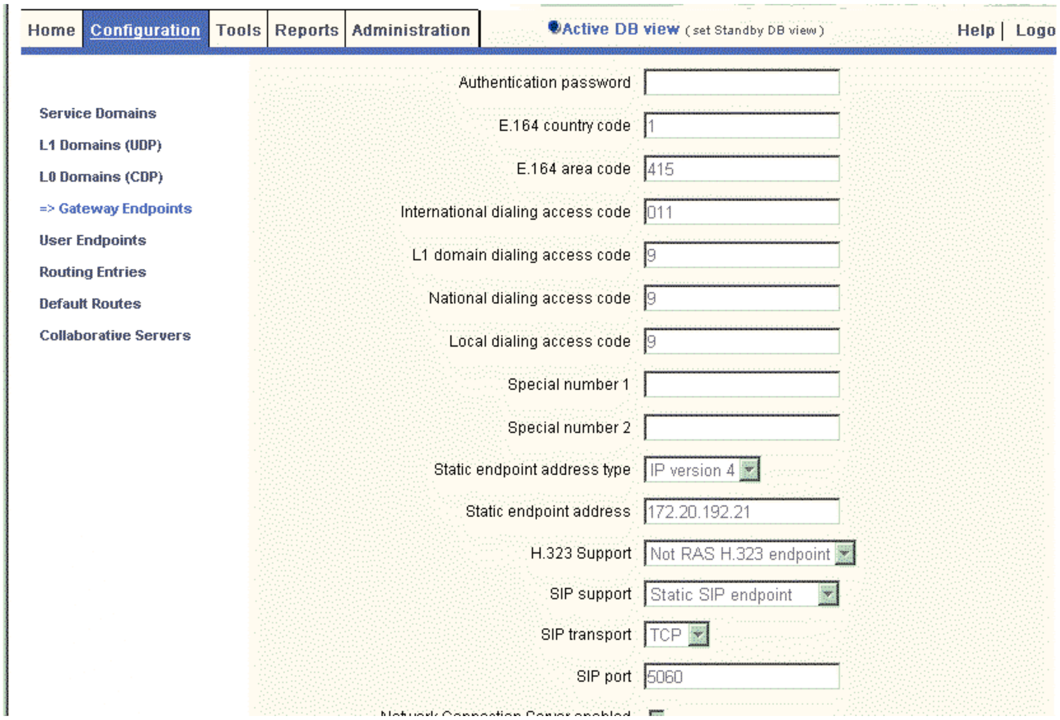


Configure an L0 Domain (CDP)

