



Avaya Solution & Interoperability Test Lab

Application Notes for the Vocera Communications System with an Avaya IP Telephony Infrastructure - Issue 1.0

Abstract

These Application Notes describe a solution for integrating the wireless communication features of a Vocera Communications System with Avaya IP Telephony, including Avaya Communication Manager, Avaya IP Office, Avaya Wireless Mobility Gateway and Avaya Wireless Access Points. An Extreme Networks Alpine 3804 Ethernet Switch interconnected all the network devices.

Emphasis of the testing was placed on verifying connectivity between the Vocera Badges with the Avaya Wireless Gateway and Access Points, as well as reliable integration between the Vocera Telephony Server, Avaya Communication Manager, and Avaya IP Office, using T1 Robbed-Bit, T1 ISDN-PRI, and Analog ports.

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 solution for integrating the wireless communication features of a Vocera Communications System with Avaya IP Telephony, including Avaya Communication Manager, Avaya IP Office, Avaya Wireless Mobility Gateway and Avaya Wireless Access Points. An Extreme Networks Alpine 3804 Ethernet Switch interconnected all the network devices.

The Vocera solution is comprised of three main components: the Vocera Server, the Vocera Badges, and the optional Vocera Telephony Server. The two server applications can reside in the same physical server platform.

The Vocera Badges are wireless 802.11b devices that serve as communicators in a wireless environment. A user places a call from a Badge by pressing a button and interfacing with the Vocera Server via speech. A user can answer a call via speech or automatically.

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

The Vocera Telephony Server is an optional interface that provides connectivity to a PBX system. The interfaces to the PBX can be ISDN-PRI, T1 Robbed Bit (Channel Associated Signaling), or Analog. 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.

Figure 1 illustrates the network configuration used to verify the Vocera Communications solution. Although all three PBX interface types (T1, ISDN-PRI, and Analog) were verified, it was done one interface at a time, since the mix of interfaces is not a typical solution.

The configuration details provided in these Application Notes focus on the PBX interfaces between Avaya Communication Manager, Avaya IP Office, and the Vocera Telephony Server as well as the wireless configuration between the Vocera Badges and the Avaya Wireless Mobility Gateway and Avaya Wireless Access Points.

