Application Note

Avaya INDeX using DPNSS to Westell IiQ2000plus using QSIG to Cisco Unified Cisco Unified CallManager 4.1

October 26, 2007 Revision 5

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Introduction

Note: This configuration was not tested at Cisco. It was tested at a customer site.

Although specific gateway router models were used to validate its content, this application note also applies to all 1700/2600/3600/3700/2800/3800 series Cisco IOS voice gateways, the Catalyst 6608 module, the Catalyst 6500 CMM Module and any future MGCP-controlled ISO Q.Sig device registered to Cisco Unified CallManager 4.X above 4.1(2).

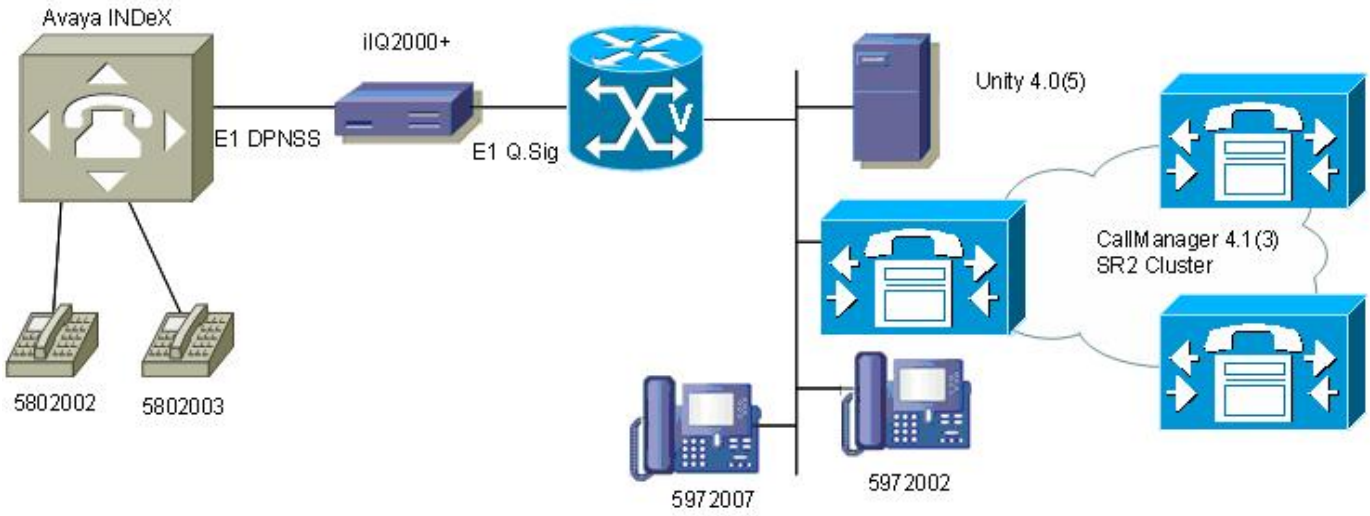
This application note provides configuration guidelines for interconnecting the INDeX PBX using DPNSS to standard BTNR 188. As Cisco Unified CallManager does not natively support this protocol, use of an external protocol converter, the Westell IiQ2000plus, is required. This converts DPNSS to Q.Sig, mapping DPNSS features to their Q.Sig equivalent, where available.

A single Avaya INDeX was connected to a 2600 router with an NM-HDV, running MGCP backhaul to a Cisco Unified CallManager 4.1(3)SR2 cluster. The INDeX hosted digital “feature” phones. The DPNSS Line Card was then connected on G.703 to the Westell converter. The Westell converter was connected to the IOS gateway using a standard E1 cross-over cable, with the Cisco Unified CallManager cluster hosting a 7912G and a 7940 phone. In order to prove MWI, a Unity 4.0(5) system was registered into Cisco Unified CallManager. MWI from the PBX was tested using the “Message” feature on the INDeX digital handsets to switch on/off MWI across the DPNSS trunk.

Using the INDeX PBX configurations, Cisco IOS voice gateway configurations, Westel IiQ2000plus parameters and Cisco Unified CallManager settings in this application note, successful integration was achieved. This includes basic call, call transfer, call conference, call forward, calling and connected names and numbers with some limitations on Caller ID features during transfer, forward, and conference scenarios. MWI was also passed from Cisco Unified CallManager to PBX phones and from the PBX to Cisco Unified CallManager, allowing possible integration with voicemail solutions on either side of the DPNSS connection to be considered. Call Back services were shown to work – the exception being Call Back When Free initiated by the IPT side, which produces an immediate response from the PBX.

Network Topology

Figure 1. Network Topology or Test Setup



Limitations

Call Back When Free between an IP Phone and a PBX extension where the IP Phone is calling a busy PBX extension and then initiates a Call Back Request will cause the PBX to alert Cisco Unified CallManager that the PBX phone is free immediately after the IP Phone clears down following the Call Back request. This is due to an error with eh PBX implementation of DPNSS callback.

For Call Back to work correctly, the Service Parameter "Connection Response Type" in the "Clusterwide Parameters (Feature – Call Back)" needs to be set to "Default to Connection Release."

When call mature due to CallBack, only OLI information is displayed on the IP Phone. No name information is displayed. This is due to a incorrect implementation of CallBack calls on the INDeX.

For Call Forwarding to work correctly, the Service Parameter "Forward by Reroute Enabled" needs to be set to True.

A dedicated DN needs to be allocated to act as a Q.Sig PINX ID on the Cisco Unified CallManager. This should be in the same number range as the Cisco Unified CallManager phones, and is required for Path Replacement.

Path Replacement on Cisco Unified CallManager will by default be disabled.

Conference calls which are initiated by the PBX where the PBX host drops out leaving just IPT users will retain all connections between the PBX and Cisco Unified CallManager.

Conference calls which are initiated by Cisco Unified CallManager where the IPT host drops out leaving just PBX users will retain all connections between the PBX and Cisco Unified CallManager

Although any mode of PBX side (A/B) or Glare configuration (X/Y) is supported, fractional DPNSS and/or Q.Sig trunks are not supported.

MWI requirements vary between both PBX models, configuration and combination of voicemail platform and PBX. By default, the Westell IiQ2000plus sends/receives both NSI and CallBack MWI messages – this may not work in a particular deployment and will require modification. Please see later section for details.

Hardware Requirements

(1) Cisco IOS voice gateways with E1 VWICs (voice/WAN interface cards) or Catalyst 6500 CMM module with E1 ports, or Catalyst 6608 E1 module

(1) Avaya/SDX INDeX.

(2) Avaya/SDX Digital telephones.

Westell IiQ2000plus

Software Requirements

Avaya/SDX INDeX – all versions of software.

Cisco IOS voice gateways: Cisco IOS Release Version 12.3(9)T or later for the majority of gateways.

Cisco Unified CallManager 4.1(3) SR1 or later (requirement is to support IOS Q.Sig backhaul using MGCP.

Westell software, version R3.0.0 or later.

Westell VisionIQ Management software.

Features Supported

Basic Call (ENBLOC and Overlap)

Calling/Connected Number Display and Update

Calling/Connected Name Display and Update *see limitations*

Call Transfer: Supervised Local Transfer

Call Transfer: Supervised Network/External Transfer

Call Conference: Local

Call Conference: Network/External

Call Forward: Local

Call Forward: Network/External

Call Back When Free *see limitations*

Call Back Next Used

MWI

Features Not Supported

Route Optimisation

Configuration

Configuring the Avaya/SDX INDeX PBX

Figure 2. Initia Access Screen

```
                Head Office         CPU-X1000  10.1.4

    1.  Reports
    2.  System
    3.  User
    4.  Station
    5.  Trunk
    6.  Group
    7.  Call Control Plan
    8.  Directory
    9.  Maintenance
    10. PSTN Access
    11. Network Facilities
    12. Permissions
    13. Night Service
    14. Automatic Route Selection
    15. Automatic Call Announcing
    16. Database Management
    17. Linecard Information


INDeX>
```

Figure 3. Select DPNSS Linecard

```
                Linecard Information

1/1 PRI   30 2.0 O.K.      2/1 DPNSS 15 2.1          3/.
  2 DSLC  24 1.7 O.K.        2 DPNSS 15 2.1            2 DPNSS 15 2.1
  3 COMBO 32 1.2 O.K.        .                       3 DPNSS 15 2.1
  4 PRI   30 2.0             4 DPNSS 15 2.1            4 DPNSS 15 2.1
  5 PRI   30 2.0             5 DPNSS 15 2.1            5 IPNC   5 3.3
  6 PRI   30 2.0             6 DPNSS 15 2.1            .
  7 LC-4E    1.3 O.K.        7 DPNSS 15 2.1            7 DPNSS 15 2.1

4/1 DSLC  24 2.0 O.K.      5/.
  2 COMBO 24 1.7 O.K.        .
  3 DPNSS 30 2.1 O.K.        .
  4 SVRC   0 2.2 O.K.        .
  5 VPC   16 1.0 O.K.        .
  6 IPNC  20 3.3 O.K.        .
  7 PRI   30 2.0             .

  1. Linecard
  2. System Shutdown

       <ESC> Administration
INDeX>
```

Figure 4. DPNSS Linecard Configuration

```
                Linecard - 4/3 DPNSS 2.1

        DPNSS 30


        23:30 17/05/06  : Online
        09:58 02/03/06  : Card Installation
        23:30 17/05/06  : Reset

        1. Description :
        2. Locked      : yes
        3. Shutdown    : no

        4. Channels
        5. Setup
        6. Deallocate
        7. Select new target

        <ESC> Linecard Information, <, >


INDeX>
```

Figure 5. Configuration of individual Channels showing on Linecard

```
                Channels - 4/3 DPNSS

 1 4/3/01   1682              16 4/3/17   1697
 2 4/3/02   1683              17 4/3/18   1698
 3 4/3/03   1684              18 4/3/19   1699
 4 4/3/04   1685              19 4/3/20   1700
 5 4/3/05   1686              20 4/3/21   1701
 6 4/3/06   1687              21 4/3/22   1702
 7 4/3/07   1688              22 4/3/23   1703
 8 4/3/08   1689              23 4/3/24   1704
 9 4/3/09   1690              24 4/3/25   1705
10 4/3/10   1691               25 4/3/26   1706
11 4/3/11   1692               26 4/3/27   1707
12 4/3/12   1693               27 4/3/28   1708
13 4/3/13   1694               28 4/3/29   1709
14 4/3/14   1695               29 4/3/30   1710
15 4/3/15   1696               30 4/3/31   1711


<ESC> Linecard, <, >, ->|


Channels [1-n,*]>
```

Figure 6. Sample Channel Configuration for Channel 1682

```
Trunk 1682 - DPNSS - 4/3/01

 1.  Type                      : Both way
 2.  Tenant                    : 1
 3.  Identification            :
 4.  DDI Line                  : no
 5.  DDI digit count           :
 6.  Live speech path          : no
 7.  Forward on Busy/No answer     : yes
 8.  Network priority          : X
 9.  Wait for dial tone(10th secs) : 0
 10. Analogue control data

 11. Default record
 12. Copy to record(s)

 <ESC> Administration, <, >, ->|
```

INDeX>

Figure 7. Build all Channels on Linecard into Group

```
      Group 916  - Trunk sequential

1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697
1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711

                1. Delete number(s)
                2. Add number(s)
                3. Insert before
                4. Rotate group

      <ESC> Administration, ^, v, <, >, ->|

INDeX>
```

Figure 8. Local Access Code to Line Group mapping

```
                Routing Digits 1/1

581...( 7)  914  81 192.168.2.250
582...( 7)  914  82 192.168.4.250
583...( 7)  914  83 192.168.7.250
584...( 7)  914  84 192.168.8.250
585...( 7)  914  85 192.168.5.250
586...( 7)  914  86 192.168.6.250
587...( 7)  914  87 192.168.9.250
588...( 7)  914  88 192.168.11.250
589...( 7)  914  89 192.168.10.250
590...( 7)  914  90 192.168.3.250
591...( 7)  914  91 192.168.12.250
592...( 7)  914  92 192.168.13.250
593...( 7)  914  93 192.168.14.250
594...( 7)  914  94 192.168.16.250
595...( 7)  914  95 192.168.17.250
596...( 7)  914  96 192.168.15.250
597...( 7)  916


            <ESC> Network Facilities, <, >
Routing Digits [nn.. (6)]>
```

