Application Note

Siemens Realitis / GPT iSDX using DPNSS to Westell IiQ2000plus using QSIG to Cisco Unified CallManager 4.1

October 26, 2007 Revision 4

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Introduction

Although specific gateway router models were used to validate its content, this application note also applies to all Cisco 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).

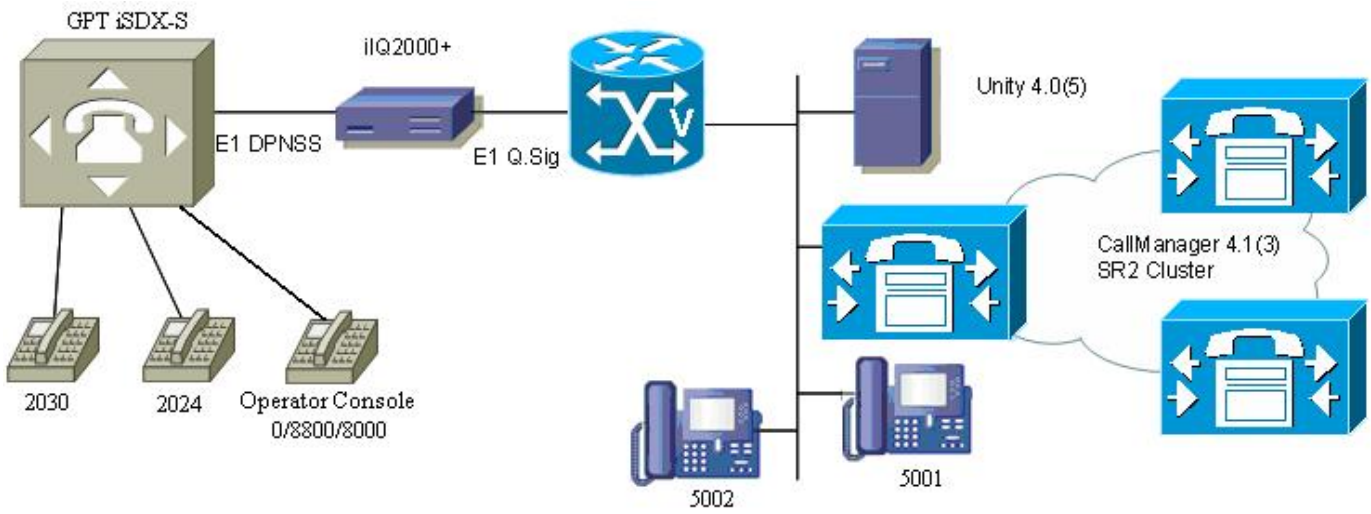
This application note provides configuration guidelines for interconnecting the iSDX/Realitis PBX using DPNSS to standard BTNR 188. As Cisco Unified CallManager does not natively support this protocol, use of an external protocol converter, the Westell Interchange iQ2000plus, is required. This converts DPNSS to Q.Sig, mapping DPNSS features to their Q.Sig equivalent, where available.

A single GPT iSDX-S was connected to a Cisco 2600 router with an NM-HDV, running MGCP backhaul to a Cisco Unified CallManager 4.1(3)SR1 cluster. The iSDX-S hosted analogue phones and a standard three-piece operators console. The DLI (Digital Line Interface) was then connected on G.703 to the Westell converter. The Westell converter was connected to the Cisco IOS gateway using a standard E1 cross-over cable, with the Cisco Unified CallManager cluster hosting a Cisco 7912G and a Cisco 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 operator feature codes to switch on/off MWI across the DPNSS trunk.

Using the iSDX 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 scenarCisco IOS. 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. Additionally, inter-working of DPNSS Route Optimisation with Q.Sig Path Replacement was demonstrated. Call Back services were shown to work – the exception being Call Back Next Used initiated by the IPT side, which produces an immediate response from the PBX.

Network Topology

Figure 1. Network Topology or Test Setup



Limitations

On Supervised Transfers from a PBX extension to any other destination, the Connected Name displayed on the originating IP Phone does not update, and will continue to show the name of the first called destination. This is a limitation of Cisco Unified CallManager.

Call Back When Next Used between an IP Phone and a PBX extension where the IP Phone is calling a free 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 DPNSS expecting the PBX not to be in the alerting state when the Call Back request is sent, and Q.Sig sending the request during the alerting phase. Consequently, the PBX sees the change from alerting state to free as evidence that the PBX phone has been used, and therefore alerts immediately. This is due to the state machine used in the iSDX for this particular service.

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."

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.

Various iSDX Operator Console services are not supported due to either limitations in Q.Sig or Cisco Unified CallManager. Specifically, attempts to intrude on an IPT extension, over-ride diverts set on Cisco Unified CallManager, Camp-On to a busy IPT extension and request the Status of Destination from an IPT extension (e.g. dialing "100" followed by the IPT extension) will fail. However, Return will function correctly – this is where a call is extended to an IPT extension which rings without answering. The Return timer on the PBX will force the call back to the operator showing as "Ring No Answer."

Calls from the IPT phones to the iSDX Operator which are forwarded to PBX phones will not return to the console on Ring No Answer. This is due to the way in which incoming DPNSS calls are seen by the iSDX.

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 very 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.

System Components

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) GPT iSDX.

(2) Standard Analogue Telephones

(1) Three-piece Operator Console

Westell Interchange iQ2000plus

Software Requirements

GPT/Siemens PBXs: iSDX 3.6/Realitis 6.1 or later.

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 CISCO IOS Q.Sig backhaul using MGCP.

Westell software, version R3.0.0 or later.

Westell VisionIQ Management software.

Features

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

Call Back Next Used *see limitations*

Return To Console – no answer *see limitations*

MWI

Route Optimisation

Configuration

Configuring the GPT iSDX PBX

Figure 2. Local Access Code from iSDX to Cisco Unified CallManager

```
UNPUBLISHED WORK. COPYRIGHT GPT LIMITED.
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iSDX BDPCGS013    47123.01  01.033
3.6.201 0000100 UK 04 01/02/92 A  M  110
15/10/05  18:24:40

OSL, PLEASE.
?

laca
CODE:172
CODE  TQU TCB LCR IRD
172    N   N   N   N
```

Figure 3. Ensure Trunk Group has correct Trunk Access (TAC)

```
?LTGA
GROUP:0099
ZONE:00
TAC   0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 3 3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
MG099
 Z 00
```

Figure 4. Configure Trunk Main Group

```
?ltmg 099
          D                A R     D  D     D T    M  N  D
MG  TYPE CODE  /  OUT SRCH  SEND PSD  S  T IN   D   T  REG T S OG  D  L  C   PE
          A                      T  T       T    M  T
099 DPNS  172  D  HRS  FXD          A    DDI     07     N N 00  N  03
```

Figure 5. Configuration of individual Trunk Channels showing X/Y setting (DIR) and Trunk Main Group number

?ltk
INDEX:A

TK	TYPE	PAD	MG	TG	DIR	DSA	OAD	NSA	SIG	CCT	PSP
0077	DPNS	023030	099	099	X	DDI	Y	DENS		016	
0078	DPNS	023029	099	099	X	DDI	Y	DENS		016	
0079	DPNS	023028	099	099	X	DDI	Y	DENS		016	
0080	DPNS	023027	099	099	X	DDI	Y	DENS		016	
0081	DPNS	023026	099	099	X	DDI	Y	DENS		016	
0082	DPNS	023025	099	099	X	DDI	Y	DENS		016	
0083	DPNS	023024	099	099	X	DDI	Y	DENS		016	
0084	DPNS	023023	099	099	X	DDI	Y	DENS		016	
0085	DPNS	023022	099	099	X	DDI	Y	DENS		016	
0086	DPNS	023021	099	099	X	DDI	Y	DENS		016	
0087	DPNS	023020	099	099	X	DDI	Y	DENS		016	
0088	DPNS	023019	099	099	X	DDI	Y	DENS		016	
0089	DPNS	023018	099	099	X	DDI	Y	DENS		016	
0090	DPNS	023017	099	099	X	DDI	Y	DENS		016	
0091	DPNS	023016	099	099	X	DDI	Y	DENS		016	
0092	DPNS	023015	099	099	X	DDI	Y	DENS		016	
0093	DPNS	023014	099	099	X	DDI	Y	DENS		016	
0094	DPNS	023013	099	099	X	DDI	Y	DENS		016	
0095	DPNS	023012	099	099	X	DDI	Y	DENS		016	
0096	DPNS	023011	099	099	X	DDI	Y	DENS		016	
0097	DPNS	023010	099	099	X	DDI	Y	DENS		016	
0098	DPNS	023009	099	099	X	DDI	Y	DENS		016	
0099	DPNS	023008	099	099	X	DDI	Y	DENS		016	
0100	DPNS	023007	099	099	X	DDI	Y	DENS		016	
0101	DPNS	023006	099	099	X	DDI	Y	DENS		016	
0102	DPNS	023005	099	099	X	DDI	Y	DENS		016	
0103	DPNS	023004	099	099	X	DDI	Y	DENS		016	
0104	DPNS	023003	099	099	X	DDI	Y	DENS		016	
0105	DPNS	023002	099	099	X	DDI	Y	DENS		016	
0106	DPNS	023001	099	099	X	DDI	Y	DENS		016	

Figure 6. Display of DLI, showing DPNSS Side Setting

```
?ldlc
XXYY:0230
CHANNEL:A
TRUNK    TYPE    VIRTUAL   REAL   LINK
023001   DPNSS     C       C      A
023002   DPNSS     C       C      A
023003   DPNSS     C       C      A
023004   DPNSS     C       C      A
023005   DPNSS     C       C      A
023006   DPNSS     C       C      A
023007   DPNSS     C       C      A
023008   DPNSS     C       C      A
023009   DPNSS     C       C      A
023010   DPNSS     C       C      A
023011   DPNSS     C       C      A
023012   DPNSS     C       C      A
023013   DPNSS     C       C      A
023014   DPNSS     C       C      A
023015   DPNSS     C       C      A
023016   DPNSS     C       C      A
023017   DPNSS     C       C      A
023018   DPNSS     C       C      A
023019   DPNSS     C       C      A
023020   DPNSS     C       C      A
023021   DPNSS     C       C      A
023022   DPNSS     C       C      A
023023   DPNSS     C       C      A
023024   DPNSS     C       C      A
023025   DPNSS     C       C      A
023026   DPNSS     C       C      A
023027   DPNSS     C       C      A
023028   DPNSS     C       C      A
023029   DPNSS     C       C      A
023030   DPNSS     C       C      A
0230     MAINT     U       U
```

Figure 7. System Digit Translation Patterns, showing routing for 5XXX via Access Code 172

```
?ldtt 01 5
5991        1725991
5998        1725998
5990        1725990
5001        1725001
5002        1725002

?ldtt 02 5
5991        1725991
5998        1725998
5990        1725990
5001        1725001
5002        1725002


?ldtt 03 5
5991        1725991
5998        1725998
5990        1725990
5001        1725001
5002        1725002

?ldtt 04 5
5991        1725991
5998        1725998
5999        1725999
5990        1725990
5001        1725001
5002        1725002
```

Configuring the Westell IiQ2000 Plus

Figure 8. Initial Connection to Westell via VisionIQ – define shelf

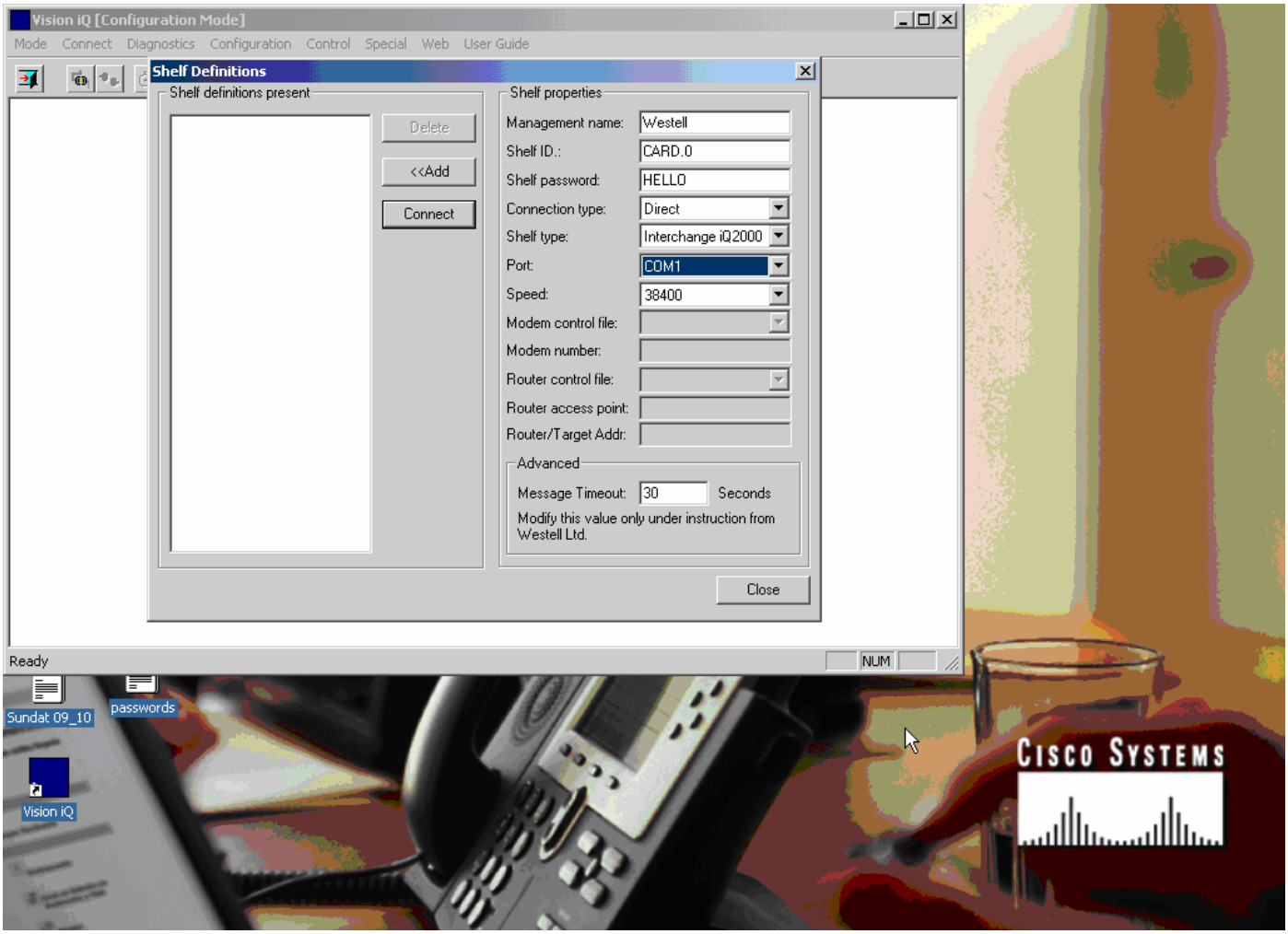


Figure 9. Connect to shelf and configure IiQ2000plus.