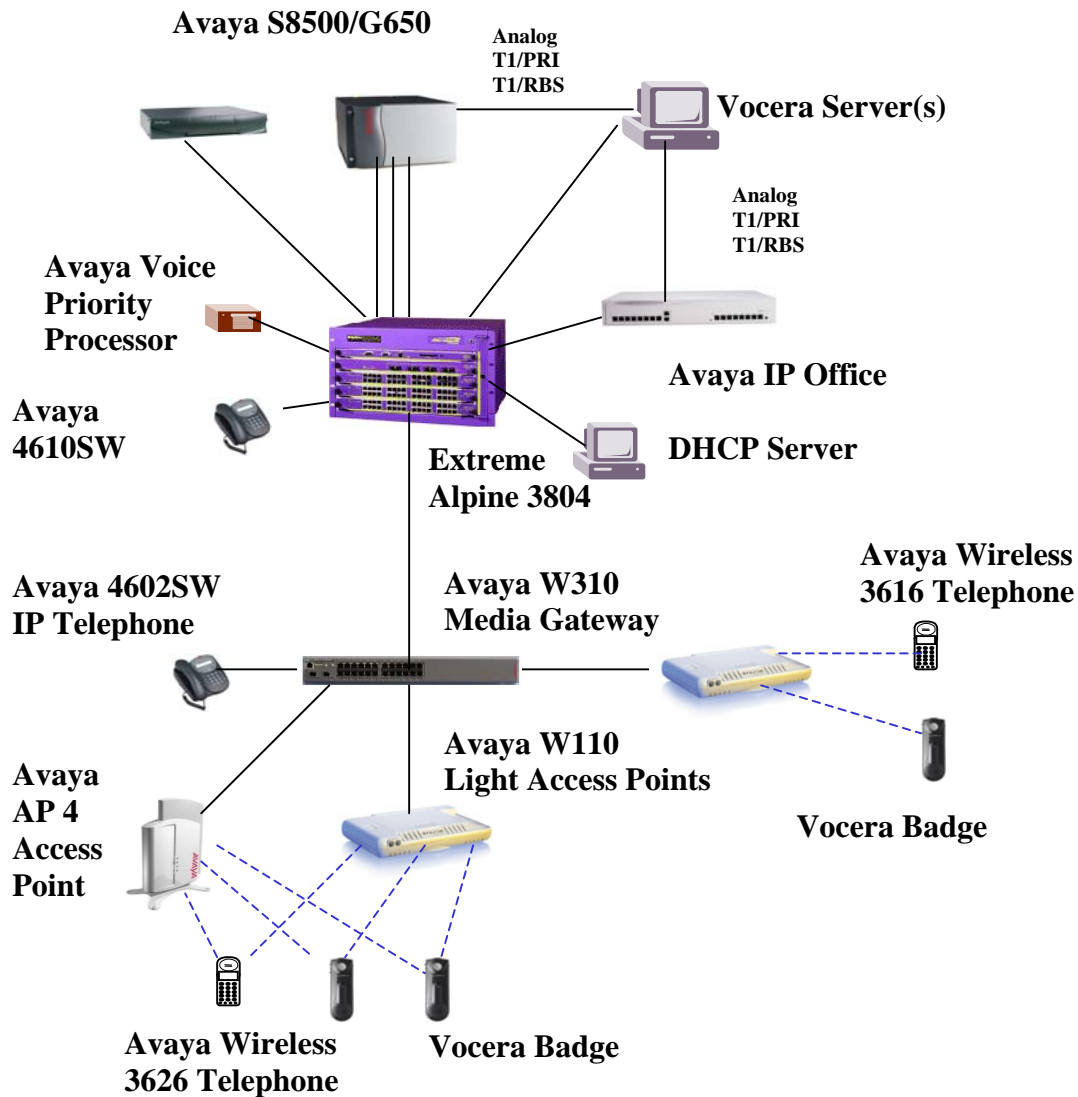


Figure 1: Avaya and Vocera Configuration

2. Equipment and Software Validated

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

Equipment	Software
Avaya S8500 Media Server with Avaya G650 Media Gateway	Communication Manager 2.1 (R012x.01.0.411.7)
Avaya W310 Media Gateway	4.3.47
Avaya W110 Light Access Point	1.1.16
Avaya AP4/5/6 Access Point	2.4.5
Avaya IP Office 403	2.1.17
Avaya Voice Priority Processor	33/02
Avaya 4602SW IP Telephone	1.800
Avaya 4610SW IP Telephone	2.130
Avaya 3616/3626 IP Wireless Telephones	96.024
Avaya Phone Manager Pro	2.1.7
Extreme Networks Alpine 3804 Ethernet Switch	7.2.0 Build 25
Vocera Server and Telephony Server	3.0 build 913
Vocera Badges	3.0 build 913

3. Configuring Avaya Communication Manager

Connectivity between Avaya Communication Manager and the Vocera Telephony Server was done with T1 Robbed-Bit trunks, T1 ISDN-PRI trunks, and Analog ports. The following sections show the relevant configuration screens for the three interfaces. When all configurations are completed it is recommended to “save translations” so that the changes are saved.

When the integration is 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. Set the “Trunk-to-Trunk Transfer” field to “all”.

```
display system-parameters features                               Page 1 of 14
      FEATURE-RELATED SYSTEM PARAMETERS
      Self Station Display Enabled? n
      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 Attnd-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
```

It is important that stations that have access to the Vocera Server are not outward restricted. All stations have a COR assigned to them in the station form. 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, in this case the COR number is 1.

display cor 1		Page 1 of 4
CLASS OF RESTRICTION		
COR Number: 1		
COR Description:		
FRL: 0	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		
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 Trunks

The configuration verified for T1 trunks used the 4xxxx extension range for the Vocera Server and Badges. A uniform dial plan was used to allow 5-digit dialing to reach the Vocera Badges. When no digits are sent to the Vocera Server, the user is greeted by the voice interface, and prompted for a badge user to contact. If digits are sent over the trunk to the Vocera Server, then Vocera looks up the digits in a table to see if they match a Badge user, and sets up the connection to that user. If the digits are not in the user table, then the caller hears an audio message indicating there is no such user and is prompted for a user to contact. The configuration shown here does not send digits to the Vocera server, so the caller always receives the initial greeting.