Figure 9. Site Code for this Switch

Installation

1. Name : Acorn Head Office
2. Number :
3. Site network number : 580

4. Default language : English

5. Network name :
6. Network setup

7. Next terminal number : 1501
8. Next trunk number : 1683
9. Next group number : 6022

10. Clear device database

11. Data Installation
12. Internal networking setup

<ESC> System

INDeX>

Configuring the Westell IiQ2000 Plus

Figure 10. Initial Connection to Westell via VisionIQ – define shelf

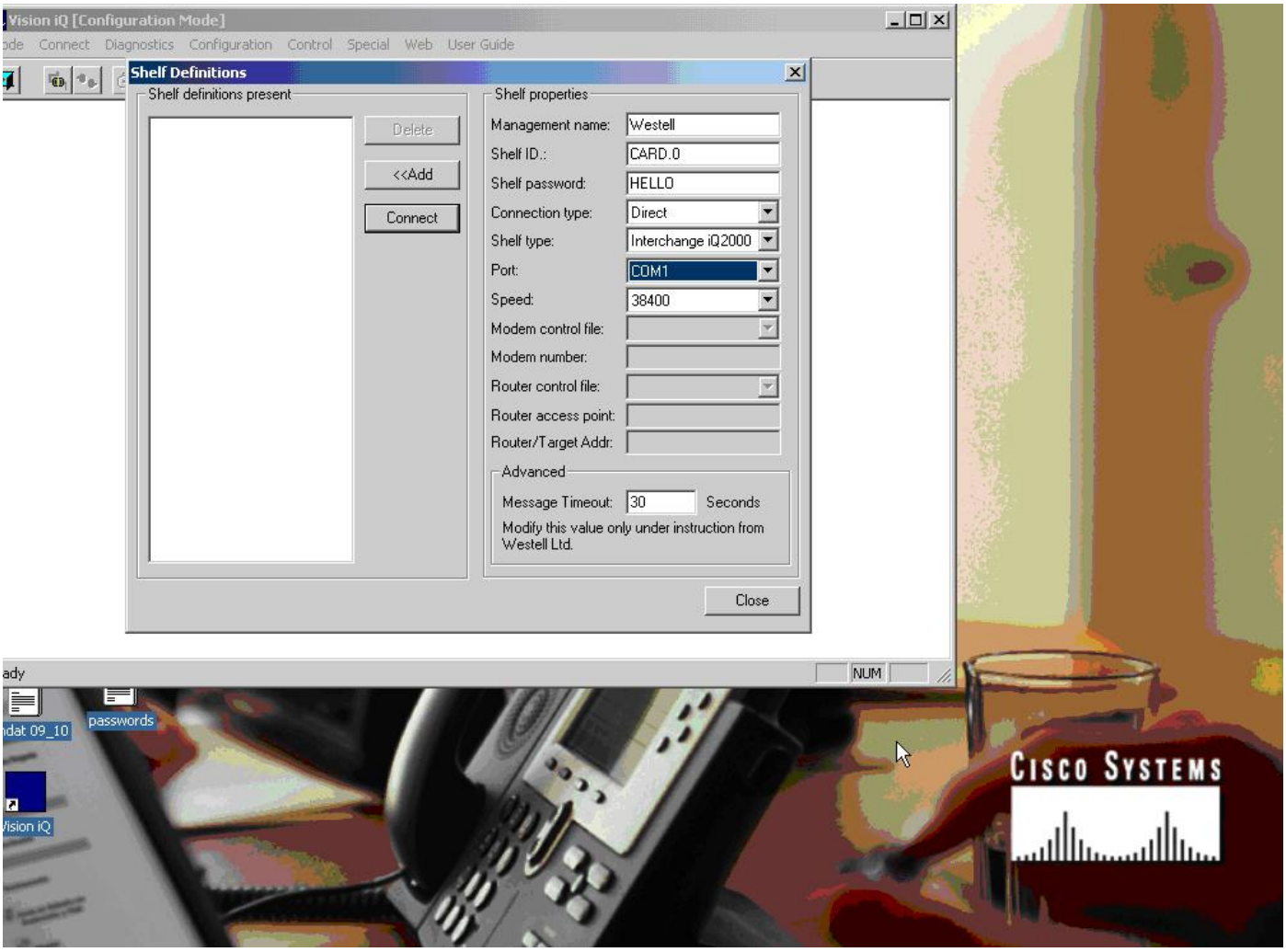


Figure 11. Connect to shelf and configure IiQ2000plus

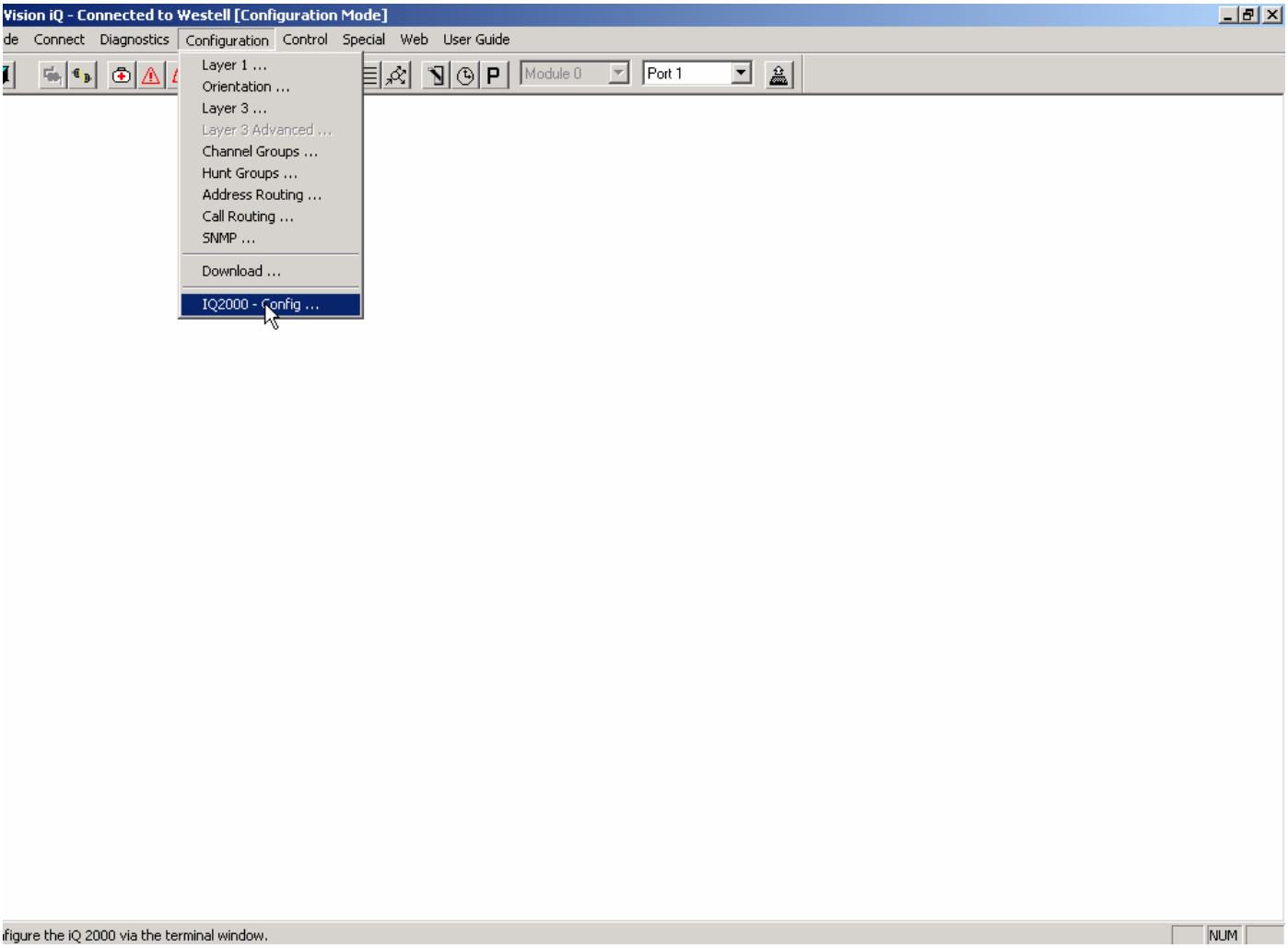


Figure 12. Connect ion warning