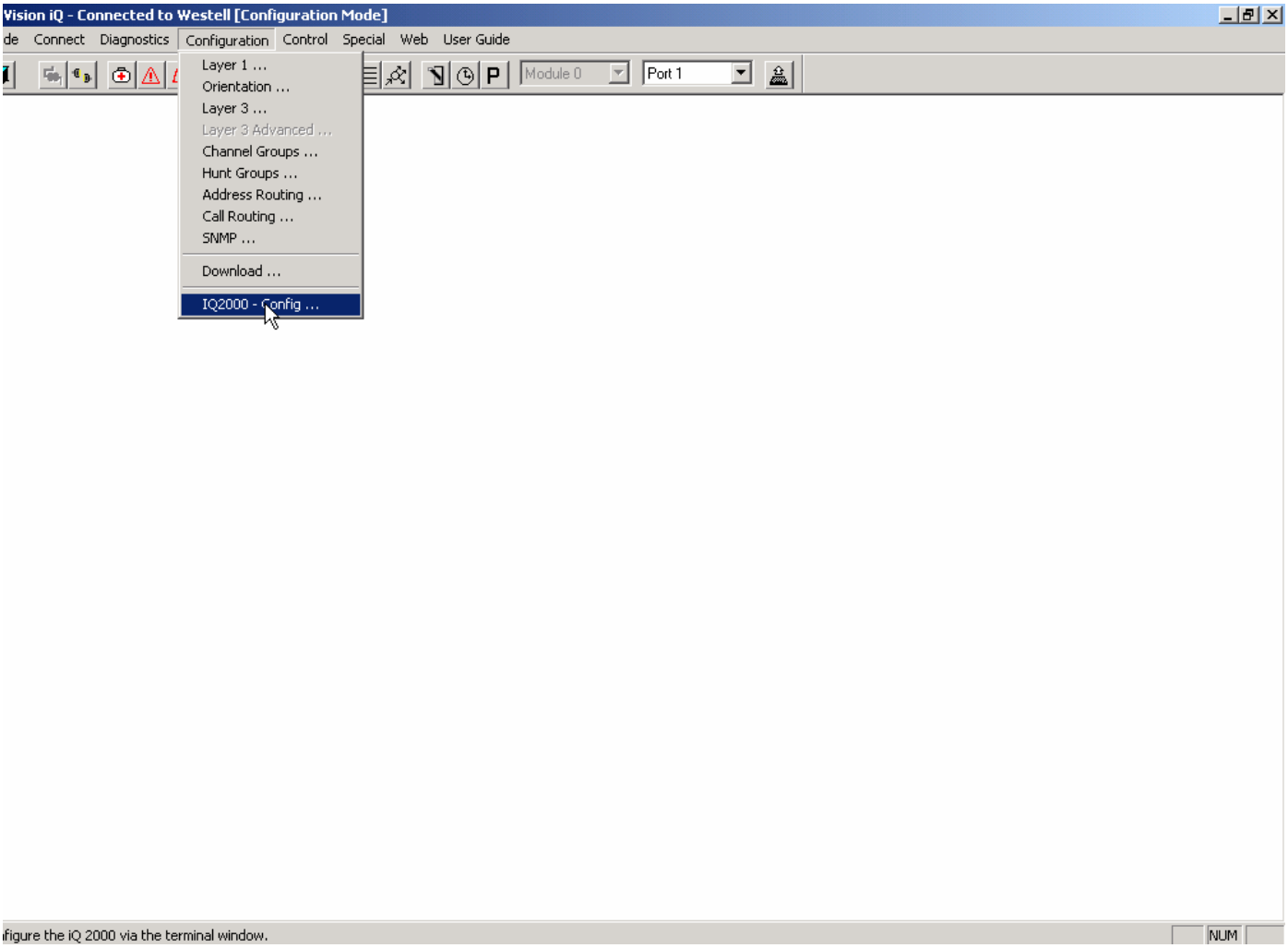


Figure 10. Connect ion warning

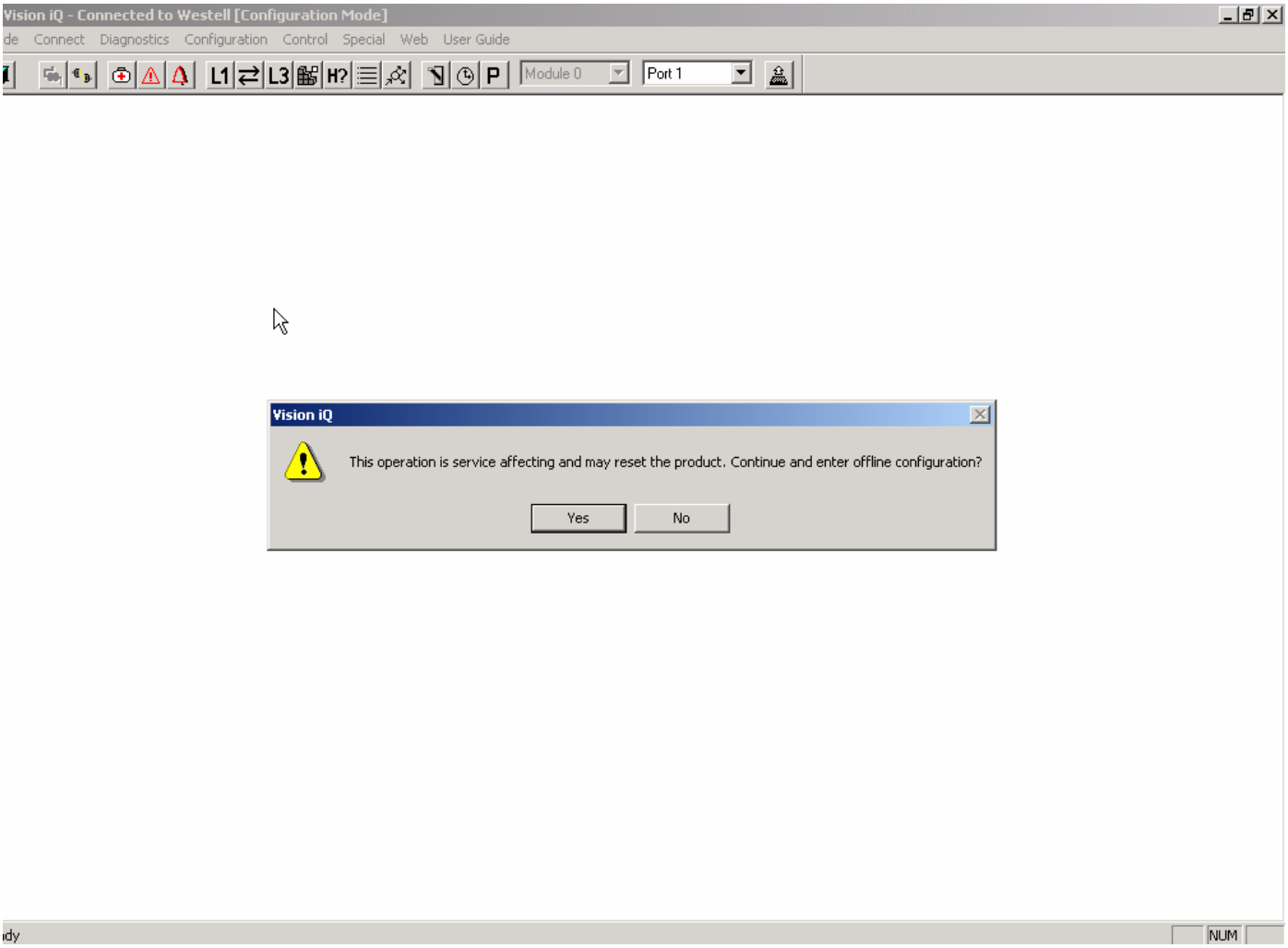


Figure 11. IiQ2000plus Off-line Configuration Screen

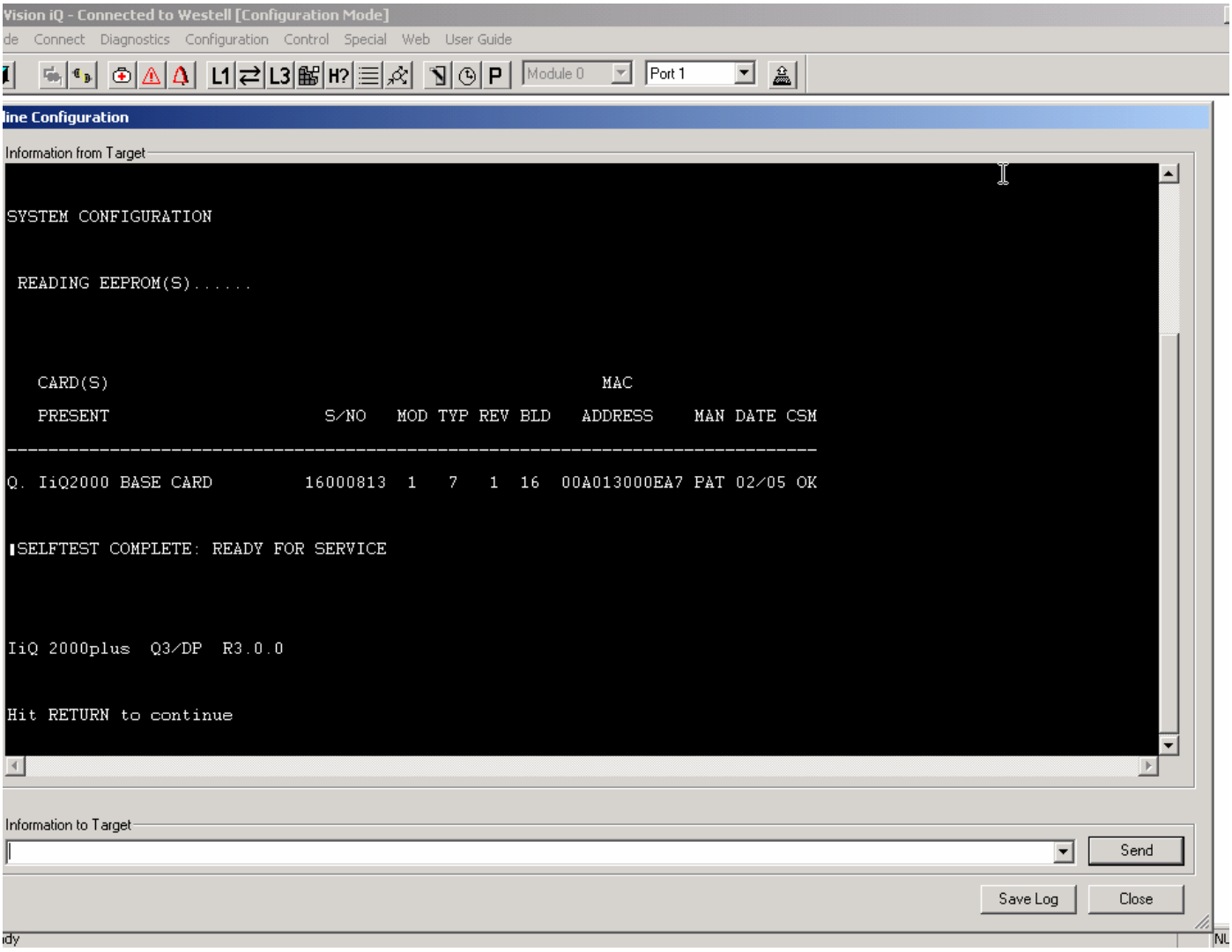


Figure 12. Select QUICK configuration mode

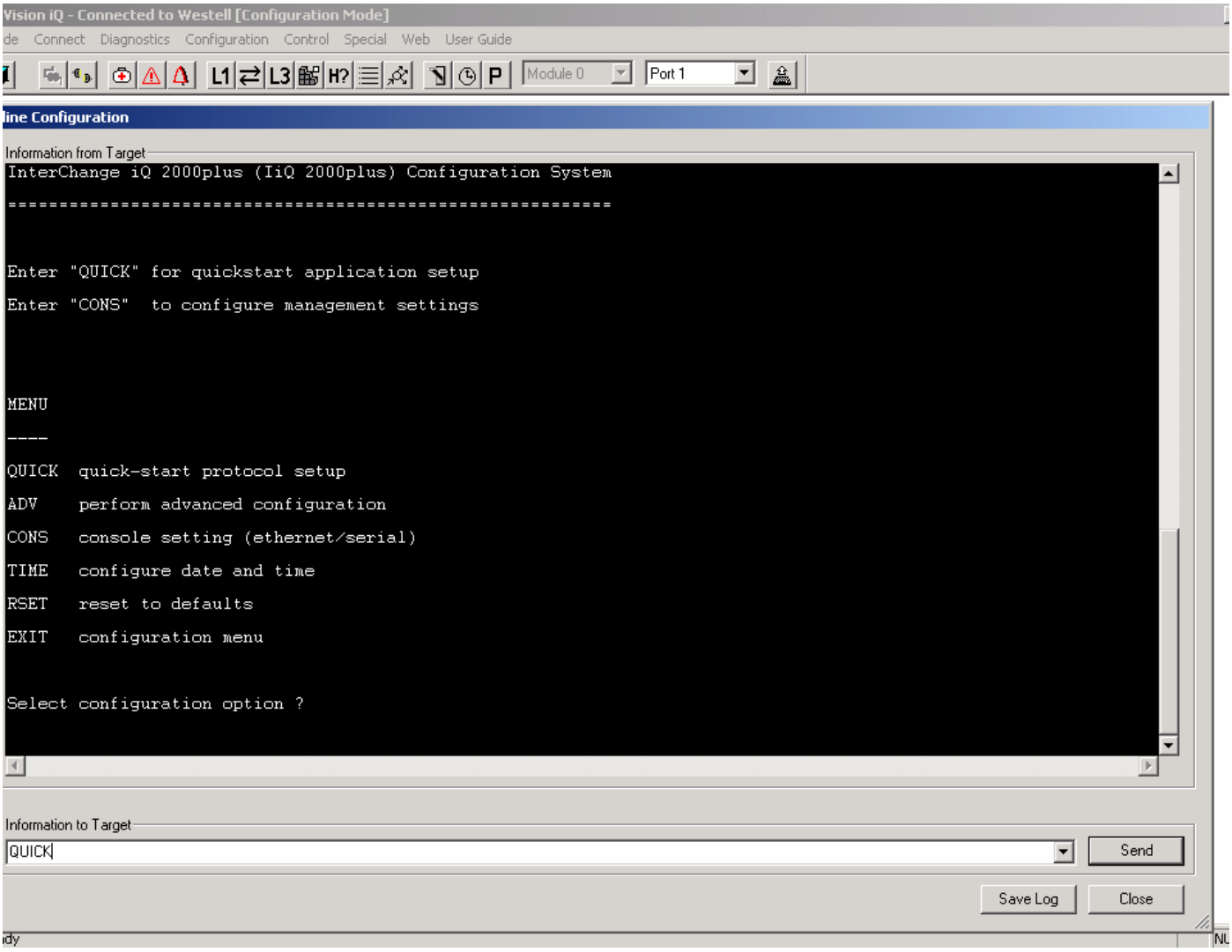


Figure 13. Instructions

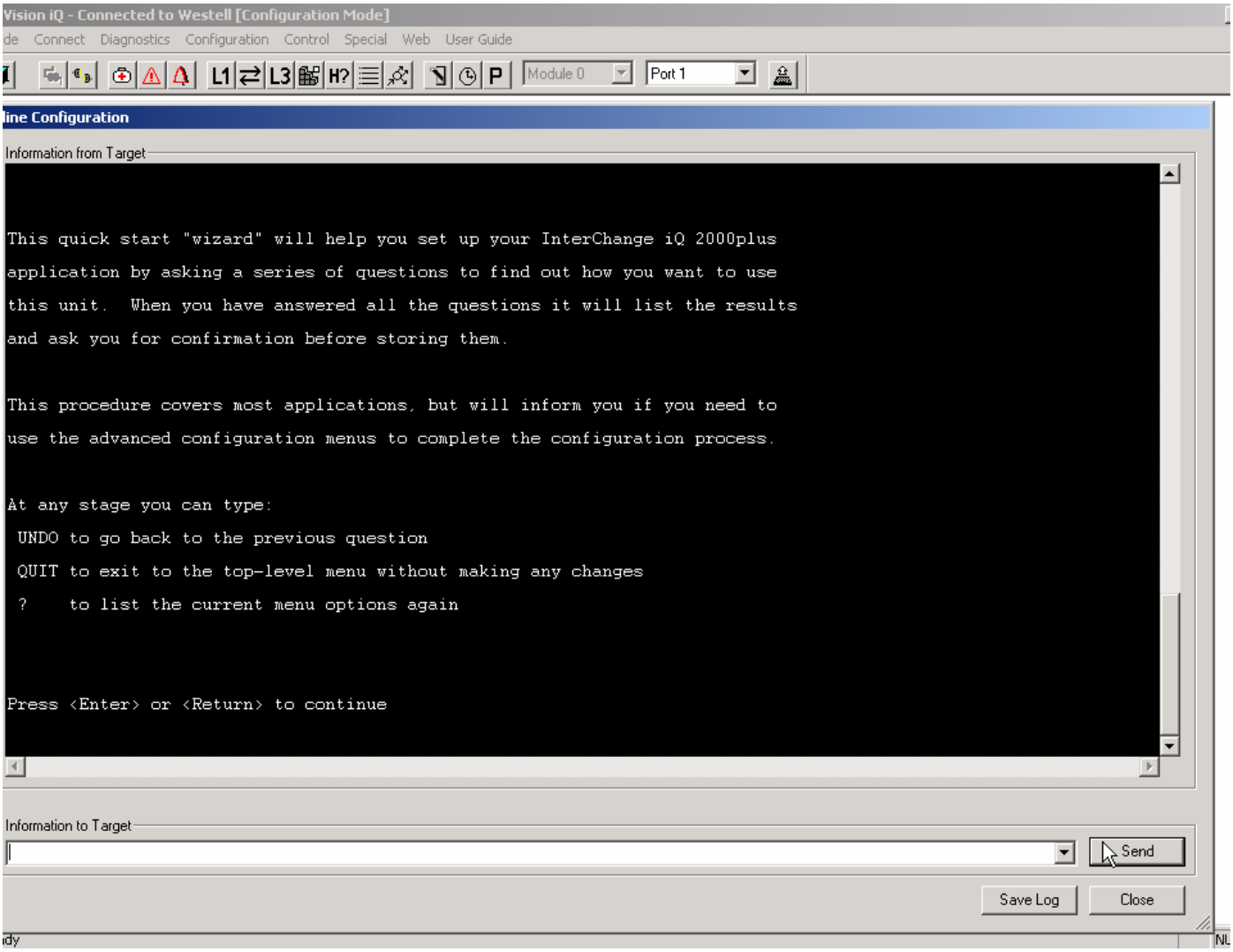


