Avaya Solution & Interoperability Test Lab

Application Notes for the Vocera Communications System with Avaya Communication Manager using the T1 and E1 Interface - Issue 1.0

Abstract

These Application Notes describe the configuration steps required to integrate the Vocera Communications System – Vocera Server, Telephony Server and badges, with Avaya Communication Manager, and Avaya Wireless AP-8.

Emphasis of the testing was placed on verifying reliable integration between the Vocera Telephony Server and Avaya Communication Manager, using the T1 and E1 interface.

Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the Developer*Connection* Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe a compliance-tested configuration comprised of the wireless communication features of Vocera Communications System with Avaya Communication Manager and Avaya Wireless AP-8s.

Vocera Communications System is comprised of three main components:

- Vocera Badges
- Vocera Server
- Vocera Telephony Server

The Vocera Badges are wireless 802.11b devices that serve as communicators in a wireless environment. By pressing the call button on a badge, a user can interface with the Vocera Server to start the call process.

The Vocera Server acts as a communication server to service calls between the badges. The Vocera Server stores the user and badge information, and has the speech access interface that allows users to place and receive calls.

The Vocera Telephony Server provides connectivity to a PBX system. The Vocera Telephony Server was tested using an ISDN-PRI trunk, robbed-bit trunk, and a set of analog stations, between the Vocera Telephony Server and Avaya Communication Manager. The trunk interfaces used between the Vocera Telephony Server and PBX were T1 and E1. The Vocera Telephony Server allows the Vocera Server to connect Badges to PBX users, as well as route calls to the public network through the PBX. The two server applications, the Vocera Server and Vocera Telephony Server, can reside in the same physical server platform.

For additional information on Vocera Communication System, please refer to Vocera documentation [3] and [4].

Figure 1 illustrates the network configuration used to verify the Vocera Communications System solution. The configuration details provided in these Application Notes focus on the interface between Avaya Communication Manager and the Vocera Telephony Server as well as the wireless configuration between the Vocera Badges, and Avaya Wireless AP-8. Site A is comprised of an Avaya S8700 Media Server and an Avaya G650 Media Gateway, and has connections to Avaya 4600 Series IP Telephones, an Avaya 9630 IP Telephone, an Avaya 6402 Digital Telephone, and an ISDN-PRI trunk to the PSTN. Vocera Site is comprised of a PC with Microsoft Windows 2003 Server and a Netgear ProSafe Switch with Power Over Ethernet (POE). The Vocera Server, Vocera Telephony Server, and DHCP Server applications were installed on the PC prior to the compliance test. Avaya Wireless AP-8s are utilized to provide the wireless network for the Vocera badges.

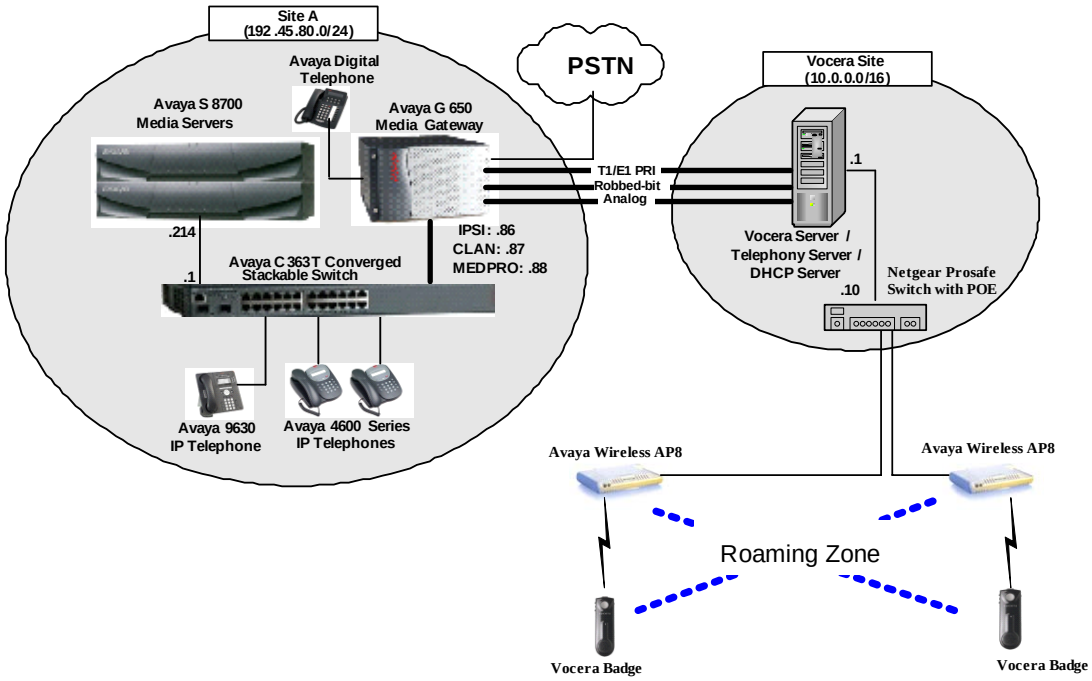


Figure 1: Test Configuration of Vocera with Avaya Communication Manager

2. Equipment and Software Validated

The following equipment and software were used for the sample configuration provided:

Equipment		Software
Avaya S8700 Media Server		Avaya Communication Manager 3.1.2 (R013x.01.2.632.1)
Avaya G650 Media Gateway		
	TN2312BP IP Server Interface TN799DP C-LAN Interface TN2302AP IP Media Processor TN2602AP IP Media Processor	HW11 FW030 HW20 FW017 HW01 FW108 HW02 FW007
Avaya 4600 Series IP Telephones		
	4620 SW 4625 SW	2.6 2.5
Avaya 9630 Series IP Telephones		1.1 (H.323)
Avaya 6402 Digital Telephone		-
Avaya C363T-PWR Converged Stackable Switch		4.5.14
Avaya Wireless AP-8		3.1
Vocera Server and Telephony Server running on Windows 2003 Server		4.0 build 1273
Vocera Badges		4.0 build 1273
Netgear ProSafe with POE		FS108P

3. Configure Avaya Communication Manager

During the compliance test, the connectivity between Avaya Communication Manager and the Vocera Telephony Server were performed with T1 ISDN-PRI and E1 QSIG protocol. Before configuring Avaya Communication Manager, the DS1 board must be physically configured for an appropriate mode (T1 or E1). The DS1 board has 24 channels in T1 mode or 32 channels in E1 mode. The default is set to the T1 mode. To modify the DS1 board to use it in E1 mode, the dipswitch in the DS1 board must be switched to the 32 channels side.

When integrating with trunks, it is important to allow trunk-to-trunk transfer for the Badges to be able to transfer/conference calls, as well as place outbound calls. Trunk to trunk transfer is a global parameter that is enabled in the "system-parameters features" form.

Enter the **display system-parameters features** command. On Page 1 of the "system-parameters feature" form, verify that the Trunk-to-Trunk Transfer field is set to **all**.

```
display system-parameters features                              Page   1 of  18
                            FEATURE-RELATED SYSTEM PARAMETERS
                               Self Station Display Enabled? y
                                    Trunk-to-Trunk Transfer: all
    Automatic Callback - No Answer Timeout Interval (rings): 3
                         Call Park Timeout Interval (minutes): 10
        Off-Premises Tone Detect Timeout Interval (seconds): 20
                                  AAR/ARS Dial Tone Required? y
                             Music/Tone on Hold: none
              Music (or Silence) on Transferred Trunk Calls? no
                         DID/Tie/ISDN/SIP Intercept Treatment: attd
    Internal Auto-Answer of Attd-Extended/Transferred Calls: transferred
                  Automatic Circuit Assurance (ACA) Enabled? n




             Abbreviated Dial Programming by Assigned Lists? n
       Auto Abbreviated/Delayed Transition Interval (rings): 2
                    Protocol for Caller ID Analog Terminals: Bellcore
    Display Calling Number for Room to Room Caller ID Calls? N
```