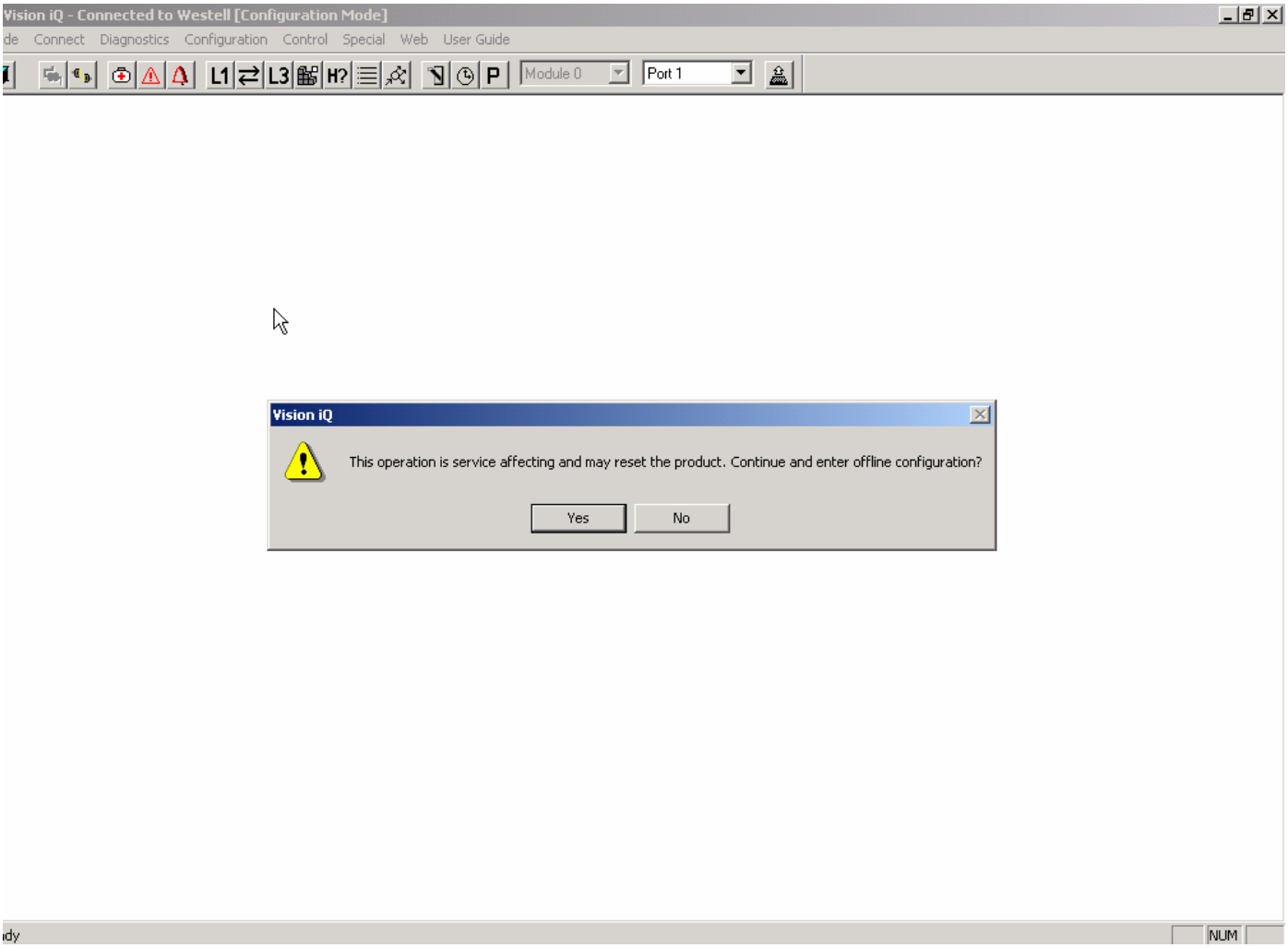


Figure 13. IiQ2000plus Off-line Configuration Screen

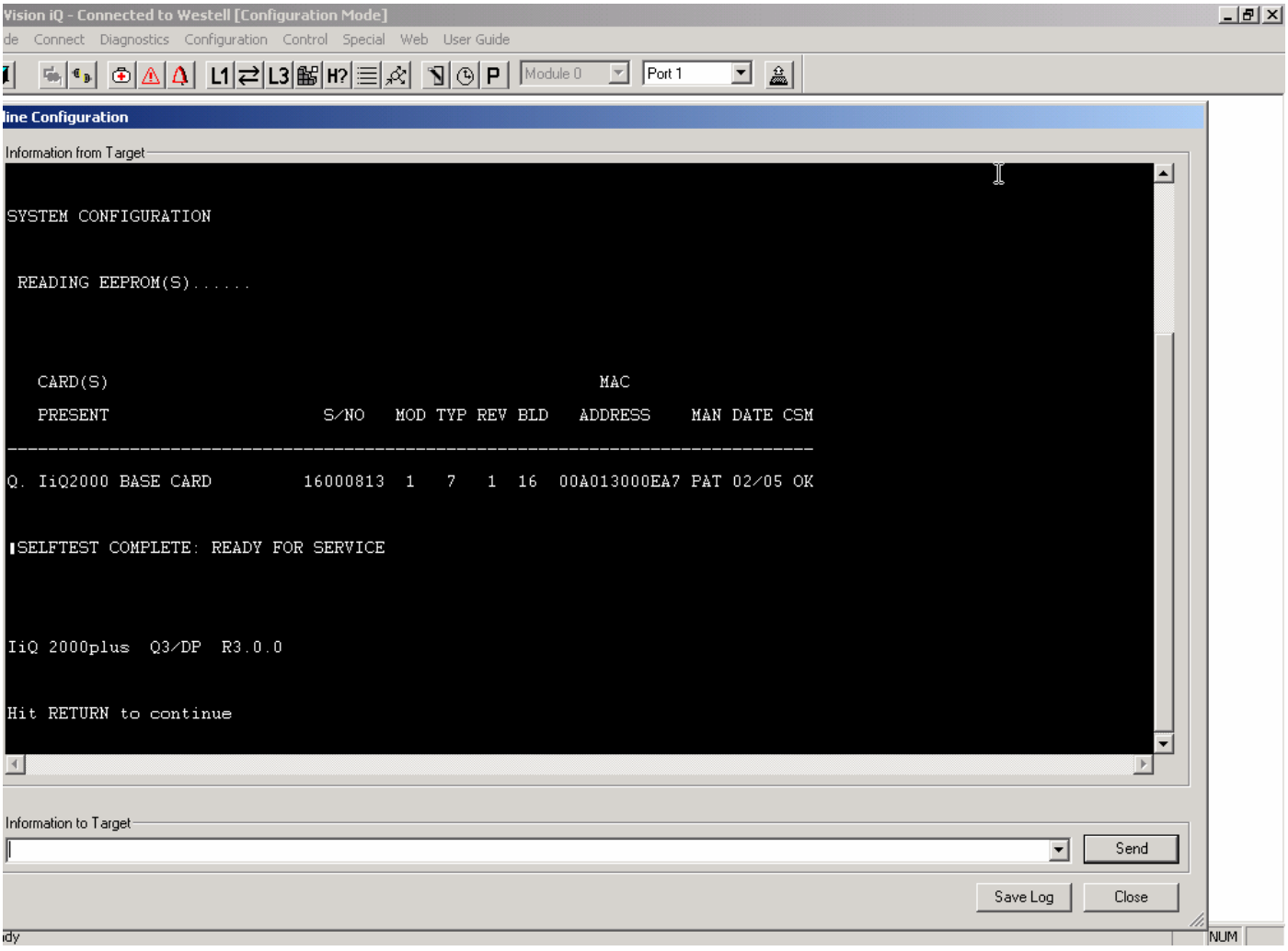


Figure 14. Select QUICK configuration mode

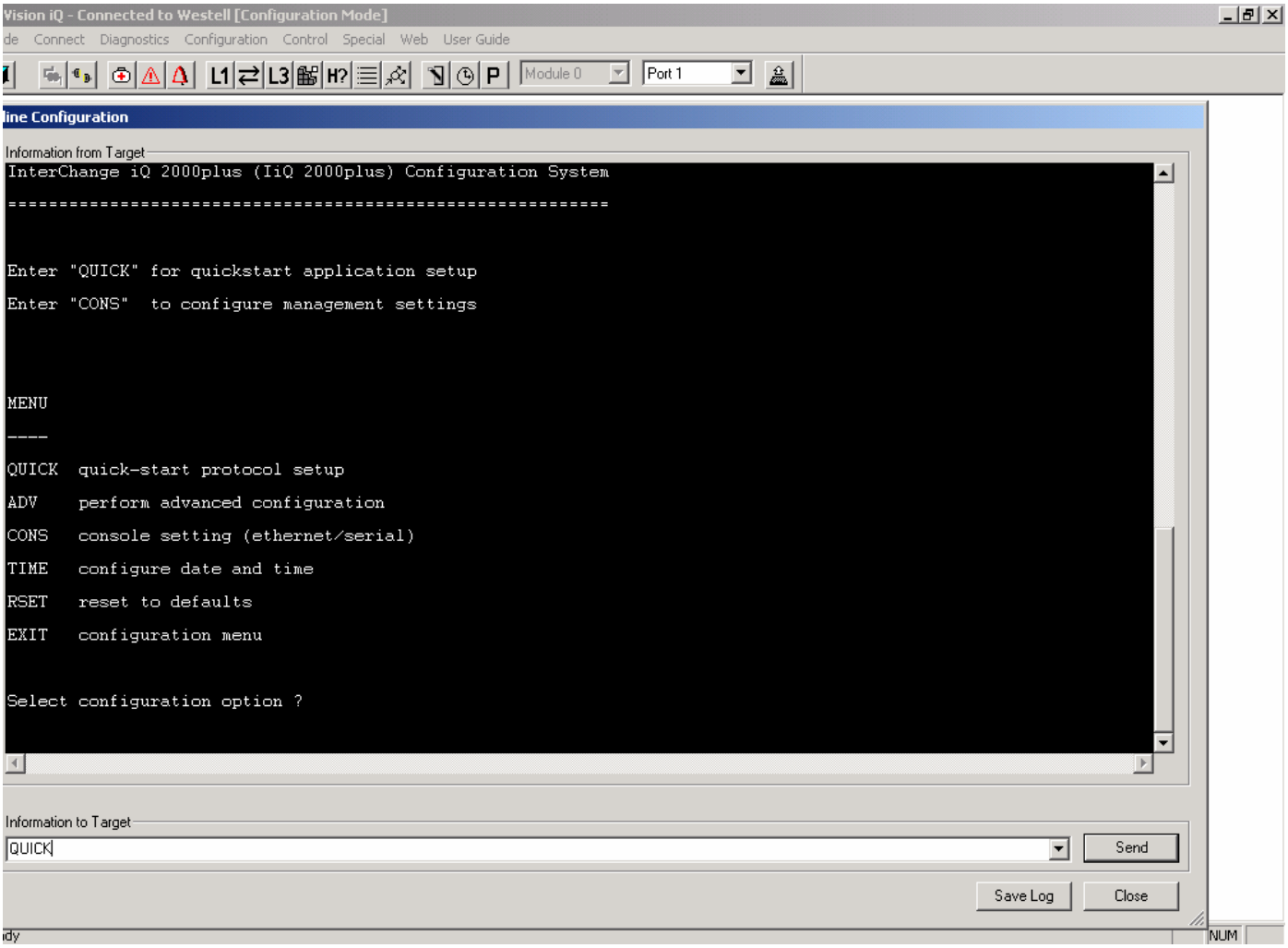


Figure 15. Instructions

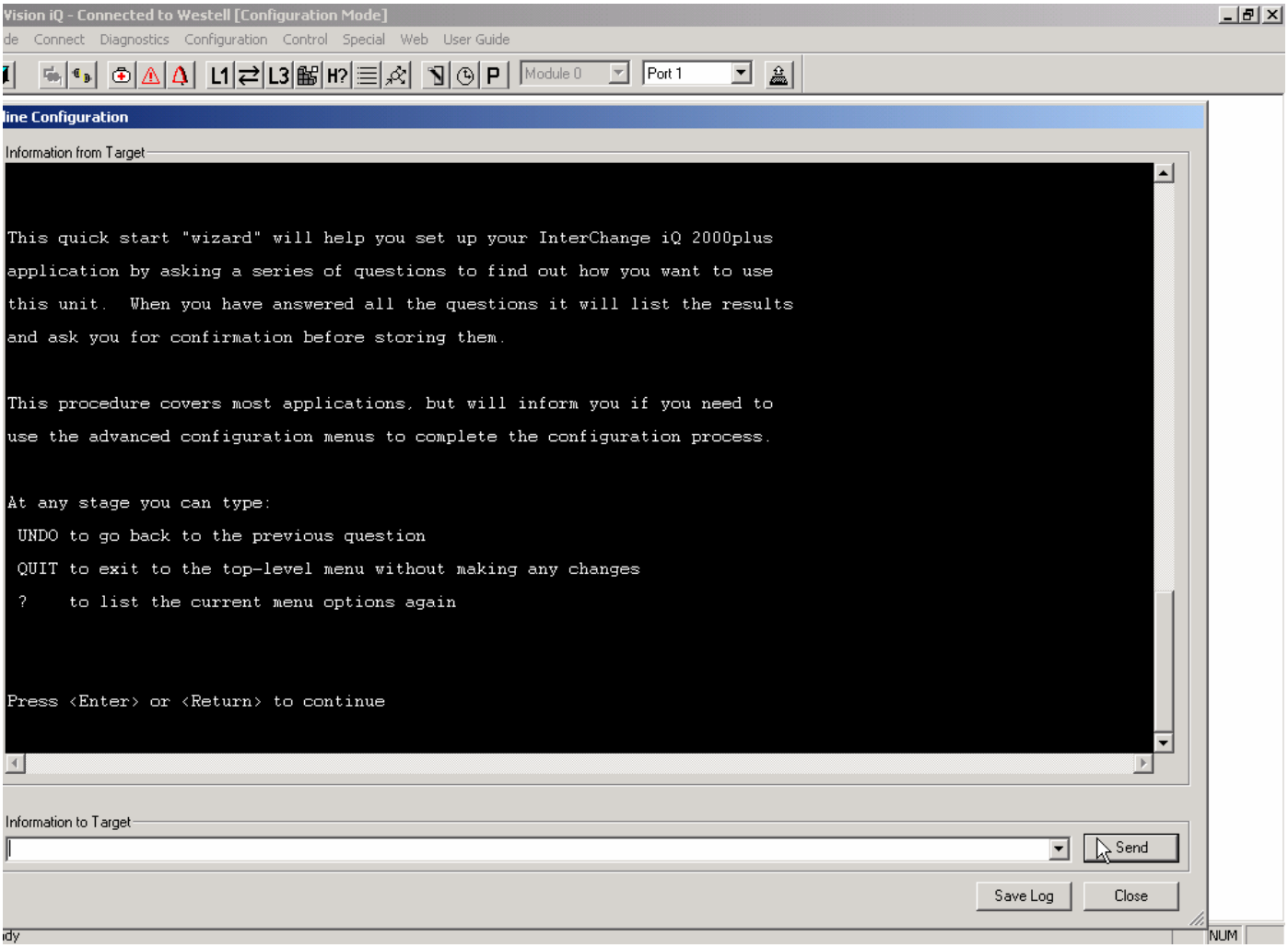


Figure 16. Select CCM for predefined options

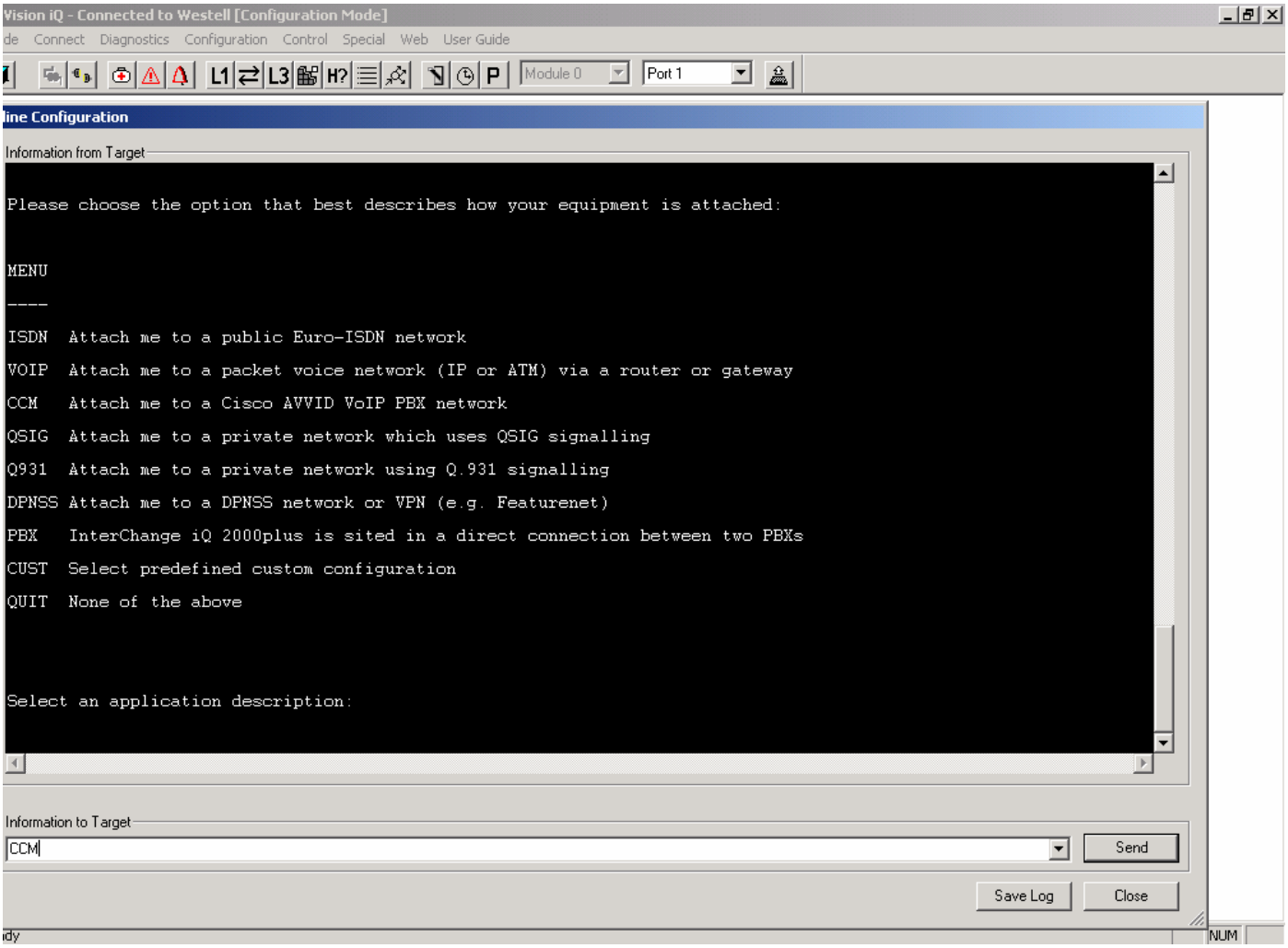


Figure 17. MGCP Gateway required for Q.Sig

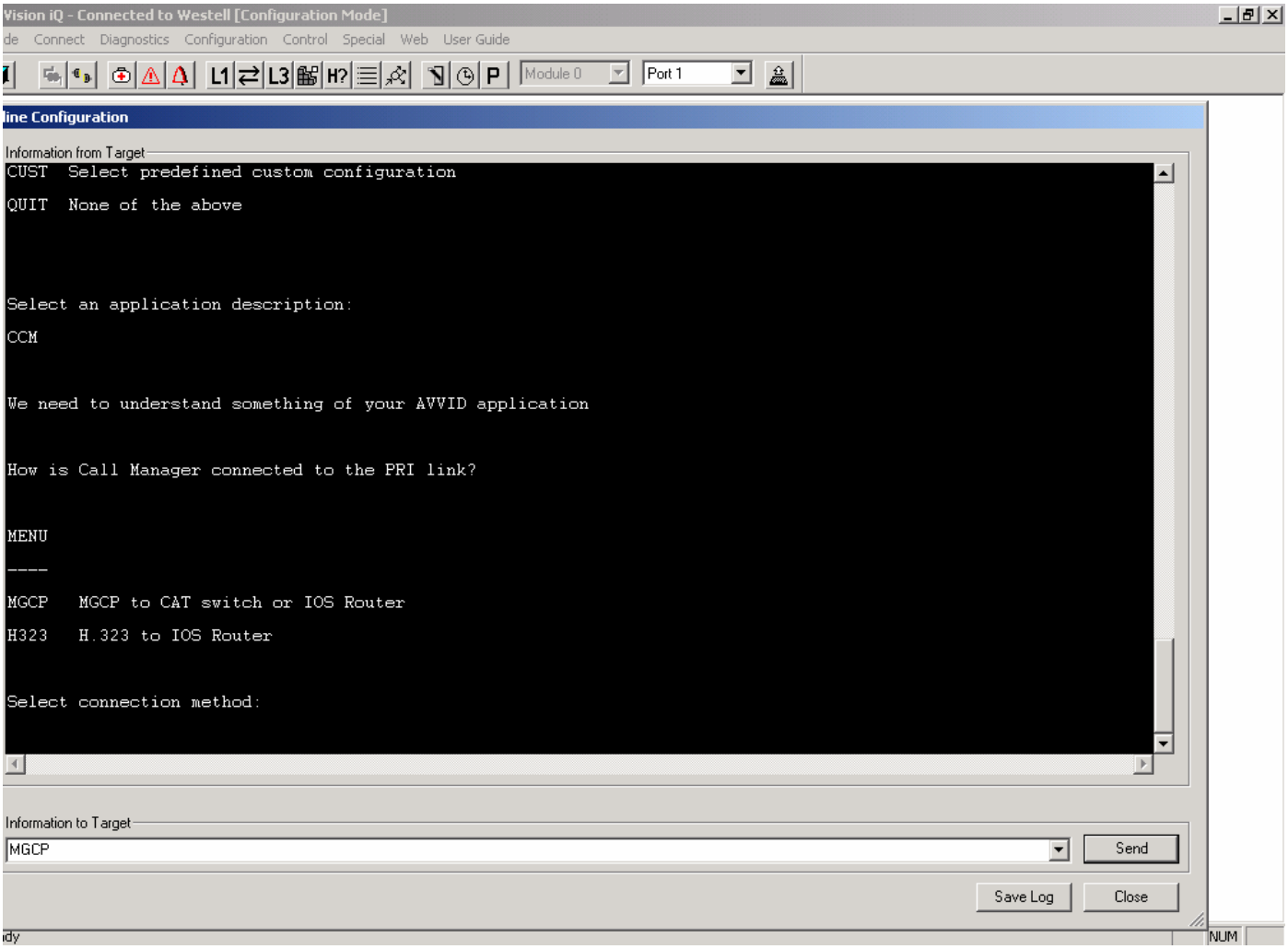


Figure 18. Q.Sig protocol selection

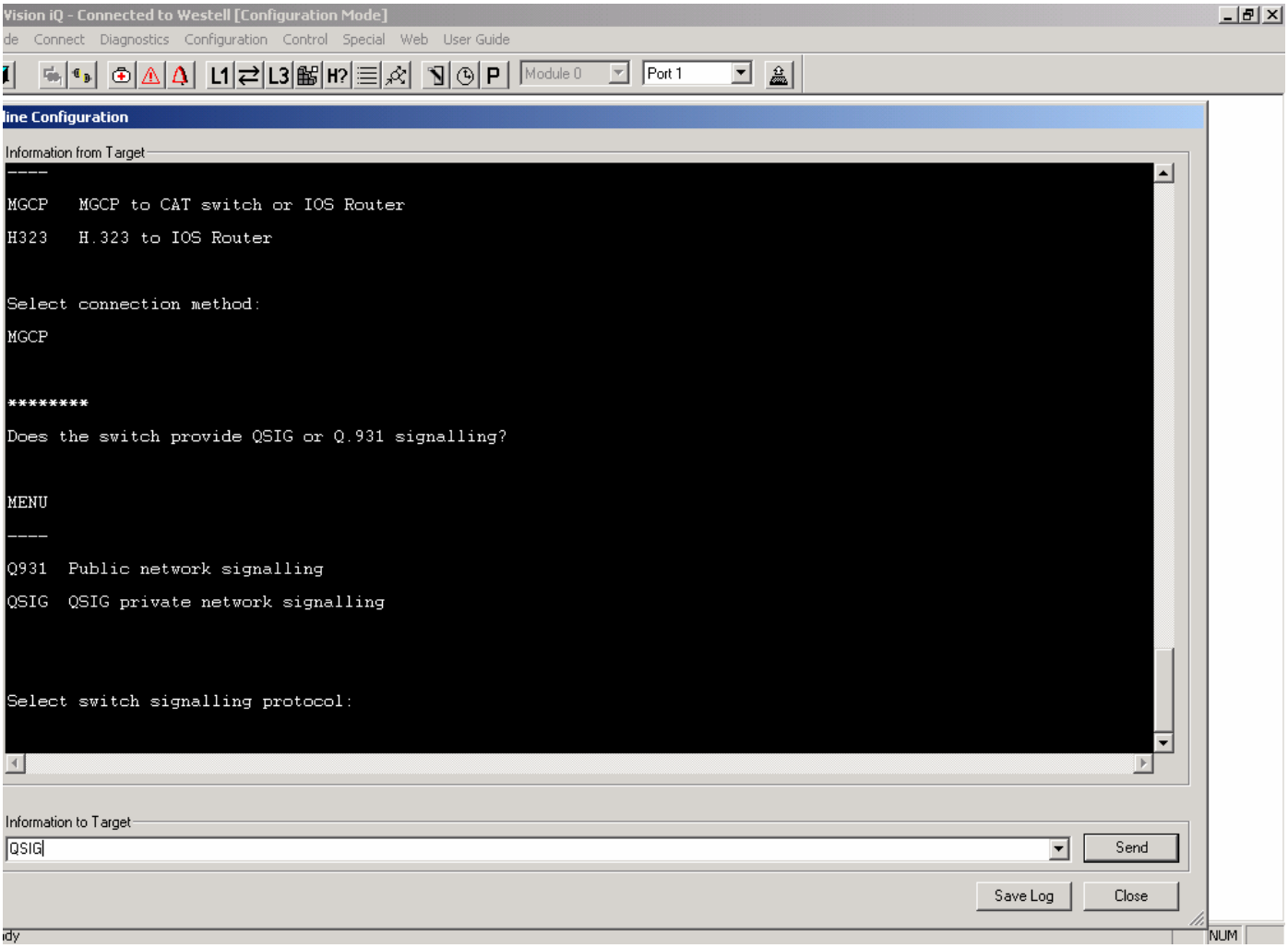


Figure 19. CCM 4.1 required for Q.Sig functionality

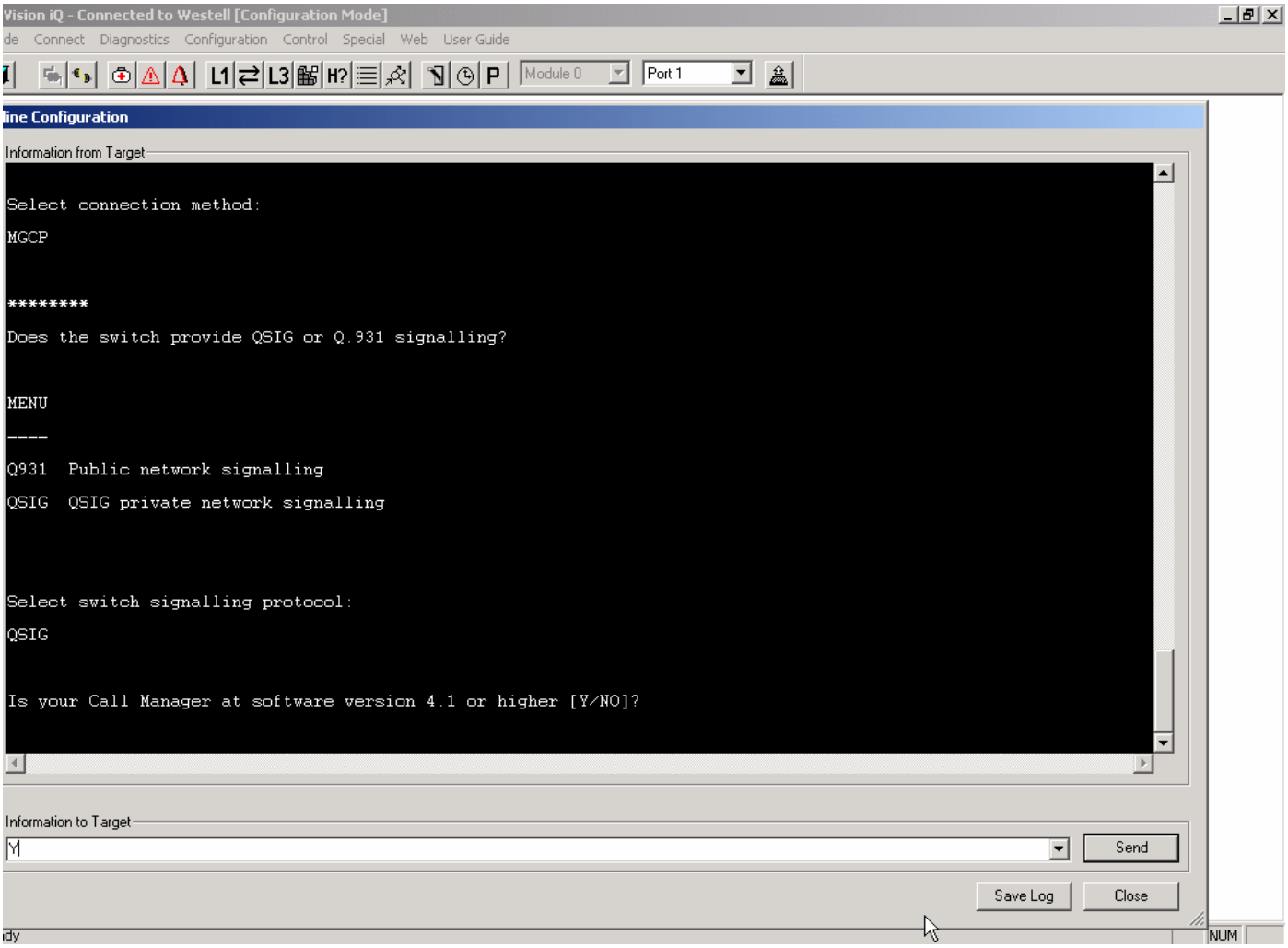


Figure 20. Select ISDN Side (Westell to CCM)