Figure 14. Select CCM for predefined options

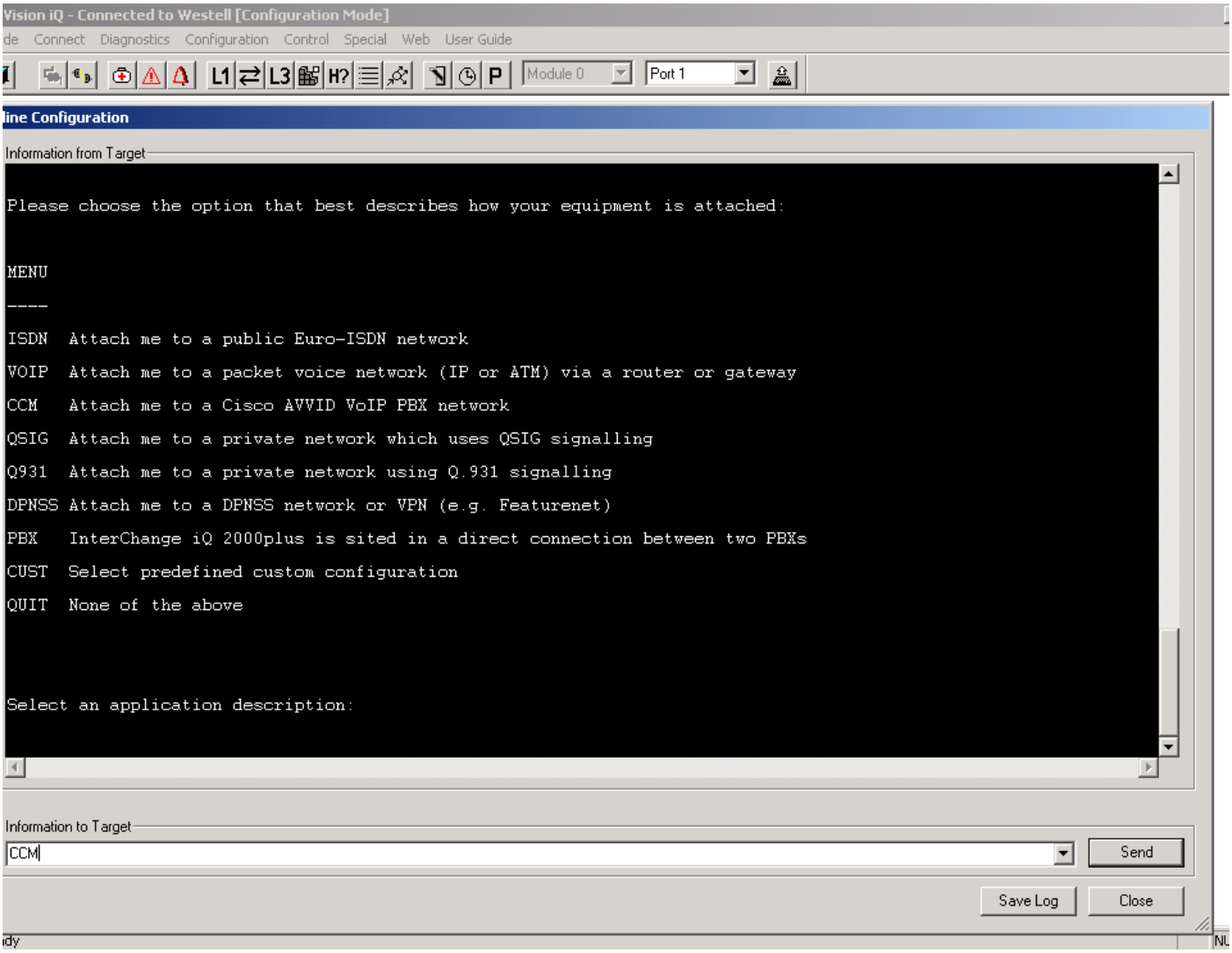


Figure 15. MGCP Gateway required for Q.Sig

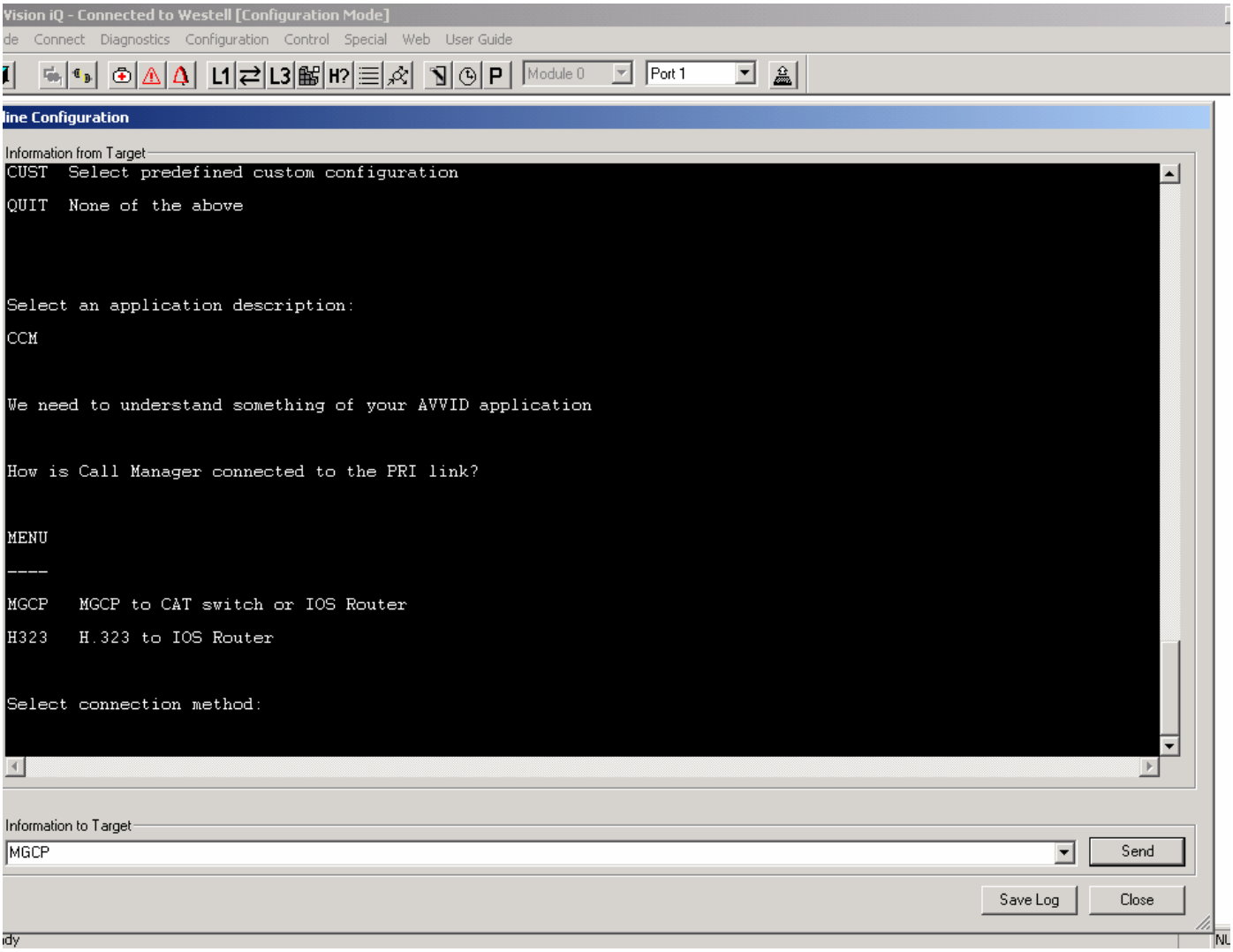


Figure 16. Q.Sig protocol selection

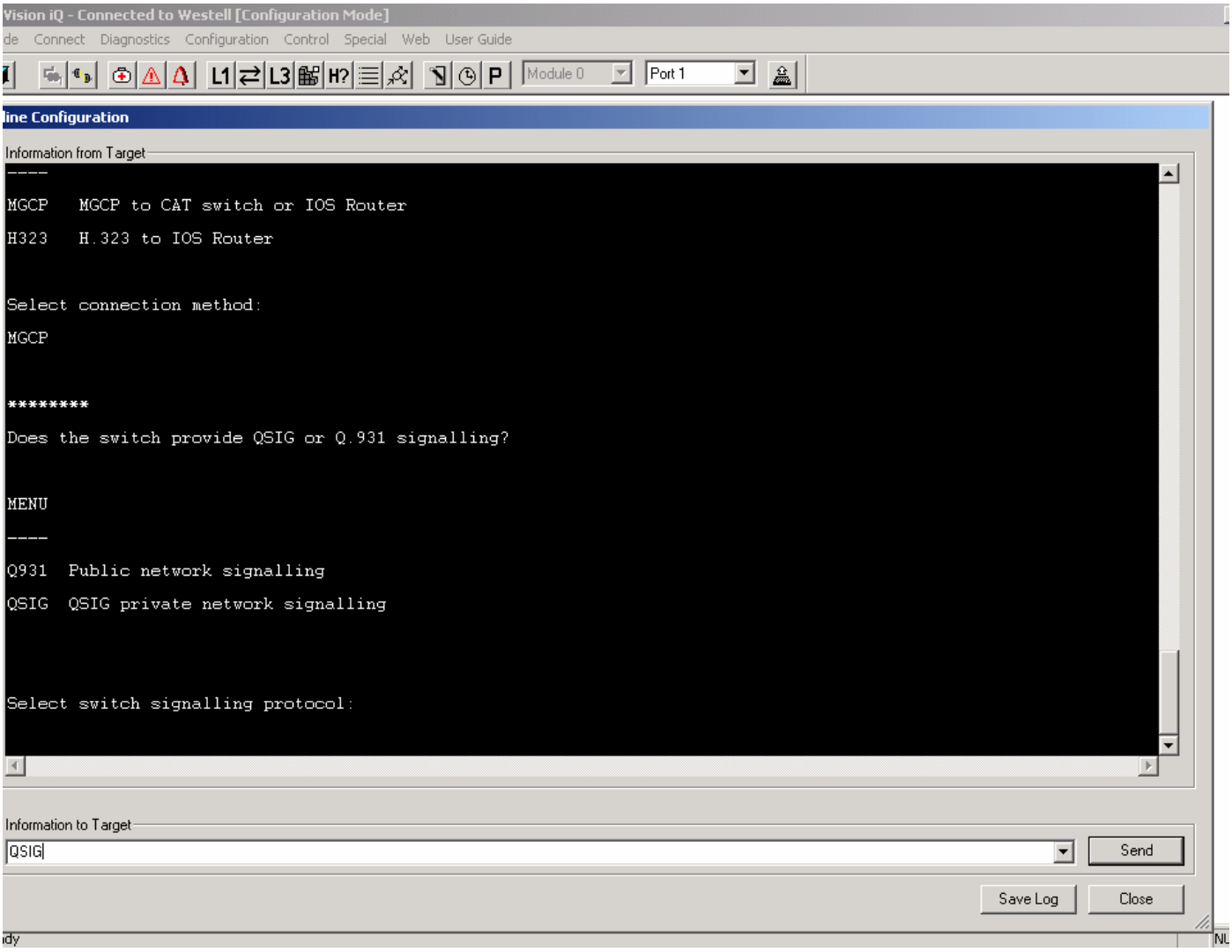


Figure 17. CCM 4.1 required for Q.Sig functionality

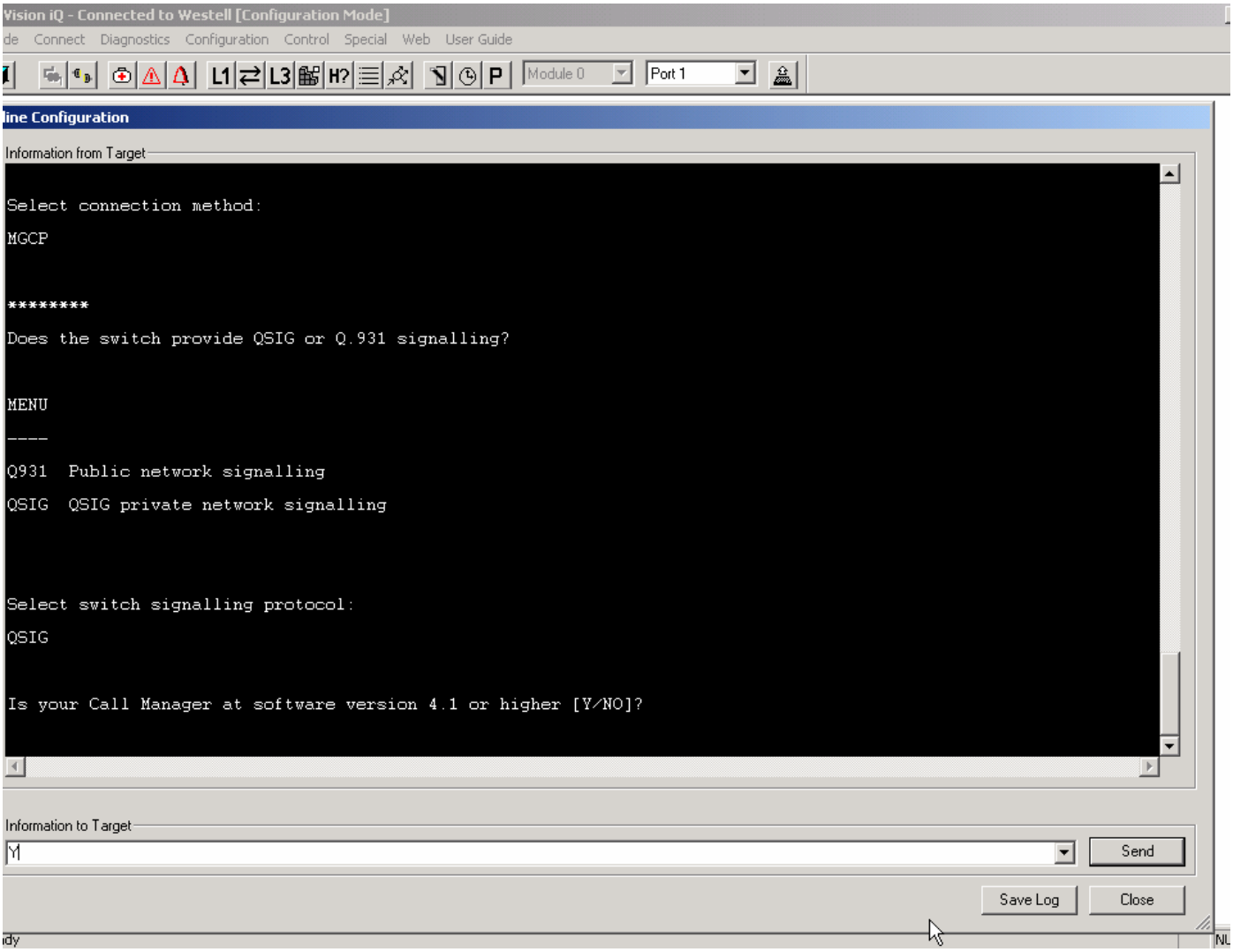


Figure 18. Select ISDN Side (Westell to CCM)