Enter the **display system-parameters customer-options** command. On Page 4 of the "system-parameters customer-options" form, verify that the ISDN-PRI field is enabled. If not, contact an authorized Avaya account representative to enable these features.

```
display system-parameters customer-options                      Page   4 of  11
                              OPTIONAL FEATURES

   Emergency Access to Attendant? y                               IP Stations? y
            Enable 'dadmin' Login? y                  Internet Protocol (IP) PNC? n
            Enhanced Conferencing? y                            ISDN Feature Plus? n
                  Enhanced EC500? y               ISDN Network Call Redirection? n
    Enterprise Survivable Server? n                             ISDN-BRI Trunks? n
       Enterprise Wide Licensing? n                                    ISDN-PRI? y
              ESS Administration? n                  Local Survivable Processor? n
          Extended Cvg/Fwd Admin? y                        Malicious Call Trace? n
     External Device Alarm Admin? n                    Media Encryption Over IP? y
  Five Port Networks Max Per MCC? n       Mode Code for Centralized Voice Mail? n
                Flexible Billing? n
   Forced Entry of Account Codes? n                     Multifrequency Signaling? y
      Global Call Classification? n Multimedia Appl. Server Interface (MASI)? n
             Hospitality (Basic)? y           Multimedia Call Handling (Basic)? n
 Hospitality (G3V3 Enhancements)? n        Multimedia Call Handling (Enhanced)? n
                       IP Trunks? y

           IP Attendant Consoles? n
       (NOTE: You must logoff & login to effect the permission changes.)
```

Enter the **display system-parameters customer-options** command. On Page 8 of the "system-parameters customer-options" form, verify that the following fields are enabled. If not, contact an authorized Avaya account representative to enable these features.

```
display system-parameters customer-options                      Page   8 of  11
                            QSIG OPTIONAL FEATURES

                                        Basic Call Setup? y
                                Basic Supplementary Services? y
                                       Centralized Attendant? n
                                       Interworking with DCS? n
                         Supplementary Services with Rerouting? n
                                Transfer into QSIG Voice Mail? n
                                          Value-Added (VALU)? N
```

It is important that stations that have access to the Vocera Server are not outward restricted. All stations and trunks have a Class of Restriction (COR) assigned to them. From the System Access Terminal interface, enter **change cor C,** where **C** is the COR number. Set the Calling Party Restriction and Called Party Restriction fields to **none** in the COR form for the appropriate COR that is assigned to the stations and trunks. During the compliance test, stations under test were assigned **1** as the COR number.

```
change cor 1                                                Page   1 of  22
                              CLASS OF RESTRICTION

               COR Number: 1
          COR Description:

                      FRL: 2                                APLT? y
  Can Be Service Observed? y           Calling Party Restriction: none
Can Be A Service Observer? y            Called Party Restriction: none
 Partitioned Group Number: 1       Forced Entry of Account Codes? n
         Priority Queuing? n                Direct Agent Calling? n
     Restriction Override: none       Facility Access Trunk Test? n
     Restricted Call List? n                 Can Change Coverage? n

            Access to MCT? y             Fully Restricted Service? n
Group II Category For MFC: 7
         Send ANI for MFE? n              Add/Remove Agent Skills? n
            MF ANI Prefix:               Automatic Charge Display? n
Hear System Music on Hold? y   PASTE (Display PBX Data on Phone)? n
                         Can Be Picked Up By Directed Call Pickup? n
                                     Can Use Directed Call Pickup? n
                                     Group Controlled Restriction: inactive
```

3.1. Configuring T1 ISDN-PRI Trunk

The configuration verified for T1 trunks used the **229xx** extension range for the Vocera Server and Badges. Add the DS1 for the T1 trunks by using the command **add ds1 xxxx**, where **xxxx** is the DS1 board location. In this case the location was **1a12**, where "**1"** is the cabinet number, "**a"** is the carrier number, and "**12"** is the slot number of the DS1 board.

The next screen shows the DS1 CIRCUIT PACK form for the ISDN-PRI protocol. Avaya Communication Manager acted as the **network**, and the Vocera Server was the **user**. The following information is provided for configuring the DS1 board.

- Line Coding: **b8zs**
- Framing Mode: **esf**
- Signaling Mode: **isdn-pri**
- Connect: **pbx**
- Interface: **network**

Default values may be used in the remaining fields.

```
add ds1 1a12                                                  Page   1 of   2
                                DS1 CIRCUIT PACK

            Location: 01A12                          Name: Vocera
            Bit Rate: 1.544                    Line Coding: b8zs
   Line Compensation: 1                        Framing Mode: esf
      Signaling Mode: isdn-pri
             Connect: pbx                         Interface: network
   TN-C7 Long Timers? n                  Country Protocol: 1
Interworking Message: PROGress           Protocol Version: a
Interface Companding: mulaw                         CRC? n
           Idle Code: 11111111
                              DCP/Analog Bearer Capability: 3.1kHz

                                          T303 Timer(sec): 4

      Slip Detection? n                Near-end CSU Type: other
```

Enter the **add signaling-group S** command**,** where **S** is the signaling-group number, to define new signaling group for the trunk between the Vocera Telephony Server and Avaya Communication Manager. Configuring the signaling-group is a two step procedure:

1. Create a signaling-group and specify the **Group Type** and **Primary D-Channel**.
2. After the trunk-group is created, specify the **Trunk Group for Channel Selection** field in the signaling group.

The following screen shows the first step. The important signaling-group related parameters that were different from the default values are highlighted here.

```
add signaling-group 73                                        Page   1 of   5
                                SIGNALING GROUP

 Group Number: 73              Group Type: isdn-pri
                     Associated Signaling? y          Max number of NCA TSC: 0
                        Primary D-Channel:01A1224      Max number of CA TSC: 0
                                                    Trunk Group for NCA TSC:
       Trunk Group for Channel Selection:
          Supplementary Service Protocol: a
```

Enter the **add trunk-group T** command, where **T** is the trunk-group number, to create a trunk group. The important trunk-group related parameters that were different from the default values are highlighted below.

```
add trunk-group 73                                            Page   1 of  21
                                TRUNK GROUP

Group Number: 73                    Group Type: isdn          CDR Reports: y
  Group Name: 2Vocera                        COR: 1        TN: 1        TAC: 118
   Direction: two-way         Outgoing Display? n          Carrier Medium: PRI/BRI
 Dial Access? n                 Busy Threshold: 255        Night Service:
Queue Length: 0
Service Type: tie                     Auth Code? n             TestCall ITC: rest
                          Far End Test Line No:
TestCall BCC: 4
```

On Page 5 of the TRUNK GROUP form, add trunk group members. To add members the following information should be specified.

- **Port**
- **Sig Grp**

The following screen shows the first five entries of the GROUP MEMBER ASSIGNMENTS page in the TRUNK GROUP form.

```
add trunk-group 73                                          Page   5 of  21
                                TRUNK GROUP
                                     Administered Members (min/max):   1/4
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   23

       Port    Code Sfx Name        Night            Sig Grp
  1: 01A1201  TN464  F                                  73
  2: 01A1202  TN464  F                                  73
  3: 01A1203  TN464  F                                  73
  4: 01A1204  TN464  F                                  73
  5: 01A1205  TN464  F                                  73
```

Enter the **change signaling-group S** command, where **S** is the signaling-group added earlier, to finish the signal group configuration. The following screen shows the signaling-group configuration. The important parameter in the screen is assigning the **Trunk Group for Channel Selection** field.

```
change signaling-group 73                                    Page   1 of   5
                              SIGNALING GROUP

 Group Number: 73             Group Type: isdn-pri
                     Associated Signaling? y          Max number of NCA TSC: 0
                        Primary D-Channel: 01A1224     Max number of CA TSC: 0
                                                    Trunk Group for NCA TSC:
       Trunk Group for Channel Selection: 73
          Supplementary Service Protocol: a
```

Enter **change uniform-dialplan U**, where **U** is the uniform-dialplan number. The following screen shows the Uniform Dial Plan configuration. The 5-digit extension range starting with **229** was used for the Vocera Server and Badges, and utilized Automatic Alternate Routing (AAR).

```
change uniform-dialplan 229                                  Page   1 of   2
                       UNIFORM DIAL PLAN TABLE
                                                           Percent Full: 0

  Matching          Insert          Node   Matching         Insert          Node
  Pattern  Len Del Digits Net Conv Num    Pattern  Len Del Digits Net Conv Num
  229        5   0         aar  n                                        n
  4          5   0         aar  n                                        n
                           n                                           n
```