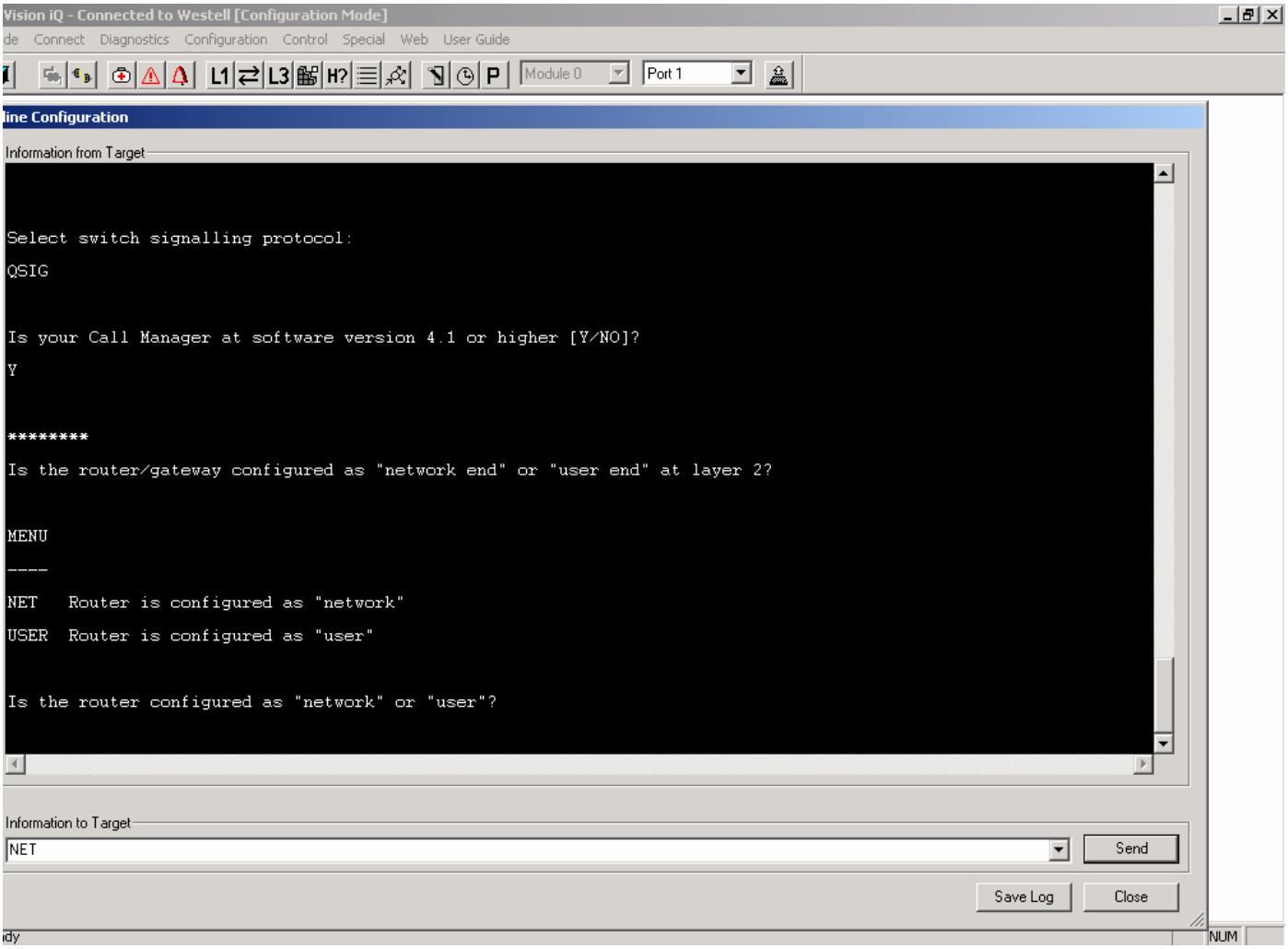


Figure 21. Define Overlap Sending

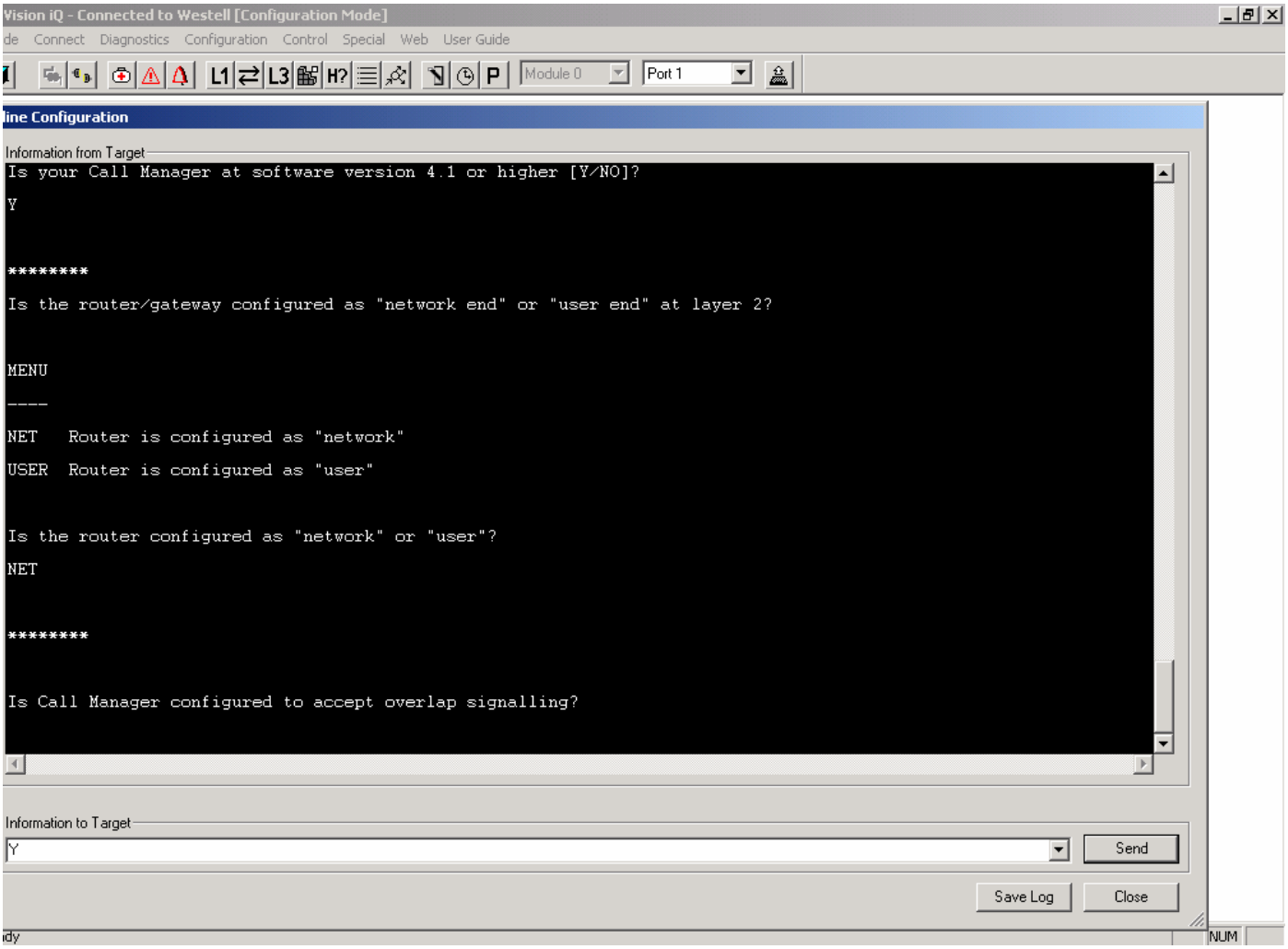


Figure 22. DPNSS A/B End Setting

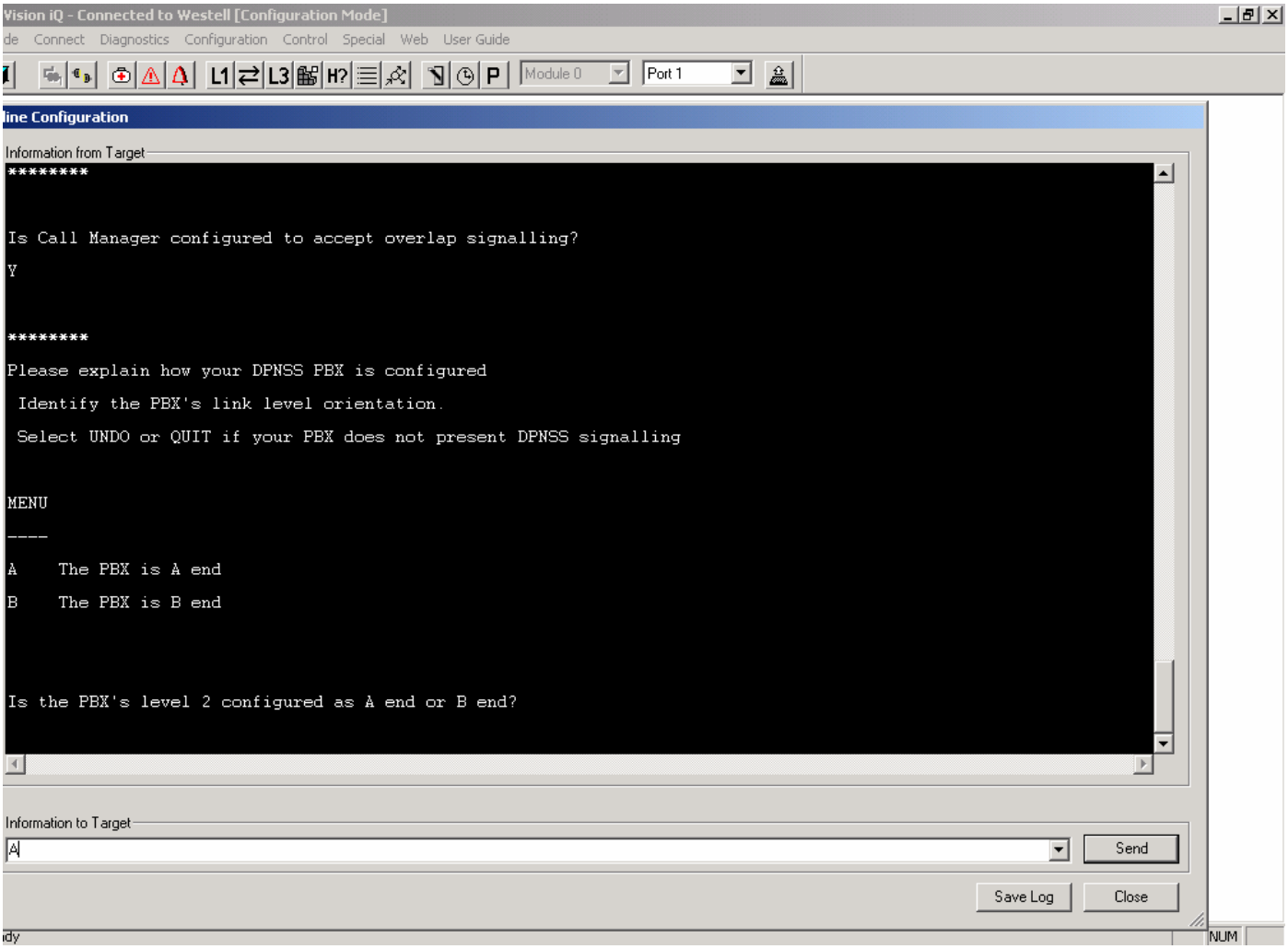


Figure 23. DPNSS X/Y Settings

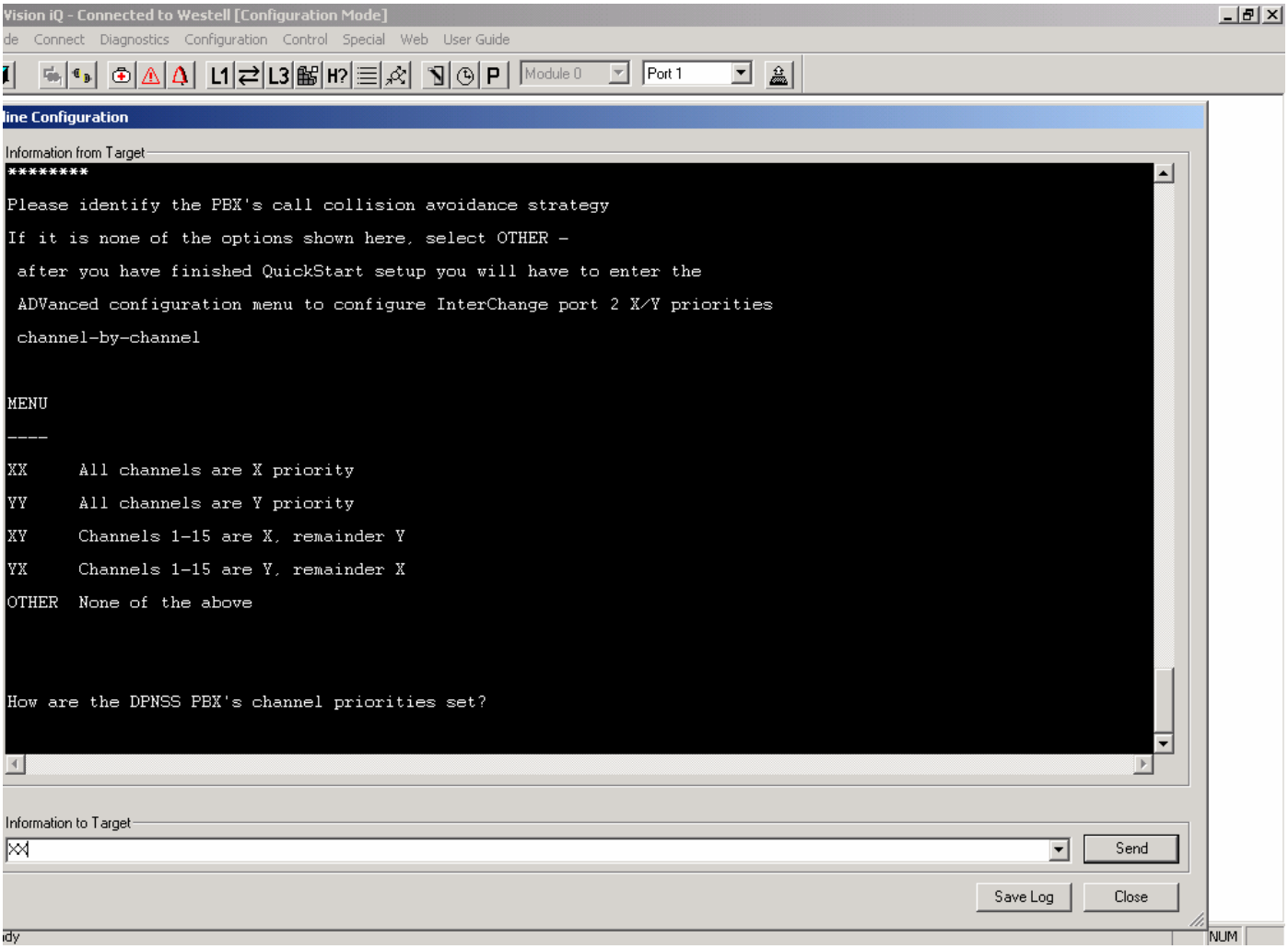


Figure 24. Configuration confirmation (1 of 2)

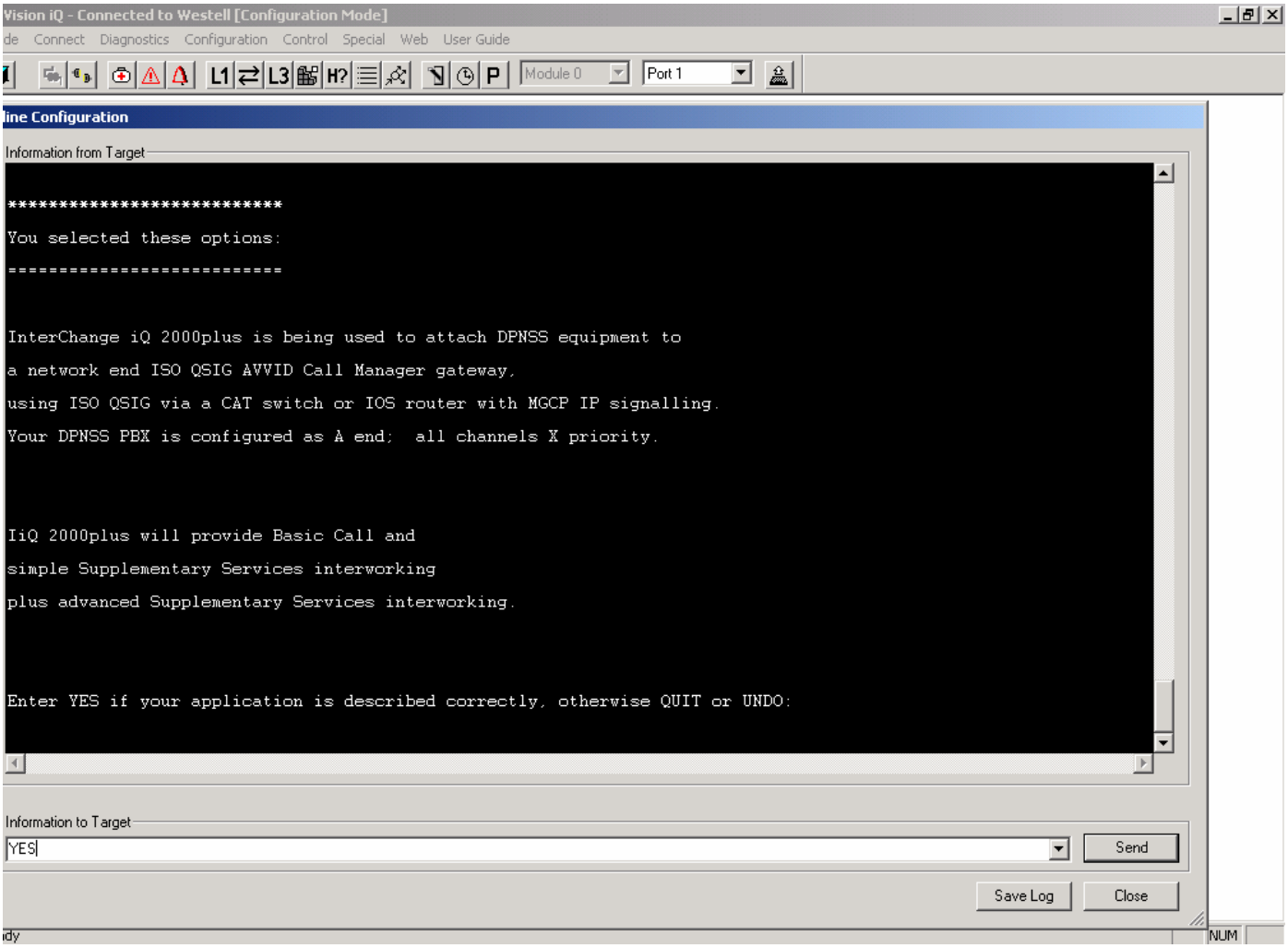


Figure 25. Configuration confirmation (2 of 2)

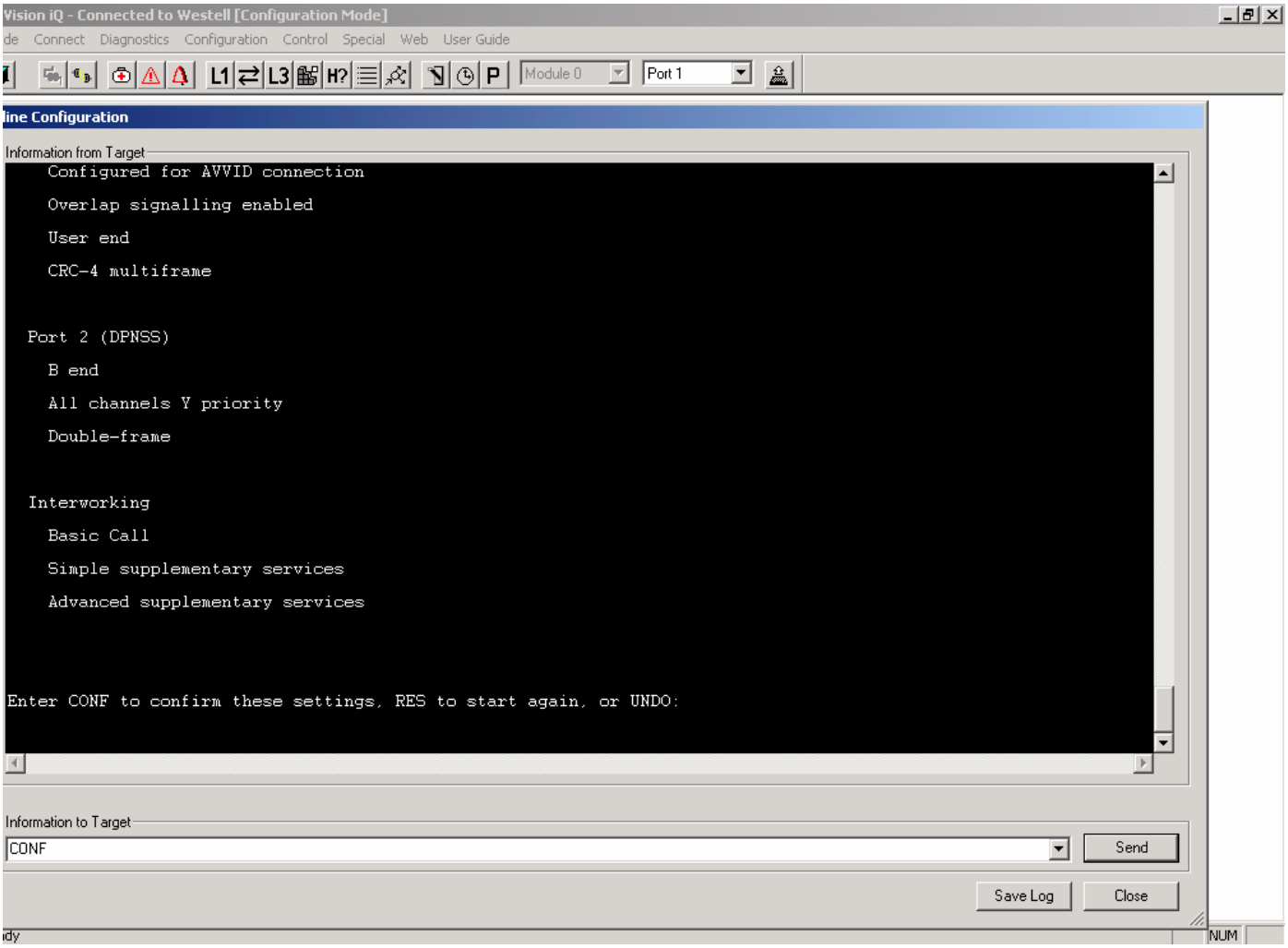


Figure 26. MGCP Gateway Configuration (1 of 9)

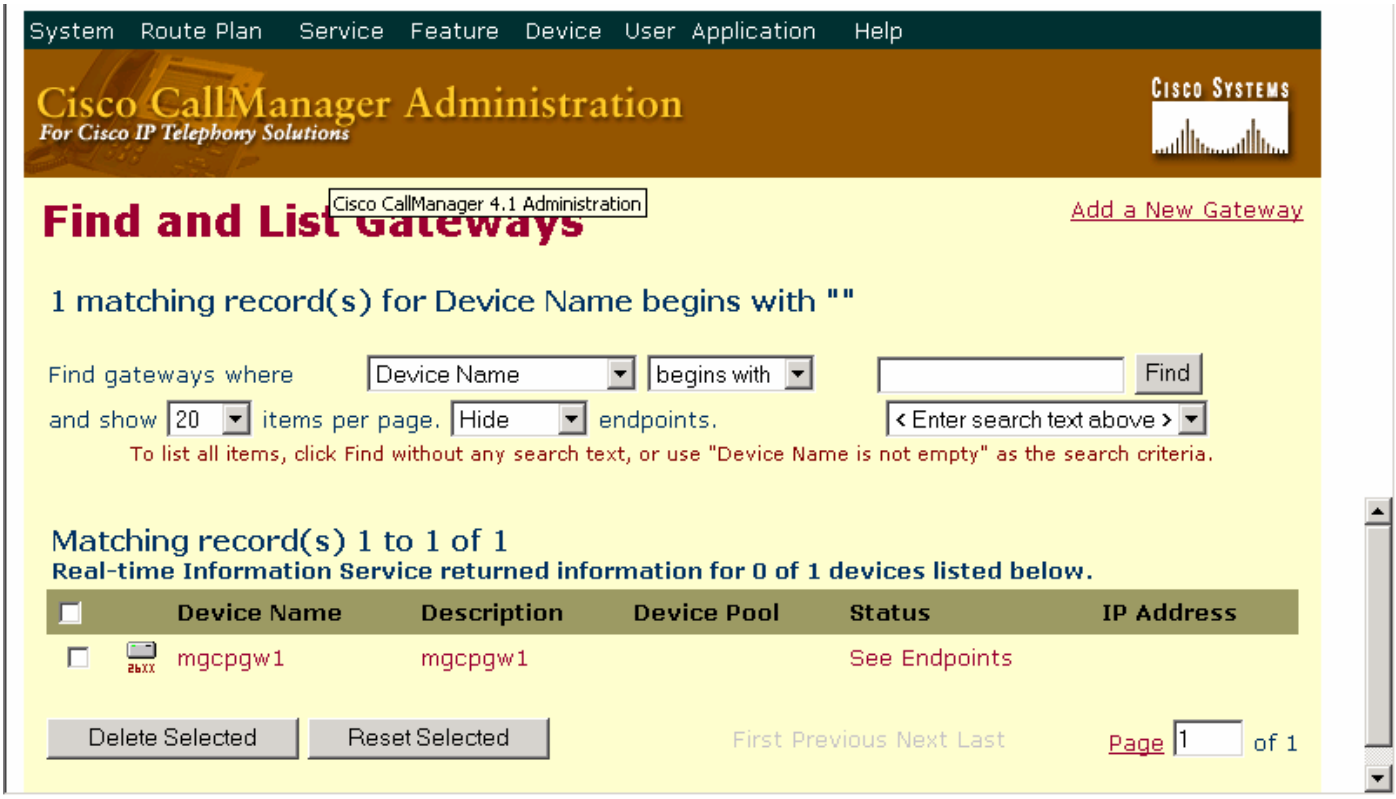


Figure 27. MGCP Gateway Configuration (2 of 9)

