Application Notes

IDT / Net2phone SIP Trunking Configuration Guide for Cisco Business Edition 3000 (BE3000) Release 8.6.4 with Cisco Unified Border Element Release 8.8.

May 31, 2013 – Eric Cimino – IDT Corporation

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1. Introduction

These Application Notes describe the procedures for configuring Session Initiation Protocol (SIP) Trunking between service provider IDT / Net2phone and Cisco Business Edition 3000 IP-PBX.

IDT / Net2Phone SIP Trunking Service (IDT) referenced within these Application Notes is designed for business customers. The service enables PSTN calling via a broadband WAN connection using SIP protocol. This converged network solution is a cost effective alternative to traditional PSTN trunks such as analog and/or ISDN-PRI.

2. SIP Trunking Network Components

The network for the SIP Trunk reference configuration is illustrated below.

Network Topology

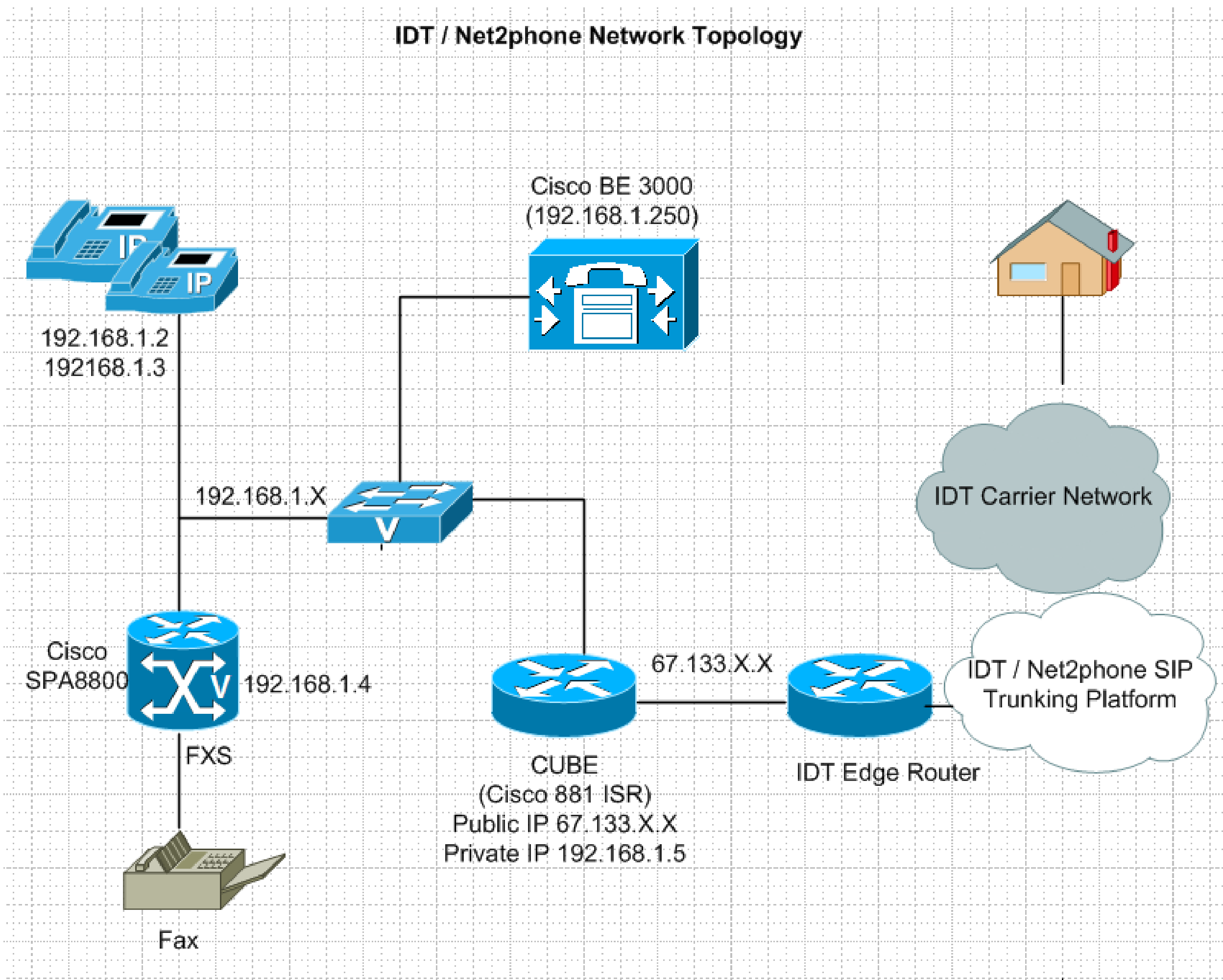


Figure 1. Basic Call Setup

Note: The Cisco Unified Border Element depicted in Figure 1 is not an IDT managed device. It is recommended that the group responsible for the administration, management and configuration of the Cisco Unified Communications Manager also manage and configure the Cisco Unified Border Element.

2.1 Hardware Components

- Cisco Business Edition 3000
- Cisco 881 Series Integrated Services Access Device
- Cisco SG300-28 switch with PoE.
- Cisco SPA8800 IP Telephony Gateway (FXS ports required for Faxing)
- Cisco IP phones (CP-3905 phones were used during testing).
- Analog fax machine

2.2 Software Requirements

- Cisco Business Edition 3000 software version 8.6.4.100000-15
- Cisco IOS version 15.1(4)M4. This configuration was validated using software version :c880voice-universalk9-mz.151-4.M4.bin.
- The documented CISCO CUBE configuration can be supported with the following IOS feature sets: UNIVERSAL
- SPA8800 software version 6.1.9

3. Features

3.1 SIP Registration Method

To establish the SIP Trunk, IDT requires a SIP REGISTER with digest authentication. IDT provides the customer with the username and password which needs to be configured on the Cisco CUBE. Please refer to the CUBE configuration at the end of this guide.

IDT also implements Digest Authentication for outgoing calls. This call authentication scheme as specified in SIP RFC 3261 provides security and integrity protection for SIP signaling.

Features Supported

- Basic call using G.729 /G.711 codec
- Calling Party Number Presentation
- Anonymous call
- Intra-Site Call Transfer
- Intra-Site Call Conference
- Call Hold and Resume
- Call Forward All, Busy and No Answer
- Call Waiting
- Call Park
- Hunt groups (Simultaneous and Sequential Ring)
- DTMF (RFC2833)
- Fax using G.711 pass-through
- Incoming DNIS translation and Routing.
- Outbound calls via IDT's IP and TDM networks.
- CPE voicemail managed service, leave and retrieve voice messages via incoming IDT SIP Trunk (voicemail on BE3000)
- Auto-attendant transfer-to-service on BE3000.
- PBX-Defined Caller ID (spoofing)

4. Caveats and Limitations

- SPA8800 does not support T.38 fax on SG3.
- Cisco IPPBX to Cisco IPPBX was not tested.