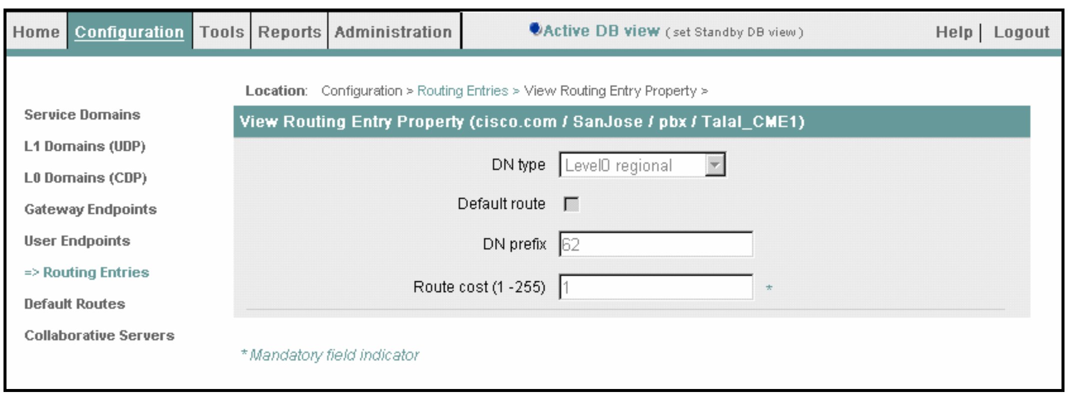


Configure an SIP Gateway





Configure the Routing Entries



Cisco 3825 configuration

```
CUBE21#sh ver
Cisco IOS Software, 3800 Software (C3825-IPVOICE_IVS-M), Version 12.4(15)XZ, REL
EASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2008 by Cisco Systems, Inc.
Compiled Fri 11-Apr-08 21:10 by prod_rel_team

ROM: System Bootstrap, Version 12.3(11r)T2, RELEASE SOFTWARE (fc1)

CUBE21 uptime is 9 weeks, 5 days, 17 hours, 39 minutes
System returned to ROM by reload at 22:56:36 UTC Wed Apr 23 2008
System image file is "flash:c3825-ipvoice_ivs-mz.124-15.XZ.bin"

Cisco 3825 (revision 1.0) with 224256K/37888K bytes of memory.
Processor board ID FTX0946A1BT
2 Gigabit Ethernet interfaces
11 Serial interfaces
1 Channelized E1/PRI port
2 Channelized T1/PRI ports
2 Voice FXS interfaces
DRAM configuration is 64 bits wide with parity enabled.
479K bytes of NVRAM.
62720K bytes of ATA System CompactFlash (Read/Write)

Configuration register is 0x2102

CUBE21#sh run
Building configuration...

Current configuration : 2225 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname CUBE21
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
logging buffered 10000000
!
no aaa new-model
no network-clock-participate slot 1
network-clock-participate slot 2
!
voice-card 0
 no dspfarm
!
```

```
voice-card 1
 dspfarm
!
voice-card 2
 dspfarm
!
ip cef
!
!
!
!
no ip domain lookup
multilink bundle-name authenticated
!
isdn switch-type primary-net5[2]
!
!
!
voice service voip
 allow-connections sip to sip
 sip
!
!
voice translation-rule 1[3]
 rule 1 /400/ /521\1/
!
voice translation-rule 2
 rule 2 /65/ /23\1/
!
!
voice translation-profile pots
 translate called 1
!
voice translation-profile voip
 translate called 2
!
!
!
!
archive
 log config
  hidekeys
!
!
controller T1 1/0/0
 framing esf
```

[2] Set ISDN switch types.

[3] The voice gateway manipulates the called digits to match configured dial-peers and to route calls appropriately. For example, digit manipulation rule 1 of voice translation rule 1 instructs the IOS gateway that when it receives "400," the IOS gateway is to strip 400 and add digit 521 as leading numbers to the remaining digits x (x in this case are either 3 or 6) and send them to the appropriate dial-peer.

```
 linecode b8zs
!
controller T1 1/0/1
 framing esf
 linecode b8zs
!
controller E1 2/0
 pri-group timeslots 1-10,16
!
!
!
!
interface GigabitEthernet0/0
 ip address 172.20.192.21 255.255.255.0
 duplex auto
 speed auto
 media-type rj45
!
interface GigabitEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
 media-type rj45
!
interface Serial2/0/0:15
 no ip address
 encapsulation hdlc
 isdn switch-type primary-net52
 isdn protocol-emulate network
 isdn incoming-voice voice
 isdn supp-service name calling ie 40 cs0[4]
 no cdp enable
!
ip default-gateway 172.20.192.1
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 172.20.192.1
!
!
ip http server
!
!
!
!
control-plane
!
!
!
voice-port 0/1/0
!
voice-port 0/1/1
```

[4] This command enables calling name.

```
!
voice-port 2/0/0:15
!
!
!
dial-peer voice 5300 voip[5]
 translation-profile incoming voip
 destination-pattern 52..
 session protocol sipv2[6]
 session target ipv4:172.20.217.100
 session transport tcp
.dtmf-relay rtp-nte[7]
codec g711alaw[8]
!
dial-peer voice 2000 pots[9]
 translation-profile incoming pots
 destination-pattern 232.
 incoming called-number 5...
 direct-inward-dial
 port 2/0/0:15
 forward-digits all
!
dial-peer voice 2325 pots
 destination-pattern 2325
 port 0/1/1
!
!
!
gatekeeper
 shutdown
!
!
line con 0
 password cisco
 logging synchronous
 login
 no activation-character
line aux 0
line vty 0 4
 password cisco
 login
!
scheduler allocate 20000 1000
end
```

[5] VOIP dial-peer toward PBX.
[6] This configures the dial-peer IETF SIP.
[7] Insert this command for DTMF RFC2833. Removing this command will do DTMF in-band.
[8] Specify codec here when testing codec. Also change codec settings at the PBX end to match the specified codec at the IOS Media Gateway.
[9] POTS dial-peer toward PSTN.

Acronyms

Acronym	Definitions
CDP	Cisco Discovery Protocol
DSP	digital signal processor
DTMF	dual-tone multi-frequency
IOS	internetwork Operating System
ISDN	integrated services digital network
PSTN	public switched telephone network
SIP	session initiation protocol

Important Information

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

Printed in the USA