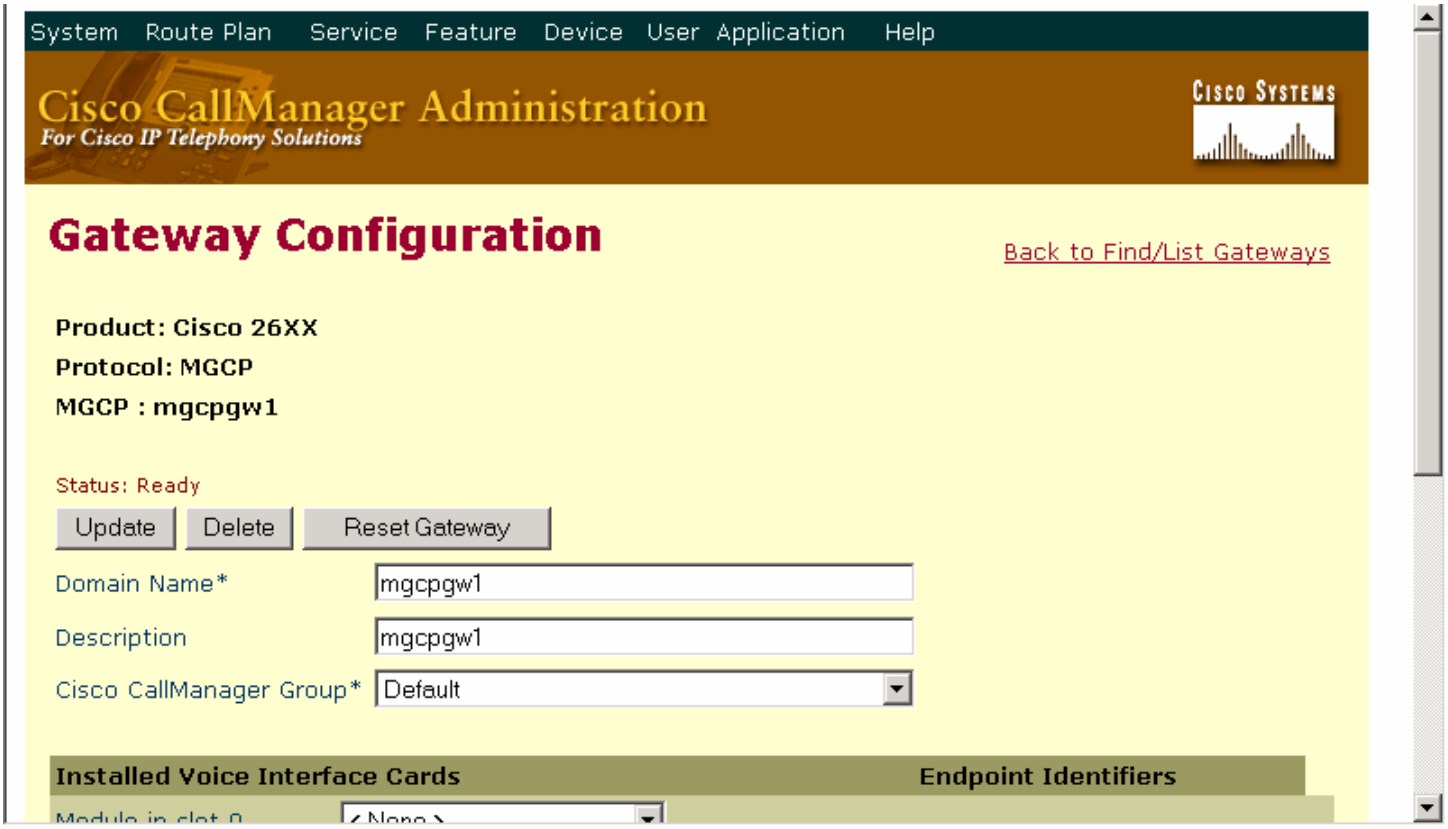


Figure 28. MGCP Gateway Configuration (3 of 9)

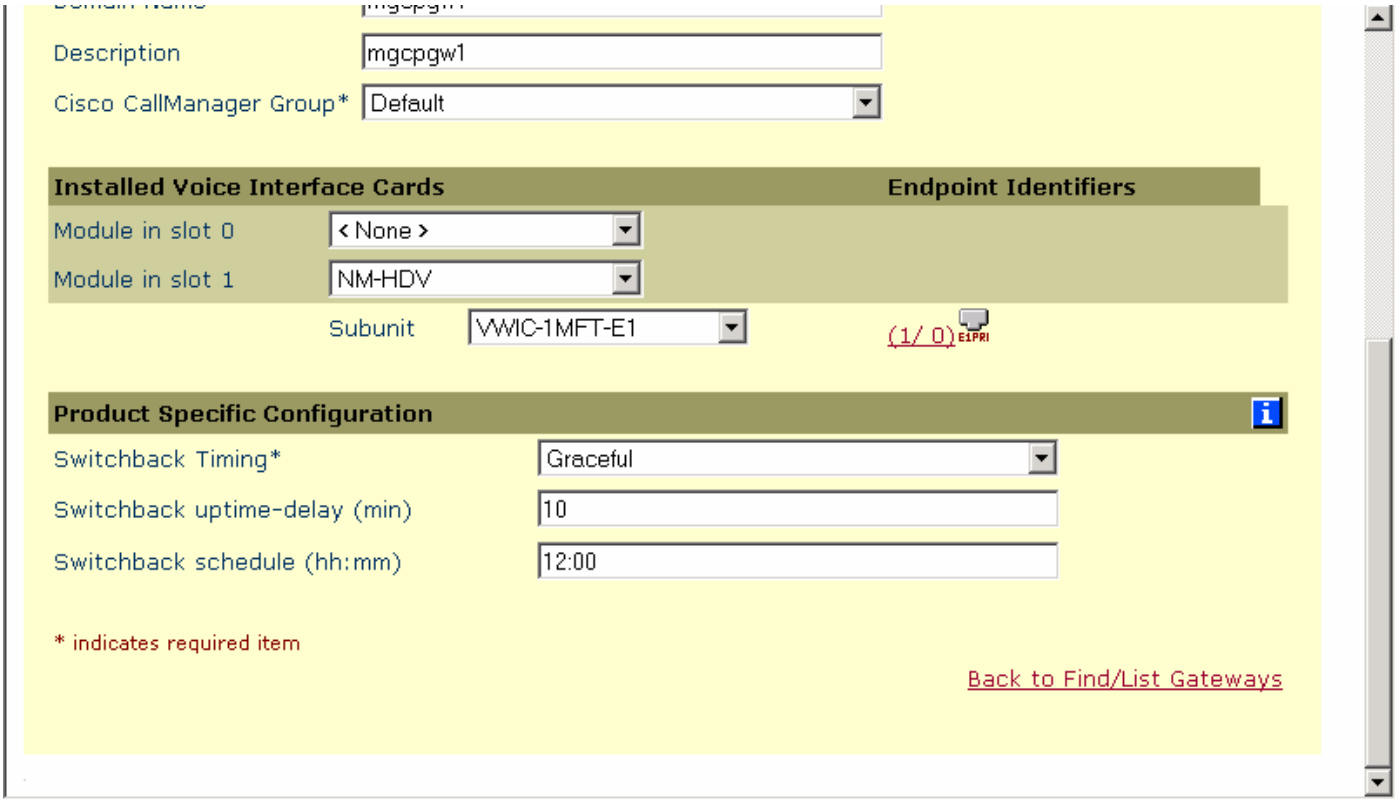


Figure 29. MGCP Gateway Configuration (4 of 9)

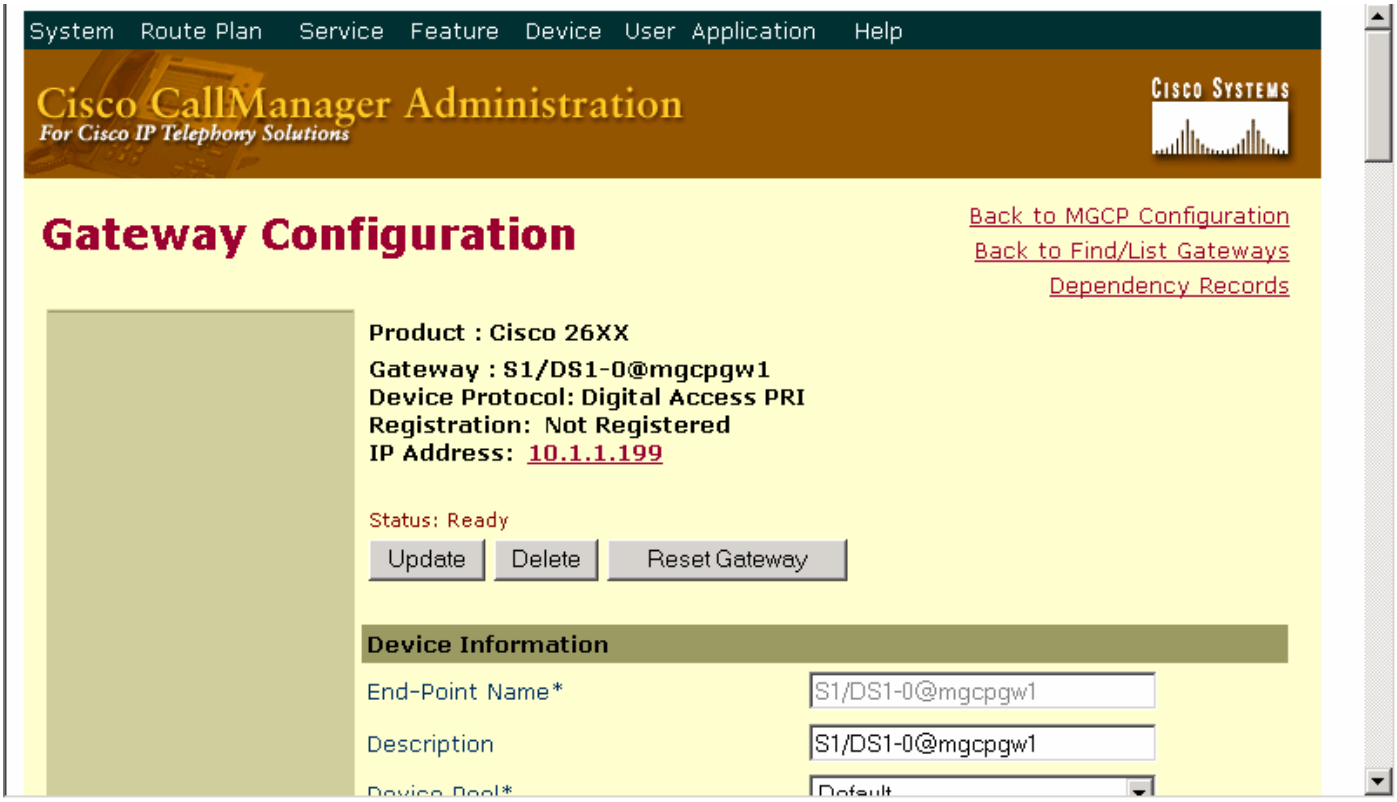


Figure 30. MGCP Gateway Configuration (5 of 9)

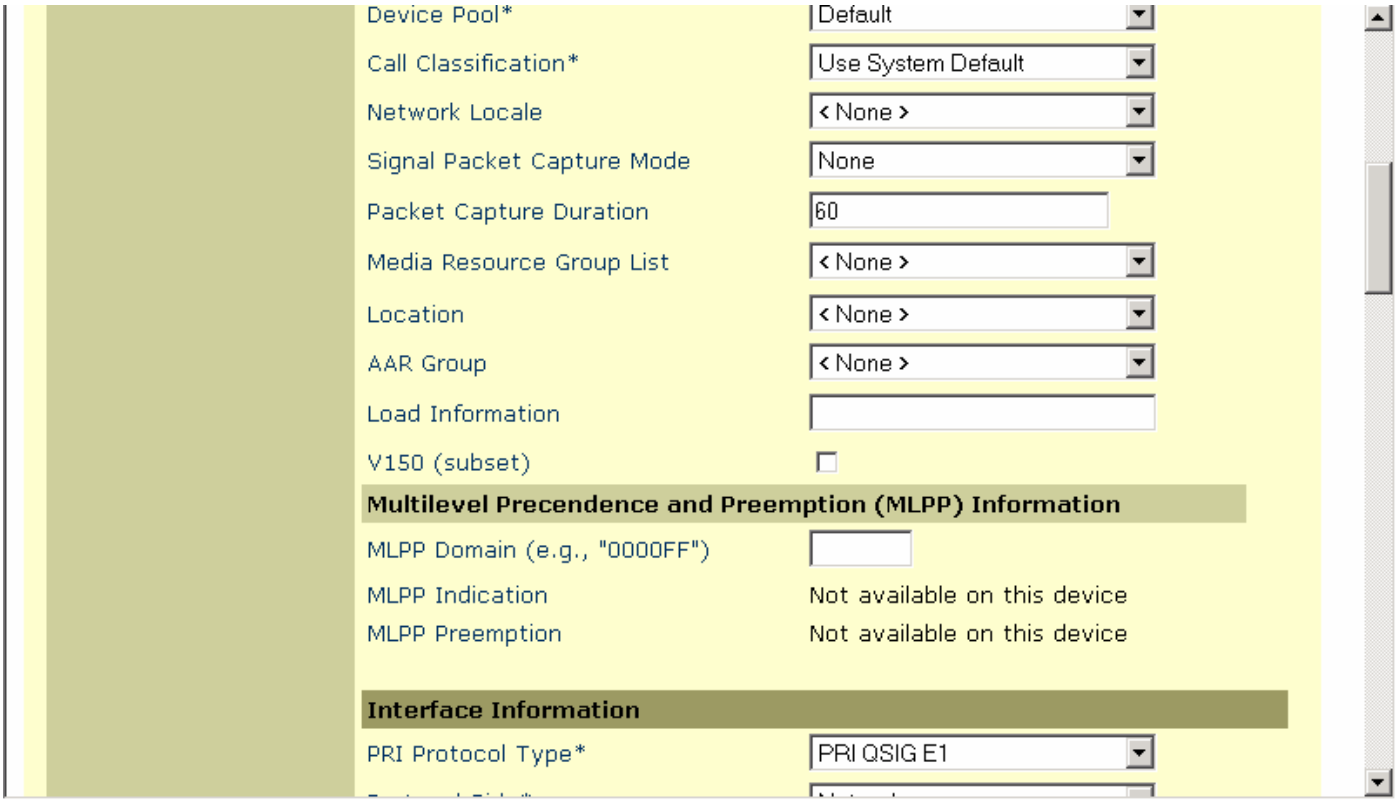


Figure 31. MGCP Gateway Configuration (6 of 9)

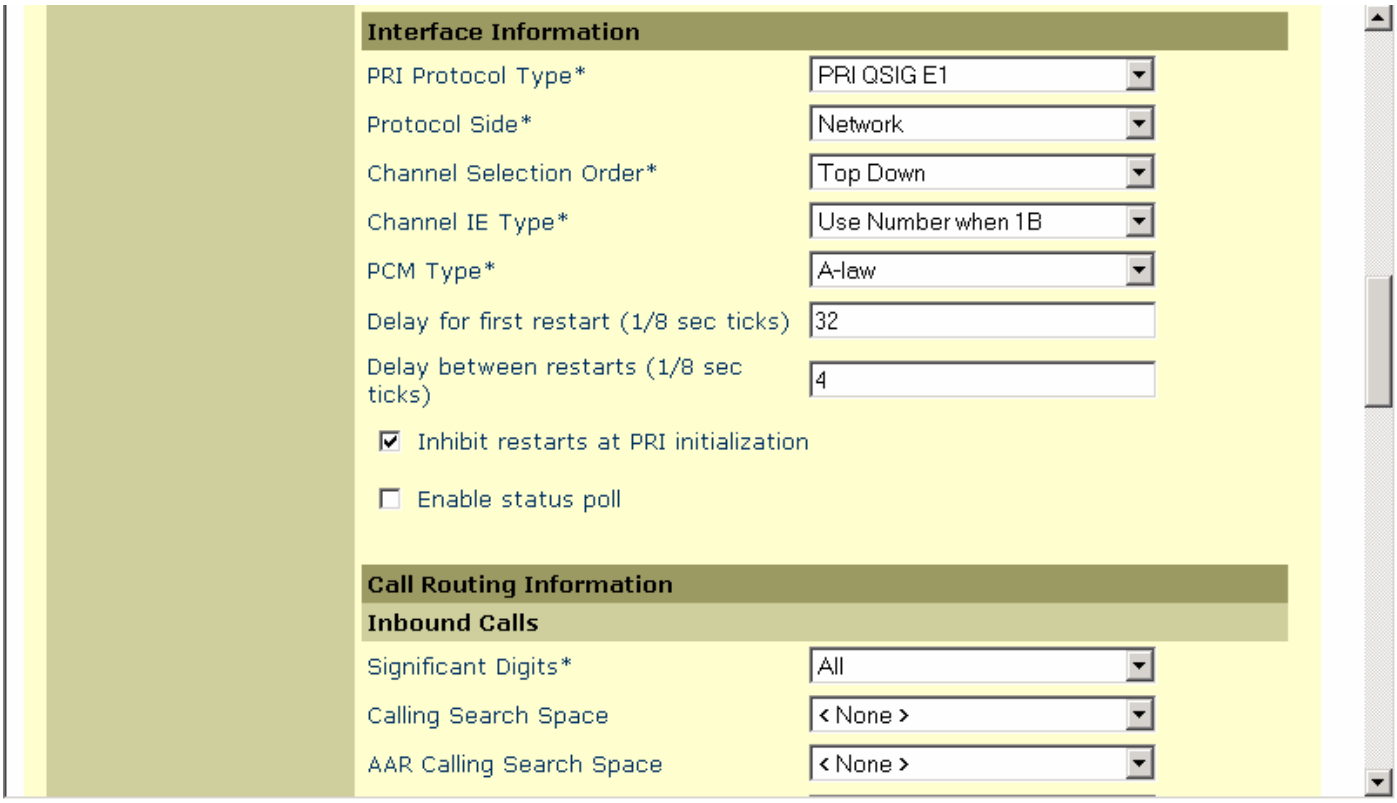


Figure 32. MGCP Gateway Configuration (7 of 9)

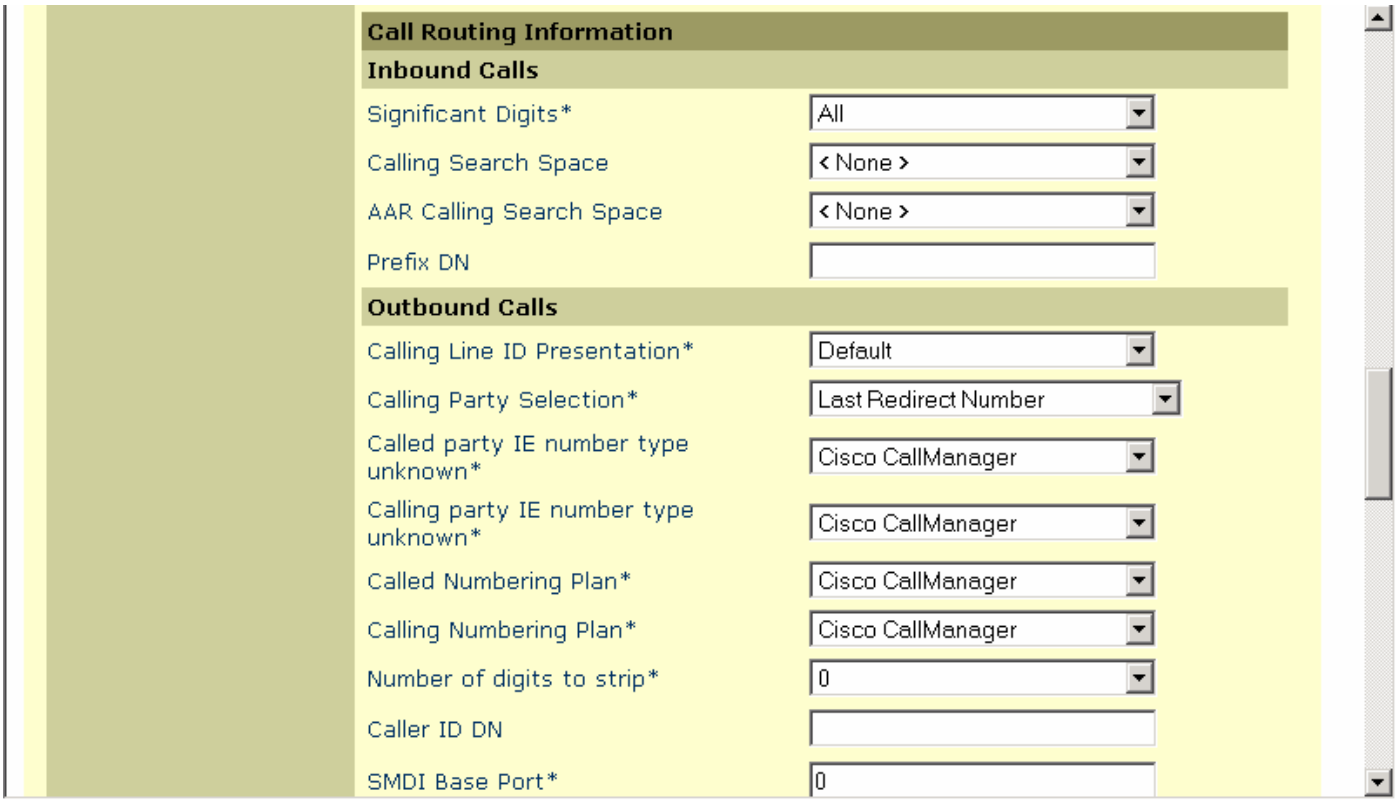


Figure 33. MGCP Gateway Configuration (8 of 9)