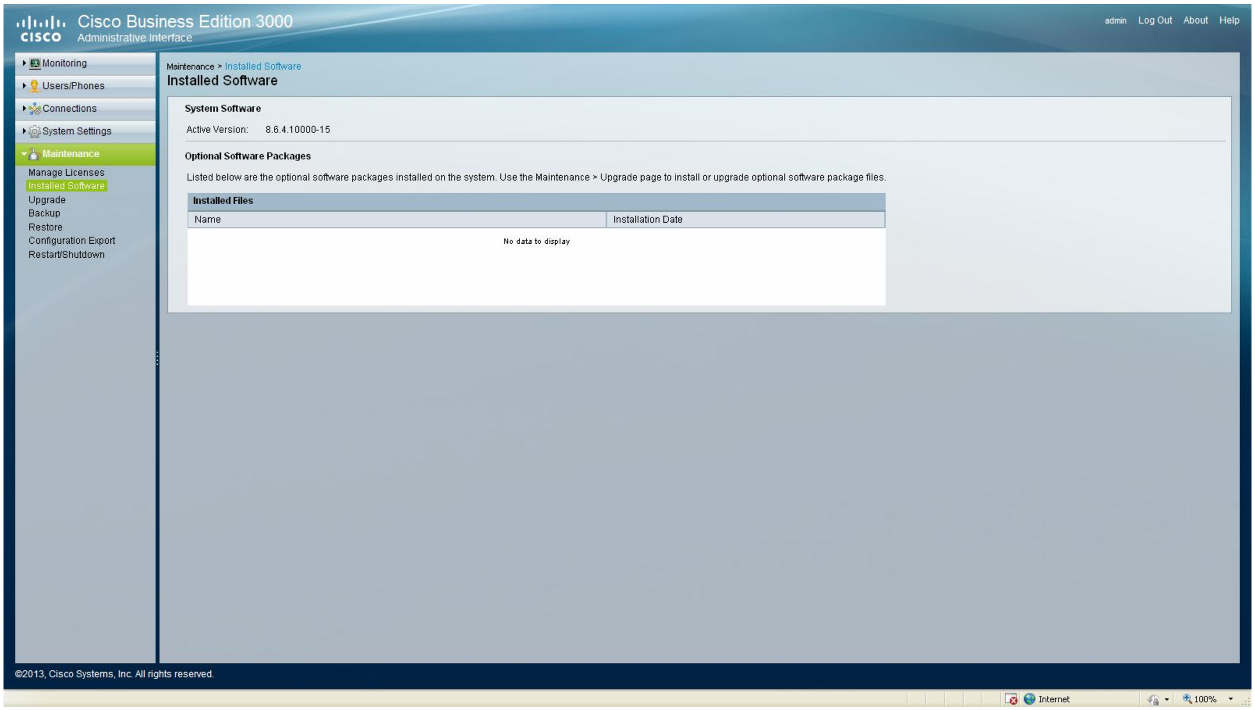
4.1 Configuration considerations

- For outbound calls, IDT recommends that customers set G.729 codec as the preferred code and G.711 as the secondary codec .
- When setting up faxing using G.711 pass-through, outbound calls should be prefixed by a dedicated outside dial access code (in this document digit "8" was used) matching a separate outbound dial-peer configured to "strip" the outside dial access code and use G.711 as the only available codec. Similarly, inbound calls to fax endpoints must match a dial-peer based on the called number, configured to only provide G.711 as the only codec to the Cisco BE3000.