The DS1 form for the ISDN-PRI board is shown here. Avaya Communication Manager acted as the network, and the Vocera Server was the user. The “Country Protocol” was set to “1” and the “Protocol Version” was set to “a”. Vocera, shown in later screens, was set to simulate a connection to a 5ESS Central Office switch.

```

display ds1 a06                                     Page 1 of 2

DS1 CIRCUIT PACK

Location: 01A06                                     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
Slip Detection? n                                 Near-end CSU Type: other

```

The trunk group screens are shown here. The important trunk related parameters that were different from their default values are highlighted here.

```

display trunk-group 60                             Page 1 of 22

TRUNK GROUP

Group Number: 60                                   Group Type: isdn
Group Name: Vocera PRI                             CDR Reports: y
Direction: two-way                                COR: 1
Outgoing Display? n                               TN: 1
Dial Access? y                                     TAC: 160
Queue Length: 0                                   Carrier Medium: PRI/BRI
Service Type: tie                                  Night Service:
Auth Code? n                                       TestCall ITC: rest
Far End Test Line No:

TestCall BCC: 4
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: a                     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? y
Answer Supervision Timeout: 0

```

display trunk-group 60										Page 6 of 22	
TRUNK GROUP											
										Administered Members (min/max): 1/23	
GROUP MEMBER ASSIGNMENTS										Total Administered Members: 23	
	Port	Code	Sfx	Name	Night				Sig	Grp	
1:	01A0601	TN464	F						60		
2:	01A0602	TN464	F						60		
3:	01A0603	TN464	F						60		
4:	01A0604	TN464	F						60		
5:	01A0605	TN464	F						60		
6:	01A0606	TN464	F						60		
7:	01A0607	TN464	F						60		
8:	01A0608	TN464	F						60		
9:	01A0609	TN464	F						60		
10:	01A0610	TN464	F						60		
11:	01A0611	TN464	F						60		
12:	01A0612	TN464	F						60		
13:	01A0613	TN464	F						60		
14:	01A0614	TN464	F						60		
15:	01A0615	TN464	F						60		

display trunk-group 60										Page 7 of 22	
TRUNK GROUP											
										Administered Members (min/max): 1/23	
GROUP MEMBER ASSIGNMENTS										Total Administered Members: 23	
	Port	Code	Sfx	Name	Night				Sig	Grp	
16:	01A0616	TN464	F						60		
17:	01A0617	TN464	F						60		
18:	01A0618	TN464	F						60		
19:	01A0619	TN464	F						60		
20:	01A0620	TN464	F						60		
21:	01A0621	TN464	F						60		
22:	01A0622	TN464	F						60		
23:	01A0623	TN464	F						60		
24:											
25:											
26:											
27:											
28:											
29:											
30:											

The Uniform Dial Plan screen is shown here. The 5-digit 4xxxx extension range was used for Vocera Server and Badges.

display uniform-dialplan 4										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
4	5	0	aar		n						n

Automatic Alternate Routing (AAR) was used to route calls to the appropriate route pattern.

display aar analysis 4							Page	1	of	2
AAR DIGIT ANALYSIS TABLE										
Percent Full: 1										
Dialed String	Total Min	Total Max	Route Pattern	Call Type	Node Num	ANI Reqd				
4	5	5	60	aar	n					

Route Pattern 60 routed calls to trunk group 60, and deleted all 5 digits dialed, so no digits were sent to the Vocera Server.

display route-pattern 60														Page	1	of	3		
Pattern Number: 60														Pattern Name: Vocera					
Secure SIP? n																			
Grp	FRL	NPA	Pfx	Hop	Toll	No.	Inserted	DCS/ IXC											
No			Mrk	Lmt	List	Del	Digits	QSIG											
								Dgts	Intw										
1:	60	0					5	n user											
2:								n user											
3:								n user											
4:								n user											
5:								n user											
6:								n user											
BCC VALUE TSC CA-TSC ITC BCIE Service/Feature BAND 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				
4:	y	y	y	y	y	n	n	rest							none				
5:	y	y	y	y	y	n	n	rest							none				
6:	y	y	y	y	y	n	n	rest							none				