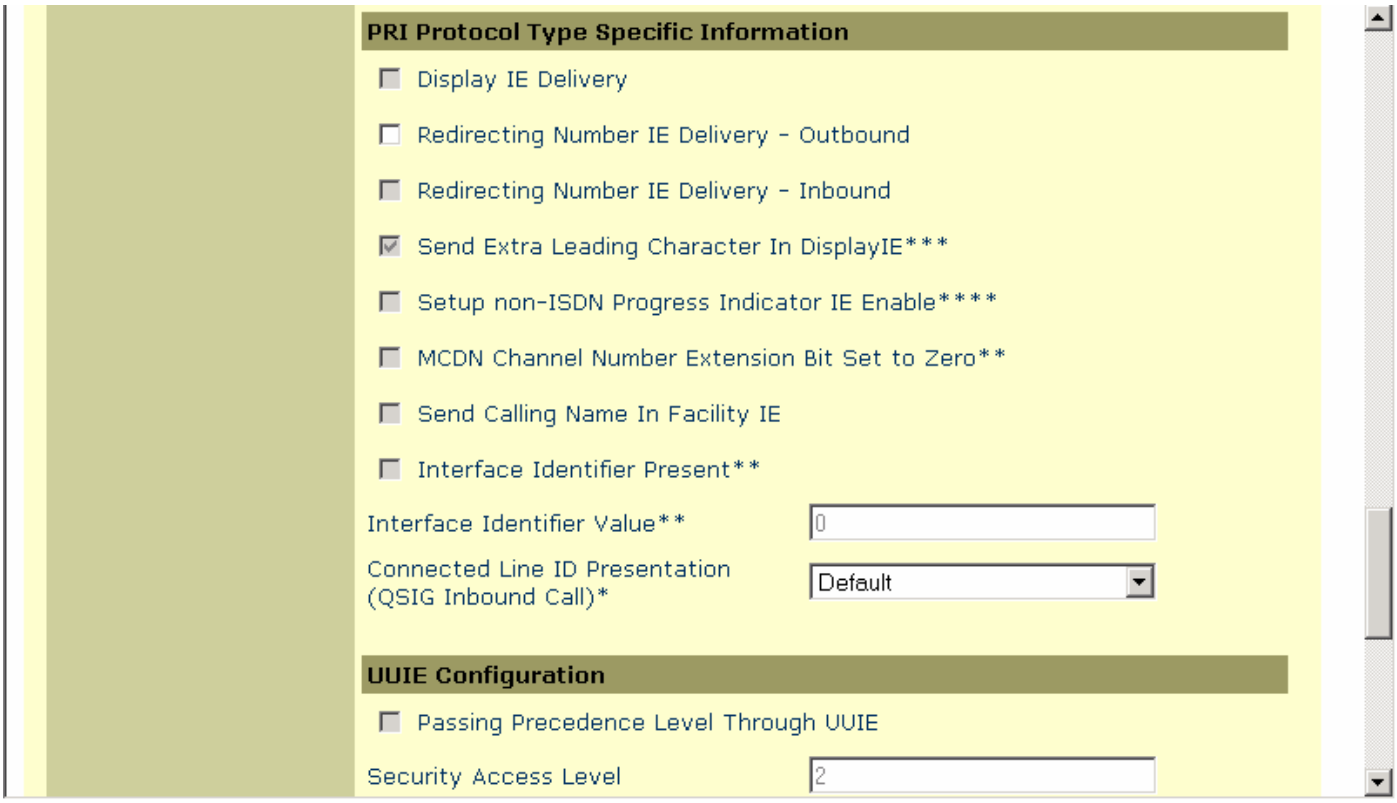


Figure 34. MGCP Gateway Configuration (9 of 9)

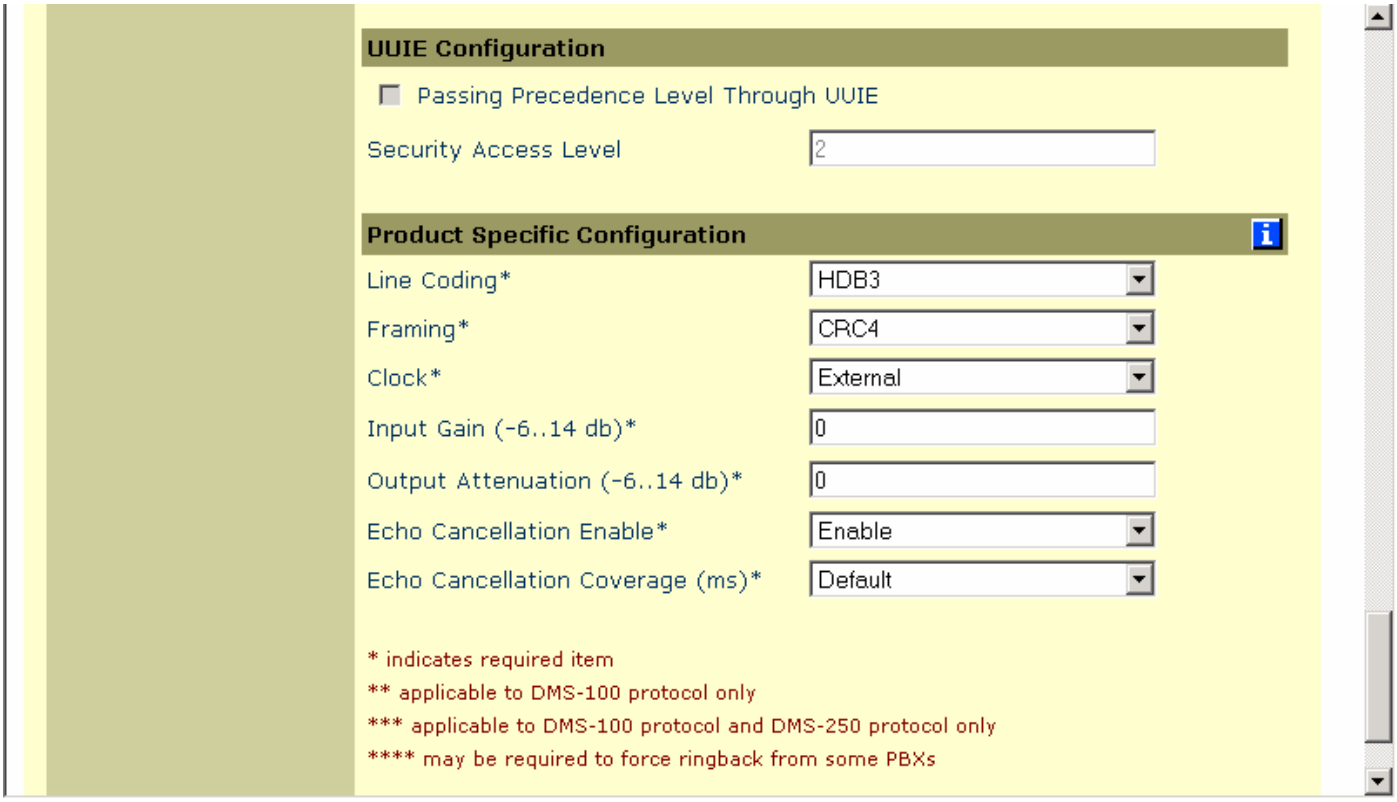


Figure 35. Route Pattern (1 of 4)

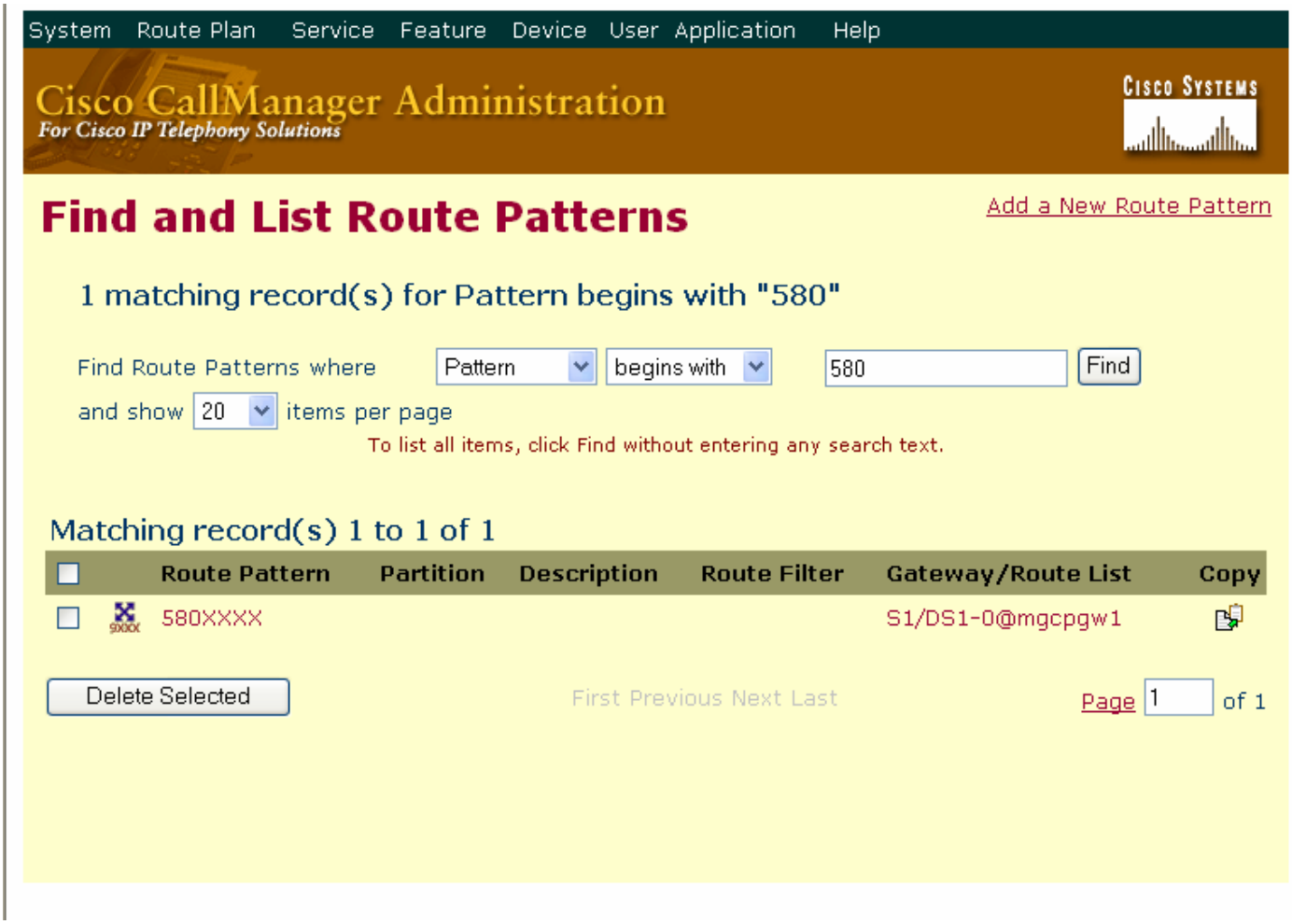


Figure 36. Route Pattern (2 of 4)

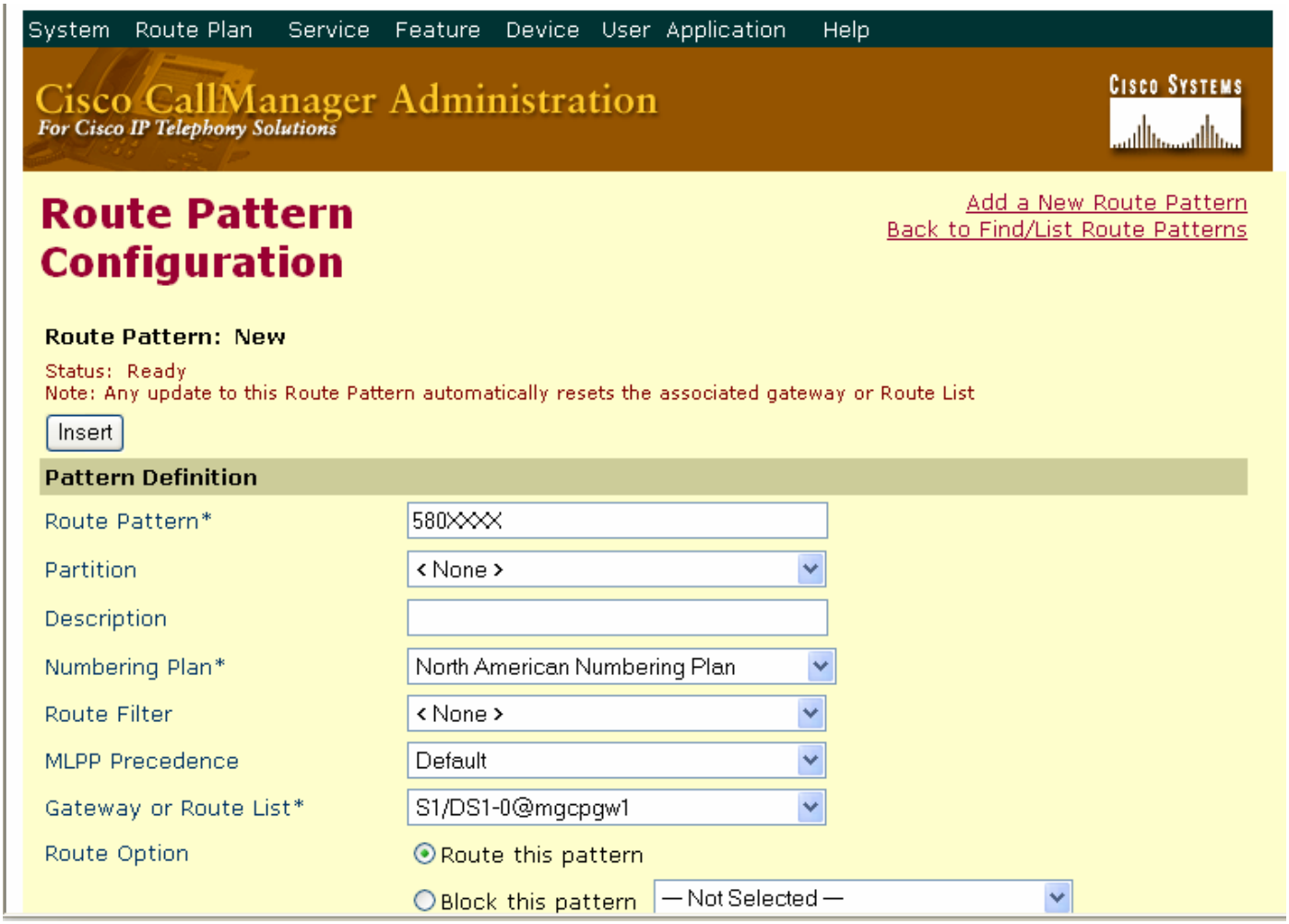


Figure 37. Route Pattern (3 of 4)

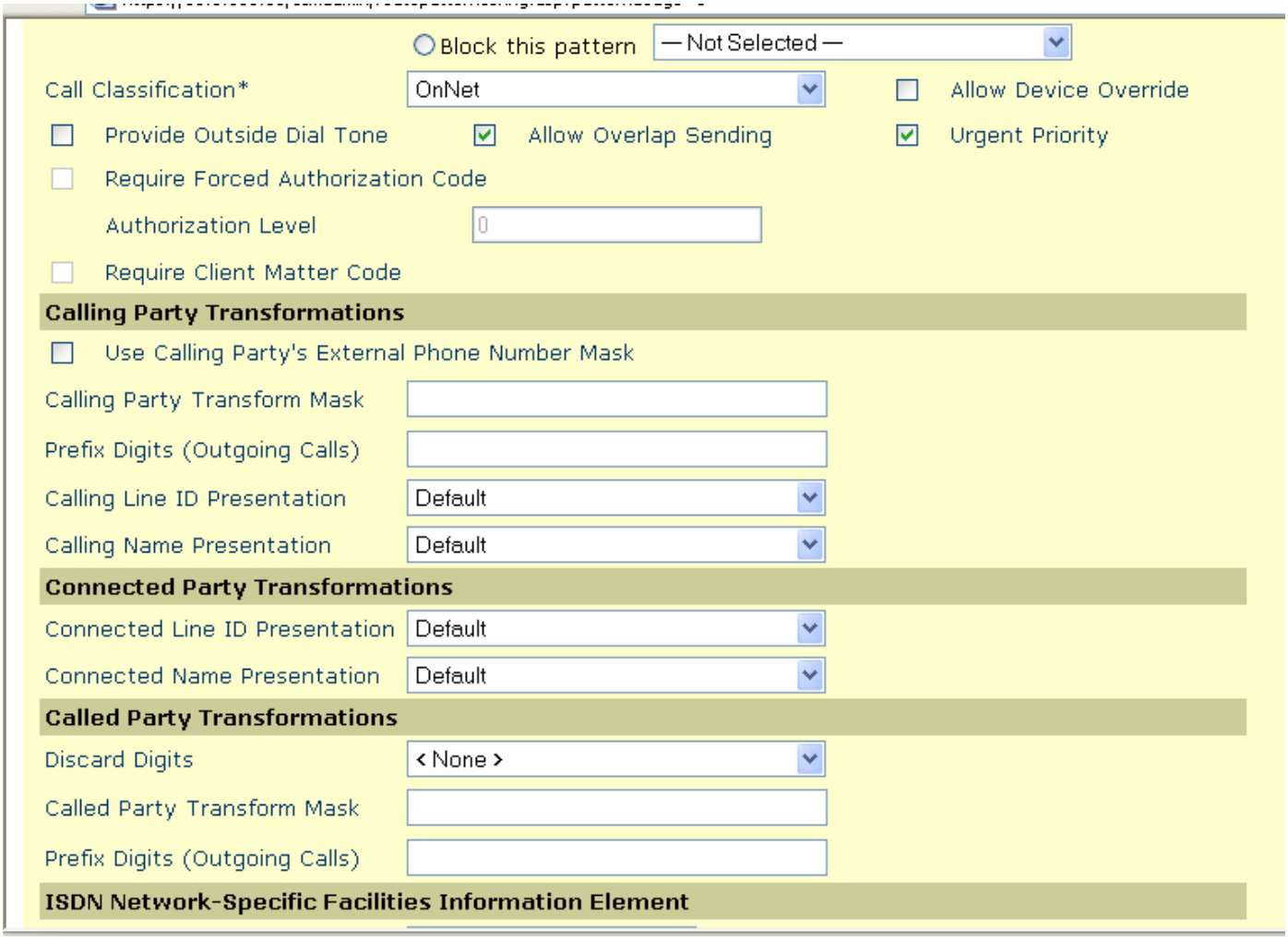


Figure 38. Route Pattern (4 of 4)