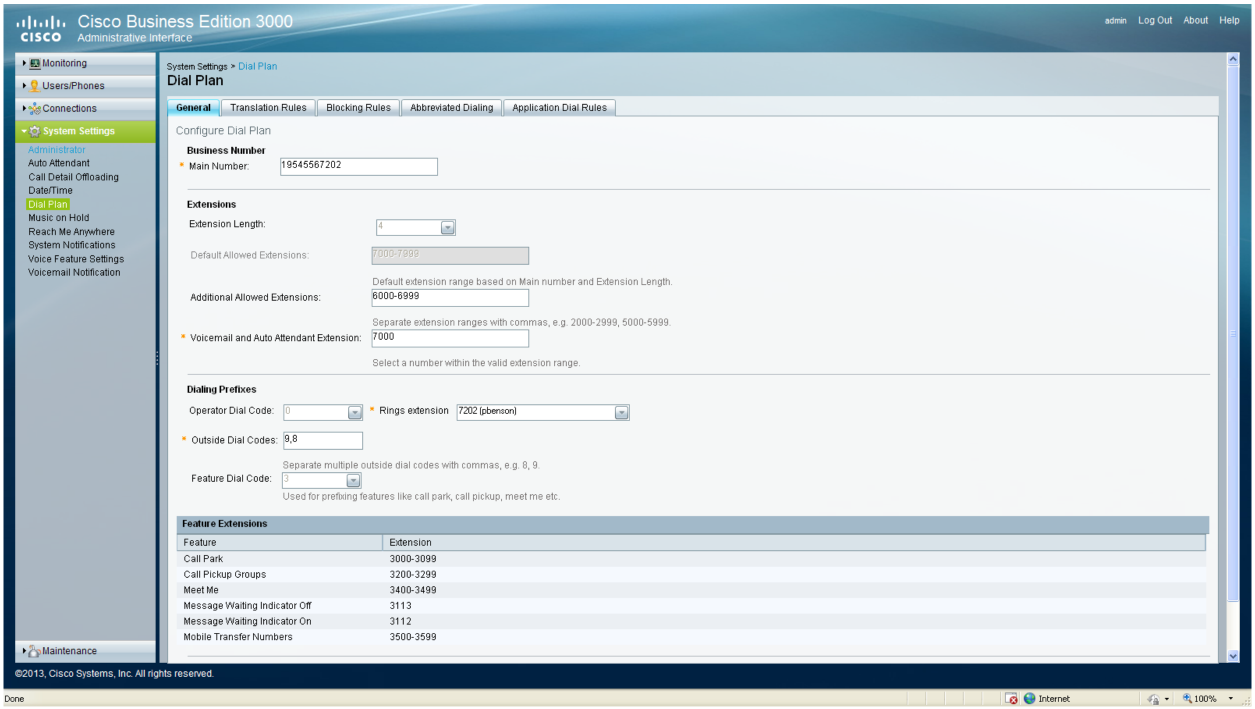
5. Configuration

5.1 Configuring the Business Edition 3000 (Cisco BE3000)

Cisco BE3000 Software version

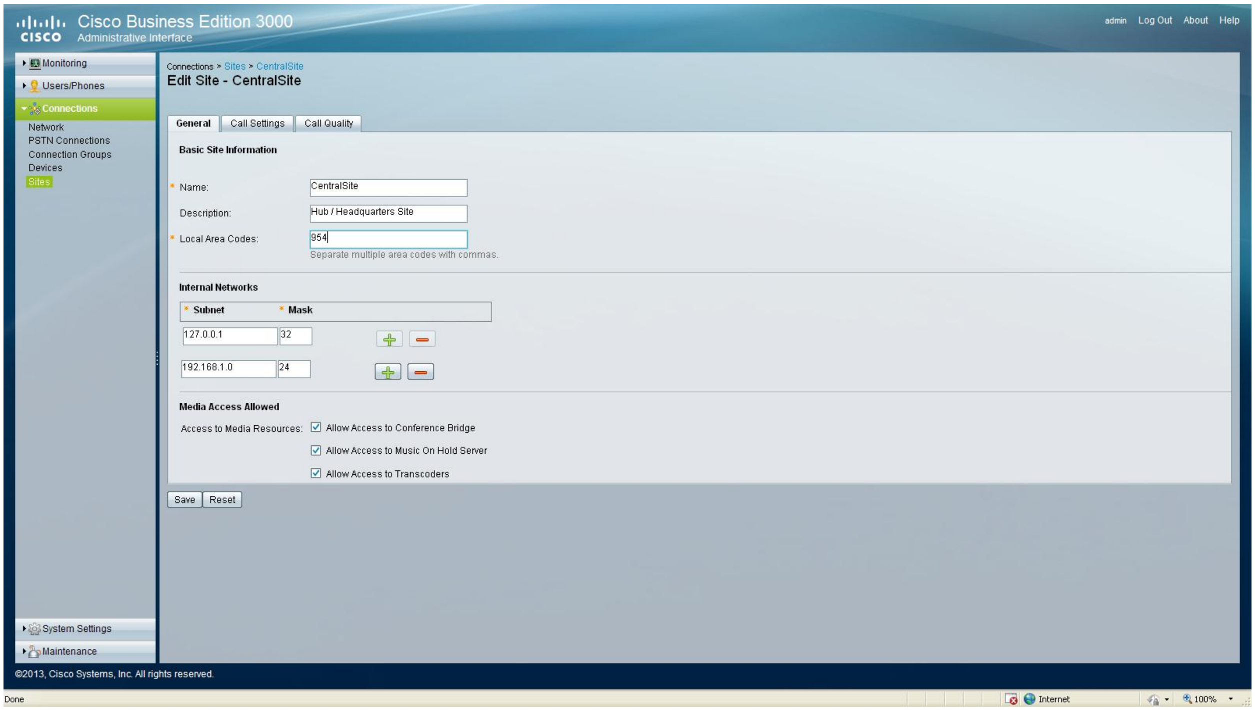


5.2 Configuring Cisco BE3000 Dial Plan

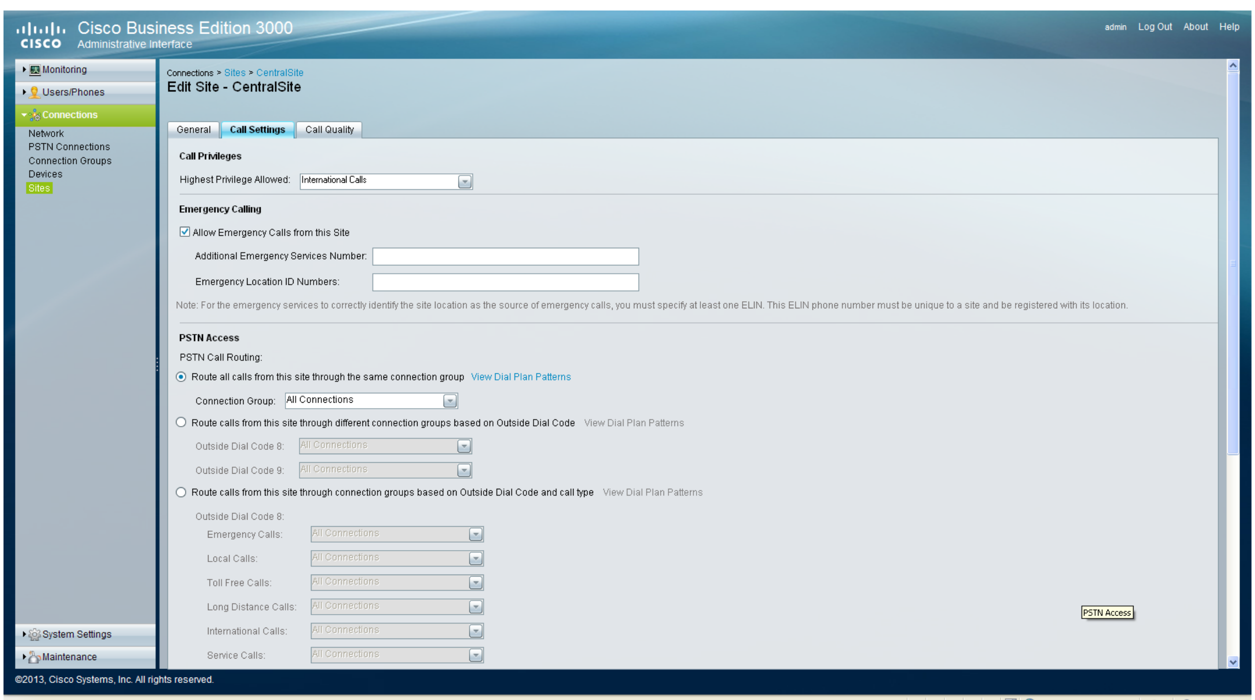


Note: In this configuration, the customer's main telephone number is defined. Also please note that 2 outside dial codes are configured: normal outbound calls (G.729 codec) will be placed dialing "9" as the outside dial access code. When dialing the "8" as the outside access code for faxing, the codec used on the calls will be G.711 based on a specific dial-peer setup on the Cisco CUBE.

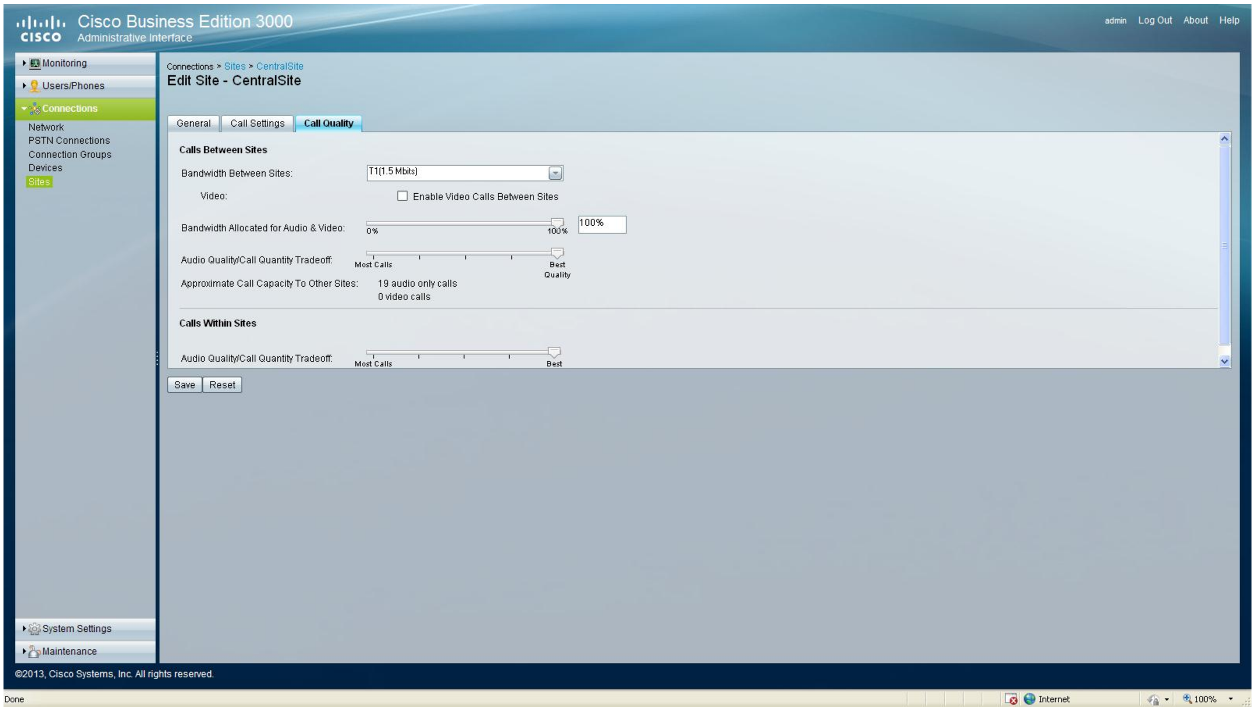
5.3 Configuring Cisco BE-3000 Hub/Central Site



Note: Using the General Settings tab, you can define the Local Area Codes as well as the internal network subnets.