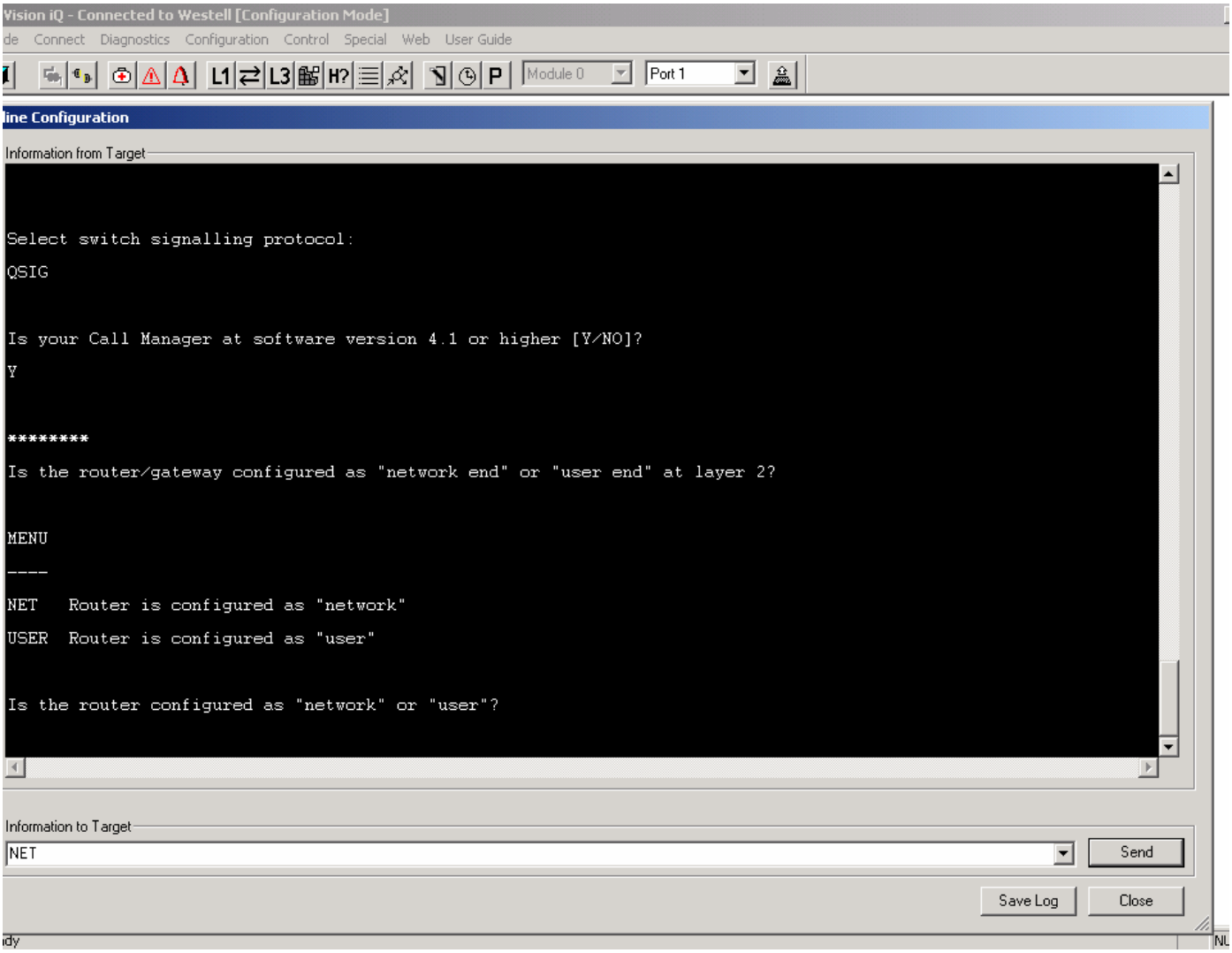


Figure 19. Define Overlap Sending

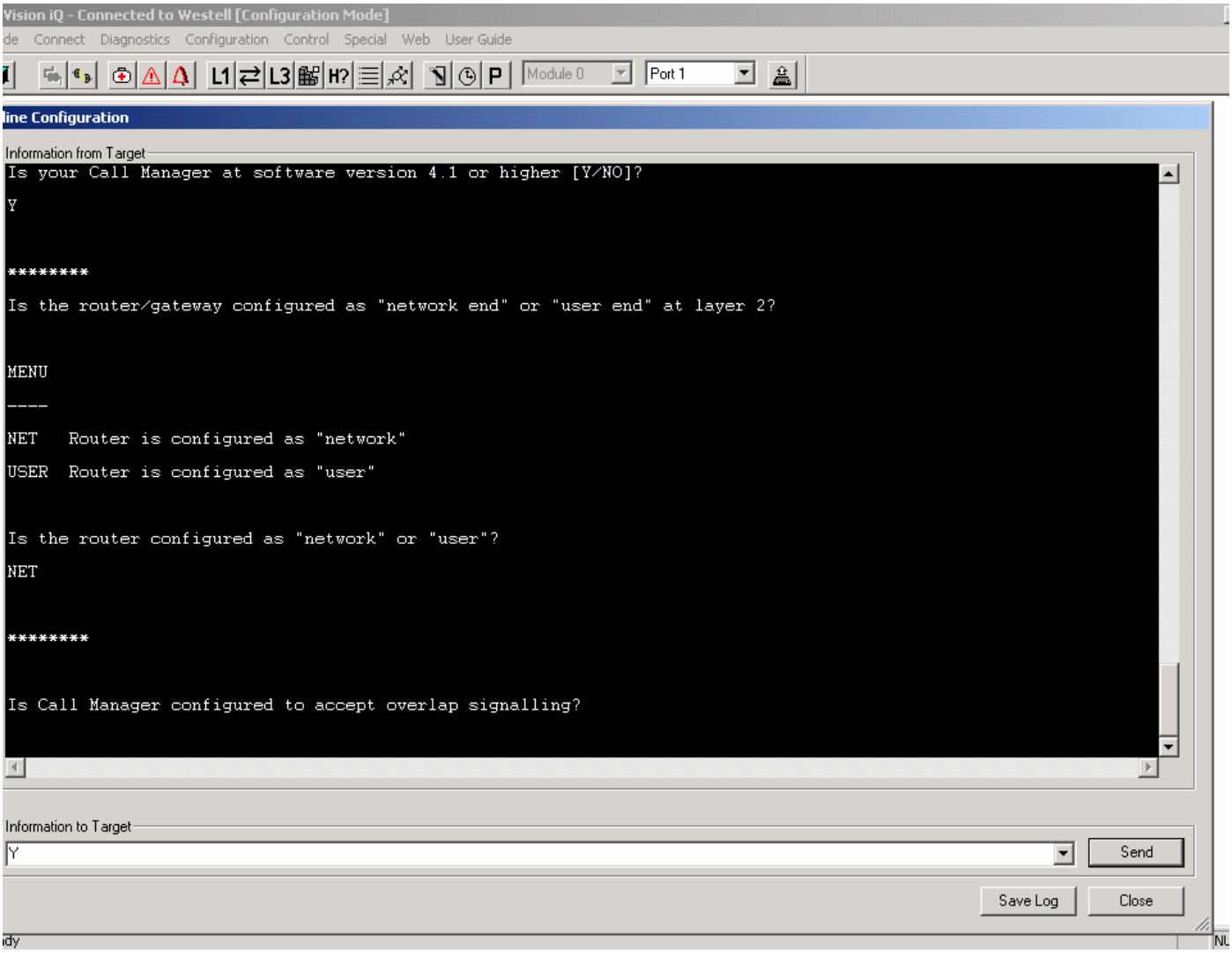


Figure 20. DPNSS A/B End Setting

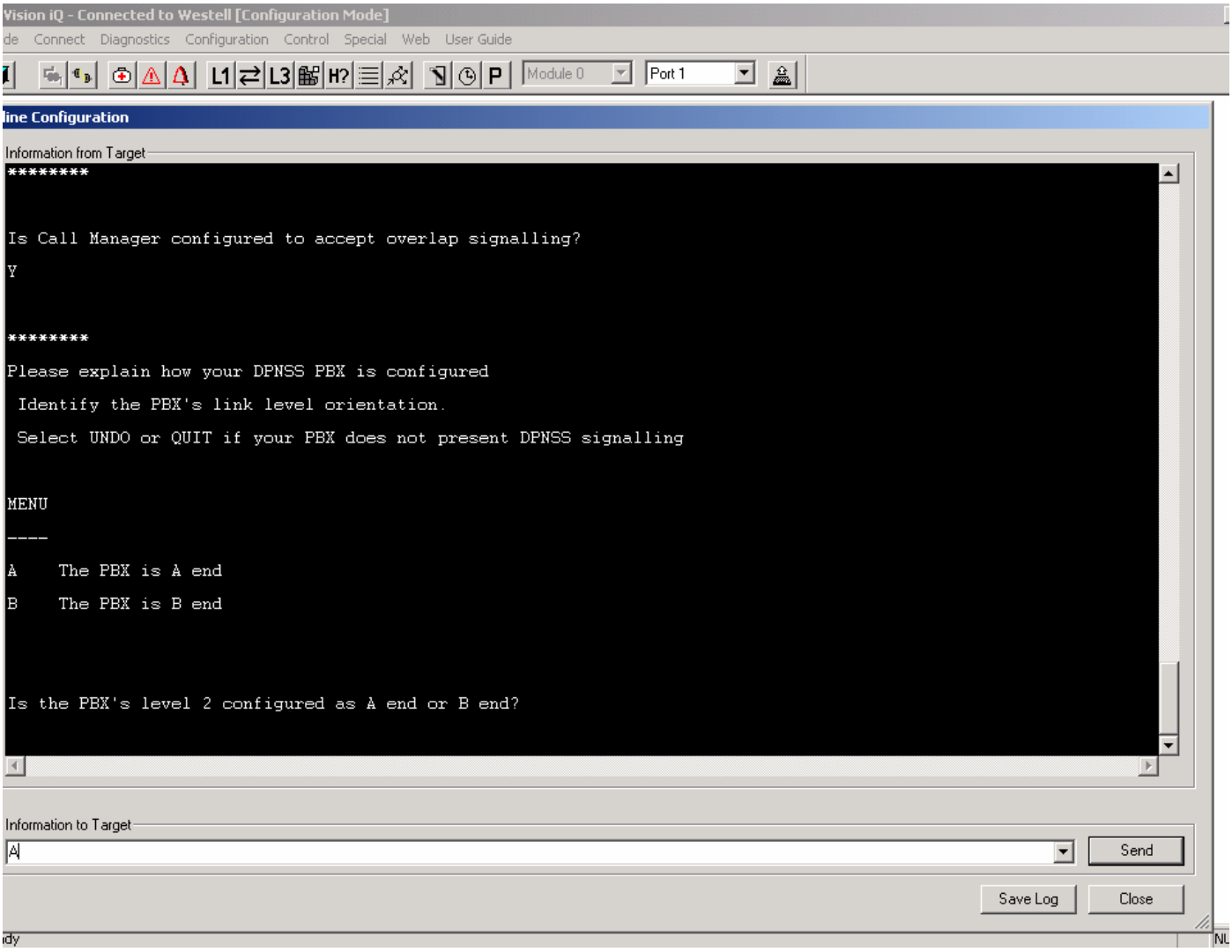


Figure 21. DPNSS X/Y Settings

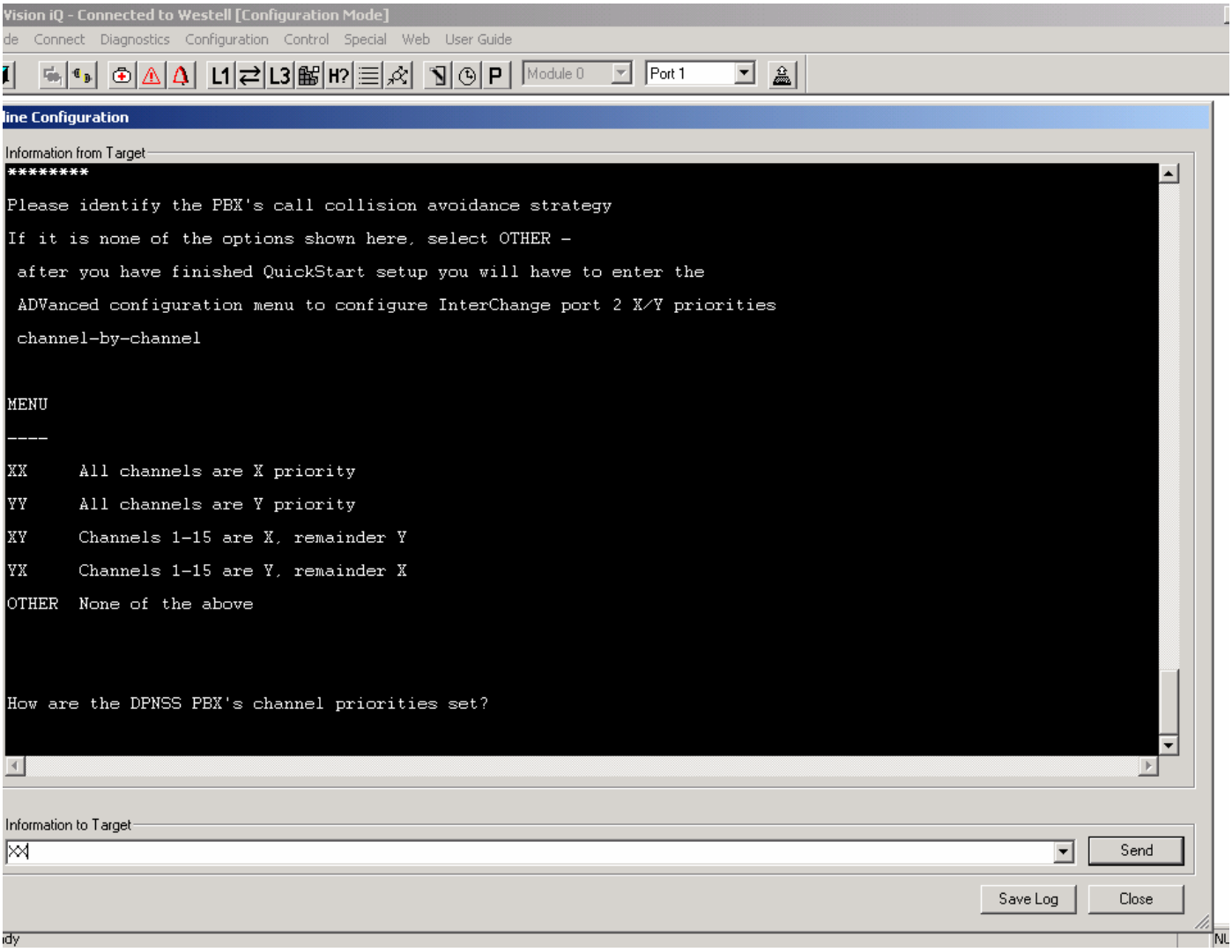


Figure 22. Configuration confirmation (1 of 2)

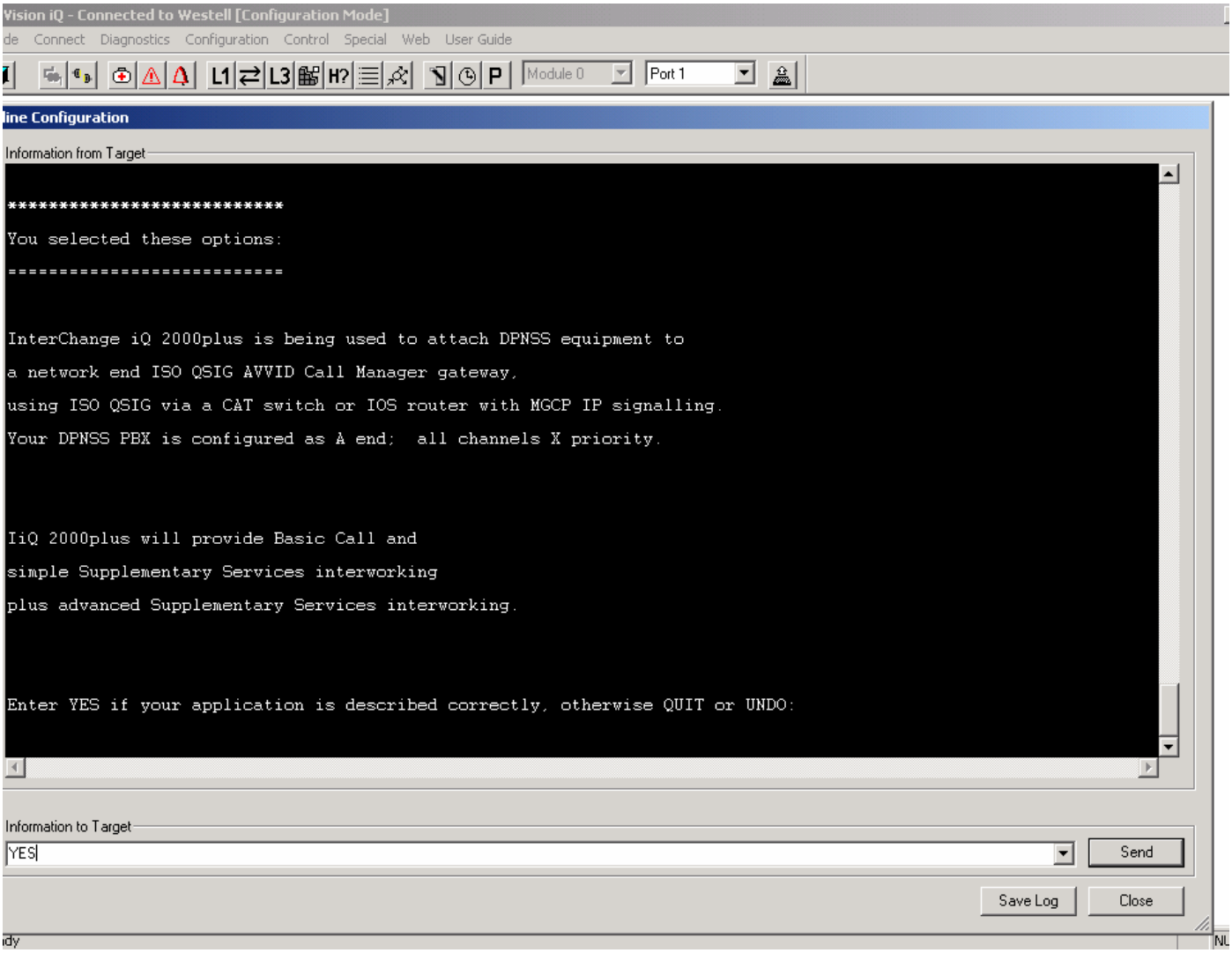


Figure 23. Configuration confirmation (2 of 2)

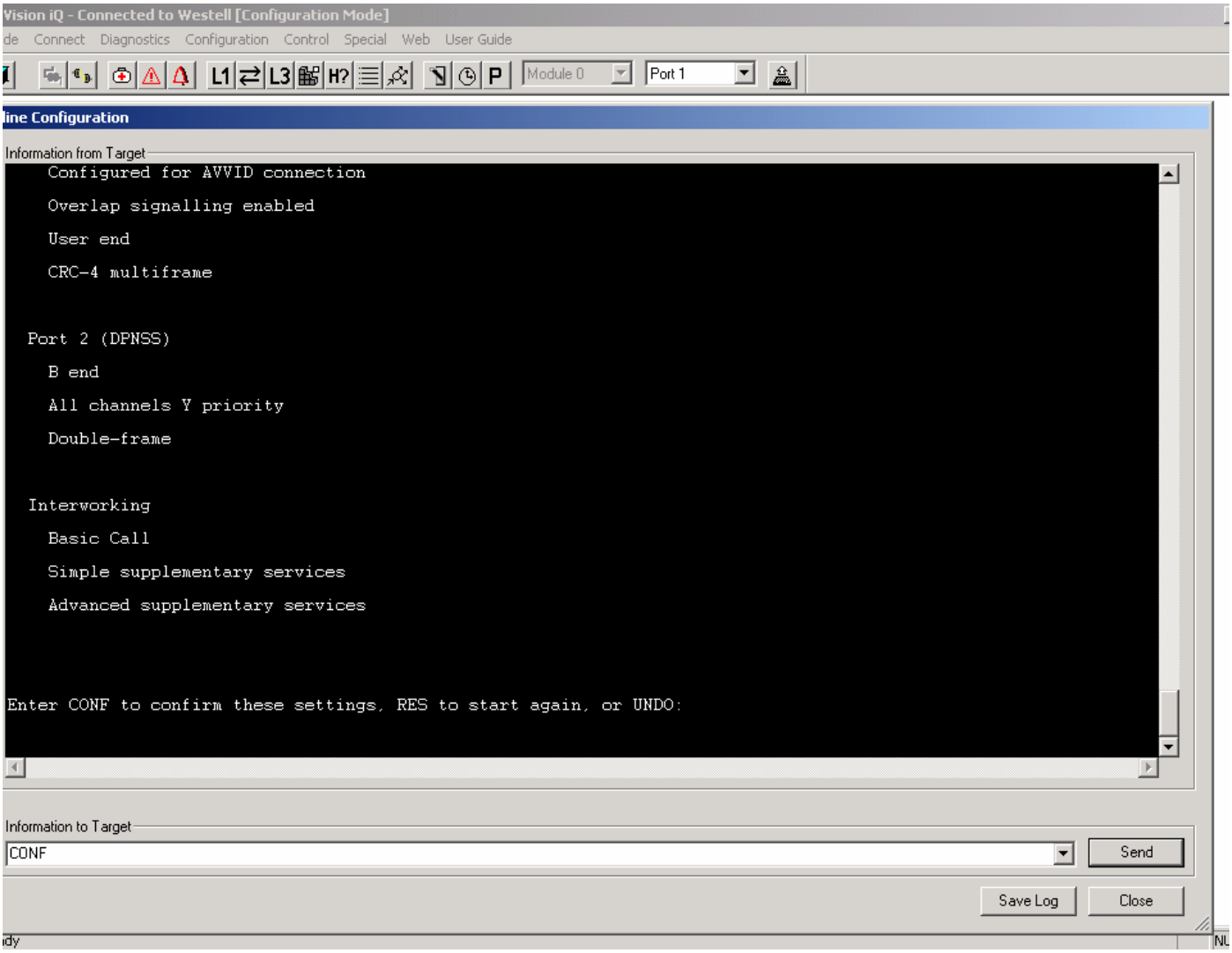


Figure 24. MGCP Gateway Configuration (1 of 9)

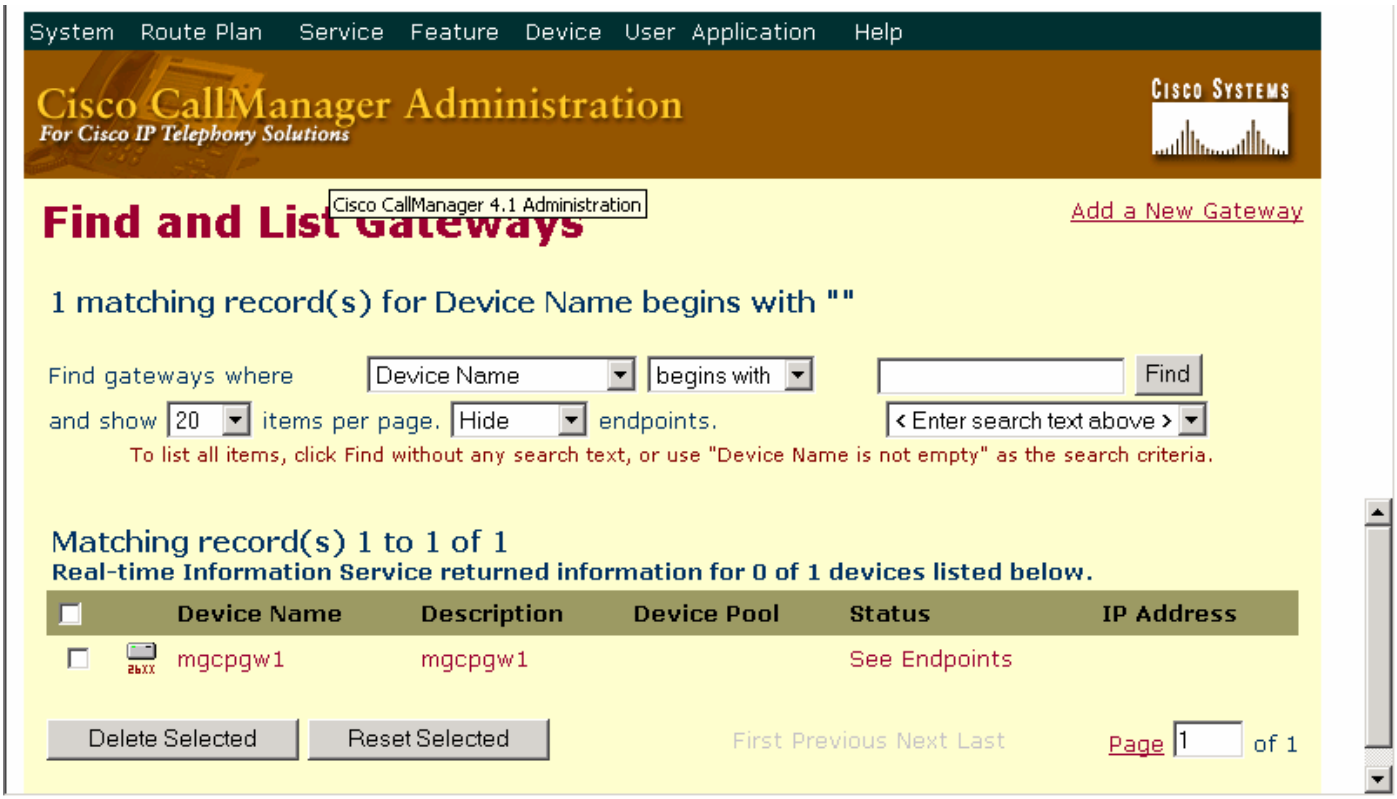


Figure 25. MGCP Gateway Configuration (2 of 9)