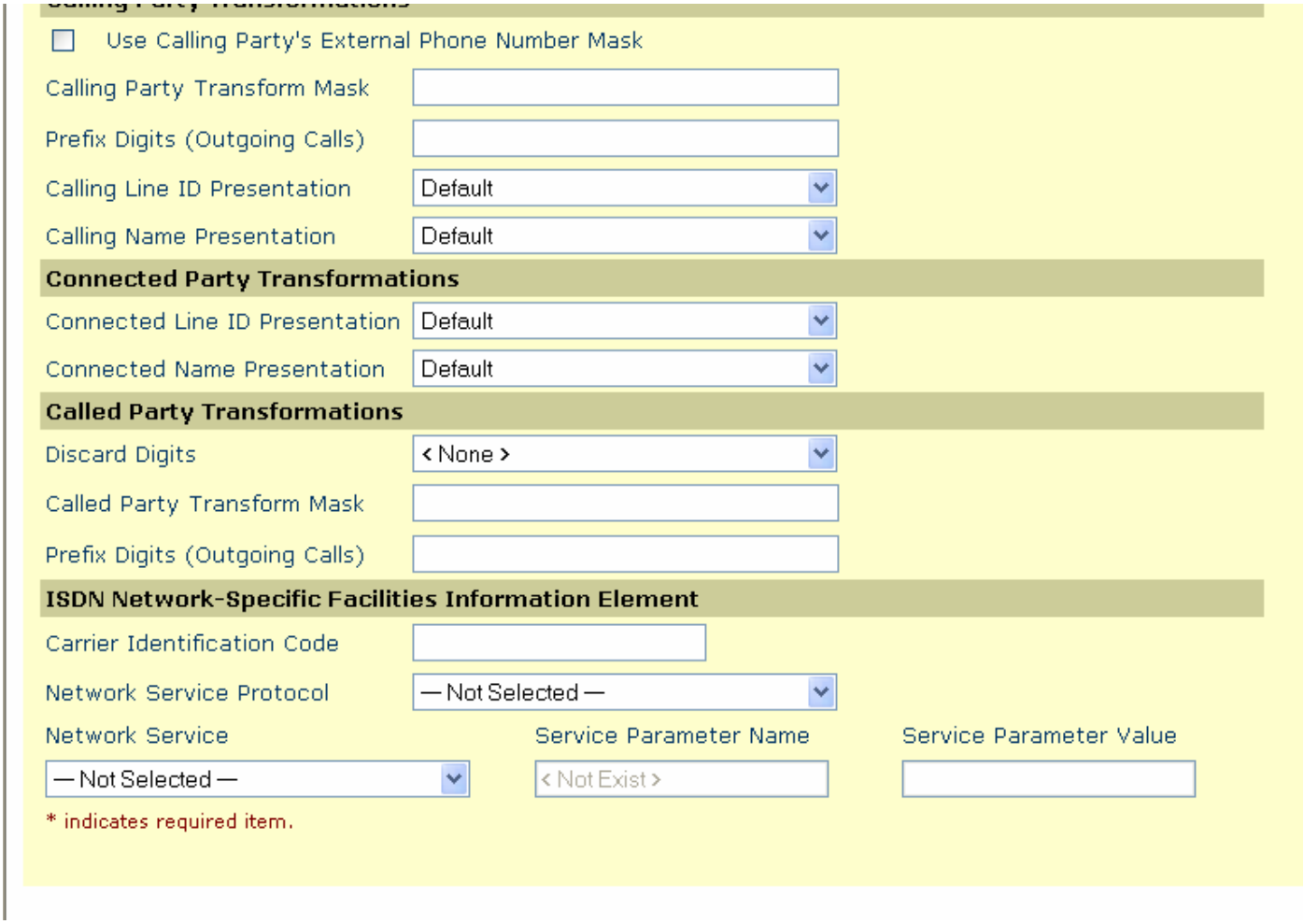


Figure 39. Service Parameters – Call Forwarding

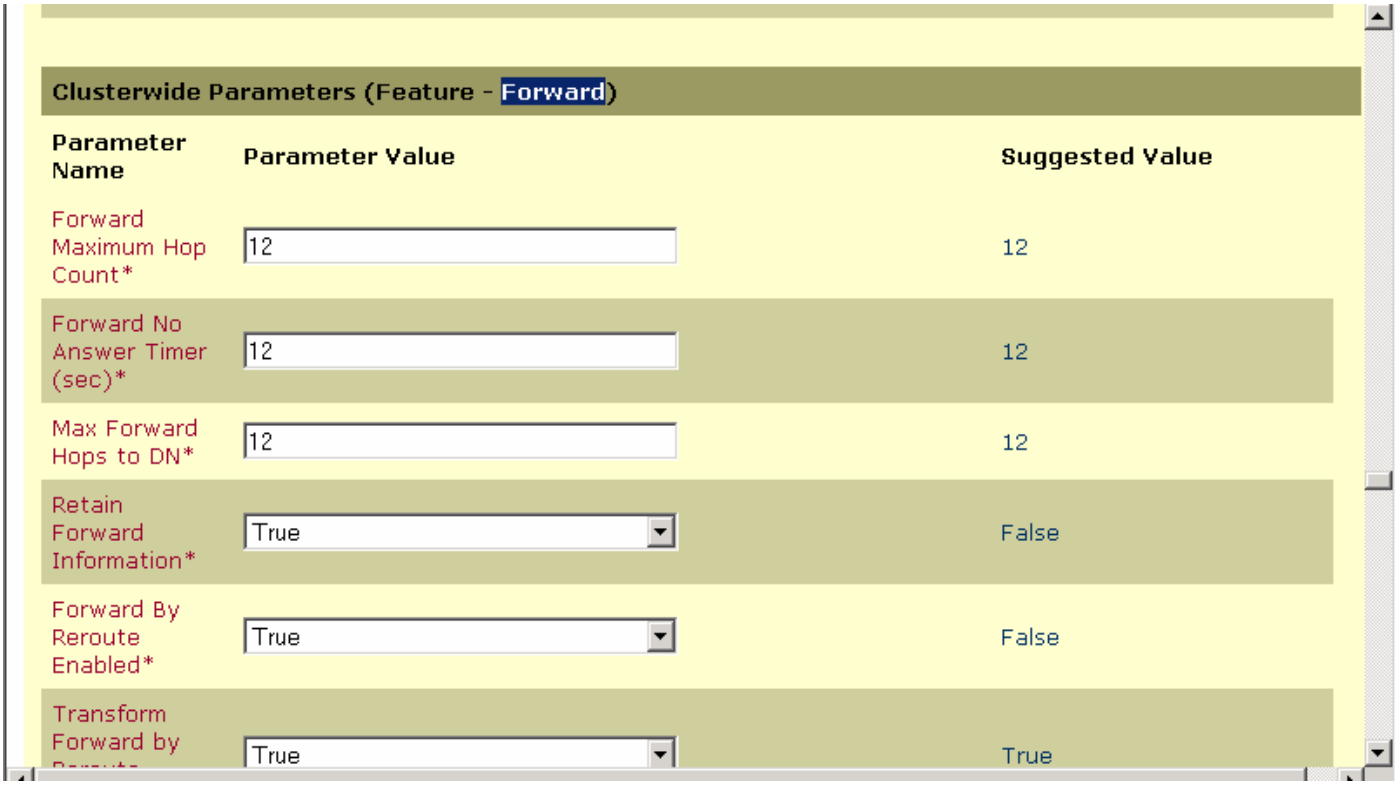


Figure 40. Service Parameters – Path Replacement (1 of 2)

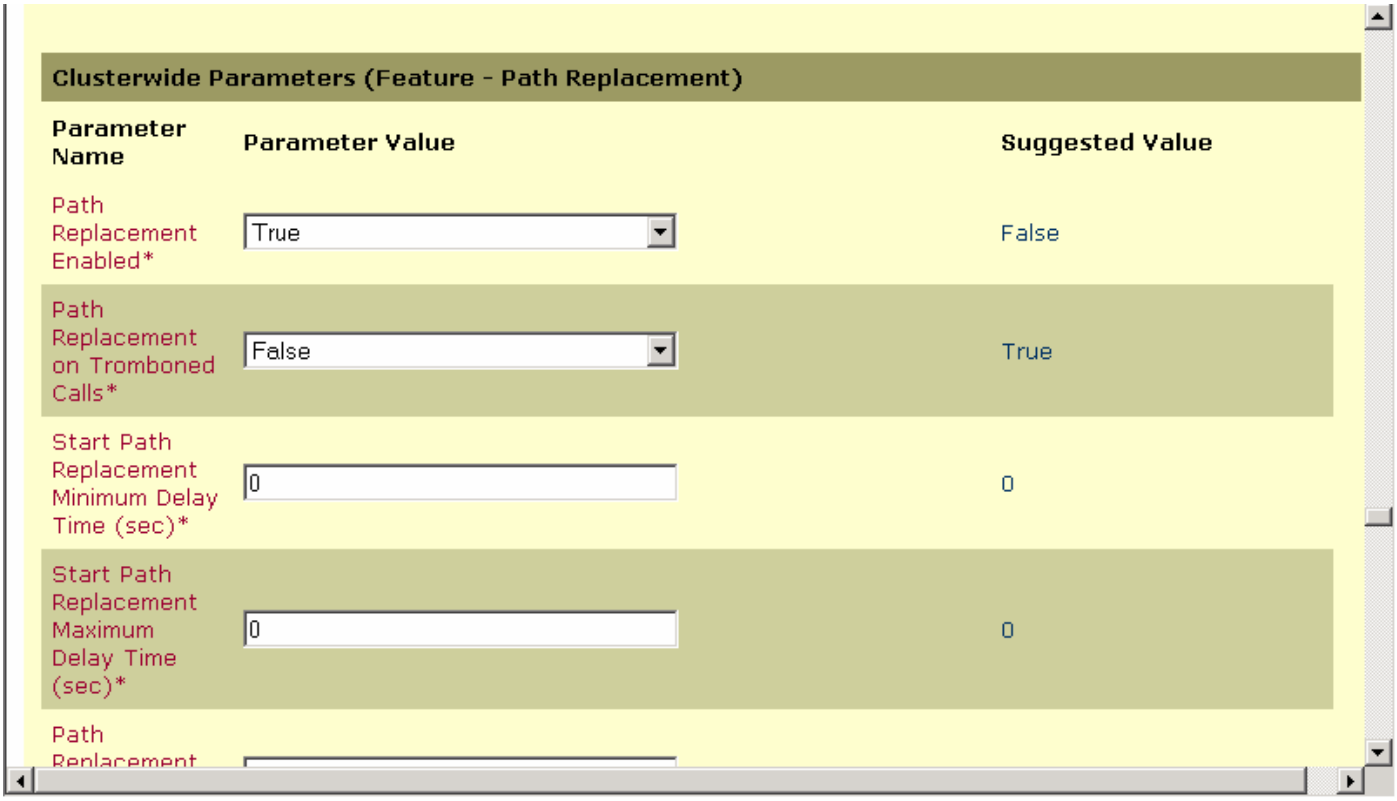


Figure 41. Service Parameters – Path Replacement (2 of 2)

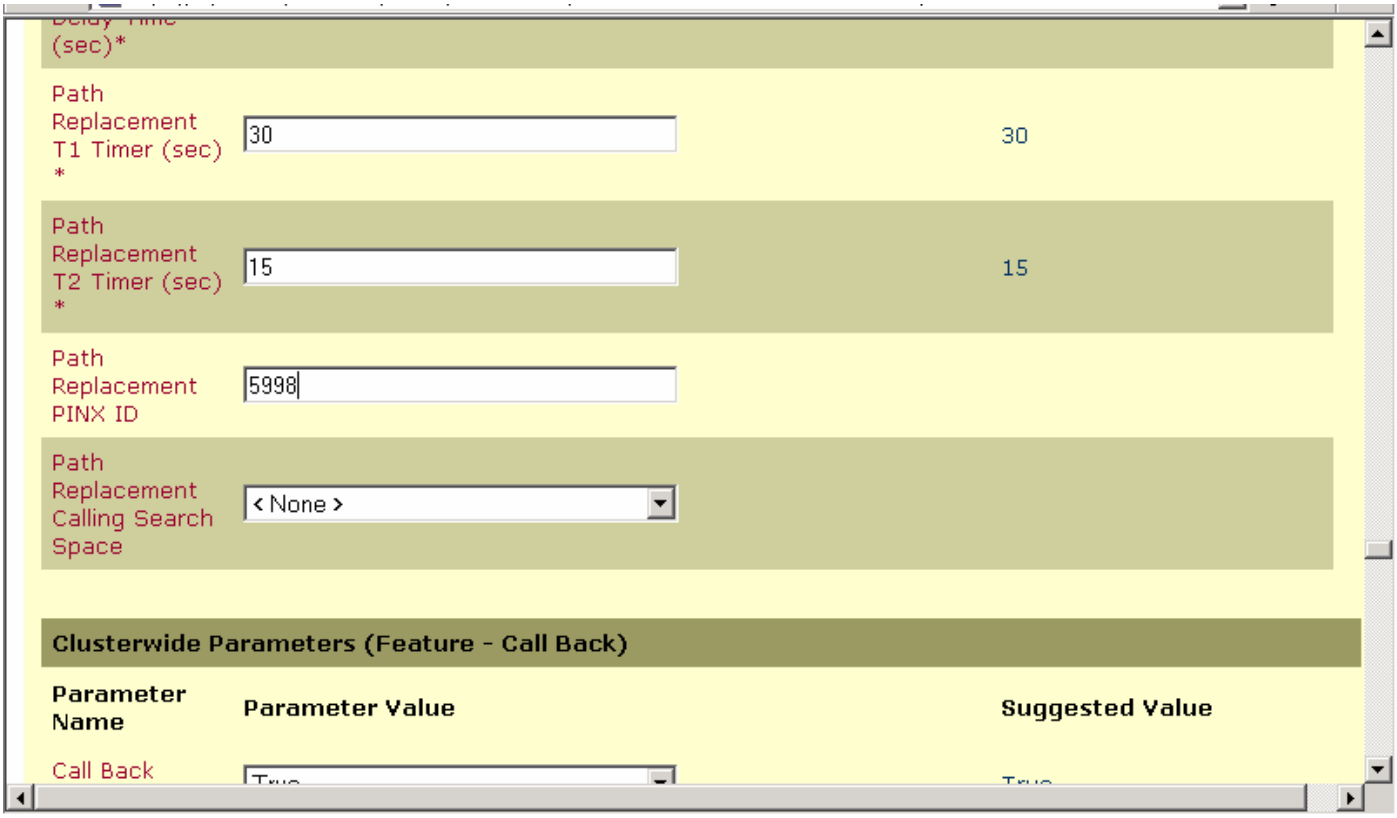
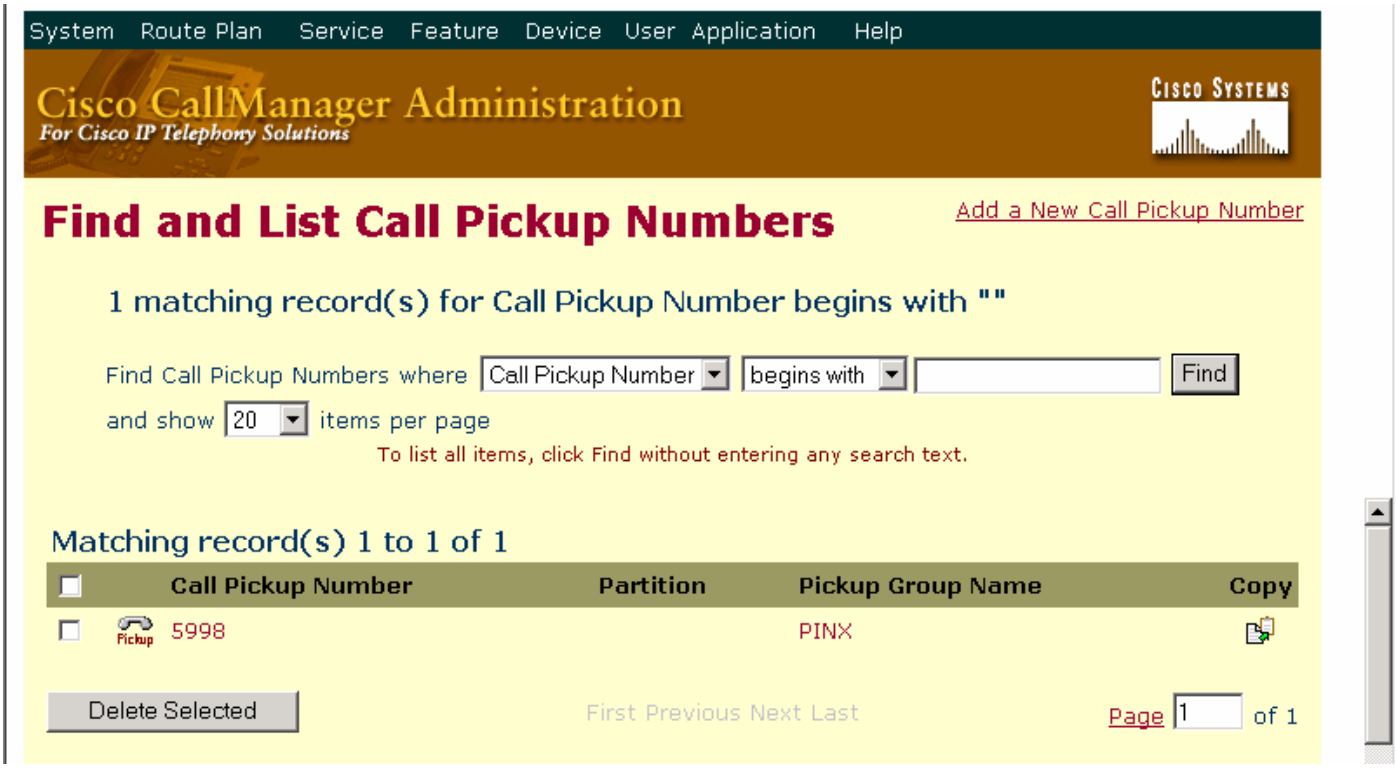


Figure 42. PINX Call Pick-up Group



Configuring the Cisco 2600

```
Current configuration : 1649 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname mgcpgw1
!
boot-start-marker
boot-end-marker
!
enable password cisco
!
memory-size iomem 10
voice-card 1
!
no aaa new-model
ip subnet-zero
ip tcp synwait-time 13
!
!
no ip domain lookup
ip host ukpeccm41 10.1.1.1
ip host mgcpgw1 10.1.1.199
!
ip cef
isdn switch-type primary-qsig
!
!
!
!
!
!
!
!
!
!
!
ccm-manager mgcp
ccm-manager music-on-hold
ccm-manager config server ukpeccm41
ccm-manager config
!
!
controller E1 1/0
 pri-group timeslots 1-31 service mgcp
!
!
!
interface Ethernet0/0
 ip address 10.1.1.199 255.255.255.0
```

```
 half-duplex
!
interface Serial1/0:15
 no ip address
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn protocol-emulate network
 isdn incoming-voice voice
 isdn bind-l3 ccm-manager
 no cdp enable
!
ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.1.1.10
ip route 0.0.0.0 0.0.0.0 10.1.1.100
!
!
!
!
!
voice-port 1/0:15
!
mgcp
mgcp call-agent ukpeccm41 service-type mgcp version 0.1
mgcp dtmf-relay voip codec all mode out-of-band
mgcp rtp unreachable timeout 1000 action notify
mgcp package-capability rtp-package
no mgcp package-capability res-package
mgcp package-capability sst-package
no mgcp package-capability fxr-package
no mgcp timer receive-rtcp
mgcp sdp simple
mgcp fax t38 inhibit
mgcp rtp payload-type g726r16 static
!
mgcp profile default
!
!
dial-peer voice 1 pots
 application mgcpapp
!
!
line con 0
line aux 0
line vty 0 4
 password cisco
 login
 length 0
!
!
end
```

Message Waiting Indication

Within DPNSS, two systems exist for notifying Message Waiting Indication; Call Back Message Waiting (171B and 172B messages) and NSI encoded Message Waiting.

Callback message waiting follows the same standard for all types of PBX/Voicemail combinations; however, it is only supported on a small subset of PBXes.

NSI indication consists of PBX specific combinations of encoded information to indicate MWI on/off states – not only do the exact NSI strings vary from PBX to PBX, they vary according to the combination of voicemail platform and PBX.

By default, the Westell IiQ2000plus sends a combination of NSI and Callback message waiting signals encoded for the GPT iSDX. This will not work with the INDeX and changes to the NSI strings must be made.