Enter **change aar analysis A**, where **A** is the AAR number. Automatic Alternate Routing (AAR) was used to route calls to the appropriate route pattern.

```
change aar analysis 229                                      Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                            Percent Full:    1

          Dialed           Total     Route    Call   Node  ANI
          String          Min  Max  Pattern   Type   Num   Reqd
    229                   5    5     73       aar          n
                                                            n
```

Enter **change route-pattern R**, where **R** is the route-pattern number. The route pattern 73 routes calls to trunk group 73. Before any call is sent to the trunk-group 73, 5 digits (21285) were inserted to make a 10 digit call.

```
change route-pattern 73                                      Page   1 of   3
                    Pattern Number: 73  Pattern Name: 2Vocera
                                SCCAN? n     Secure SIP? n
    Grp FRL NPA Pfx Hop Toll No.  Inserted                          DCS/ IXC
    No          Mrk Lmt List Del  Digits                            QSIG
                                Dgts                                Intw
 1: 73   0                      73285                               n   user
 2:                                                                 n   user
 3:                                                                 n   user

     BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature PARM  No. Numbering LAR
    0 1 2 3 4 W     Request                                    Dgts Format
                                                            Subaddress
 1: y y y y y n  n            rest                                      none
 2: y y y y y n  n            rest                                      none
 3: y y y y y n  n            rest                                      none
```

3.2. Configuring T1 Robbed Bit Trunks

The configuration verified for T1 trunks used the **229xx** extension range for the Vocera Server and Badges. Add the DS1 for the T1 trunks by using the command **add ds1 xxxx**, where **xxxx** is the T1 board location. The DS1 form for the Robbed Bit T1 board is shown here.

```
add ds1 1a12                                              Page   1 of   2
                              DS1 CIRCUIT PACK

            Location: 01A12                          Name: Vocera
            Bit Rate: 1.544                    Line Coding: b8zs
   Line Compensation: 1                        Framing Mode: esf
      Signaling Mode: robbed-bit

Interface Companding: mulaw
           Idle Code: 11111111
      Slip Detection? n                 Near-end CSU Type: other
```

Enter the **add trunk-group T** command, where **T** is the trunk-group number, to create a trunk group. The important trunk-group related parameters that were different from the default values are highlighted below.

```
add trunk-group 73                                        Page   1 of  20
                                TRUNK GROUP

Group Number: 73                   Group Type: tie           CDR Reports: y
  Group Name: Vocera RBS                    COR: 1        TN: 1        TAC: 107
   Direction: two-way         Outgoing Display? n Trunk Signaling Type:
 Dial Access? y                 Busy Threshold: 255       Night Service:
Queue Length: 0                                    Incoming Destination:
   Comm Type: voice                  Auth Code? n
                                   Trunk Flash? n

TRUNK PARAMETERS
   Trunk Type (in/out): wink/immed       Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
                                          Disconnect Timing(msec): 500
       Digit Treatment:                                   Digits:
                                                 Sig Bit Inversion: none
     Analog Loss Group: 9                        Digital Loss Group: 13
    Incoming Dial Tone? y

 Disconnect Supervision - In? y  Out? y
 Answer Supervision Timeout: 0              Receive Answer Supervision? y
```

On Page 4 of the TRUNK GROUP form, add trunk group members. To add members the following information should be specified.

- **Port**
- **Sig Grp**

The following two screens show the results of the Group Member assignments page in the TRUNK GROUP form.

```
display trunk-group 73                                        Page   4 of  20
                               TRUNK GROUP
                                    Administered Members (min/max):   1/24
GROUP MEMBER ASSIGNMENTS                Total Administered Members:  24

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01A0701  TN464  F
  2: 01A0702  TN464  F
  3: 01A0703  TN464  F
  4: 01A0704  TN464  F
  5: 01A0705  TN464  F
  6: 01A0706  TN464  F
  7: 01A0707  TN464  F
  8: 01A0708  TN464  F
  9: 01A0709  TN464  F
 10: 01A0710  TN464  F
 11: 01A0711  TN464  F
 12: 01A0712  TN464  F
 13: 01A0713  TN464  F
 14: 01A0714  TN464  F
 15: 01A0715  TN464  F
```

```
display trunk-group 73                                        Page   5 of  20
                               TRUNK GROUP
                                    Administered Members (min/max):   1/24
GROUP MEMBER ASSIGNMENTS                Total Administered Members:  24

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
 16: 01A0716  TN464  F
 17: 01A0717  TN464  F
 18: 01A0718  TN464  F
 19: 01A0719  TN464  F
 20: 01A0720  TN464  F
 21: 01A0721  TN464  F
 22: 01A0722  TN464  F
 23: 01A0723  TN464  F
 24: 01A0724  TN464  F
 25:
 26:
```

3.3. Configuring Analog Ports

Integration with analog ports requires administering the appropriate number of analog stations in Avaya Communication Manager, and assigning them to a hunt group. Users dialed the Hunt Group extension, **22023**, to reach the Vocera Server. In this configuration, 2 stations were used. The following screen shows a sample "STATION" form.

```
  display station 22024                                        Page   1 of   3
                                    STATION

Extension: 22024                          Lock Messages? n          BCC: 0
     Type: 2500                           Security Code:             TN: 1
     Port: 01A0601                      Coverage Path 1:            COR: 1
     Name: Vocera Port 1                Coverage Path 2:            COS: 1
                                       Hunt-to Station:          Tests? y

STATION OPTIONS
              Loss Group: 1                Message Waiting Indicator: none
    Off Premises Station? n
```

Enter the **add hunt-group H** command, where H is a hunt group number. On Page 1 of the "HUNT GROUP" form, the hunt group is assigned to extension **22023**.

```
add hunt-group 2                                             Page   1 of  60
                                  HUNT GROUP

            Group Number: 2                                 ACD? n
              Group Name: Vocera                          Queue? n
       Group Extension: 22023                           Vector? n
            Group Type: ucd-mia                 Coverage Path:
                    TN: 1          Night Service Destination:
                   COR: 1                    MM Early Answer? n
          Security Code:
     ISDN Caller Display
```

On Page 3 of the "HUNT GROUP" form, stations were assigned to the hunt group.

```
add hunt-group 2                                             Page   3 of  60
                                  HUNT GROUP
          Group Number: 2       Group Extension: 55555     Group Type: ucd-mia
  Member Range Allowed: 1 - 1500       Administered Members (min/max): 1   /2
                                           Total Administered Members: 2
GROUP MEMBER ASSIGNMENTS
      Ext      Name (24 characters)           Ext      Name (24 characters)
   1: 22024    Vocera Port 1              14:
   2: 22025    Vocera Port 2              15:
   3:                                     16:
   4:                                     17:
   5:                                     18:
   6:                                     19:
   7:                                     20:
   8:                                     21:
   9:                                     22:
```

3.4. Configuring E1 QSIG Trunk

The steps for configuring E1 are similar to the T1 configuration. The only section that is different than T1 is the DS1 configuration. Hence, the DS1 configuration steps are the only ones that will be discussed in this section.