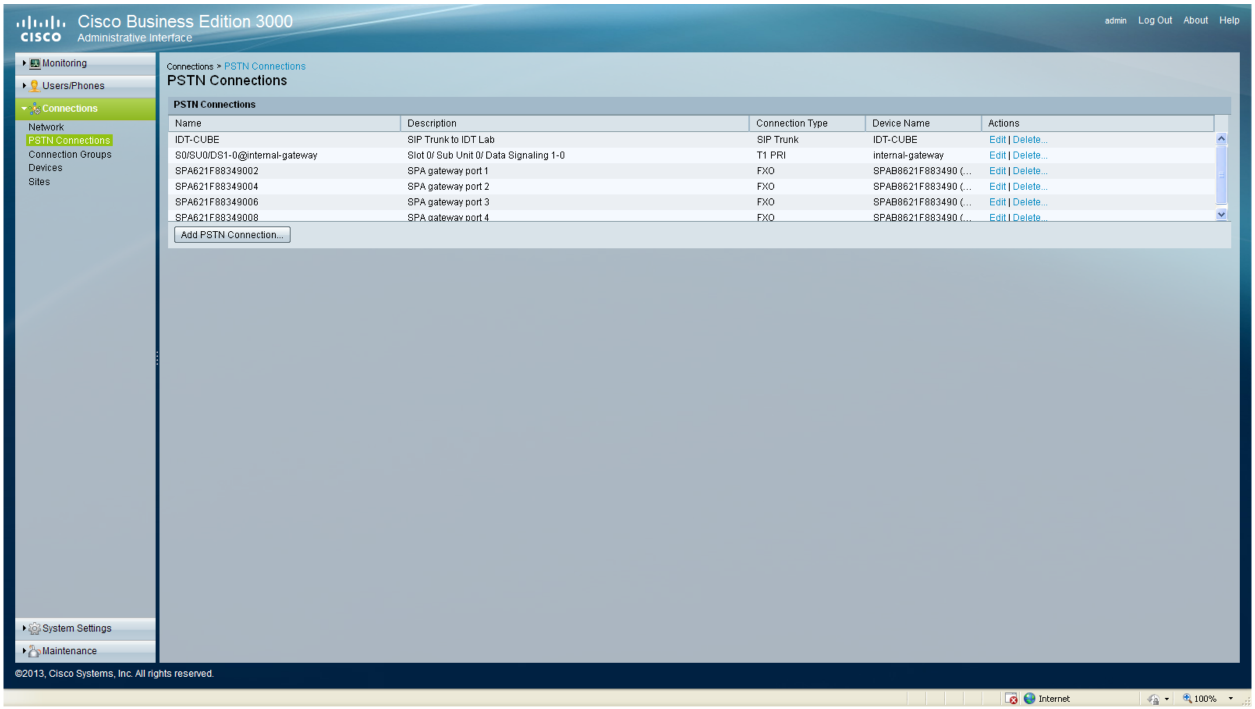


Note: Using the Call Settings tab, you have to define the trunks used for PSTN access.

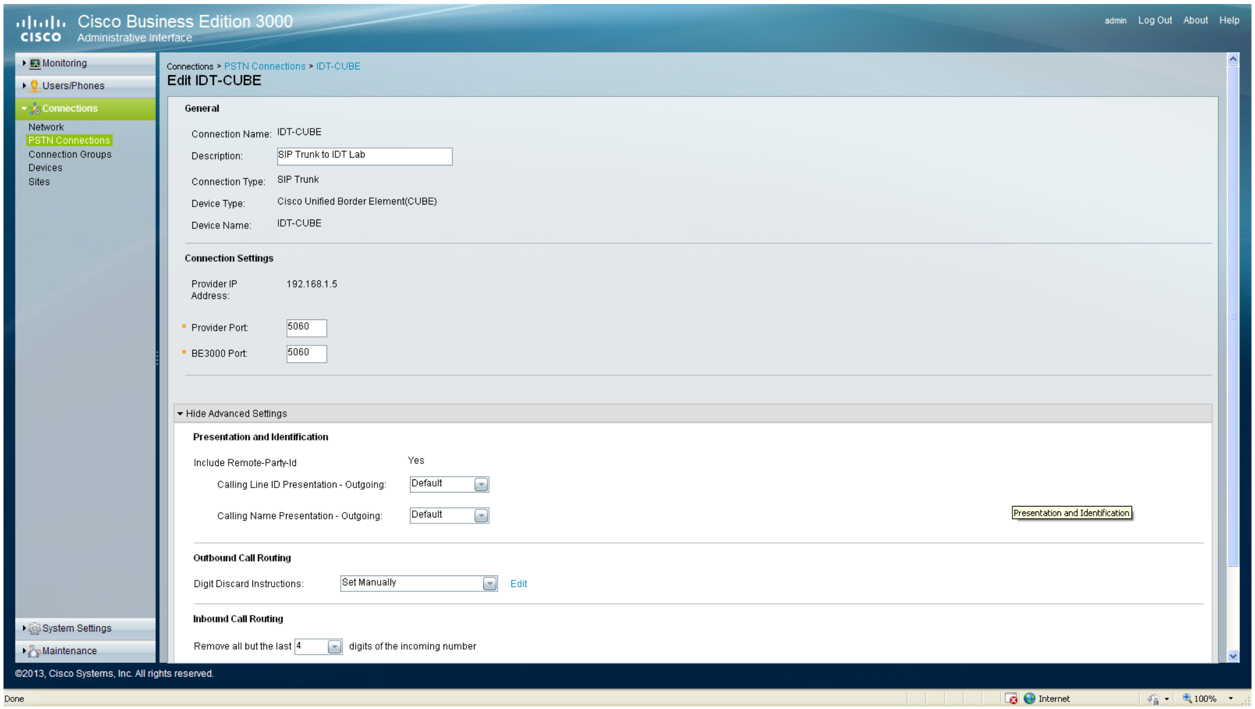


Note: Using the Call Quality tab, you can configure the BE3000 to support both G.729 and G.711 calls. This is done by setting the Audio Quality / Tradeoff to Best Quality.

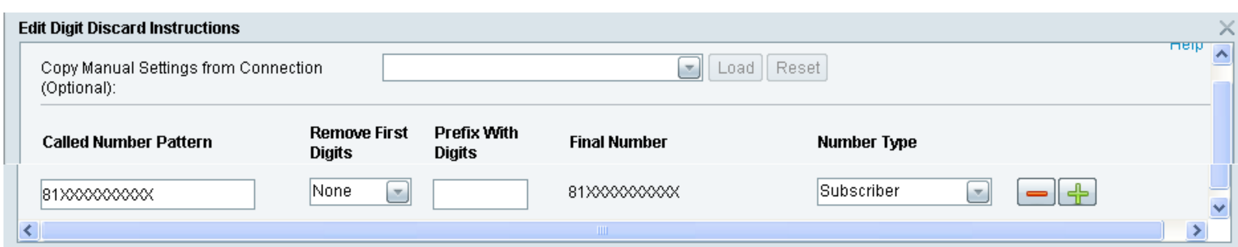
5.4 Configure Cisco BE3000 PSTN Connections



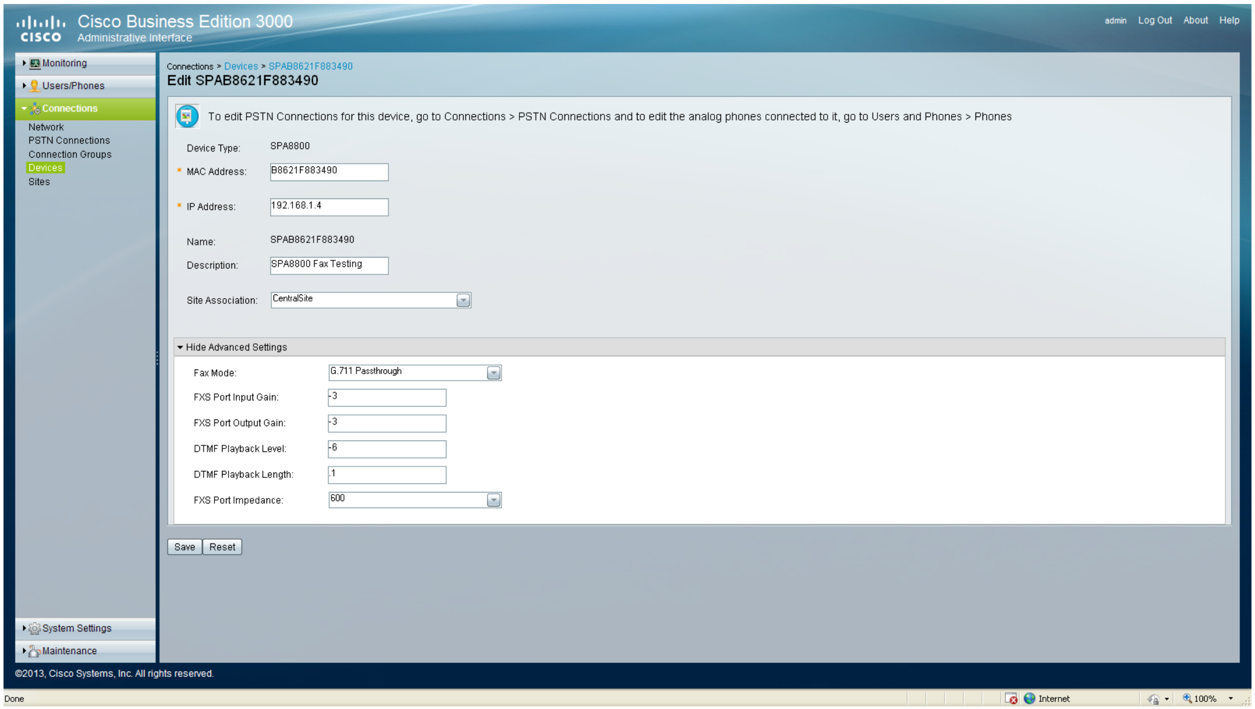
5.5 Configuring SIP Trunk to IDT / Net2phone (via CUBE)