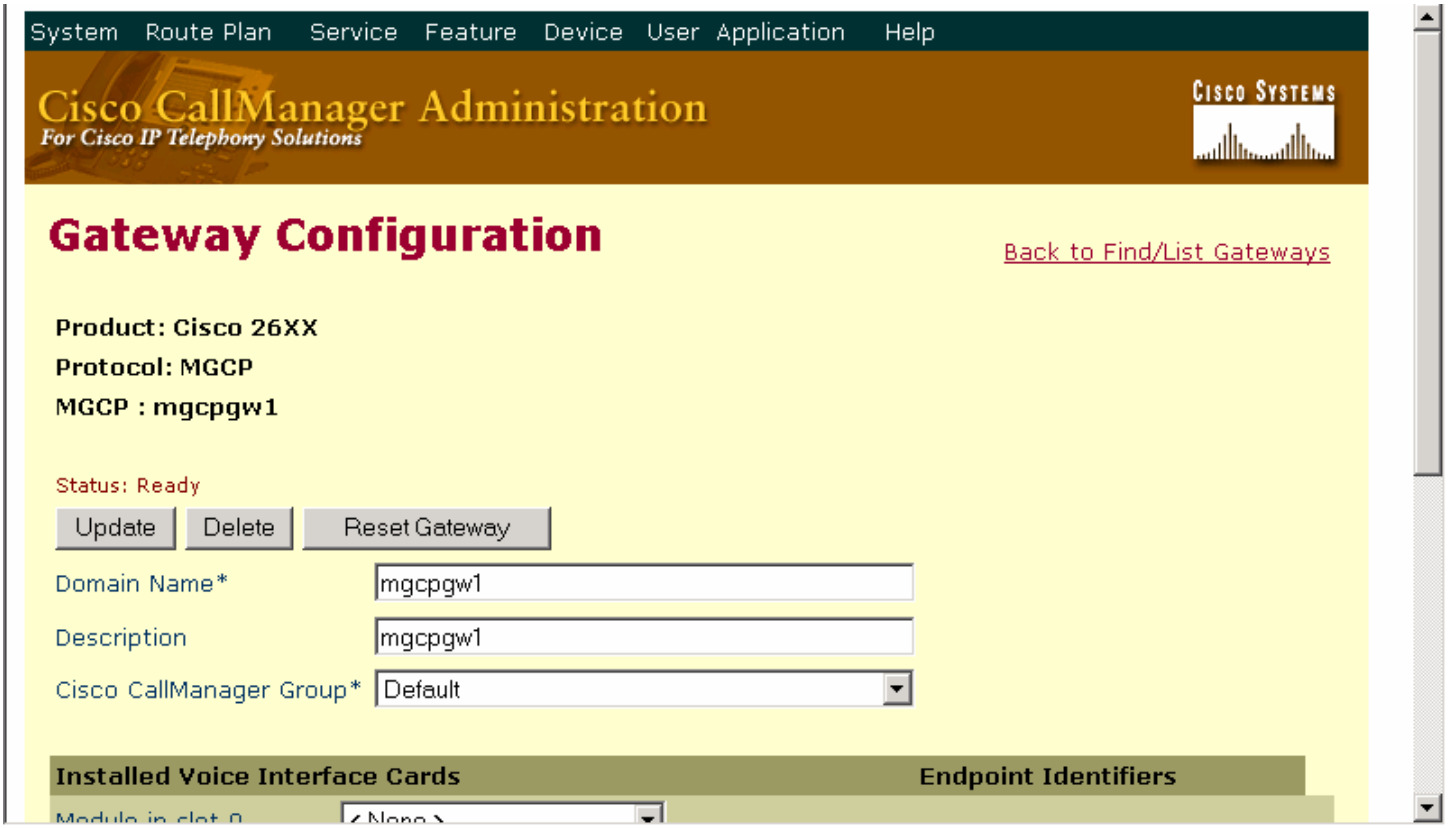


Figure 26. MGCP Gateway Configuration (3 of 9)

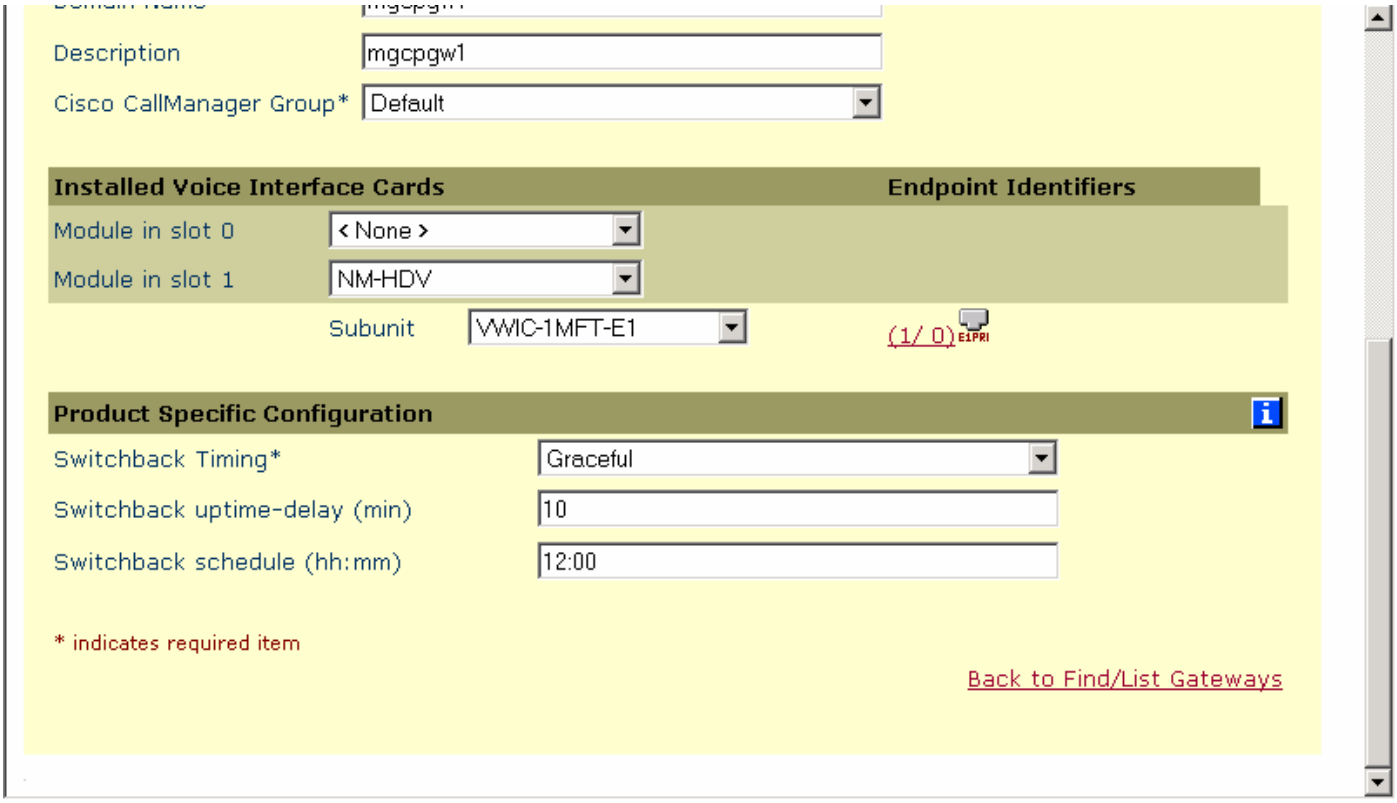


Figure 27. MGCP Gateway Configuration (4 of 9)

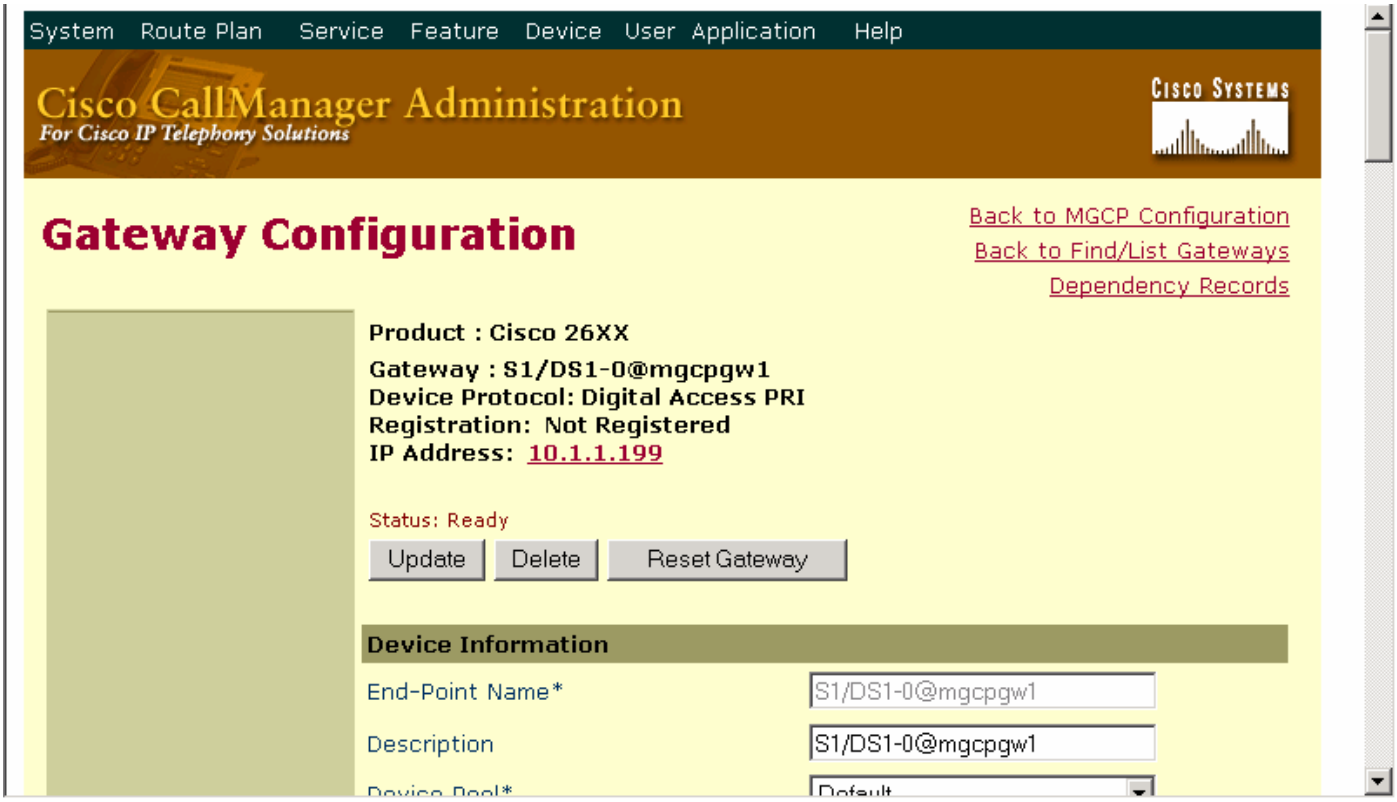


Figure 28. MGCP Gateway Configuration (5 of 9)

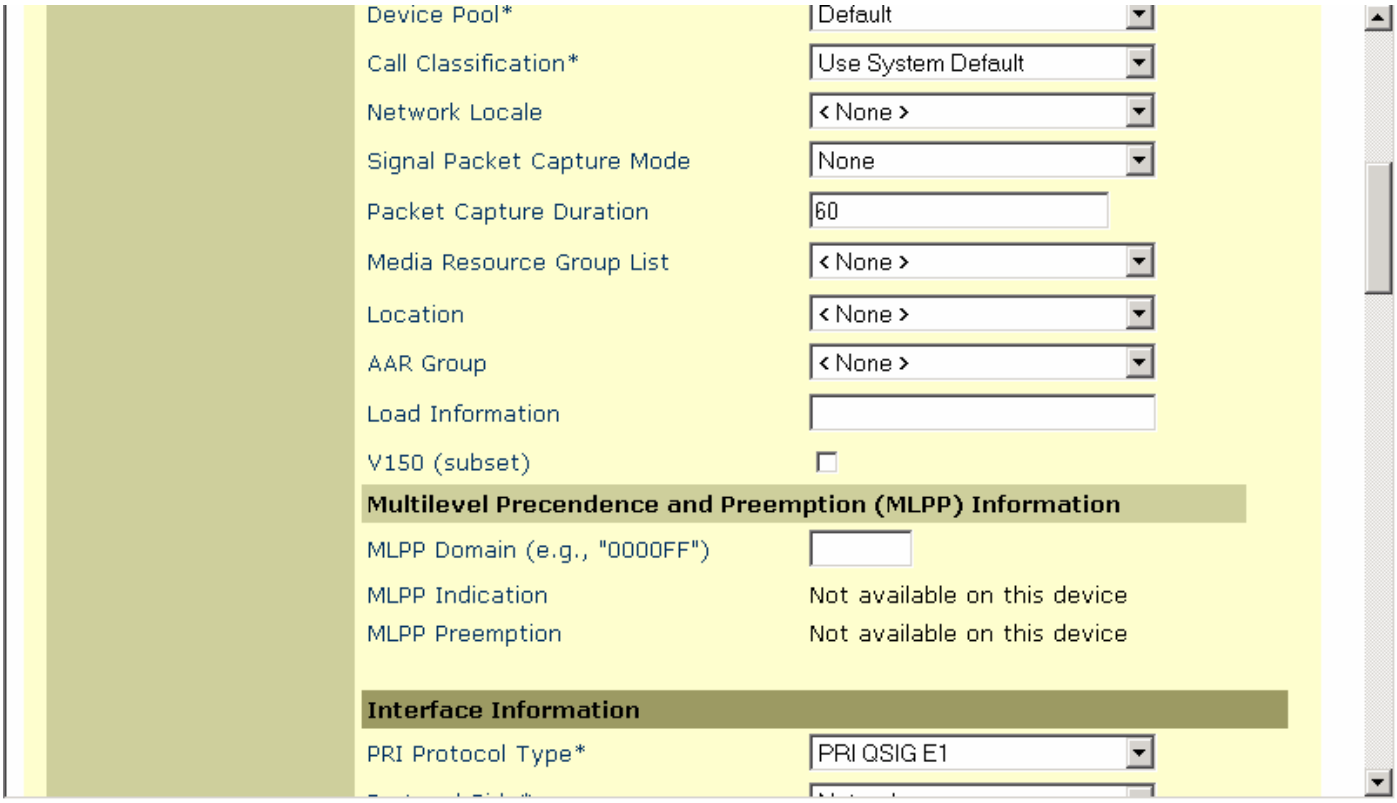


Figure 29. MGCP Gateway Configuration (6 of 9)

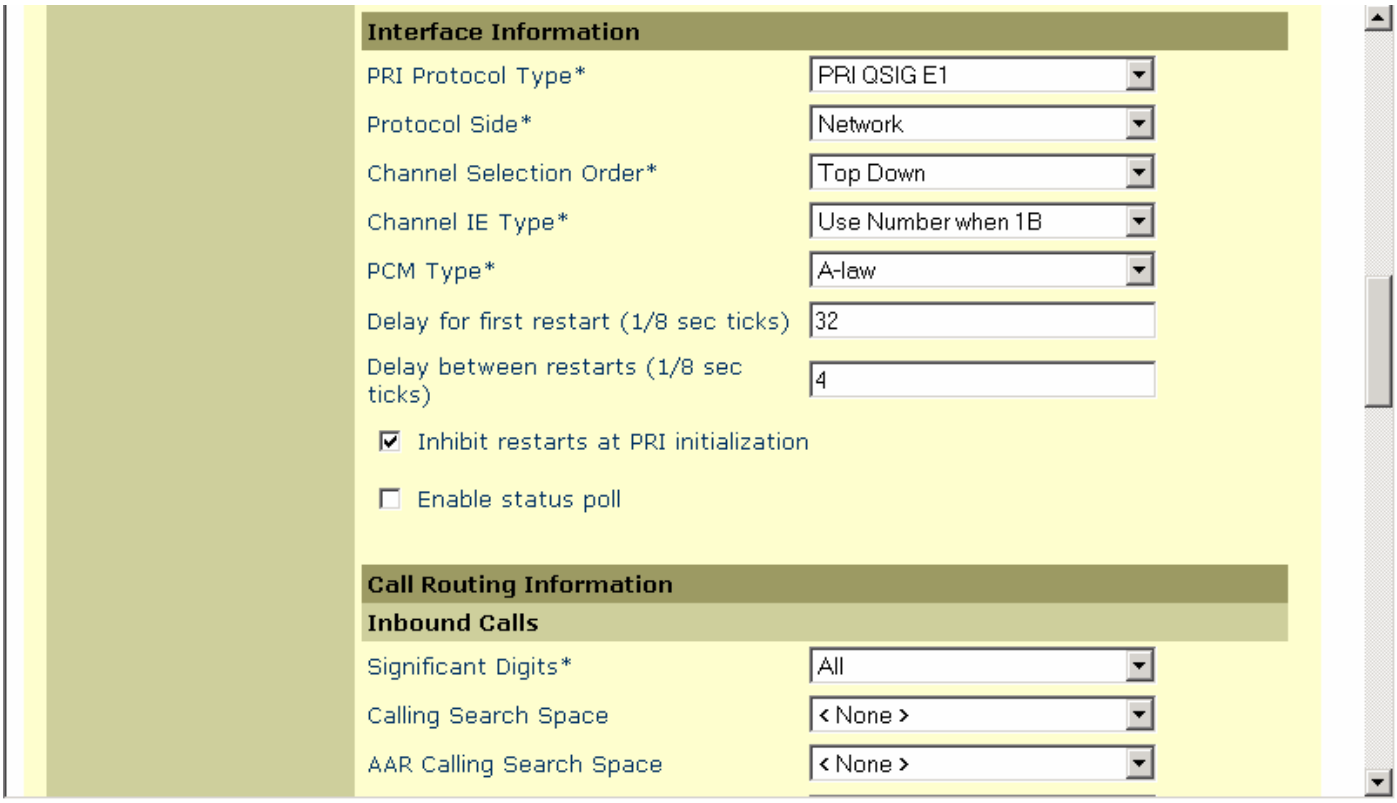


Figure 30. MGCP Gateway Configuration (7 of 9)

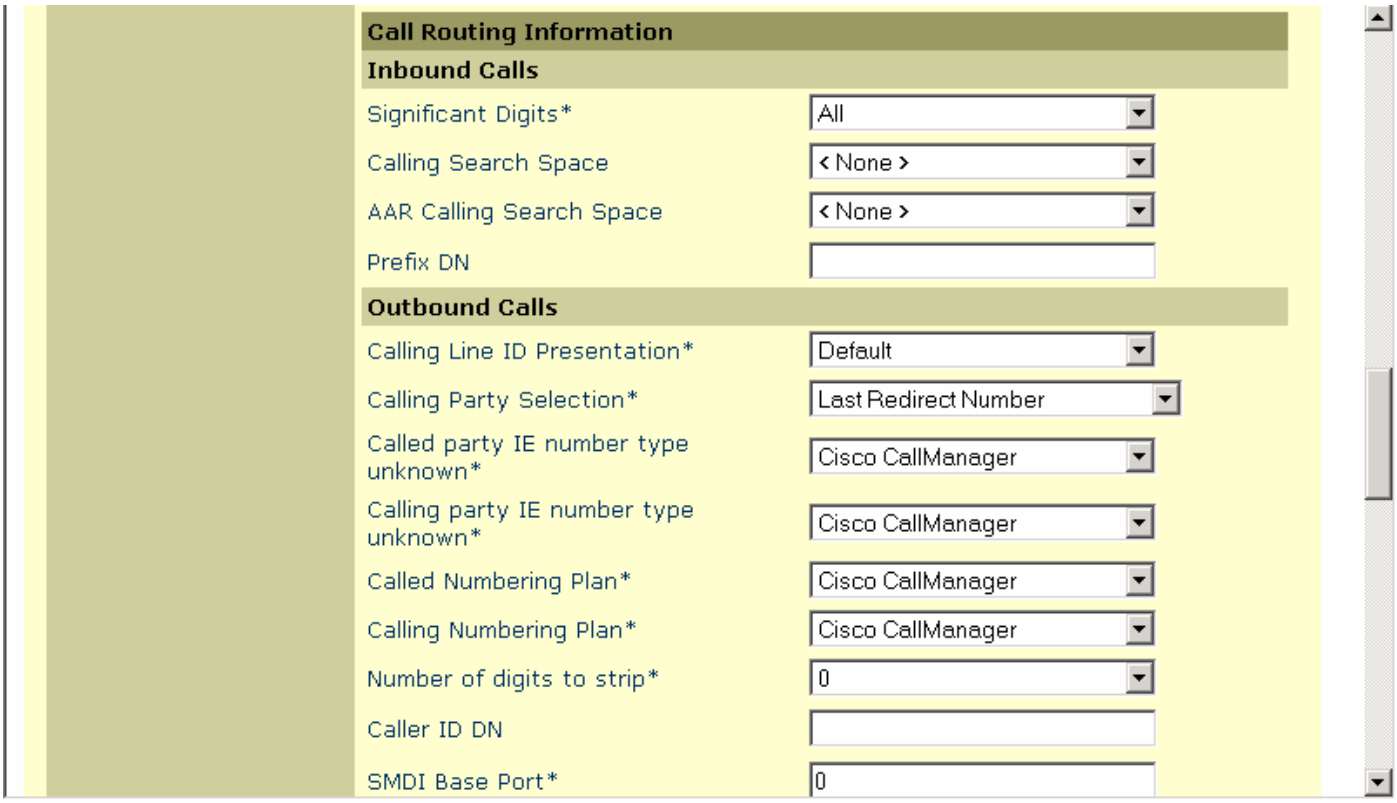


Figure 31. MGCP Gateway Configuration (8 of 9)