Enter **display system-parameters customer-options.** On Page 3, check the **DS1 MSP** field is enabled to create an E1 interface. If not, contact an authorized Avaya account representative to enable this feature.

```
display system-parameters customer-options                    Page   3 of  11
                              OPTIONAL FEATURES

    Abbreviated Dialing Enhanced List? n          Audible Message Waiting? n
        Access Security Gateway (ASG)? n              Authorization Codes? n
        Analog Trunk Incoming Call ID? n Backup Cluster Automatic Takeover? n
 A/D Grp/Sys List Dialing Start at 01? n                        CAS Branch? n
Answer Supervision by Call Classifier? n                          CAS Main? n
                                  ARS? y                 Change COR by FAC? n
                 ARS/AAR Partitioning? y  Computer Telephony Adjunct Links? n
          ARS/AAR Dialing without FAC? y   Cvg Of Calls Redirected Off-net? n
          ASAI Link Core Capabilities? n                       DCS (Basic)? n
          ASAI Link Plus Capabilities? n                 DCS Call Coverage? n
       Async. Transfer Mode (ATM) PNC? n                DCS with Rerouting? n
  Async. Transfer Mode (ATM) Trunking? n
             ATM WAN Spare Processor? n    Digital Loss Plan Modification? n
                                  ATMS? n                          DS1 MSP? y
                  Attendant Vectoring? n             DS1 Echo Cancellation? Y
```

On Page 5, check that the **Station and Trunk MSP** field is enabled to create an E1 interface. If not, contact an authorized Avaya account representative to enable this feature.

```
display system-parameters customer-options                    Page   5 of  11
                              OPTIONAL FEATURES

                Multinational Locations? n                Station and Trunk MSP? y
 Multiple Level Precedence & Preemption? n      Station as Virtual Extension? n
                     Multiple Locations? n
                                                System Management Data Transfer? n
          Personal Station Access (PSA)? n                Tenant Partitioning? n
                        Posted Messages? n       Terminal Trans. Init. (TTI)? n
                        PNC Duplication? n                Time of Day Routing? n
                  Port Network Support? y               Uniform Dialing Plan? y
                                              Usage Allocation Enhancements? y
               Processor and System MSP? n       TN2501 VAL Maximum Capacity? y
                     Private Networking? y
                     Processor Ethernet? n                 Wideband Switching? n
                                                                   Wireless? y
                           Remote Office? n
          Restrict Call Forward Off Net? y
                  Secondary Data Module? y
```

The next screen shows the configuration of the DS1 CIRCUIT PACK form for the QSIG protocol. Avaya Communication Manager acted as the **peer-master**, and the Vocera Server was the **QTE,** which is the same as **peer-slave** in Avaya Communication Manager. The following information is provided for configuring the DS1 board:

- Bit Rate: **2.048**
- Line Coding: **hdb3**
- Signaling Mode: **isdn-pri**
- Connect: **pbx**
- Interface: **peer-master**
- CRC?: **y**

Default values may be used in the remaining fields.

```
change ds1 1a13                                                Page   1 of   1
                                DS1 CIRCUIT PACK

            Location: 01A13                          Name: Vocera-E1
            Bit Rate: 2.048                   Line Coding: hdb3
      Signaling Mode: isdn-pri
             Connect: pbx                       Interface: peer-master
   TN-C7 Long Timers? n                     Peer Protocol: Q-SIG
Interworking Message: PROGress                      Side: a
Interface Companding: alaw                          CRC? y
           Idle Code: 11111111           Channel Numbering: timeslot
                              DCP/Analog Bearer Capability: 3.1kHz

                                           T303 Timer(sec): 4

      Slip Detection? n                 Near-end CSU Type: other
```

To turn on QSIG, the Supplementary Service Protocol should be set to **b** in the trunk-group and signaling-group forms. The following shows a sample trunk-group page to turn on QSIG.

```
change trunk-group 51                                          Page   2 of  21
      Group Type: isdn

TRUNK PARAMETERS
         Codeset to Send Display: 6     Codeset to Send National IEs: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: b     Digit Handling (in/out): enbloc/enbloc

            Trunk Hunt: cyclical
                                                  Digital Loss Group: 13
Incoming Calling Number - Delete:     Insert:                 Format:
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0
```

The following shows a sample signaling-group page to turn on QSIG.

```
display signaling-group 51                                     Page   1 of   5
                                SIGNALING GROUP

 Group Number: 51             Group Type: isdn-pri
                     Associated Signaling? y          Max number of NCA TSC: 0
                        Primary D-Channel: 01A1024     Max number of CA TSC: 0
                                                  Trunk Group for NCA TSC:
       Trunk Group for Channel Selection: 51
          Supplementary Service Protocol: b
```

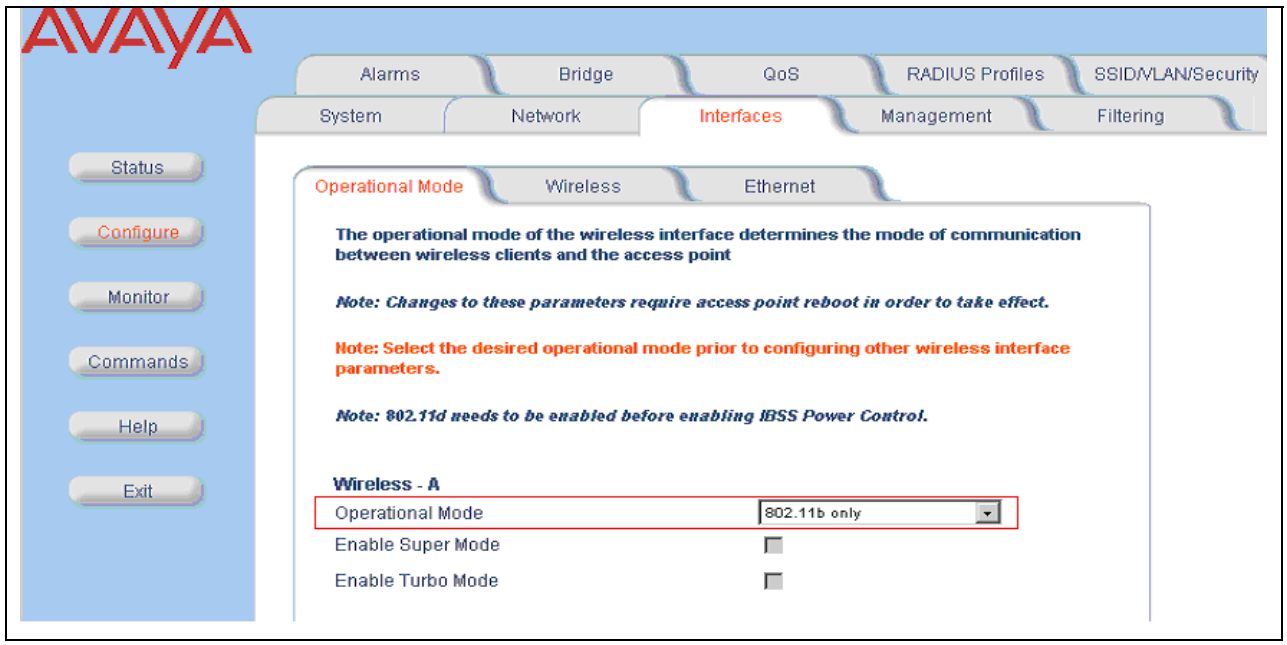
4. Configure Avaya Wireless AP-8

Avaya Wireless AP-8s were utilized for providing the wireless network for the Vocera badges to register to the Vocera server. The initial configuration for the Avaya Wireless AP-8 is accomplished through the ScanTool software, which comes with the Avaya Wireless AP-8 software. After the initial configuration, the web interface was utilized to do the configuration modifications. The configuration screens included here show how to configure the **Network**, **Interfaces**, and **Service Set Identifier** (**SSID)**.