Note: Outbound Call Routing: In order to allow the Cisco BE3000 to pass the "8" outside dial access code to CUBE, you will need to choose the "Set Manually" option and then add/edit the Call Number Pattern – see example below.

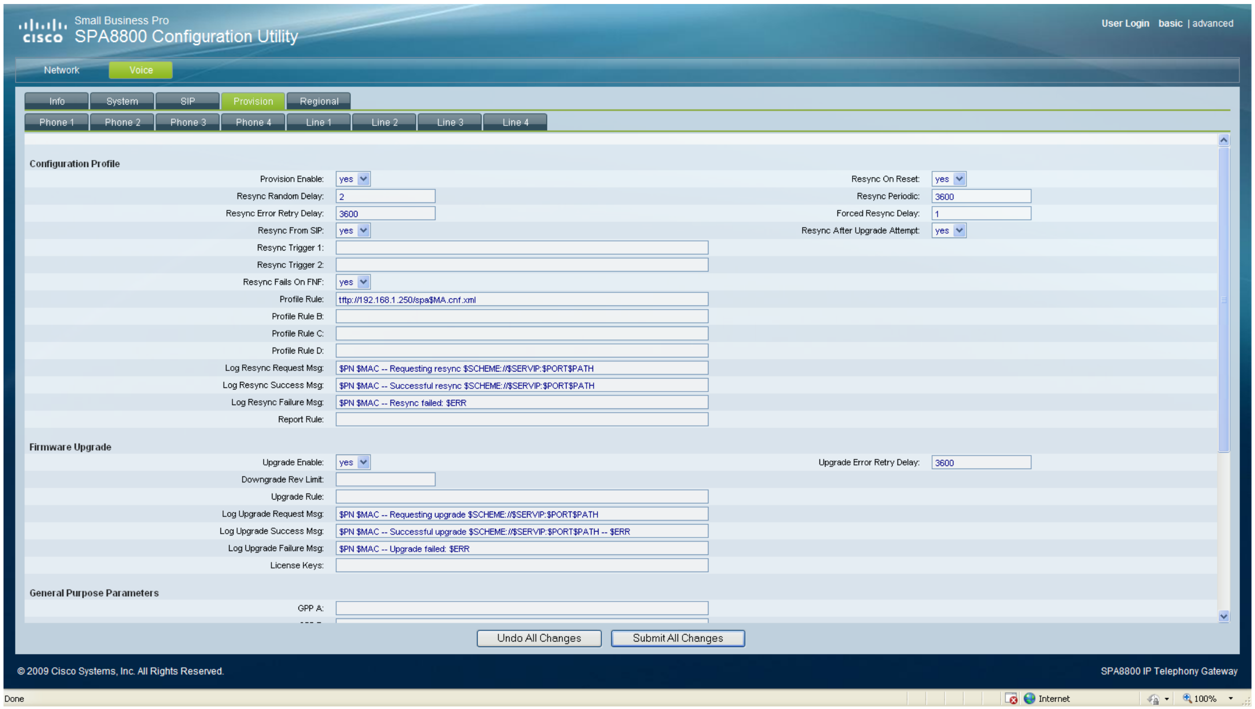


5.6 Configuring Cisco BE3000 Devices (SPA88000 IP telephony gateway)



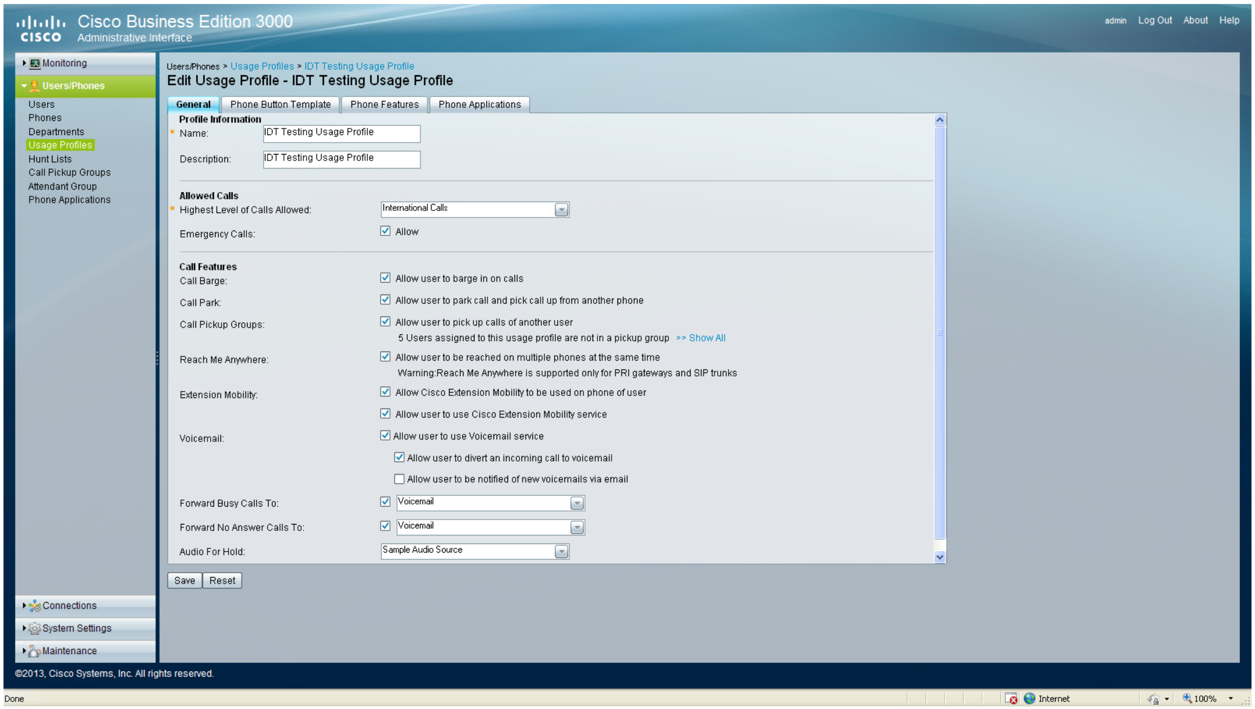
Note: When configuring the SPA8800 to support fax equipment, ensure that the Fax Mode is set to G.711 Pass-through as it is the most reliable fax relay method offered by the SPA8800 gateway.