3.2. Configuring T1 Robbed Bit Trunks

The configuration verified for T1 trunks used the 4xxxx extension range for the Vocera Server and Badges. A uniform dial plan was used to allow 5-digit dialing to reach Vocera Badges. When no digits are sent to the Vocera Server, the user is greeted by the voice interface, and prompted for a badge user to contact. If digits are sent over the trunk to the Vocera Server, then Vocera looks up the digits in a table to see if they match a Badge user, and sets up the connection to that user. If the digits are not in the user table, then the caller hears an audio message indicating there is no such user and is prompted for a user to contact. The configuration shown here does not send digits to the Vocera Server, so the caller always receives the initial greeting.

The DS1 form for the Robbed Bit T1 board is shown here.


```

display ds1 a07
DS1 CIRCUIT PACK
Page 1 of 2

Location: 01A07
Bit Rate: 1.544
Line Compensation: 1
Line Coding: b8zs
Framing Mode: esf
Signaling Mode: robbed-bit

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

```

The trunk group screens are shown here. The important trunk related parameters that were different from their default values are highlighted here.

```

display trunk-group 70
TRUNK GROUP
Page 1 of 20

Group Number: 70
Group Name: Vocera RBS
Direction: two-way
Dial Access? y
Queue Length: 0
Comm Type: voice

Group Type: tie
COR: 1
TN: 1
TAC: 107
Outgoing Display? n
Trunk Signaling Type:
Busy Threshold: 255
Night Service:
Incoming Destination:
Auth Code? n
Trunk Flash? n

TRUNK PARAMETERS
Trunk Type (in/out): wink/immed
Outgoing Dial Type: tone
Digit Treatment:
Analog Loss Group: 9
Incoming Dial Tone? y
Incoming Rotary Timeout(sec): 5
Incoming Dial Type: tone
Disconnect Timing(msec): 500
Digits:
Sig Bit Inversion: none
Digital Loss Group: 13
Disconnect Supervision - In? y Out? y
Answer Supervision Timeout: 0
Receive Answer Supervision? y

```

```

display trunk-group 70
TRUNK GROUP
Page 4 of 20

Administered Members (min/max): 1/24
Total Administered Members: 24

GROUP MEMBER ASSIGNMENTS

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 70									
TRUNK GROUP									
Administered Members (min/max): 1/24									
Total Administered Members: 24									
GROUP MEMBER ASSIGNMENTS									
	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:									
27:									
28:									
29:									
30:									

The Uniform Dial Plan screen is shown here. The 5-digit 4xxxx extension range was used for Vocera Server and Badges.

display uniform-dialplan 4									
UNIFORM DIAL PLAN TABLE									
Percent Full: 0									
Matching	Insert		Node		Matching	Insert		Node	
Pattern	Len	Del	Digits	Net	Conv	Num	Pattern	Len	Del
4	5	0	aar		n				

Automatic Alternate Routing (AAR) was used to route calls to the appropriate route pattern.

display aar analysis 4									
AAR DIGIT ANALYSIS TABLE									
Percent Full: 1									
Dialed		Total		Route		Call	Node	ANI	
String		Min	Max	Pattern	Type	Num	Reqd		
4		5	5	70	aar		n		

Route Pattern 70 routed calls to trunk group 70, and deleted all 5 digits dialed, so no digits were sent to the Vocera Server.

display route-pattern 70										Page	1 of	3		
Pattern Number: 60 Pattern Name: Vocera														
Secure SIP? n														
Grp	FRL	NPA	Pfx	Hop	Toll	No.	Inserted			DCS/	IXC			
No			Mrk	Lmt	List	Del	Digits			QSIG				
							Dgts			Intw				
1:	70	0					5			n	user			
2:											n	user		
3:											n	user		
4:											n	user		
5:											n	user		
6:											n	user		
BCC		VALUE		TSC	CA-TSC		ITC		BCIE	Service/Feature	BAND	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		
4:	y	y	y	y	y	n	n	rest				none		
5:	y	y	y	y	y	n	n	rest				none		
6:	y	y	y	y	y	n	n	rest				none		

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, 55555, to reach the Vocera Server. In this configuration, four stations were used. A sample station form is shown here.

display station 50011		Page	1 of	3
STATION				
Extension: 50011		Lock Messages? n	BCC: 0	
Type: 2500		Security Code:	TN: 1	
Port: 01A1201		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				

The stations were assigned to Hunt Group 2, and Hunt Group 2 was assigned extension 55555. The hunt group forms are shown here.