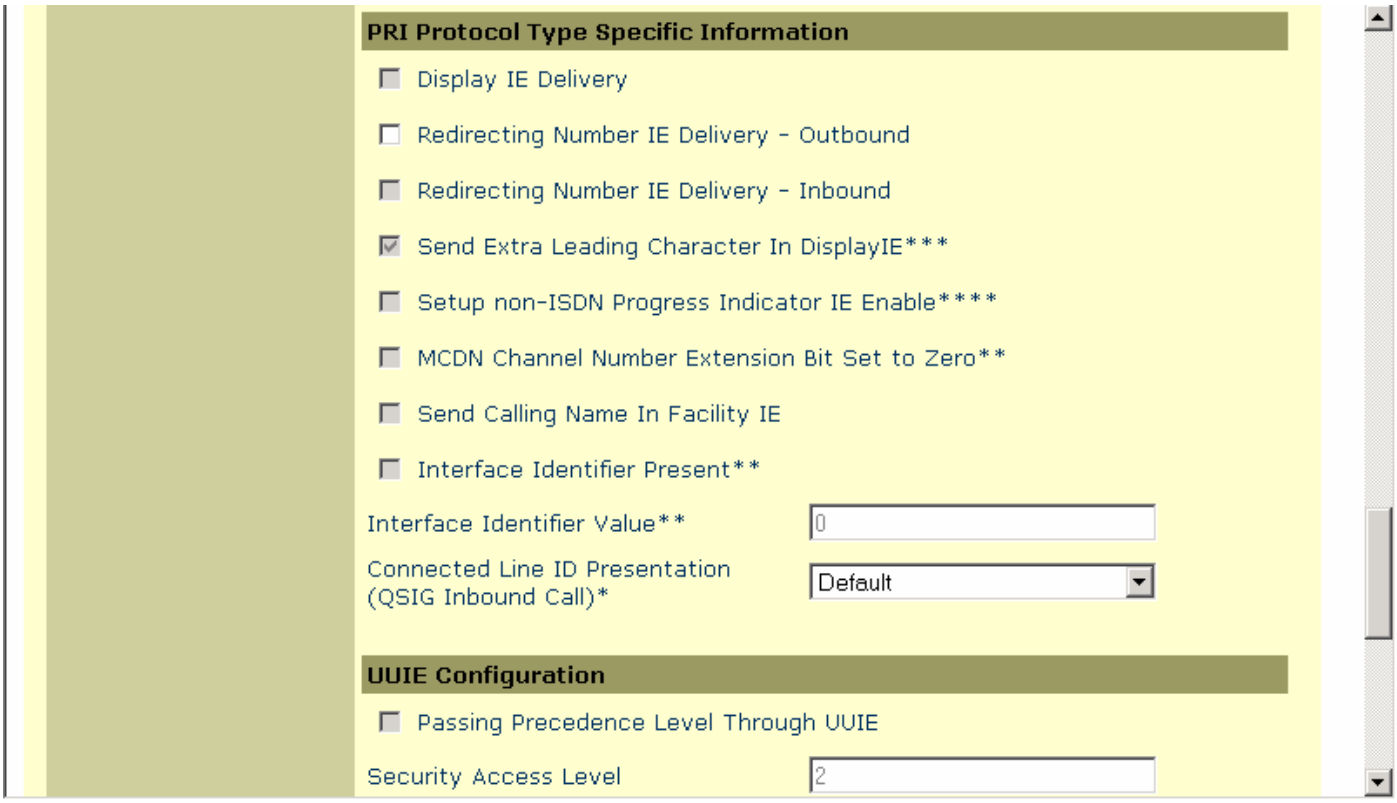


Figure 32. MGCP Gateway Configuration (9 of 9)

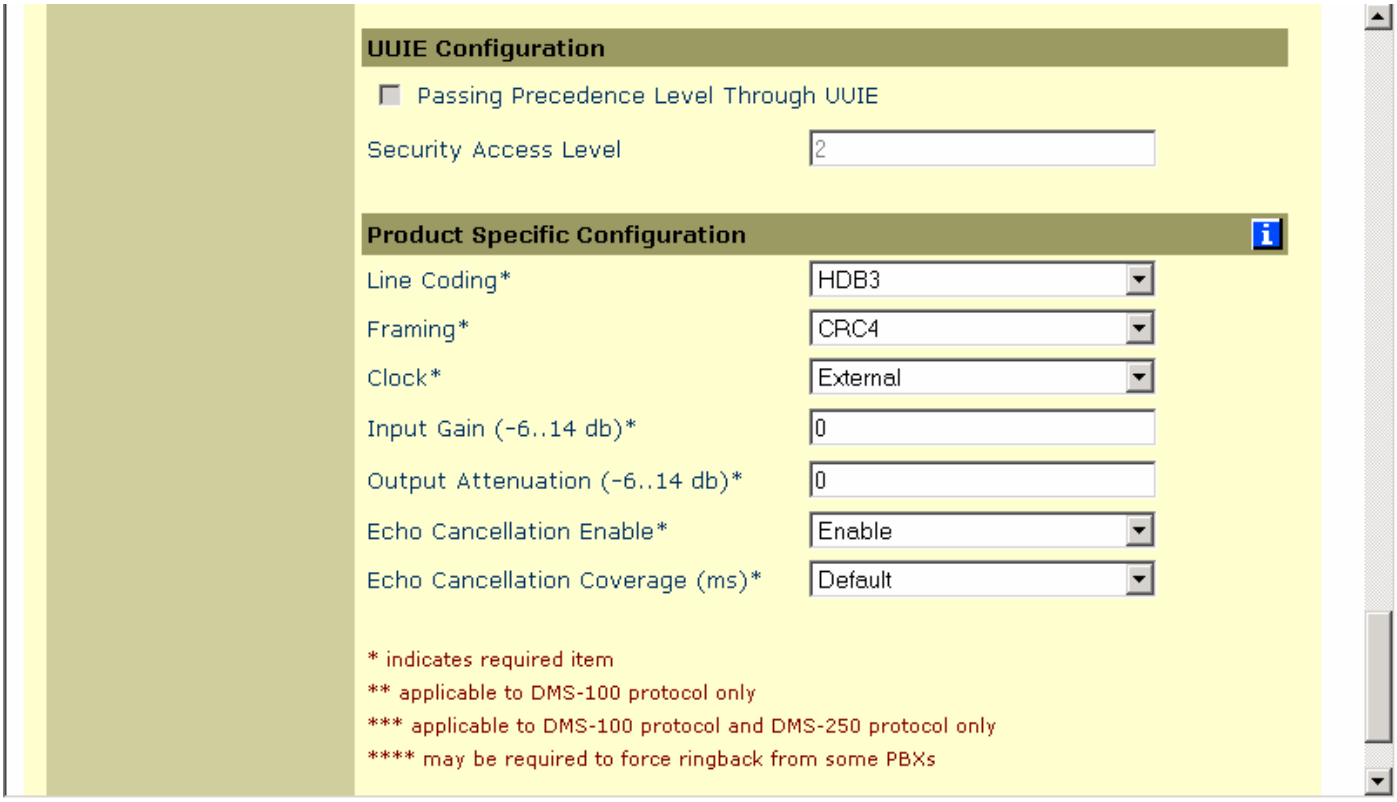


Figure 33. Route Pattern (1 of 4)

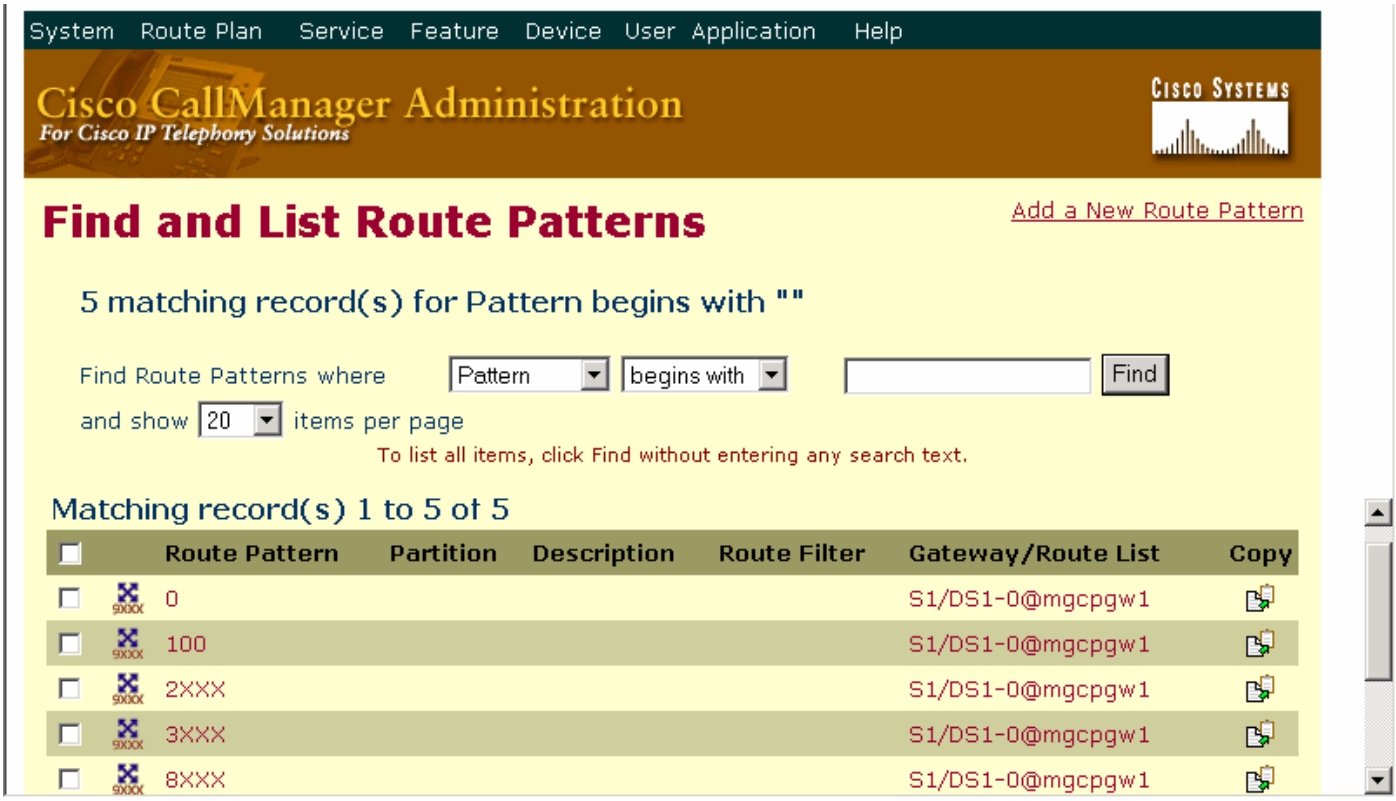


Figure 34. Route Pattern (2 of 4)

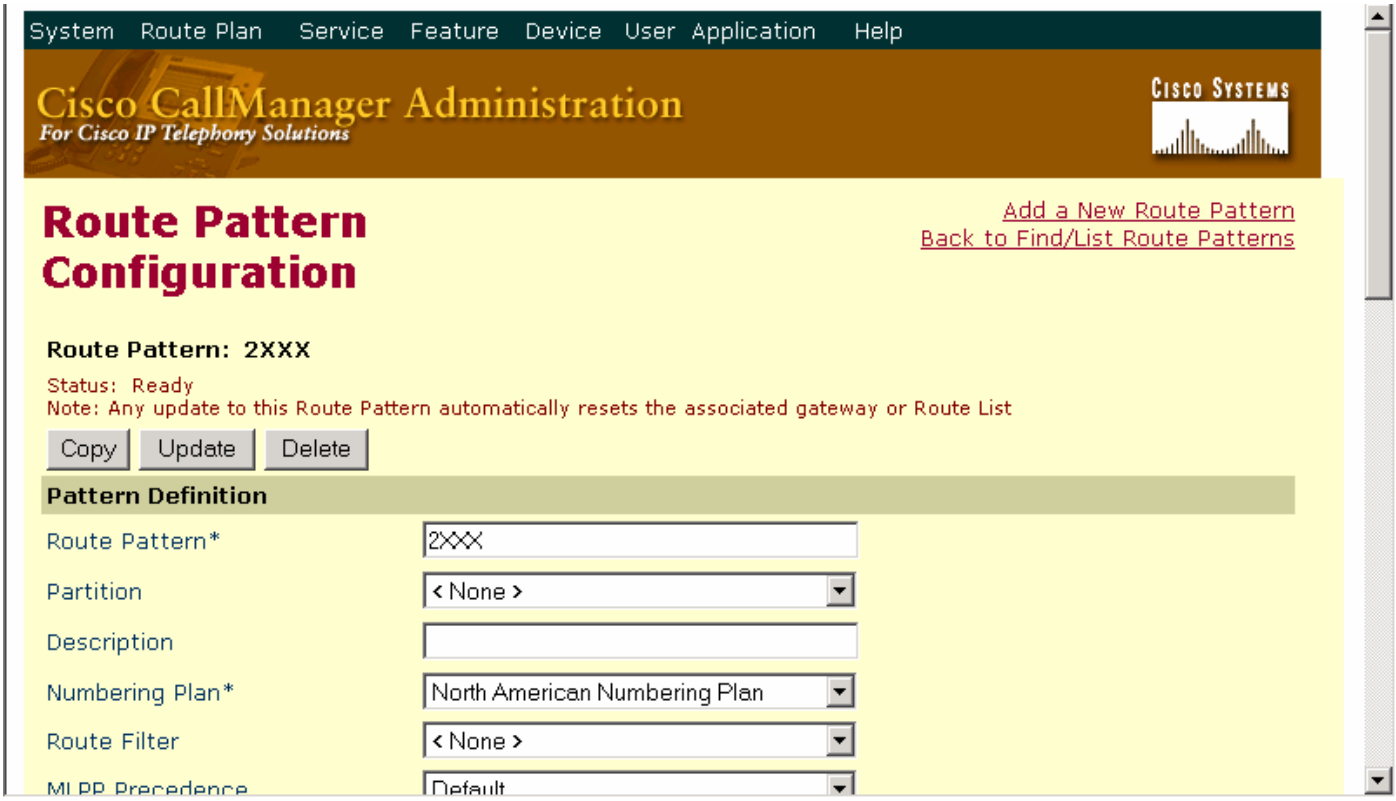


Figure 35. Route Pattern (3 of 4)

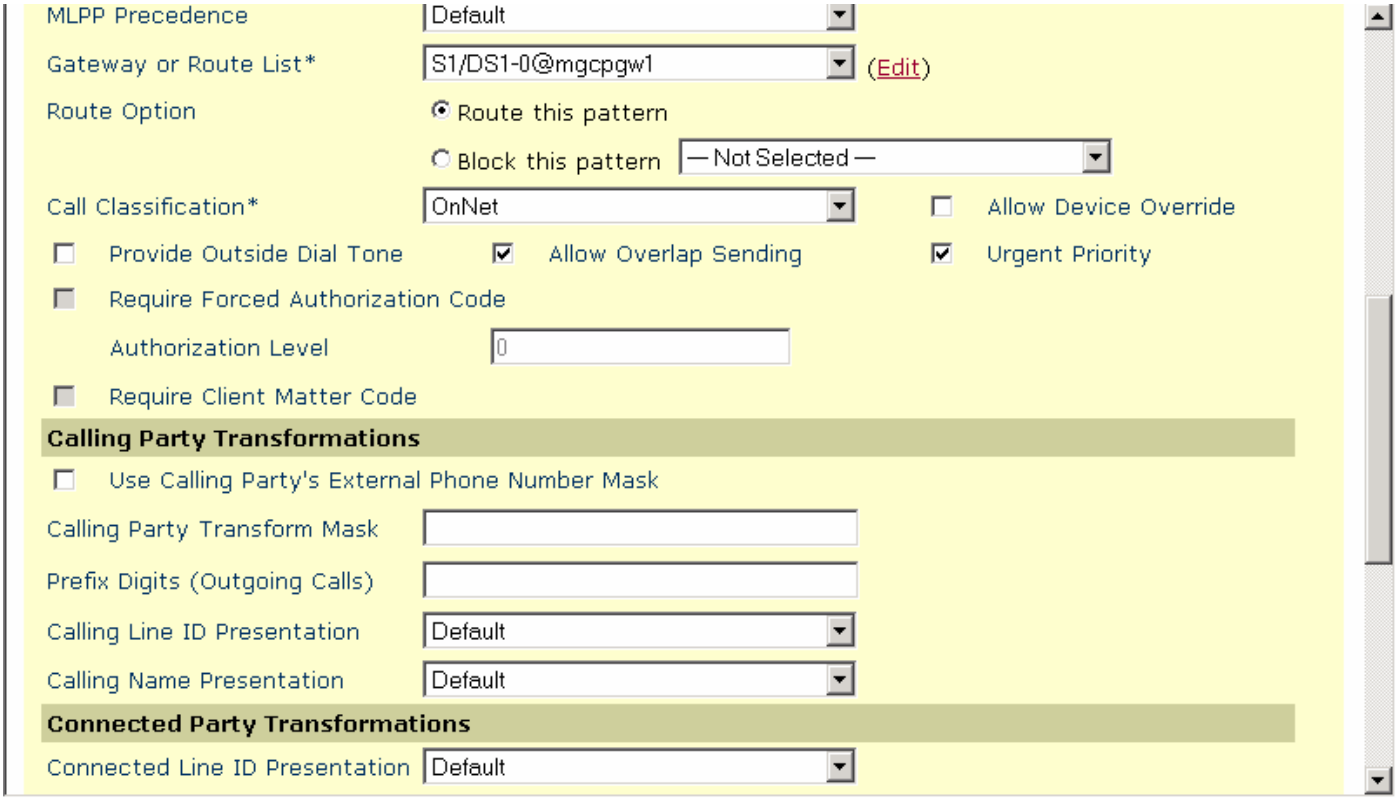


Figure 36. Route Pattern (4 of 4)