5.7 Configuring SPA8800 Advanced Voice Settings



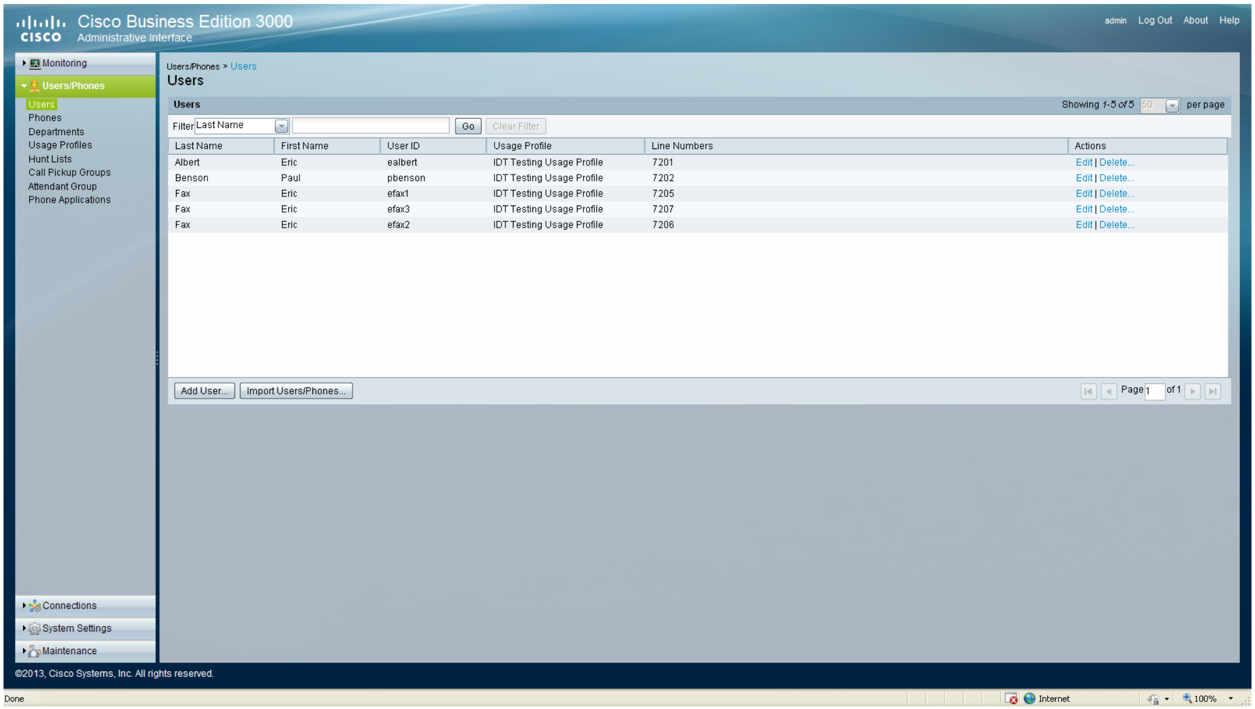
Note: During the first time installation of the SPA8800, configure the Profile Rule as **"tftp://BE3000 IP address/spa$MA.cnf.xml"**. In the above example, the IP address assigned to the BE3000 is 192.168.1.250.

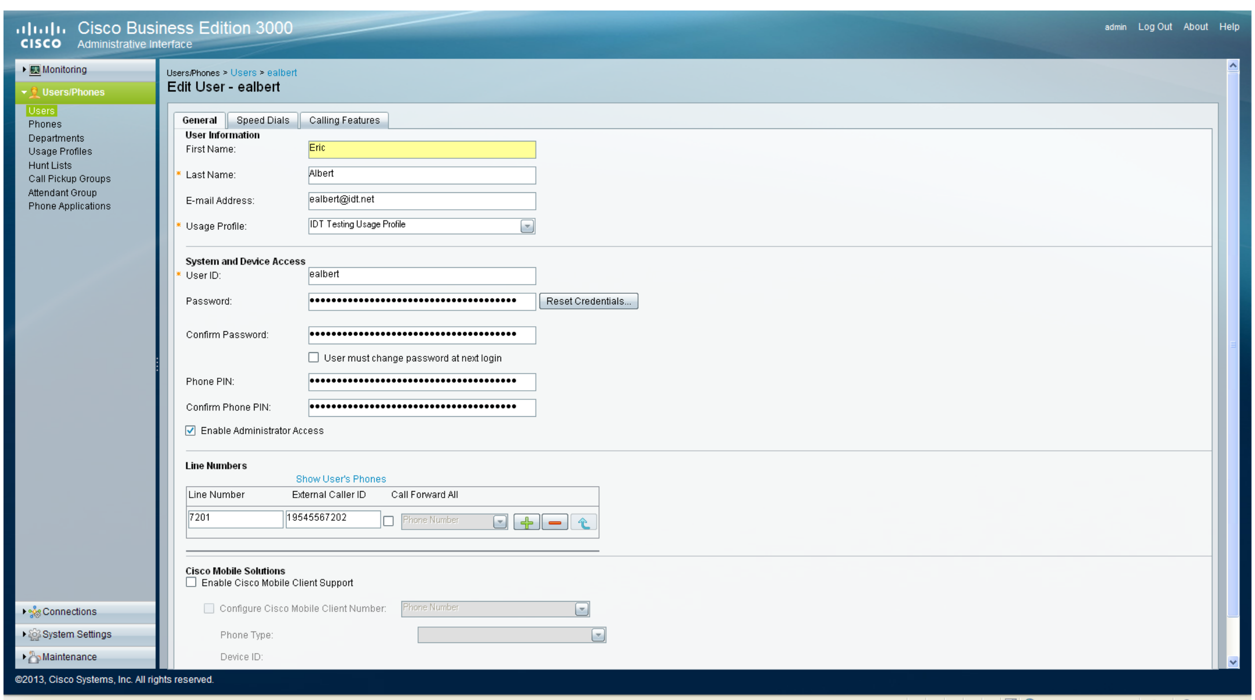
5.8 Configuring Cisco BE30000 Usage Profile



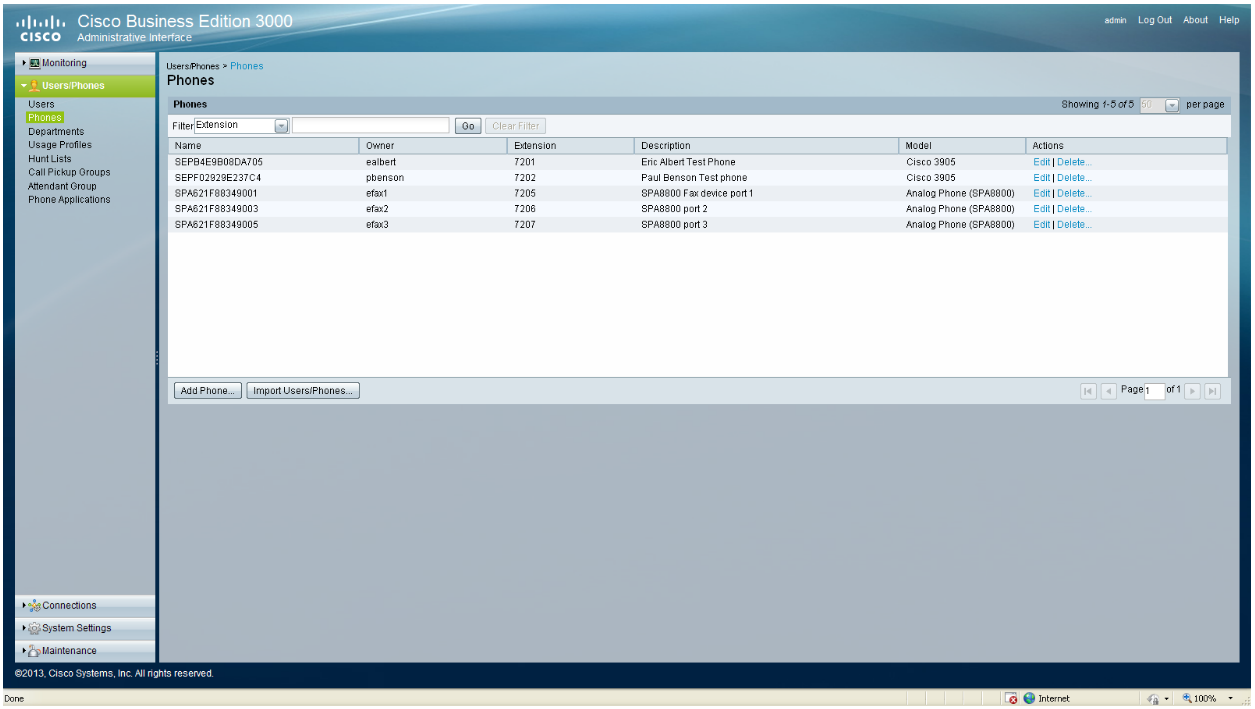
Note: On the Usage Profile page, you can set the highest level of calls allowed to be assigned to users. You can also setup forwarding of busy / no answer calls.