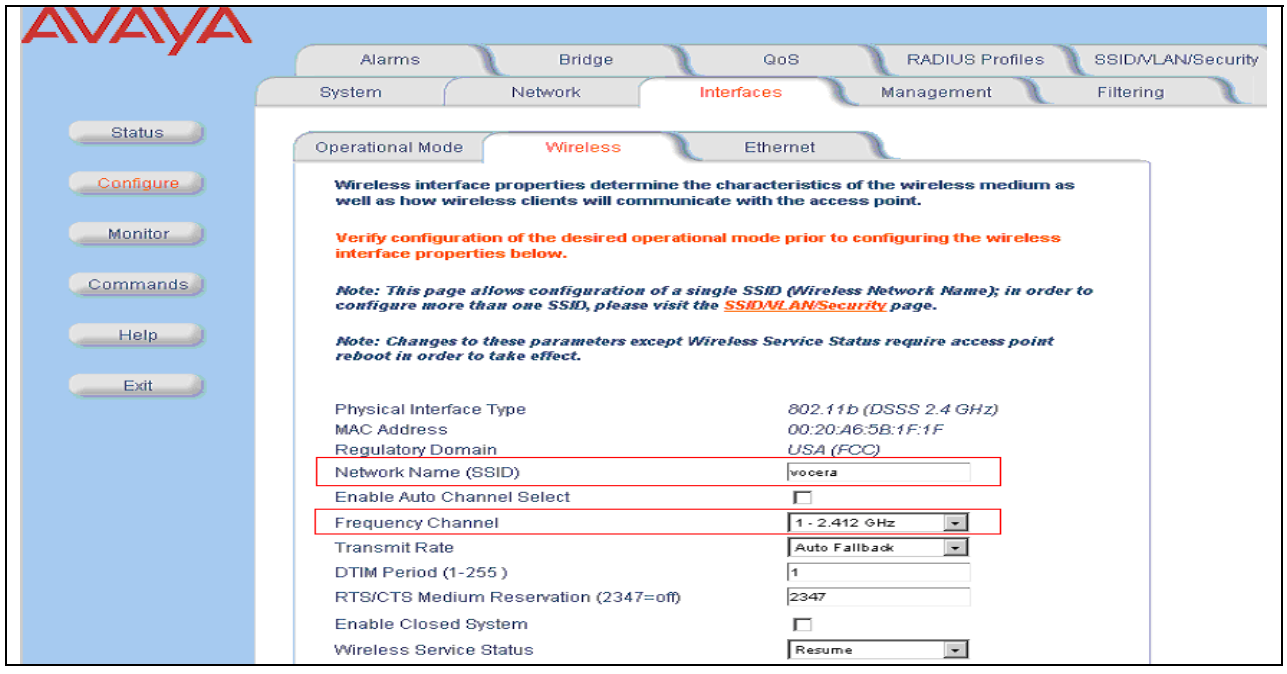
Use a web browser to access the Management IP address of the Avaya Wireless AP-8. Provide proper credentials to login. Click on the **Configure** button from the main menu on the left. Click the **Network** tab from the right menu and select **DHCP RA** (DHCP Relay Agent) tab from the submenu (**Configure → Network → DHCP RA**). The following screen appears. Enable the DHCP Relay Agent by checking the box. Add the DHCP server by clicking the **Add** button and provide the IP address of the DHCP server.

After completion of adding DHCP server, click **OK** button.

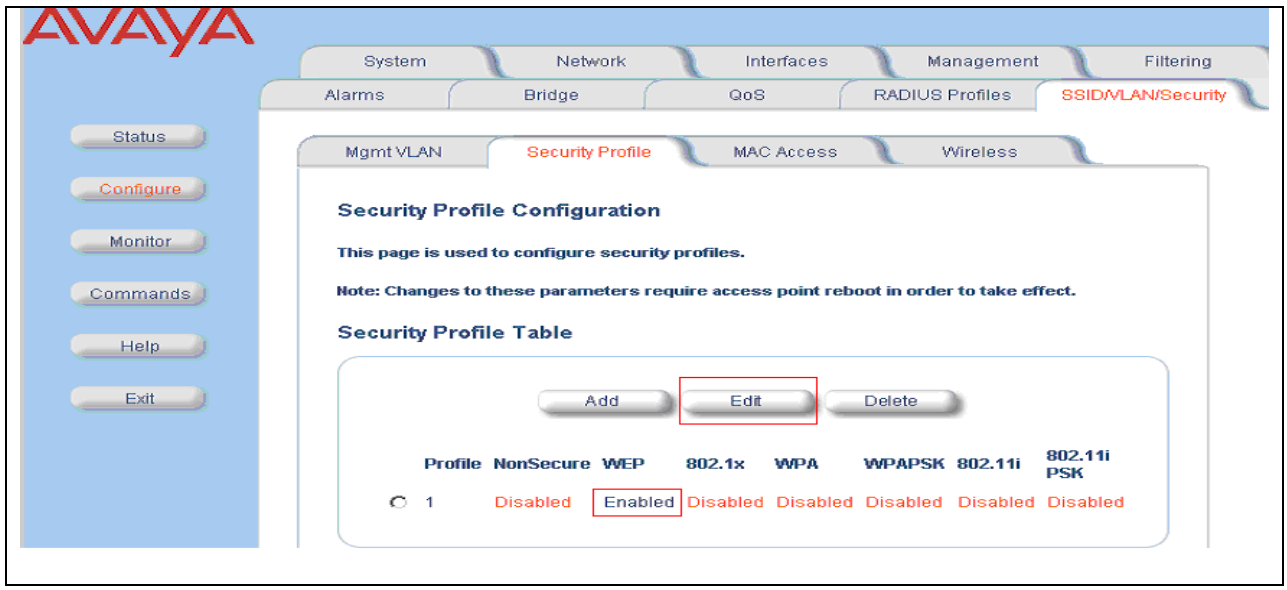
Navigate to the **Configure → Interfaces → Operational Mode** page. Select the **802.11 B only** for the Operational Mode field as shown in the following screen.



Navigate to the **Configure → Interfaces → Wireless** page. The following screen appears. Configure the SSID and "Frequency Channel" fields and enter the value as shown below. For the roaming test, the "Frequency Channel" field for Avaya Wireless AP-8 was set to Channel **1**. The Avaya Wireless AP-8 device used channel **11** for the "Frequency Channel" field.



Navigate to the **Configure → SSID/VLAN/Security → Security Profile** page. The following screen appears. Enable the WEP encryption by clicking the **Edit** button.



To Add or Edit the WEP encryption, click on the **WEP Station** box, and enter 13 characters to be used for the WEP 128 encryption key on the Encryption Key 0 field.
Note that the same WEP encryption key needs to be used by all wireless devices to be able to communicate.

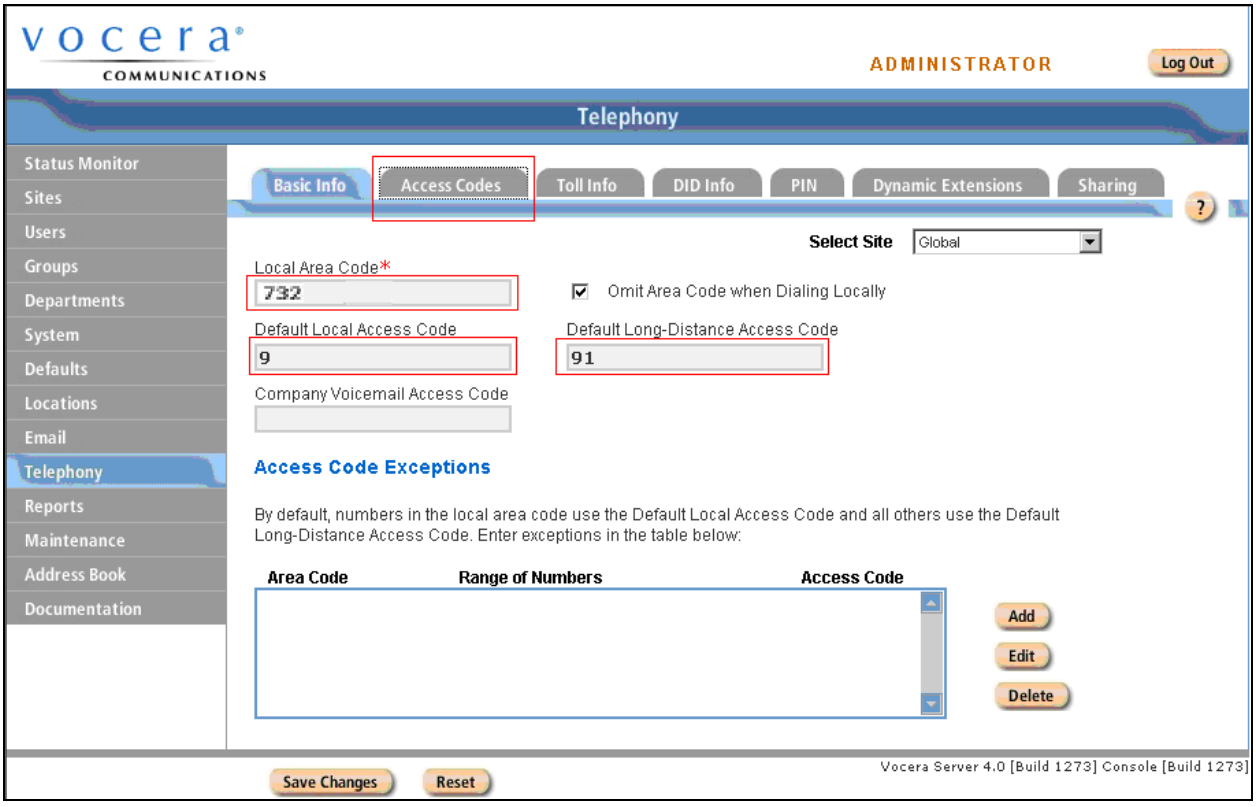
For the new configuration to take effect, the Avaya Wireless AP-8 must now be rebooted. Click the **Commands** tab from the main menu, and then select the **Reboot** tab to reboot.