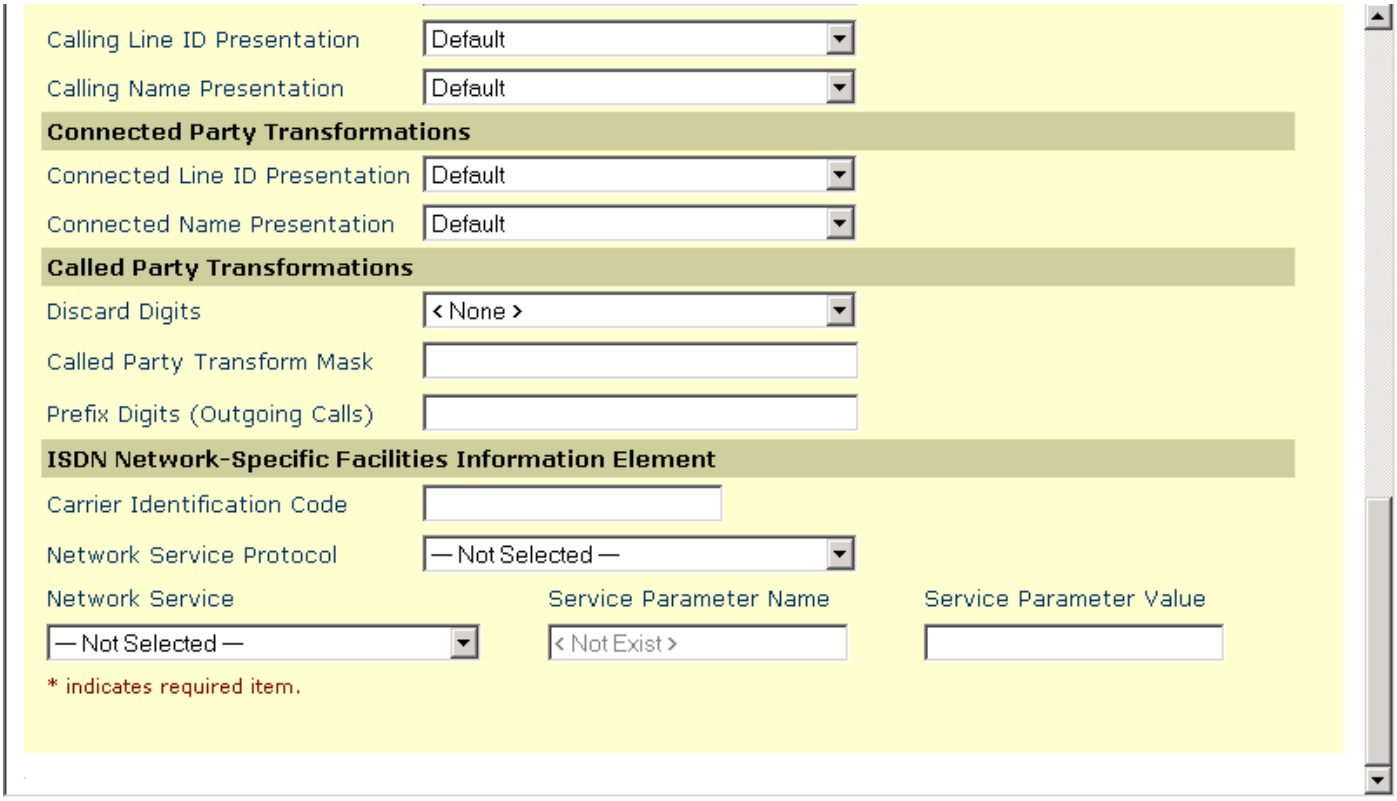


Figure 37. Service Parameters – Call Forwarding

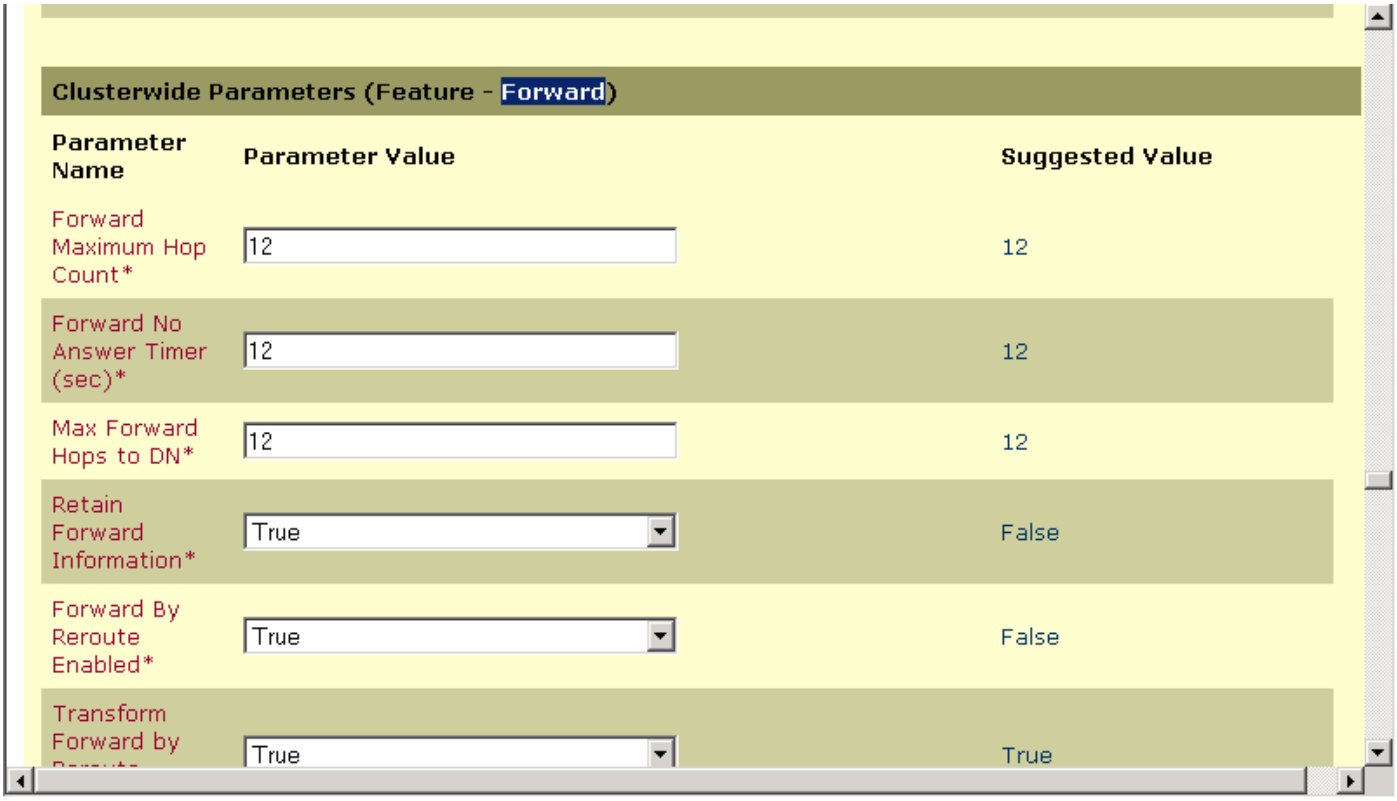


Figure 38. Service Parameters – Path Replacement (1 of 2)

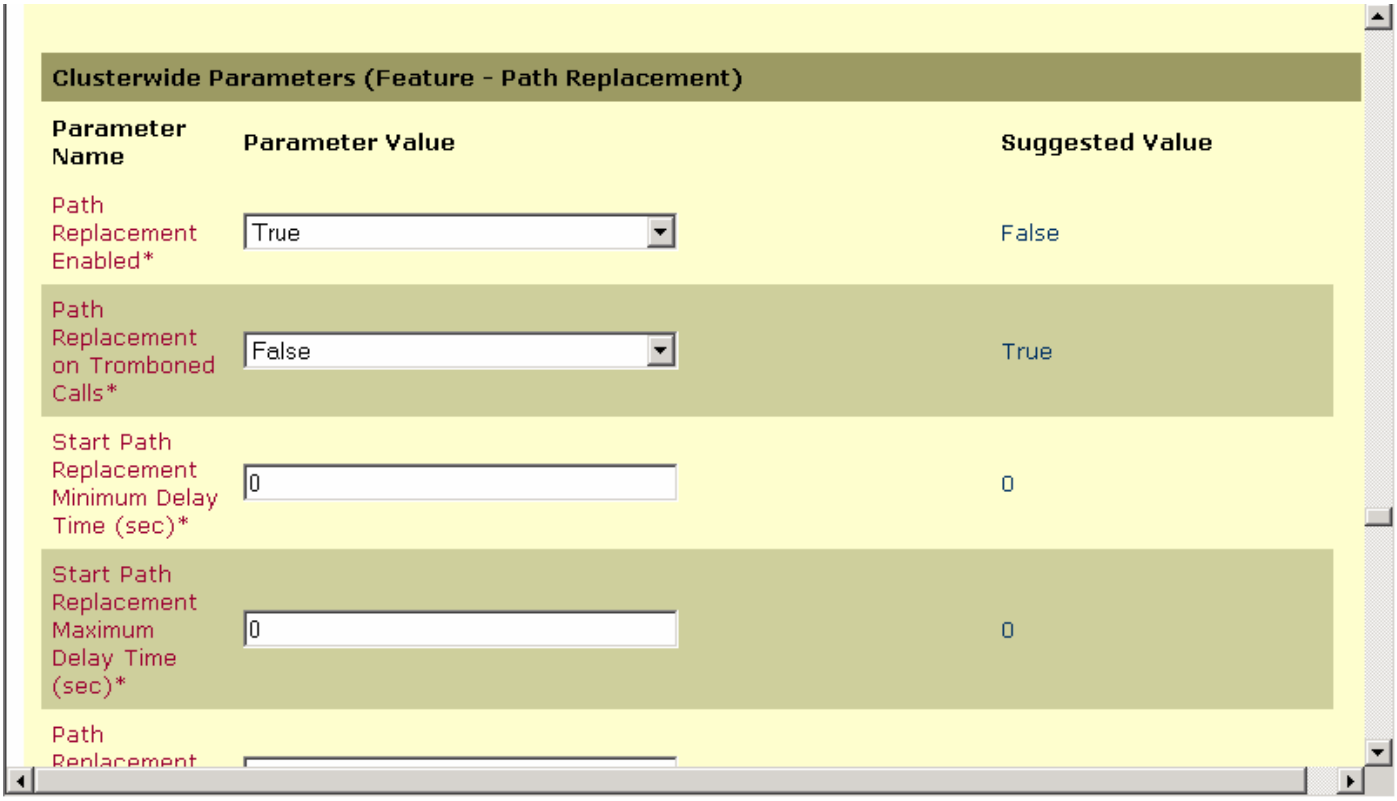


Figure 39. Service Parameters – Path Replacement (2 of 2)

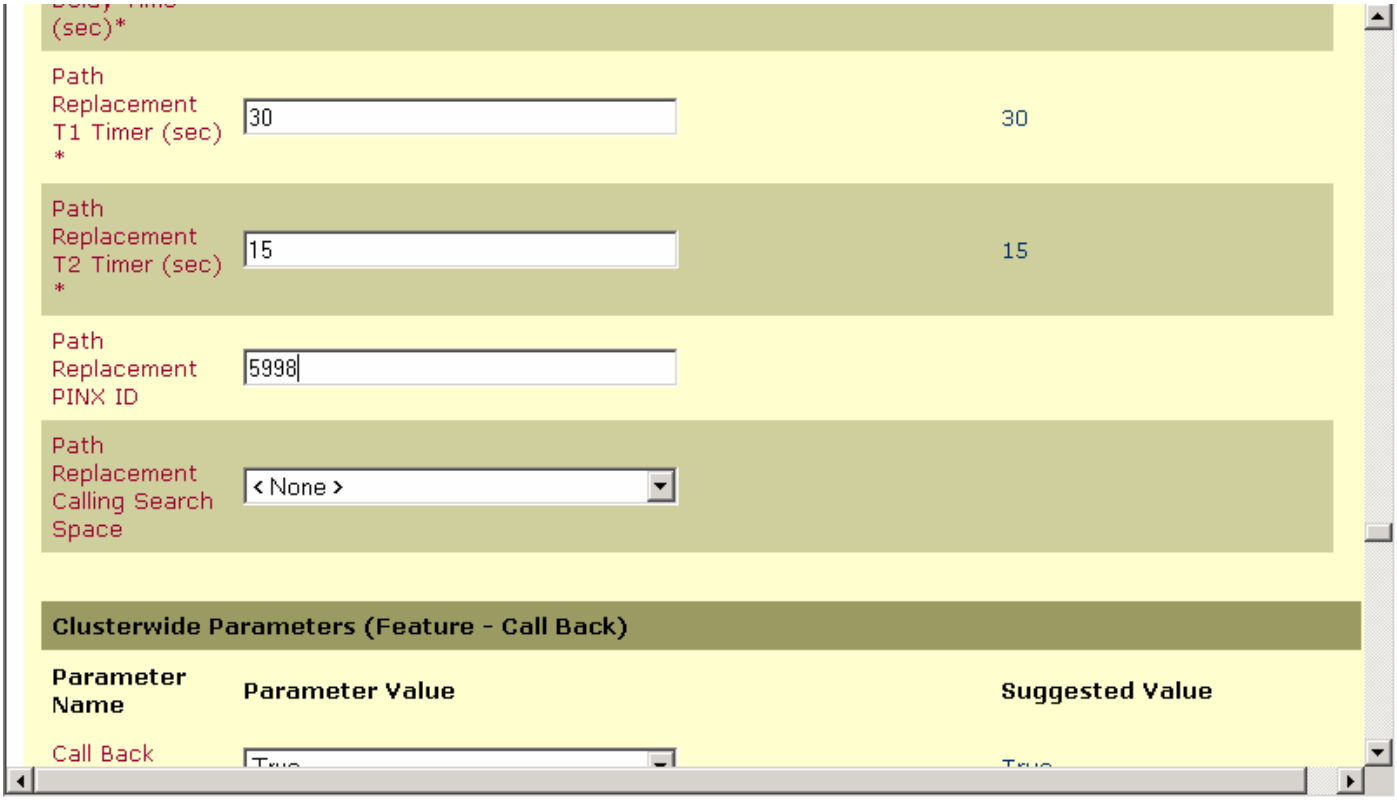
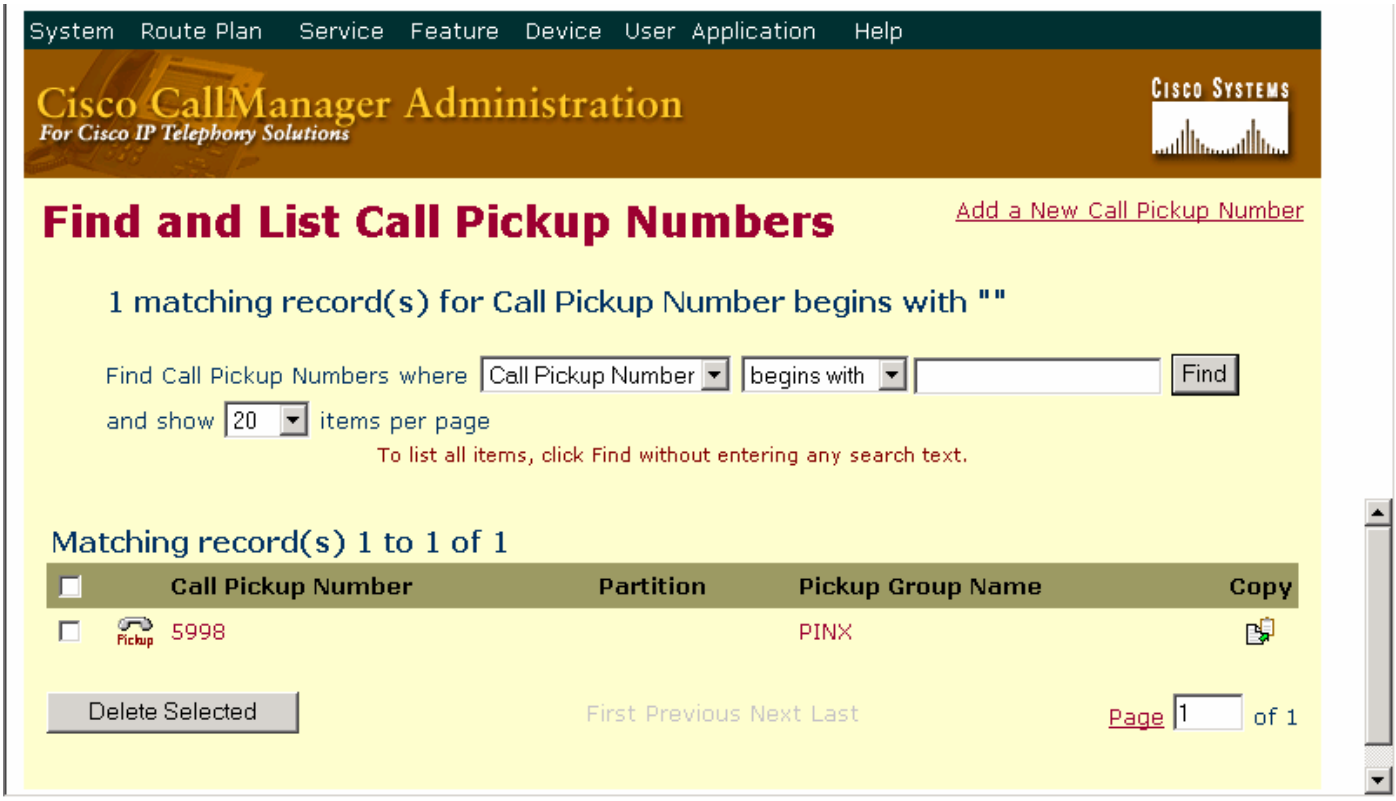


Figure 40. PINX Call Pick-up Group



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 IiQ2000 sends a combination of NSI and Callback message waiting signals encoded for the GPT iSDX. In most cases, this will work without modification.

In cases of existing installations where the PBX MWI settings have been changed, it will be necessary to ascertain the MWI sequence in use, and then mimic these through the advance settings options on the Westell.

First, it will be necessary to determine the MWI strings in use.

For the iSDX, this can be achieved as follows:

> On the MMI terminal, run a DPNSS trace for Virtual messages on the first channel in use for outbound calls from the PBX to the Westell converter
> From the Operator Console, send a MWI On request to one of the IPT numbers; this can be actioned by dialing “##61<IPT Number>”
> Note the DPNSS sequence seen
> From the Operator Console, send a MWI Off request to the same IPT number; this can be actioned by dialing “##60<IPT Number>”
> Note the DPNSS sequence seen

It will then be necessary to modify the MWI NSI settings to mimic those seen. In some cases, the COS/TAC will prevent DPNSS devices from activating MWI on PBX phones – in these cases, appending a valid COS string to the MWI message (*18) may be required. For PBX hosted Voicemail systems, the ports connected to the voicemail platform may be required to be moved to a difference TAC. Please see site documentation for details.