```

display hunt-group 2                                     Page 1 of 60
                                     HUNT GROUP

      Group Number: 2                                ACD? n
      Group Name: Vocera                             Queue? n
      Group Extension: 55555                         Vector? n
      Group Type: ucd-mia                           Coverage Path:
      TN: 1                                           Night Service Destination:
      COR: 1                                           MM Early Answer? n
      Security Code:
      ISDN Caller Display

```

```

display hunt-group 2                                     Page 2 of 60
                                     HUNT GROUP

      Message Center: none

      LWC Reception: none
      AUDIX Name:

```

```

display 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 /4
                                     Total Administered Members: 4

GROUP MEMBER ASSIGNMENTS
  Ext      Name (24 characters)      Ext      Name (24 characters)
  1: 50011  Vocera Port 1           14:
  2: 50012  Vocera Port 2           15:
  3: 50013  Vocera Port 3           16:
  4: 50014  Vocera Port 4           17:
  5:                                     18:
  6:                                     19:
  7:                                     20:
  8:                                     21:
  9:                                     22:
  10:                                    23:
  11:                                    24:
  12:                                    25:
  13:                                    26:

      At End of Member List

```

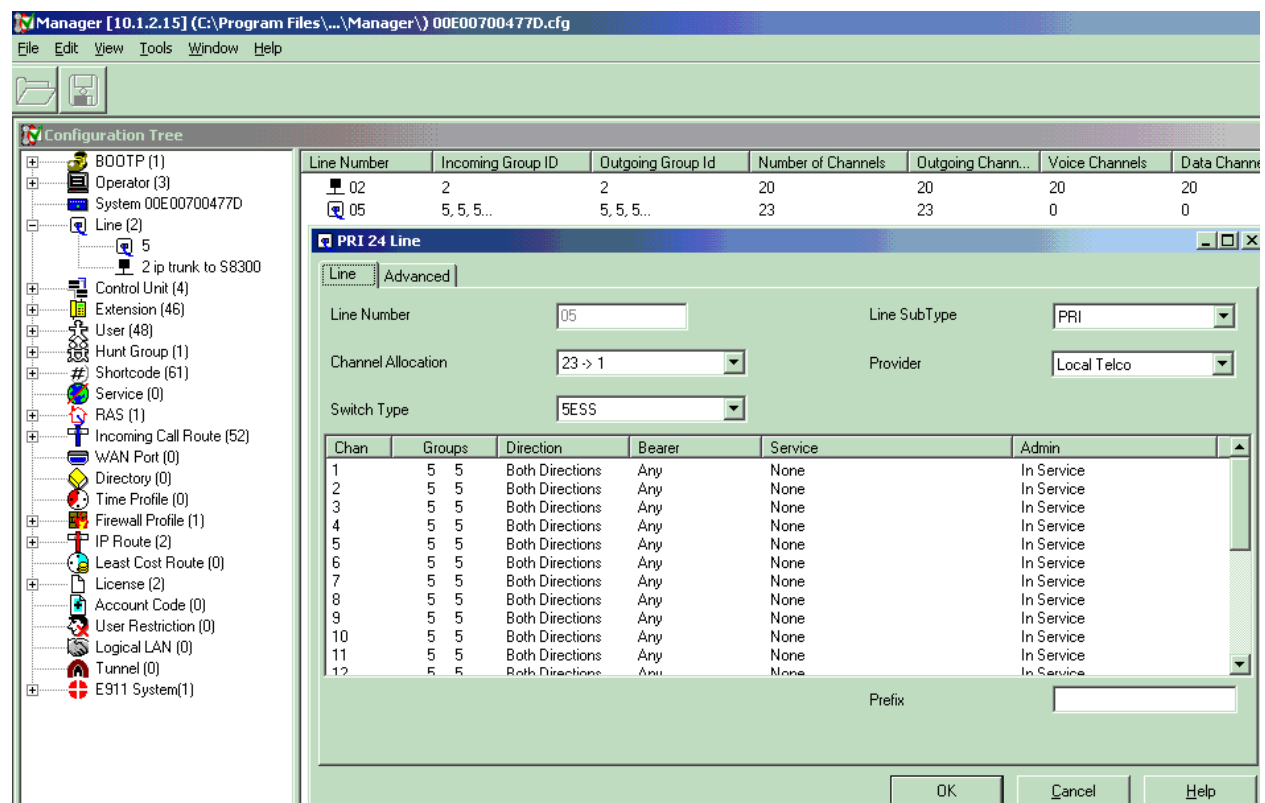
4. Configuring the Avaya IP Office

Connectivity between Avaya IP Office and the Vocera Telephony Server was done with T1 E&M trunks, T1 ISDN-PRI trunks, and Analog ports. The following sections show the relevant configuration screens for the three interfaces. IP Office configurations are done using the IP Office Manager. After each configuration is completed it is recommended to save the configuration and initiate an immediate reboot, if appropriate, so that the configuration is applied to the Avaya IP Office switch.

4.1. Configuring T1 ISDN-PRI Trunks