5. Configure the Vocera Communications System

The Vocera Communications System is configured using a web based console interface. Use a web browser to access the IP address of the Vocera Communication System. Log in with appropriate credentials. The following screen shows the telephony configuration used when the Vocera Telephony Server places outbound calls through the PBX.

Select **Telephony** from the left pane. Select the **Access Codes** tab in the right pane to configure Local and Long Distance Access Code. The Local Area Code field should match the local PBX area code. The Default Long-Distance Access Code field is typically the same as the Local Access Code, followed by a **1**.

After completion, click the **Save Changes** button.



5.1. Configuring the Vocera Telephony Server for T1 ISDN-PRI

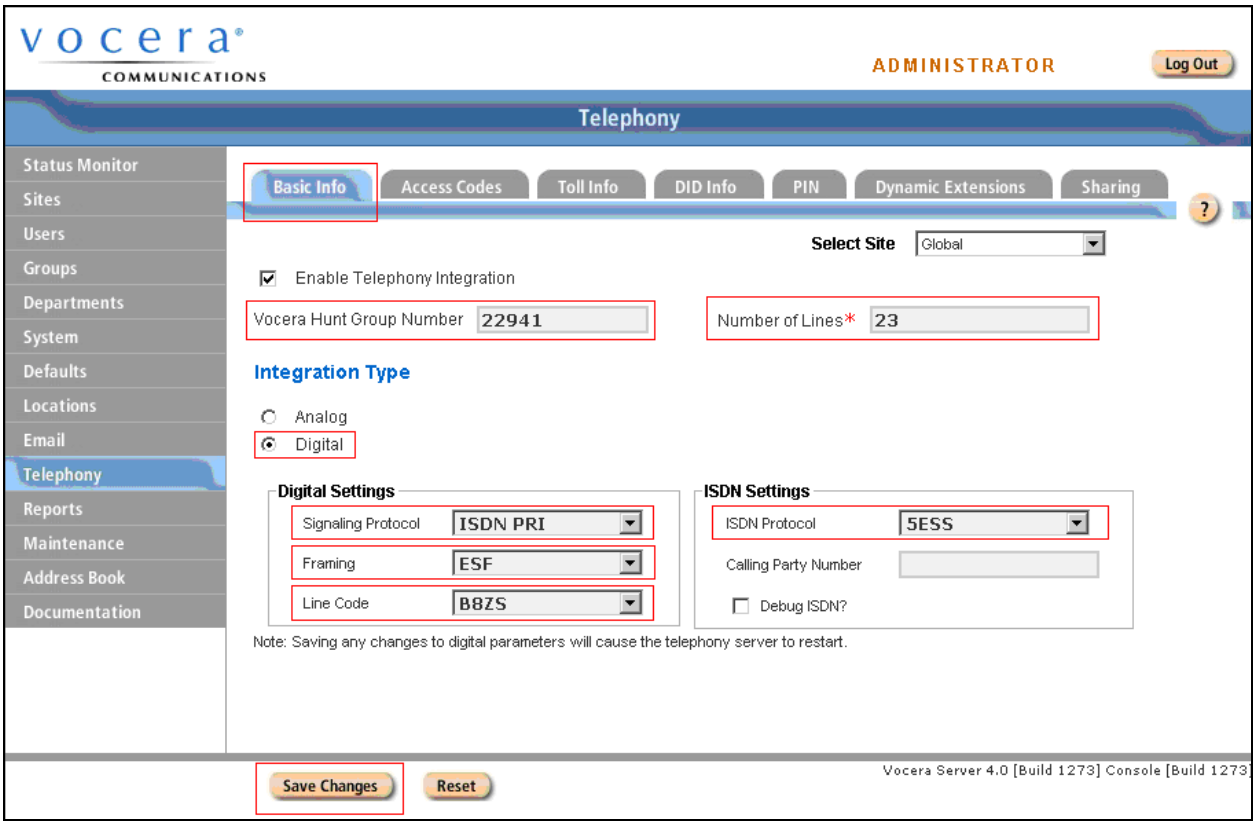
The next screen shows the configuration used when the Vocera Telephony server was connected to Avaya Communication Manager using an ISDN-PRI T1 trunk. For inbound, there are two ways that a call can reach an individual badge.

- A caller calls the Vocera Hunt Group Number. In this case, the user is greeted by the voice interface, and prompted for a badge user to contact.
- A user calls a Direct Inward Dialing (DID) number for a badge user. In this case, the call will be directly connected to the badge user without a greeting.

Select **Telephony** from the left pane, and select the **Basic Info** tab in the right pane. Edit the values as indicated below:

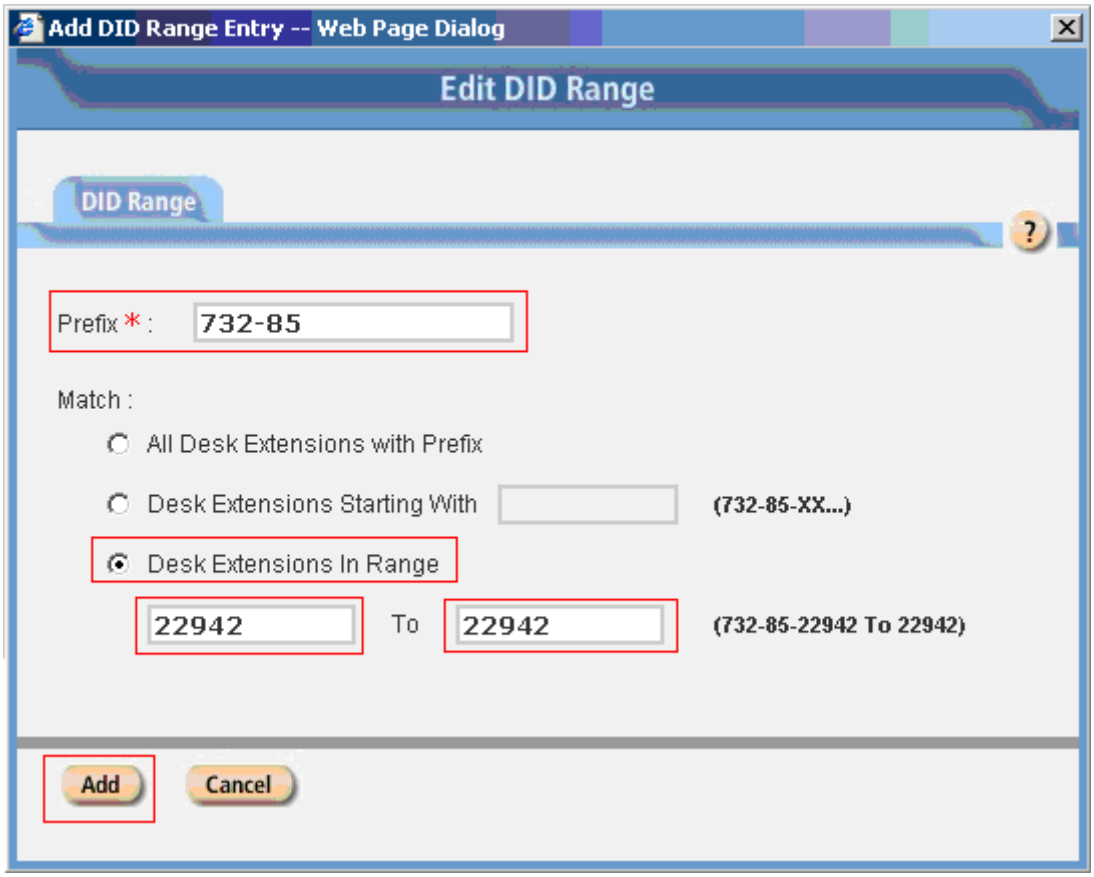
- Vocera Hunt Group Number: **22941**
- Number of Lines: **23**
- Integration Type: **Digital**
- Signaling Protocol: **ISDN PRI**
- Framing: **ESF**
- Line Code: **B8ZS**
- ISDN Protocol: **5ESS**

After completion, click the **Save Changes** button.