Figure 41. Advanced Options

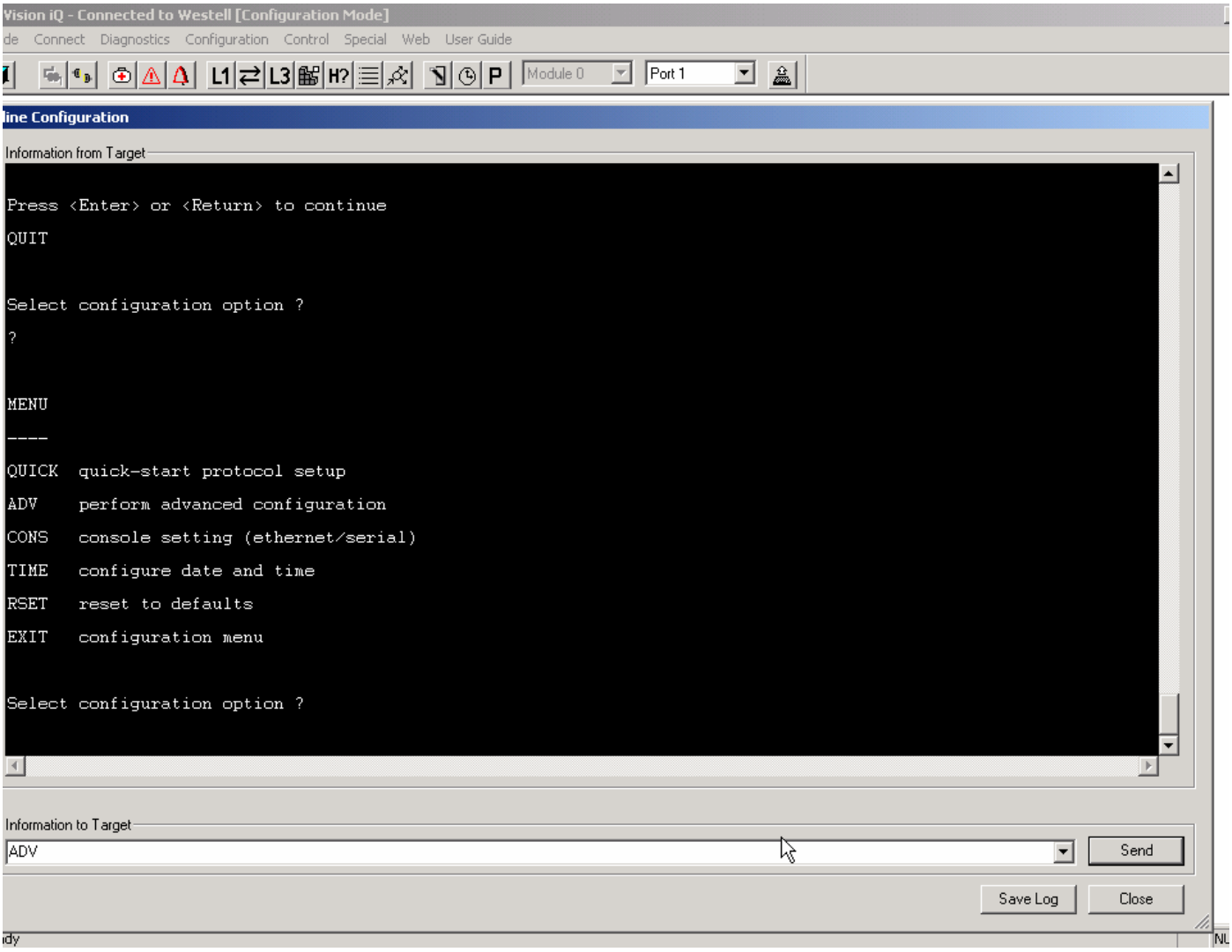


Figure 42. Interworking

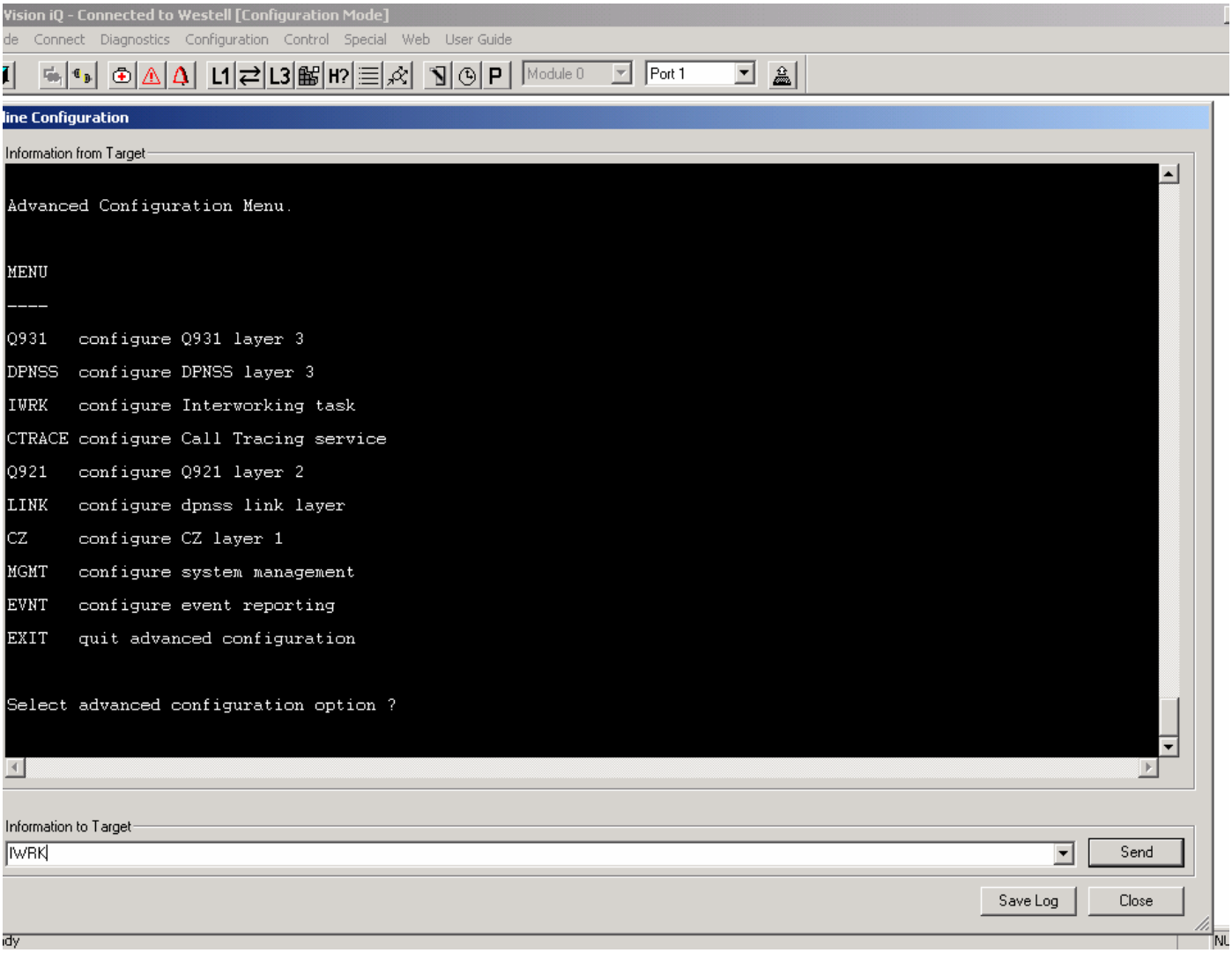


Figure 43. NSI Selection

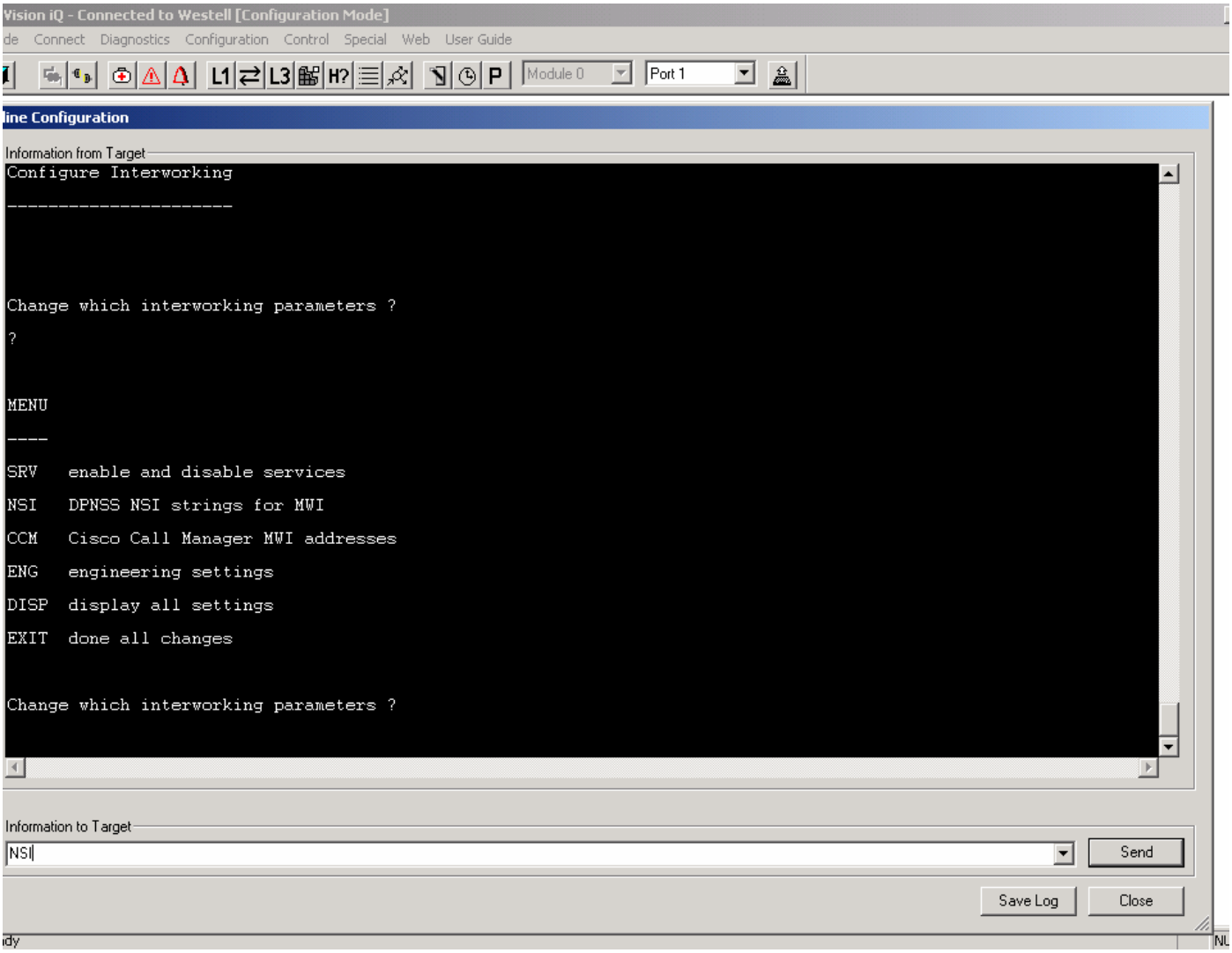


Figure 44. MWI Settings

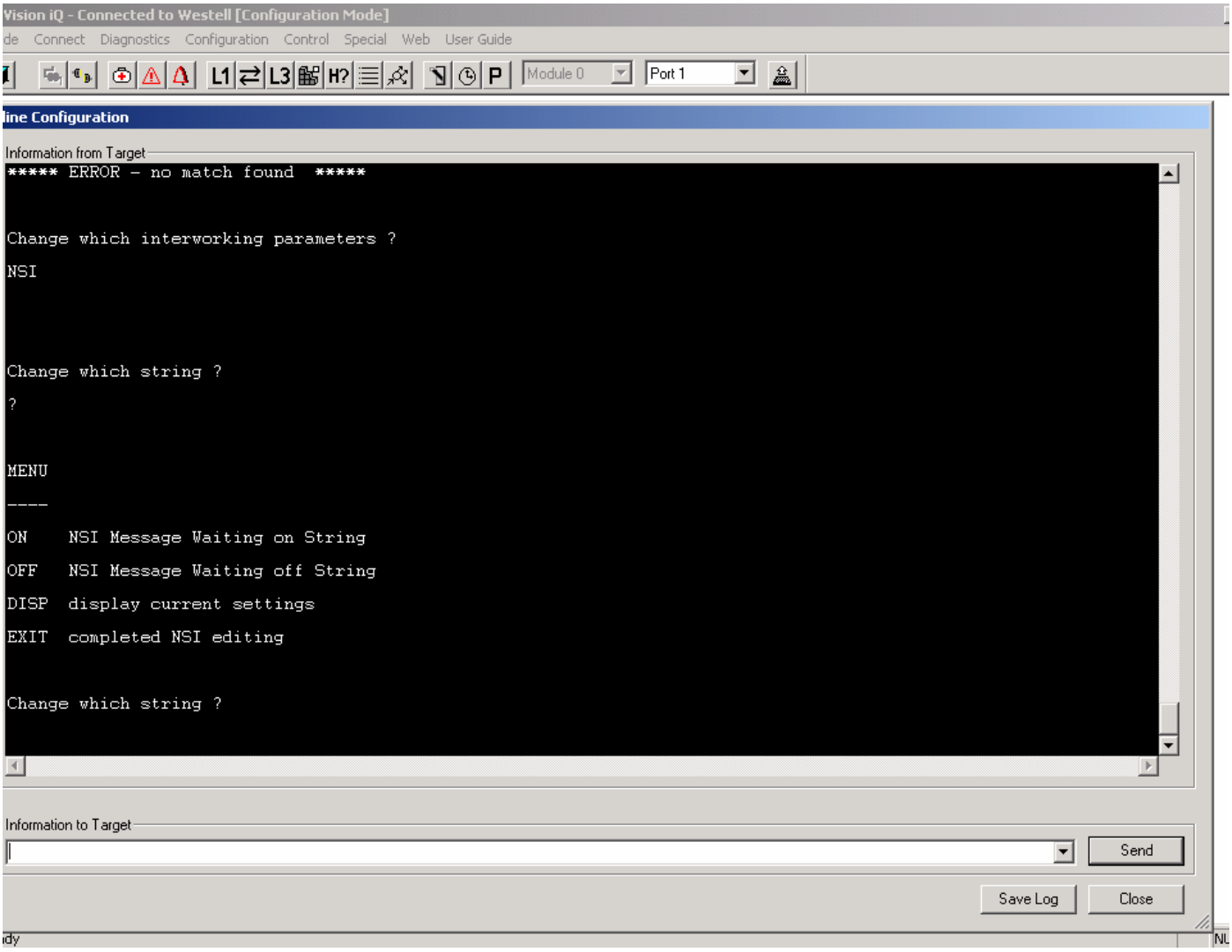
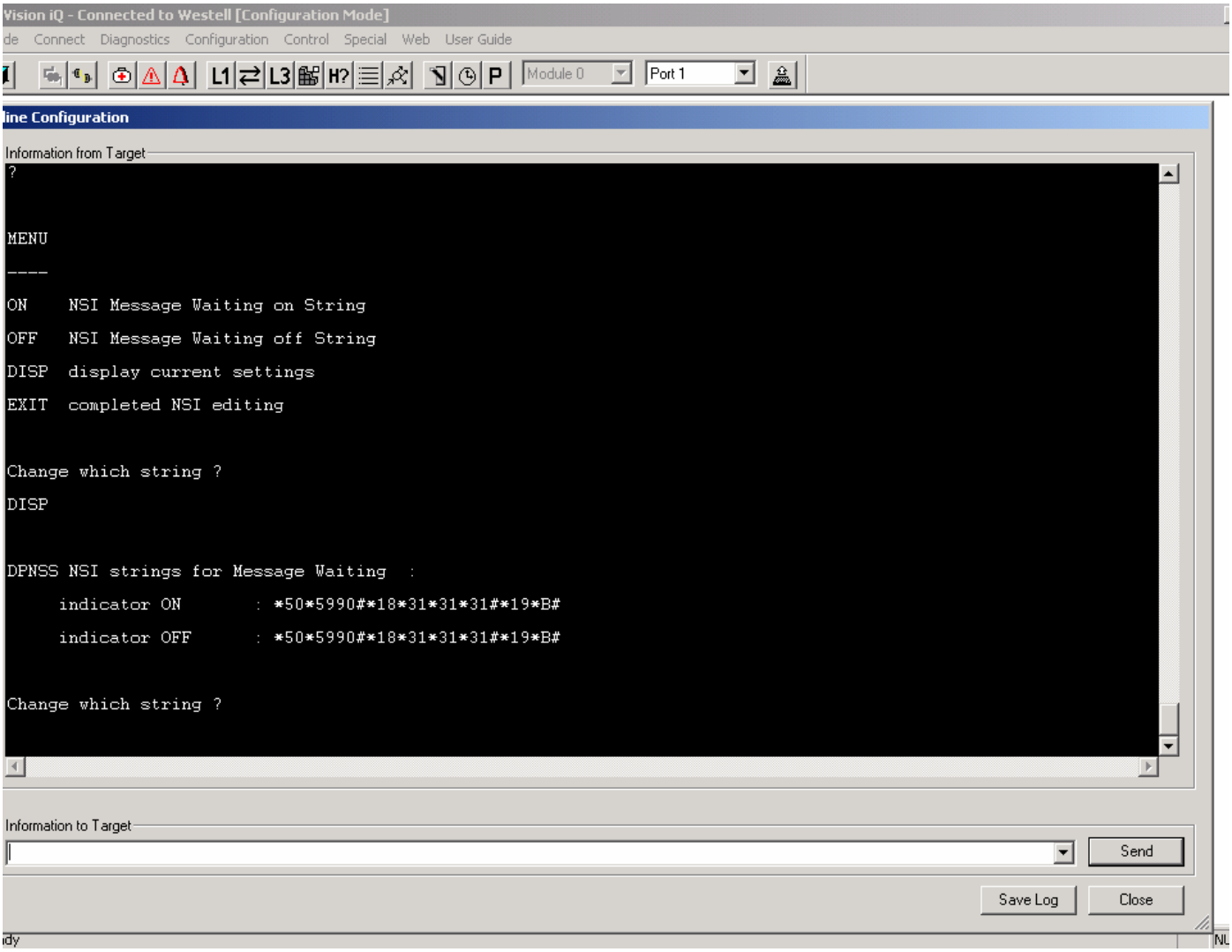


Figure 45. Display of Raw NSI settings for iSDX-S



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 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 iSDX/Realitis, a VT100 style console
COS	Class Of Service – on an iSDX, the ability to activate features on a particular line
TAC	Trunk Access Class – the ability for an extension to use a specific trunk

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