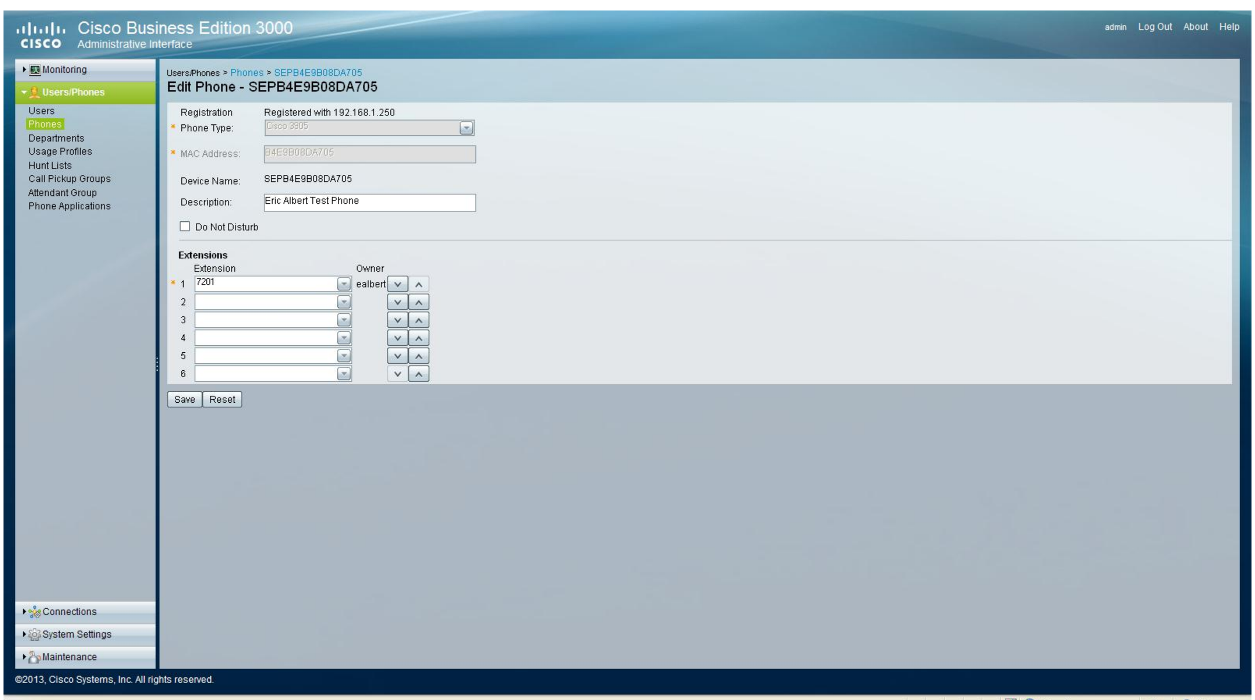
5.9 Configuring Cisco BE3000 Users





5.10 Configuring Cisco BE3000 Phones





5.11 Configuring CISCO CUBE

Show version

vpocube#sh version
Cisco IOS Software, C880 Software (C880VOICE-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Wed 21-Mar-12 01:24 by prod_rel_team

ROM: System Bootstrap, Version 12.4(22r)YB5, RELEASE SOFTWARE (fc1)

vpocube uptime is 3 weeks, 1 day, 23 hours, 36 minutes
System returned to ROM by reload at 17:44:06 UTC Tue May 7 2013
System restarted at 17:44:51 UTC Tue May 7 2013
System image file is "flash:c880voice-universalk9-mz.151-4.M4.bin"
Last reload type: Normal Reload
Last reload reason: Reload Command

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco 881 (MPC8300) processor (revision 1.0) with 498688K/25600K bytes of memory.
Processor board ID FTX1707811A

5 FastEthernet interfaces
1 Virtual Private Network (VPN) Module
256K bytes of non-volatile configuration memory.
125440K bytes of ATA CompactFlash (Read/Write)

License Info:

License UDI:

```
-------------------------------------------------
Device#   PID                SN
-------------------------------------------------
*0        C881-CUBE-K9       FTX1707811A



License Information for 'c880-iad'
    License Level: advipservices   Type: Permanent
    Next reboot license Level: advipservices


Configuration register is 0x2102

vpocube#
```

Show running-configuation

```
vpocube#sh run
Building configuration...

Current configuration : 9149 bytes
!
! Last configuration change at 19:34:37 UTC Tue May 14 2013 by vpo
! NVRAM config last updated at 15:48:33 UTC Wed May 15 2013 by vpo
! NVRAM config last updated at 15:48:33 UTC Wed May 15 2013 by vpo
version 15.1
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname vpocube
!
boot-start-marker
boot-end-marker
!
!
logging buffered 51200 warnings
!
```

```
no aaa new-model
!
crypto pki token default removal timeout 0
!
crypto pki trustpoint TP-self-signed-1254493017
 enrollment selfsigned
 subject-name cn=IOS-Self-Signed-Certificate-1254493017
 revocation-check none
 rsakeypair TP-self-signed-1254493017
!
!
crypto pki certificate chain TP-self-signed-1254493017
 certificate self-signed 01
```

```
  3082022B 30820194 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
  31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274
  69666963 6174652D 31323534 34393330 3137301E 170D3133 30333034 31363035
  35335A17 0D323030 31303130 30303030 305A3031 312F302D 06035504 03132649
  4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D31 32353434
  39333031 3730819F 300D0609 2A864886 F70D0101 01050003 818D0030 81890281
  8100DAD4 B1D52AA8 9D80D332 64F3271F 4B0A8901 FA989871 32819139 4D33C06B
  E7CF9A2E 010CD052 974E977F 970023AB 8D1E3359 0C153159 2A1A6415 A07AEDF6
  9A28CF52 B8778FA1 1438A4BE B084CE08 8CC9DB1B 395A0AB9 BF965982 A3D6159E
  A50D5BDE AB2C2003 0A4EFFD5 217DBFBB 839D59B8 8145BDBA FCA954E4 F9039E6F
  08390203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF 301F0603
  551D2304 18301680 144FE13B 03859D11 30C74F73 36BD0653 320D6966 1B301D06
  03551D0E 04160414 4FE13B03 859D1130 C74F7336 BD065332 0D69661B 300D0609
  2A864886 F70D0101 05050003 8181004B A00CE8A0 FED299B3 F1B67CF4 7E983039
  A8ED5605 B5A9D7D8 EBE6709D 6CE328D8 397D0A8F B4B5B0E7 EFEC552B EB5FB2CE
  EEB72BAF A1A0675A B8E78EA8 9E8D5BD8 75D7CB6F 3DCD0D41 CB2B1FEC 3C652E55
  B82E84A0 7ED09F8C 4B3CAF4F F7F2620E 0CE14115 918B635F 1E96C9E9 BF72BFAC
  5D172FE8 581363E2 D401B113 A2F0DC
```

```
        quit
ip source-route
!
!
!
ip dhcp excluded-address 10.10.10.1
!
ip dhcp pool ccp-pool
 import all
 network 10.10.10.0 255.255.255.248
 default-router 10.10.10.1
 lease 0 2
!
!
ip cef
```



```
no ip domain lookup
ip domain name yourdomain.com
no ipv6 cef
!
!
!
!
!
multilink bundle-name authenticated
!
!
!
voice service voip
 ip address trusted list
  ipv4 169.xxx.xxx.xxx
  ipv4 66.xxx.xxx.xxx
  ipv4 192.xxx.xxx.xxx
  ipv4 67.xxx.xxx.xxx
 no ip address trusted authenticate
 address-hiding
 allow-connections sip to sip
 redirect ip2ip
 fax protocol pass-through g711ulaw[1]
 sip
  header-passing
  error-passthru
  asserted-id pai[2]
  early-offer forced
  midcall-signaling passthru
  privacy-policy passthru
  g729 annexb-all
  sip-profiles 100
  no call service stop
!
voice class codec 1[3]
 codec preference 1 g729r8
 codec preference 2 g711ulaw
!
voice class sip-profiles 100[4]
```