The configuration verified for T1 trunks used the 4xxxx extension range for the Vocera Server and Badges. Short codes were used to allow 5-digit dialing to reach Vocera Badges. When no digits are sent to the Vocera Server, the user is greeted by the voice interface, and prompted for a badge user to contact. If digits are sent over the trunk to the Vocera Server, then Vocera looks up the digits in a table to see if they match a Badge user, and sets up the connection to that user. If the digits are not in the user table, then the caller hears an audio message indicating there is no such user and is prompted for a user to contact. The configuration shown here does not send digits to the Vocera server, so the caller always receives the initial greeting.

In the Configuration Tree, expand the Line section. Line group number 5 was configured to connect to the Vocera Server. Double click on Line Number 5 and the configuration window appears.



Avaya IP Office only supports the user side of the ISDN-PRI protocol, so the Vocera Telephony Server was set for the network side. The “Line Sub Type” was set to “PRI”. The “Provider” was set to “Local Telco”. The “Switch Type” was set for “5ESS”, and 23 channels were allocated.

PRI 24 Line

Line | **Advanced**

Line Number: 05 Line SubType: PRI

Channel Allocation: 23 -> 1 Provider: Local Telco

Switch Type: 5ESS

Chan	Groups	Direction	Bearer	Service	Admin
1	5 5	Both Directions	Any	None	In Service
2	5 5	Both Directions	Any	None	In Service
3	5 5	Both Directions	Any	None	In Service
4	5 5	Both Directions	Any	None	In Service
5	5 5	Both Directions	Any	None	In Service
6	5 5	Both Directions	Any	None	In Service
7	5 5	Both Directions	Any	None	In Service
8	5 5	Both Directions	Any	None	In Service
9	5 5	Both Directions	Any	None	In Service
10	5 5	Both Directions	Any	None	In Service
11	5 5	Both Directions	Any	None	In Service
12	5 5	Both Directions	Any	None	In Service

Prefix:

OK Cancel Help

In the Advanced Tab, it is important to set the “Clock Quality” to “Unsuitable” to prevent Avaya IP Office from attempting to synchronize its clock from the Vocera Server. The Vocera Server will synchronize its clock from Avaya IP Office.

PRI 24 Line

Line | **Advanced**

Test Number:

Framing: ESF

Zero Suppression: B8ZS

Clock Quality: Unsuitable

CSU Operation: ☐

Line Compensation: 0-115 ft

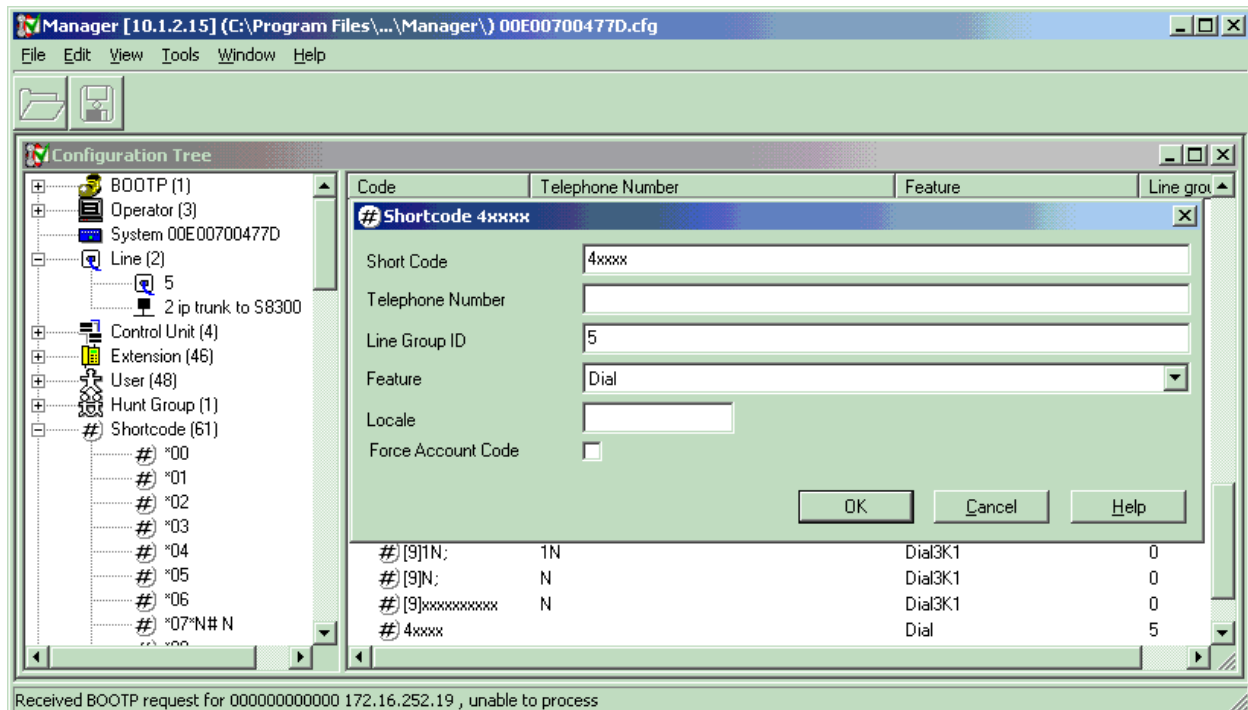
Line Signalling: CPE

Incoming Routing Digits: 5

CRC Checking: ☒

OK Cancel Help