Click the **DID Info** tab to start configuring Direct Inward Dialing (DID) for an individual badge. Click the **Add** button to add DID range. After completion of the Add screen, shown later, click **Save Changes** button.

From the “Edit DID Range” screen, provide a 5 digit **Prefix** to make a 10 digit DID number. This Prefix should match with the **Inserted Digit** in route-pattern 73 in Section 3.1. During the compliance test, the DID number (732-852-2942) was allocated.
Click the **Add** button to finish the DID configuration.

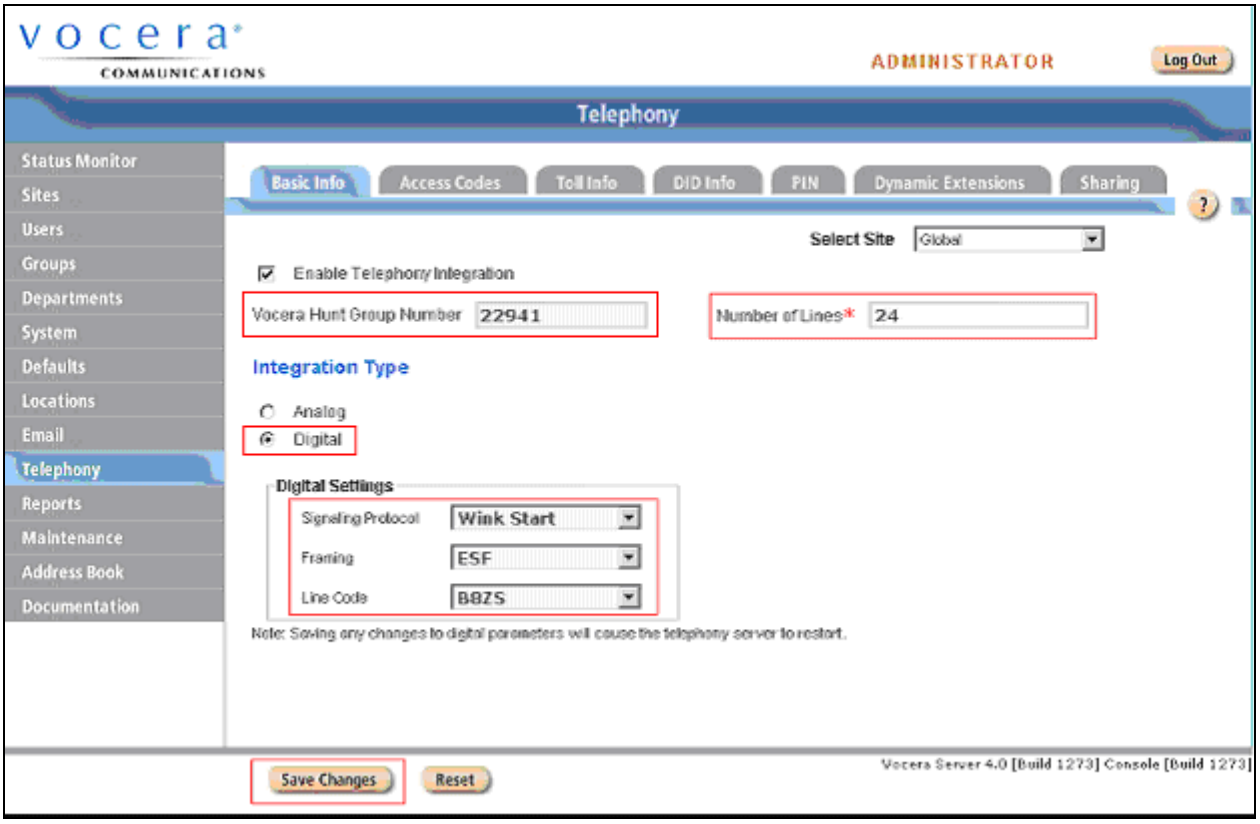


5.2. Configuring the Vocera Telephony Server for Wink Start

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager using T1 robbed-bit Signaling Mode.

- Vocera Hunt Group Number: **22941**
- Number of Lines: **24**
- Integration Type: **Digital**
- Signaling Protocol: **Wink Start**
- Framing: **ESF**
- Line Code: **B8ZS**

After completion, click the **Save Changes** button.

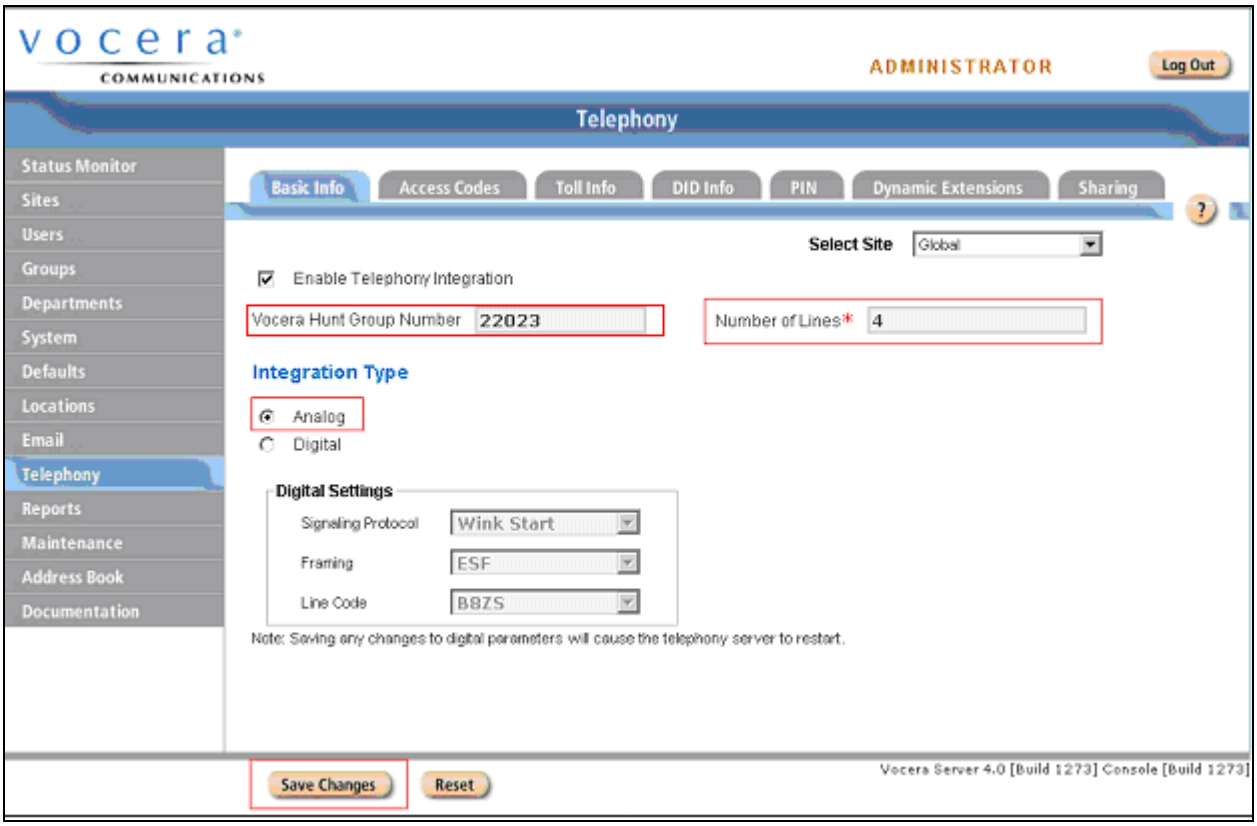


5.3. Configuring the Vocera Telephony Server for Analog Ports

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager using 4 analog Ports.