The INDeX uses standard CallBack MWI (*171B/*172B) but requires a calling line number – in this case 5977700 for the Unity system on CCM, or *50*5977700#). This information is not passed by Cisco Unified CallManager, and consequently the pilot number for Unity needs to be statically configured. This is only required where the voicemail platform is on Cisco Unified CallManager – where the voicemail platform is on the INDeX, no changes are required.

Figure 43. Advanced Options

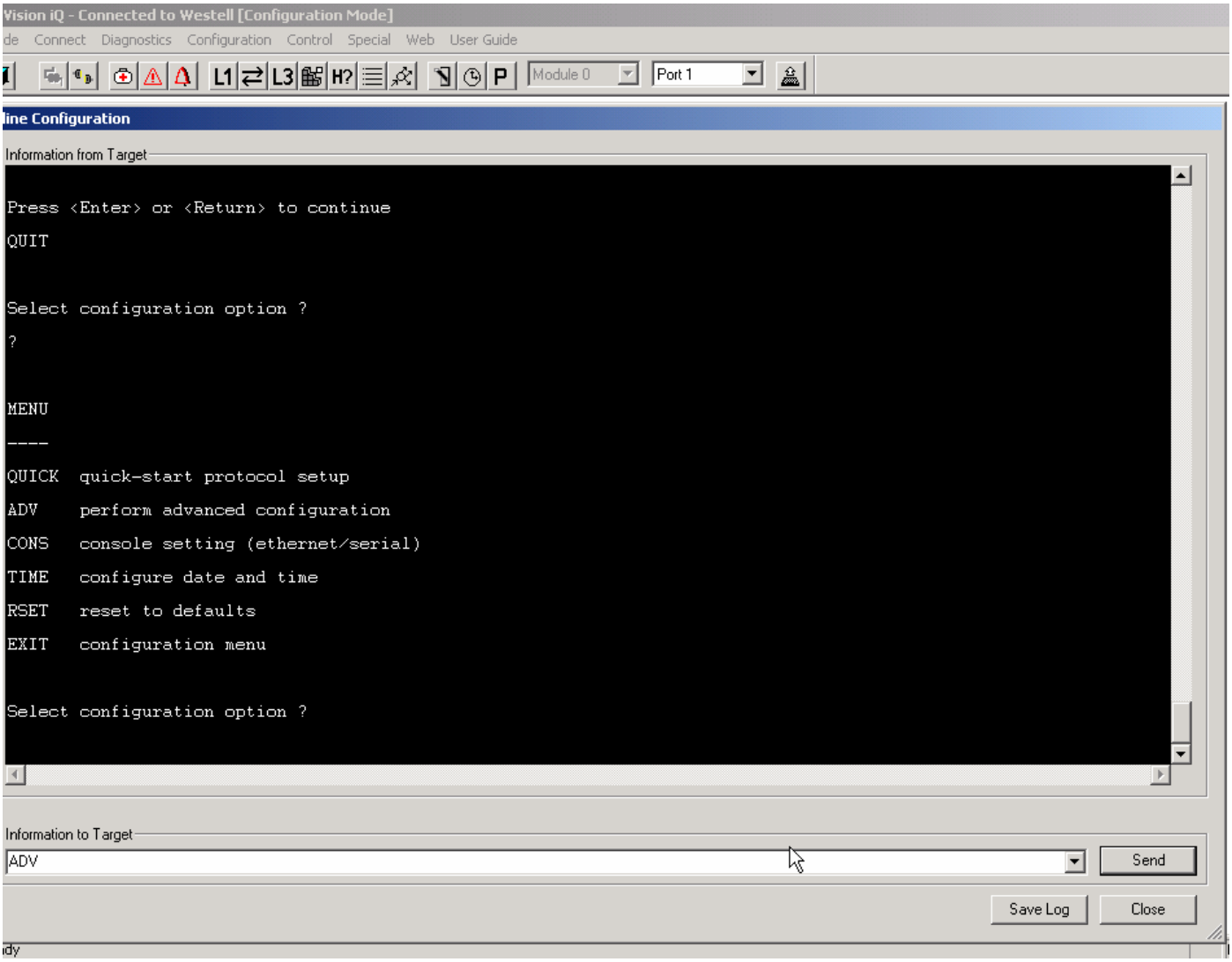


Figure 44. Interworking

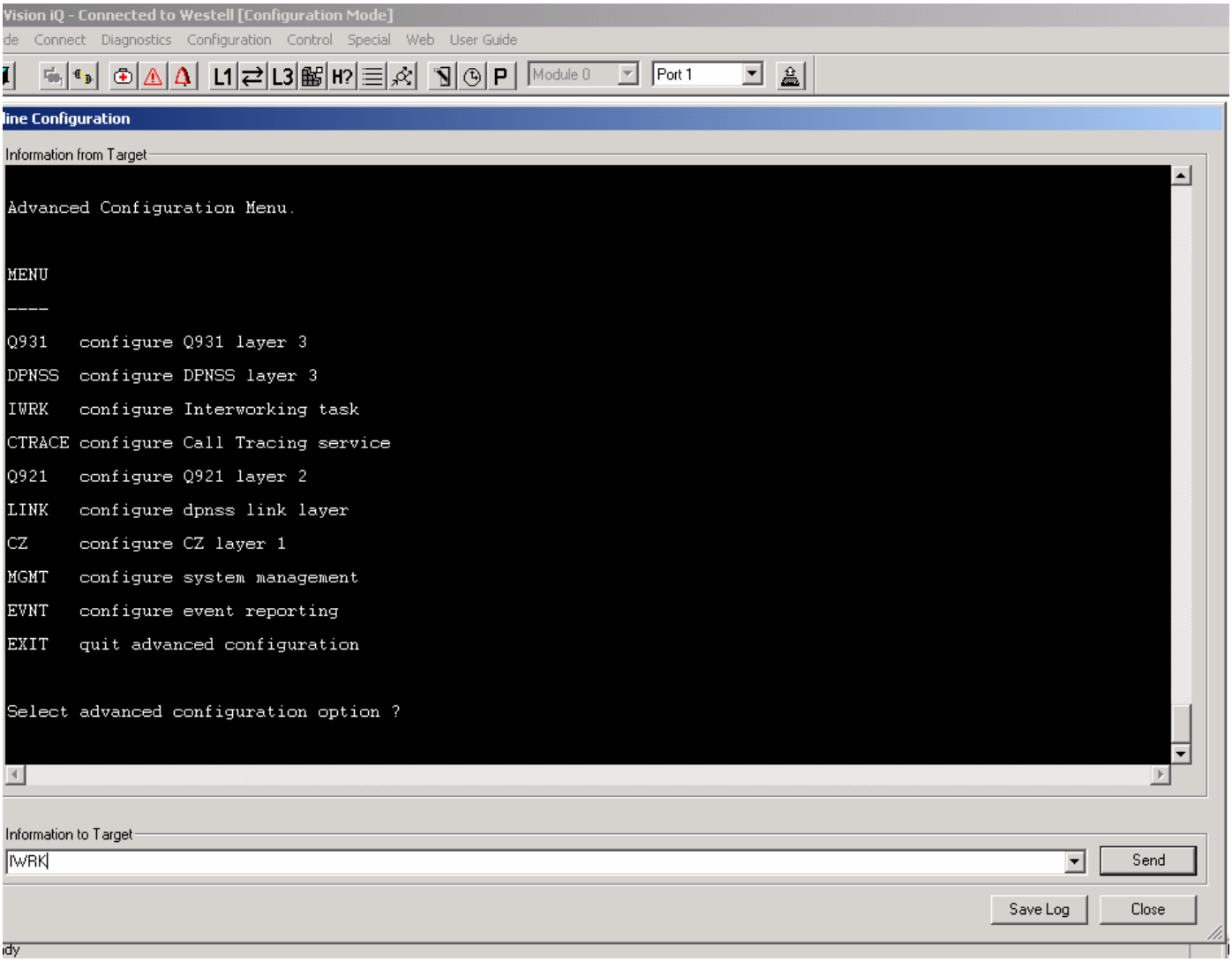


Figure 45. NSI Selection

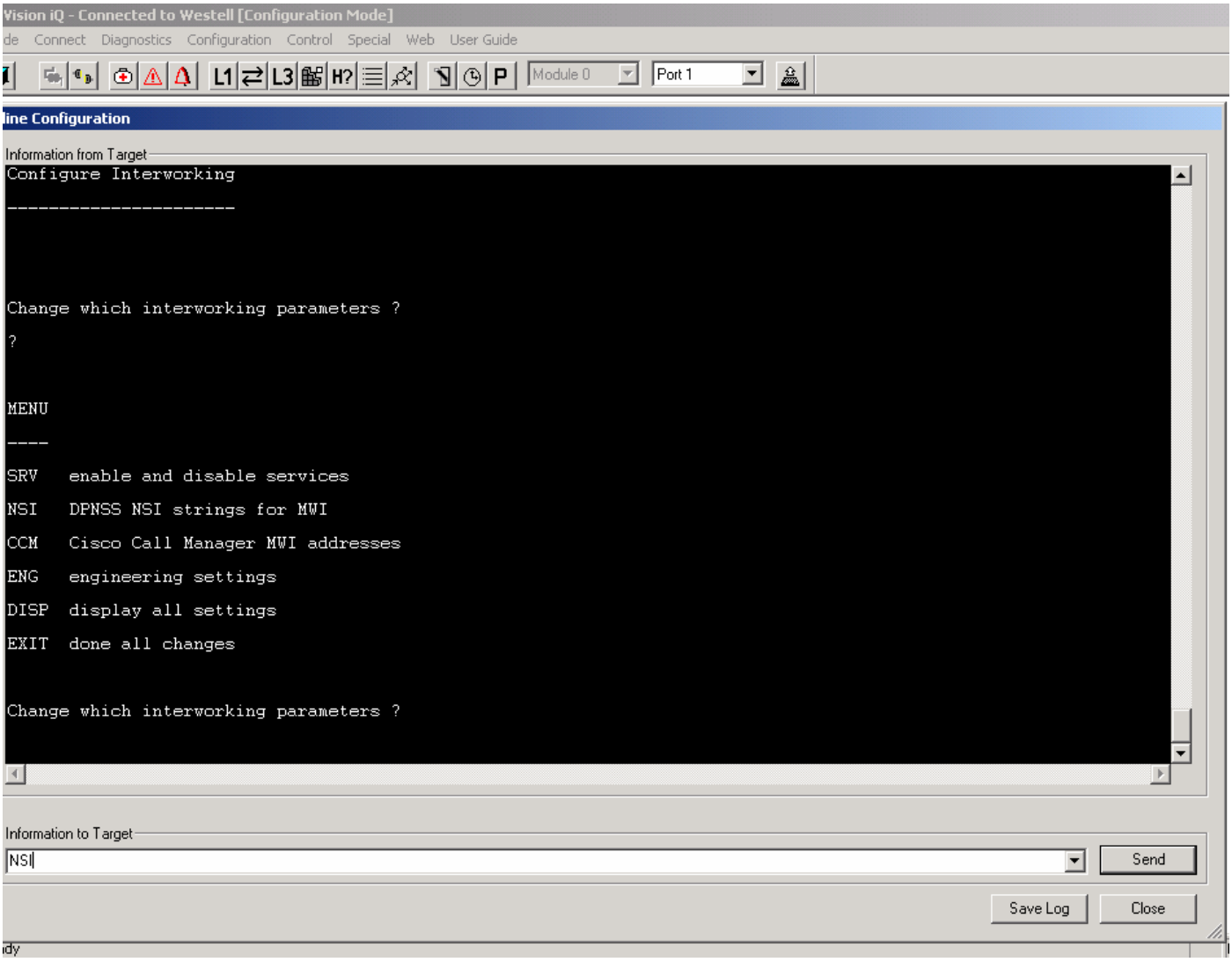


Figure 46. MWI Settings

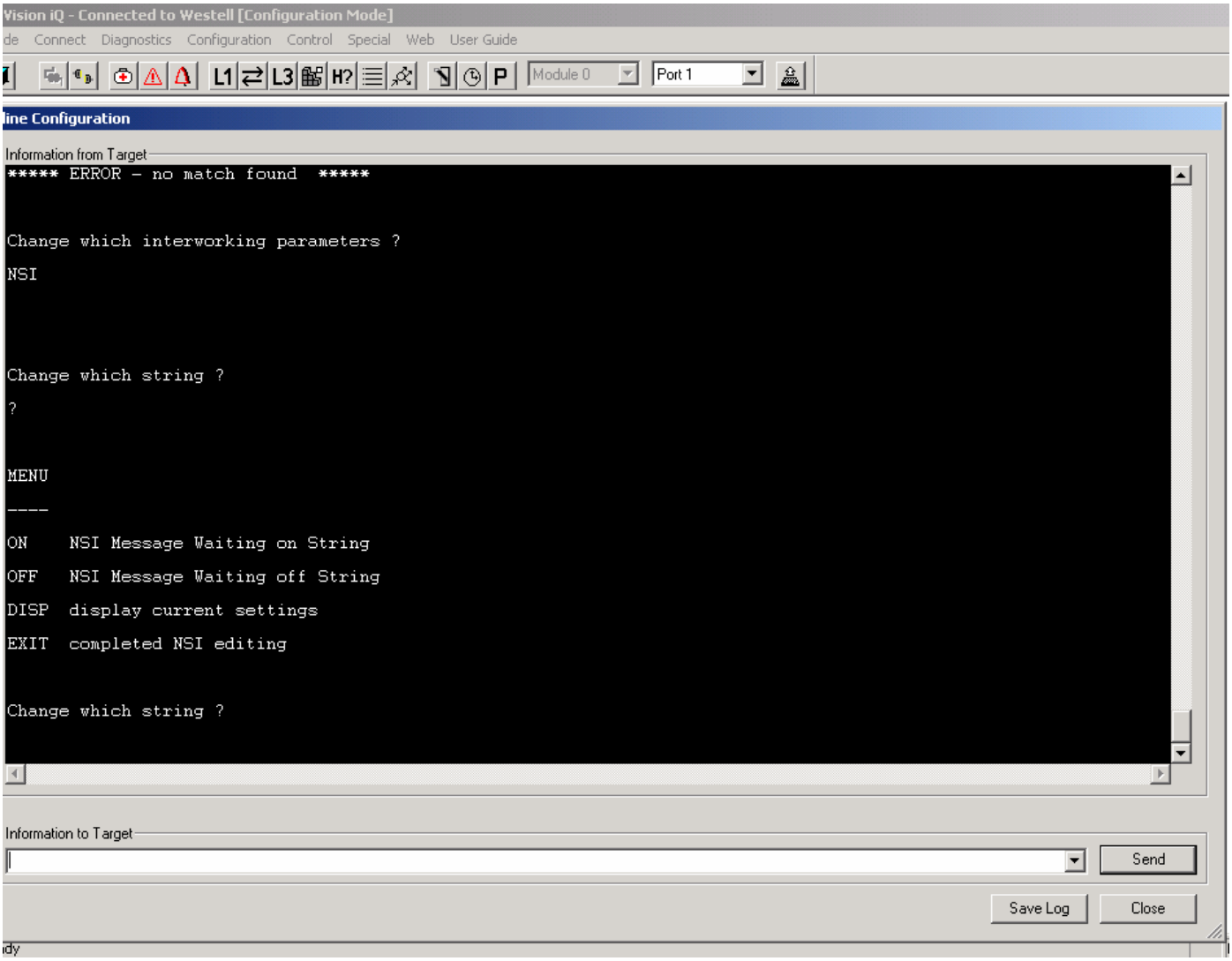
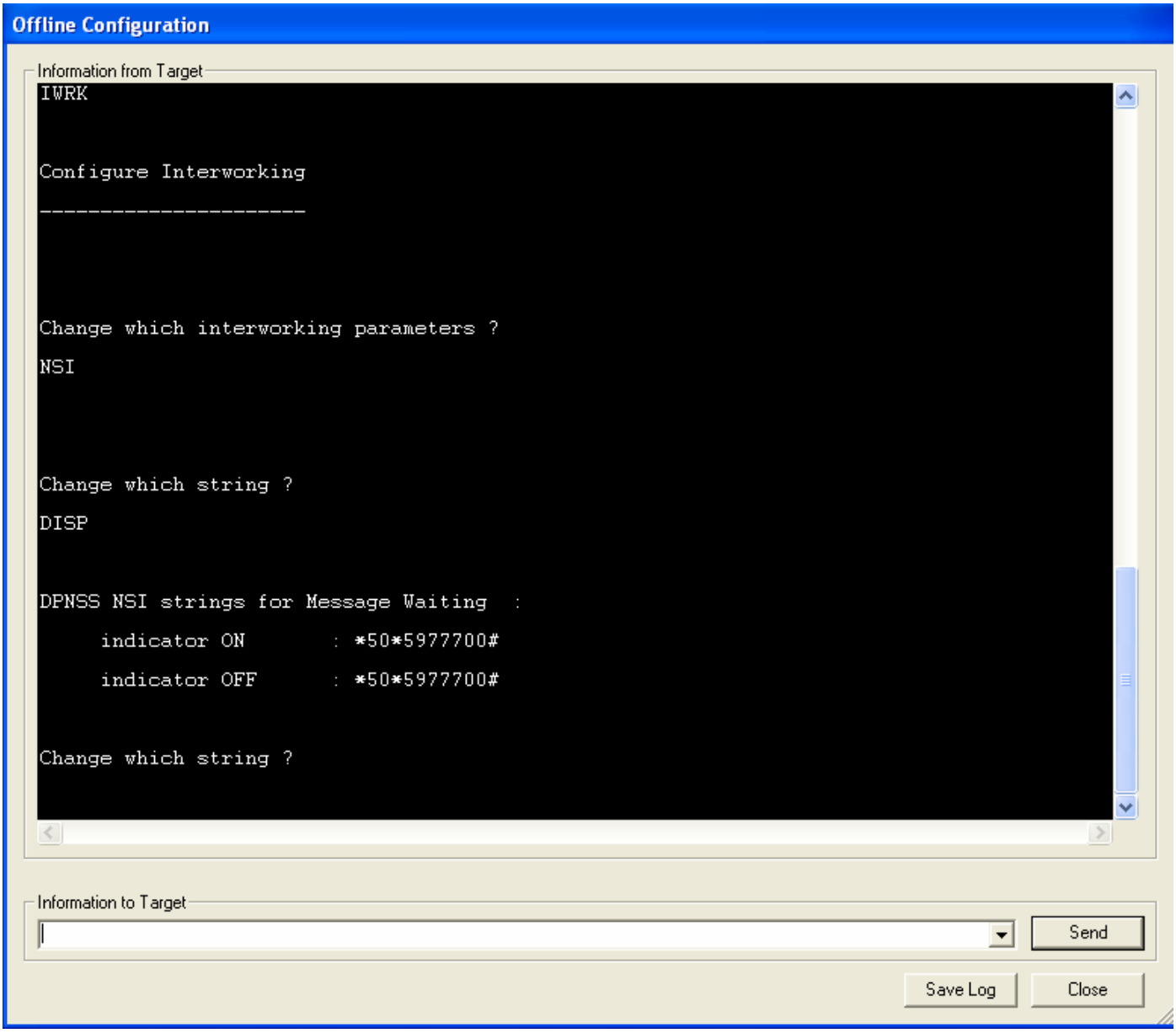


Figure 47. Display of Raw NSI settings for INDeX



Acronyms

Acronym	Definitions
DPNSS	Digital Private Network Signaling System as detailed in BTNR 188 and 189
NSI	Non-Specified Information – vendor specific free-form PBX-to-PBX messaging
IPT	IP Telephony
CCM	Cisco Cisco Unified CallManager
Q.931	ITU ISDN protocol at level 3
Q.Sig	ITU ISDN protocol enhancement to q.931 carrying additional features
MGCP	Media Gateway Control Protocol
PBX	Private Branch Exchange
MMI	Man Machine Interface – specifically on INDeX, a VT100 style console

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