[1] This command enables the router to perform G.711 pass-through for faxing.
[2] This command enables the router to send P-Asserted Identity header on the outbound calls.
[3] This command sets the codec preference to be assigned to dial-peers. IDT recommends that G.729 codec be set as the preferred codec on calls.
[4] This SIP Profile is recommended when setting up a SIP Trunk with IDT / Net2phone. IDT recommends including the /siptrunking in the SIP contact header of the REGISTER as well as in the INVITE.

```
 request REGISTER sip-header Contact modify "<sip:(.*)@(.*):5060>" "<sip:siptrunking@\2>"
 request INVITE sip-header Contact modify "<sip:(.*)@(.*):5060>" "<sip:siptrunking@\2>"
!
!
!
!
voice translation-rule 1[5]
 rule 1 /81/ /1\1/
!
!
voice translation-profile outbound_fax_g711
 translate called 1
!
!
license udi pid C881-CUBE-K9 sn FTX1707811A
!
!
username vpo privilege 15 secret 4 Ai2HyYxj4jk0kY.qvF6sy3b8QsoqM1PHF/3rXWebe.6
!
!
!
!
!
!
!
!
!
!
!
!
interface FastEthernet0
 switchport access vlan 110
 no ip address
!
interface FastEthernet1
 no ip address
!
interface FastEthernet2
 no ip address
!
interface FastEthernet3
 no ip address
!
interface FastEthernet4
```

[5] The command allows CUBE to string off the leading “8” from the dialed string using for outbound G.711 fax calls.

```
 description "Uplink to IDT ISP"
 ip address 67.133.xxx.xxx 255.255.255.0
 duplex auto
 speed auto
!
interface Vlan1
 description $ETH_LAN$
 ip address 10.10.10.1 255.255.255.248
 ip tcp adjust-mss 1452
!
interface Vlan110
 description LAN segment
 ip address 192.168.1.5 255.255.255.0
!
ip default-gateway 67.133.xxx.xxx
ip forward-protocol nd
ip http server
ip http access-class 23
ip http authentication local
ip http secure-server
ip http timeout-policy idle 60 life 86400 requests 10000
!
!
ip route 0.0.0.0 0.0.0.0 67.133.xxx.xxx
ip route 67.133.xxx.xxx 255.255.255.255 FastEthernet4
ip route 192.168.0.0 255.255.255.0 192.168.1.1
!
access-list 23 permit 10.10.10.0 0.0.0.7
!
!
!
!
!
control-plane
!
!
!
!
mgcp profile default
!
!
dial-peer voice 2051 voip
 description "Int'l calls to IDT - IDT facing side"
 destination-pattern 011T
 session protocol sipv2
 session target sip-server
```

```
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte[6]
 no vad
!
dial-peer voice 2050 voip
 description "Int'l calls to IDT - IP-PBX facing side"
 session protocol sipv2
 incoming called-number 011T
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2041 voip
 description "N11 Calls to IDT - IDT facing side"
 destination-pattern .11
 session protocol sipv2
 session target sip-server
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2040 voip
 description "N11 Calls to IDT - IP-PBX facing side"
 session protocol sipv2
 session target sip-server
 incoming called-number .11
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2000 voip
 description "Outgoing calls to IDT - IP-PBX facing side"
 session protocol sipv2
 session target sip-server
 incoming called-number .T
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
```

[6] This command enabled DTMF digit passing using RFC2833

```
dial-peer voice 2001 voip
 description "Outgoing to IDT - IDT facing side"
 destination-pattern 1T
 session protocol sipv2
 session target sip-server
 voice-class codec 1
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2011 voip
 description "Incoming calls to IP-PBX - IP-PBX facing side"
 destination-pattern 19545567202[7]
 session protocol sipv2
 session target ipv4:192.168.1.250[8]
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2010 voip
 description "Incoming calls to IP-PBX - IDT Facing side"
 session protocol sipv2
 incoming called-number 19545567202
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 no vad
!
dial-peer voice 2100 voip
 description "Outgoing G.711 fax calls to IDT - IDT facing side"
 translation-profile outgoing outbound_fax_g711
 destination-pattern 8T
 session protocol sipv2
 session target sip-server
 voice-class sip early-offer forced
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 codec g711ulaw
 fax-relay sg3-to-g3
 fax rate 14400
 fax protocol pass-through g711ulaw
!
dial-peer voice 2101 voip
 description "Incoming G.711 fax calls - IP-PBX facing side"
```

[7] This is the DID assigned by IDT / Net2phone to you.
[8] This is the IP address assigned to the BE3000 in this example.

```
 destination-pattern 19545567205[9]
 session protocol sipv2
 session target ipv4:192.168.1.250
 voice-class sip asserted-id pai
 voice-class sip privacy-policy passthru
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 codec g711ulaw
 fax-relay sg3-to-g3
 fax rate 14400
 fax protocol pass-through g711ulaw
!
dial-peer voice 2102 voip
 description "Incoming G.711 fax calls - IDT facing side"
 session protocol sipv2
 session target sip-server
 incoming called-number 19545567205
 voice-class sip asserted-id pai
 voice-class sip privacy-policy passthru
 voice-class sip profiles 100
 dtmf-relay rtp-nte
 codec g711ulaw
 fax-relay sg3-to-g3
 fax rate 14400
 fax protocol pass-through g711ulaw
!
!
num-exp 5567202 19545567202
sip-ua
 credentials username 263xxxxxxx password 7 075B701A1B realm net2phone[10]
 authentication username 263xxxxxxx password 7 03500A5D53
 retry invite 2
 retry register 10
 timers connect 100
 registrar ipv4:169.132.xxx.xxx expires 3600[11]
 sip-server ipv4:169.132.xxx.xxx
 host-registrar
!
banner login ^C^C
banner motd ^CC@
#####################################################################
```

[9] This is the separate number used for G.711 inbound faxing

[10] Used by CUBE for registration purposes. The actual SIP registration Username and Password will be provided to you by your IDT Account Manager and must be kept confidential.

[11] The SIP proxy server IP address will be provided to you by your IDT Account Manager as well.

```
# This system is the property of Net2Phone and is              #
# specifically for the use of authorized users for  legitimate    #
# business purposes only.                                    #
#                                                            #
# Individuals using this computer system without authority, or in #
# excess of their authority, are subject to having all of their   #
# activities on this system monitored and recorded by system      #
# personnel.                                                 #
#                                                            #
# In the course of monitoring individuals improperly using this   #
# system, or in the course of system maintenance, the activities  #
# of authorized users may also be monitored.                  #
#                                                            #
# Anyone using this system expressly consents to such monitoring  #
# and is advised that if such monitoring reveals possible        #
# evidence of criminal activity, system personnel may provide the #
# evidence of such monitoring to law enforcement officials.      #
####################################################################
^C
!
line con 0
 login local
line aux 0
line vty 0 4
 privilege level 15
 login local
 transport input telnet ssh
!
end

vpocube#
```