- Voice Hunt Group Number: **22023**
- Number of Lines: **4**
- Integration Type: **Analog**

After completion, click the **Save Changes** button.



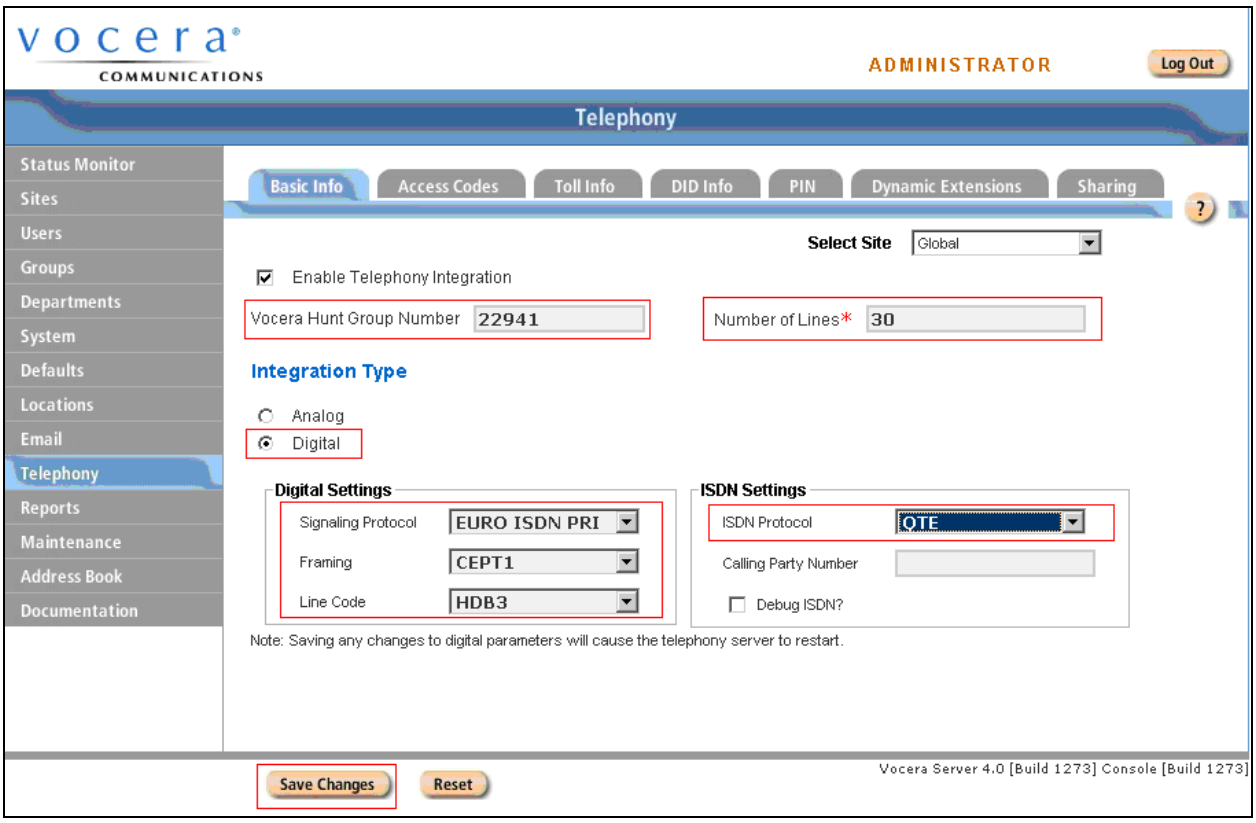
5.4. Configuring the Vocera Telephony Server for E1 ISDN-PRI

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager using an E1 trunk.

- Vocera Hunt Group Number: **22941**
- Number of Lines: **30** (For an E1 trunk, the 16th channel is reserved for signaling and 32nd channel is reserved for Controlling. This leaves 30 channels for voice.)
- Integration Type: **Digital**
- Signaling Protocol: **EURO ISDN PRI**

- Framing: **CEPT1**
- Line Code: **HDB3**
- ISDN Protocol: **QTE** (Indicates that the Vocera Telephony Server was set to **peer-slave**)

After completion, click the **Save Changes** button.



5.5. Configuring the Vocera Badges

A Vocera provided script is used to easily download configuration information to the Vocera Badges. The following screen shows the applicable fields that were changed for the Vocera Badges to communicate with the Avaya Wireless AP-8.

```
AuthenticationType              Open
EncryptionType                  WEP128
SSID                            vocera
ServerIPAddr                    10.0.0.1
ShortPreamble                   FALSE
UpdaterIPAddr                   10.0.0.1
WEPKey1                         31323334353637383930313233
WEPKeySlot                      1
```

6. Interoperability Compliance Testing

Interoperability compliance testing covered connectivity, error recovery, and feature functionality. Feature tests verified the ability of the Vocera Server to communicate with Avaya Communication Manager to make and receive calls, transfer calls, and conference calls. Connectivity tests verified that the Vocera Server was able to connect to Avaya Communication Manager over the T1 and E1 trunks, and as a set of analog stations. The test also verified that the Vocera Badges were able to connect to Avaya Wireless AP-8s, and roam between access points. Error recovery testing verified that the Vocera Server was able to recover connectivity to Avaya Communication Manager under a link failure scenario.

6.1. General Test Approach

All test cases were performed manually. The following features and functionality were verified:

- T1 connectivity between Vocera Telephony Server and Avaya Communication Manager, using the ISDN-PRI protocol
- T1 connectivity between Vocera Telephony Server and Avaya Communication Manager, using a Robbed-bit Wink Start trunk.
- E1 connectivity between Vocera Telephony Server and Avaya Communication Manager, using the QSIG protocol.
- Analog Integration
- Layer 2 Roaming
- Transfer and Conference calls between the Vocera badges and Avaya IP Telephones
- Link failure scenario

6.2. Test Results

All test cases passed. The Vocera Communications System provided connectivity to Vocera Badge users over an Avaya wireless infrastructure, and connected to Avaya Communication Manager over the T1 and E1 interfaces, and a set of analog stations.

7. Verification Steps

To verify the solution is properly configured, the following steps can be utilized.

- Place calls between the Vocera Badges to verify proper connectivity through the wireless infrastructure. If the Vocera Badge is not able to reach the Vocera Server, verify that the proper WEP encryption key and SSID was configured for the badge and Avaya Wireless AP-8s.
- Place calls in both directions between Vocera Telephony Server and Avaya Communication Manager. If the calls are not successful, verify the proper configuration for the trunk port between Avaya Communication Manager and the Vocera Telephony Server. To check the trunk between Avaya Communication Manager and the Vocera Telephony Server, the following commands were utilized.
    - **test board** (to check the physical connection between Avaya Communication Manager and the Vocera Telephony Server)
    - **status trunk** (to check the trunk between Avaya Communication Manager and the Vocera Telephony Server)

8. Support

For technical support on the Vocera Communications System, call Vocera Support at (800) 473-3971 or send email to Support@Vocera.com.

9. Conclusion

These Application Notes describe the configuration steps required for integrating the Vocera Communications System with Avaya Communication Manager. The systems interoperated successfully, providing a suitable solution for wireless access and connectivity between Vocera Badge users and Avaya Communication Manager users.

10. References

This section references the Avaya and Vocera Communications documentation that are relevant to these Application Notes.

The following Avaya product documentation can be found at http://support.avaya.com.

[1] *Feature Description and Implementation For Avaya Communication Manager*, Release 3.1, Issue 4, February 2006, Document Number 555-245-205.
[2] *Administrator Guide for Avaya Communication Manager*, Release 3.1, Issue 2, February 2006, Document Number 03-300509.

The following Vocera Communications system product documentation is provided. For additional product and company information, visit http://www.vocera.com.

[3] *Vocera Administration Guide*, Version 4.0 build 1273
[4] *Vocera Installation Guide*, Version 4.0 build 1273

Please e-mail any questions or comments pertaining to these Application Notes along with the full title name and filename, located in the lower right corner, directly to the Avaya Developer*Connection* Program at devconnect@avaya.com.