Shortcodes are configured from the “Shortcode” entry in the Configuration Tree. Click on “Shortcode”, and then on the screen to the right, click with the right mouse button and select New. This will open a new Shortcode window. The screen below shows the one used to route 4xxxx. Leave the “Telephone Number” field blank. This indicates that no digits will be sent to the Vocera Server. The “Line Group ID” was set to “5”, which is the T1 line that connects to the Vocera Server.



4.2. Configuring T1 E & M Trunks

The configuration for using T1 E & M trunks is similar to T1 ISDN-PRI, with the only difference being the T1 Line configuration. The following screen shows what was used.

The “Line Sub Type” was set to “T1” and 24 channels were allocated. To configure the individual channels, you click on the first one, scroll down to the last one, hold the “Ctrl” key down and double click on the last one. This brings up the configuration screen. The “Type” was set to “E & M – Tie”. The “Incoming Trunk Type” was set to “Wink-Start”. The “Outgoing Trunk Type” was set to “Automatic”.

PRI 24 Line

Line Number: 05 Line SubType: T1

Channel Allocation: 24 -> 1

Chan	Groups	Direction	Bearer	Type	Incoming Trunk Type	Outgoing Trunk Type
1	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
2	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
3	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
4	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
5	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
6	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
7	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
8	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
9	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
10	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
11	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic
12	5 5	Both Directions	Voice	E & M - Tie	Wink-Start	Automatic

Prefix:

OK Cancel Help

In the Advanced Tab, it is important to set the “Clock Quality” to “Unsuitable” to prevent Avaya IP Office from attempting to synchronize its clock from the Vocera Server. The Vocera Server will synchronize its clock from Avaya IP Office.

PRI 24 Line

Line: Advanced

Framing: ESF

Zero Suppression: B8ZS

Clock Quality: Unsuitable

CSU Operation: ☐

Line Compensation: 0-115 ft

Channel Unit: Foreign Exchange

Line Signalling: CPE

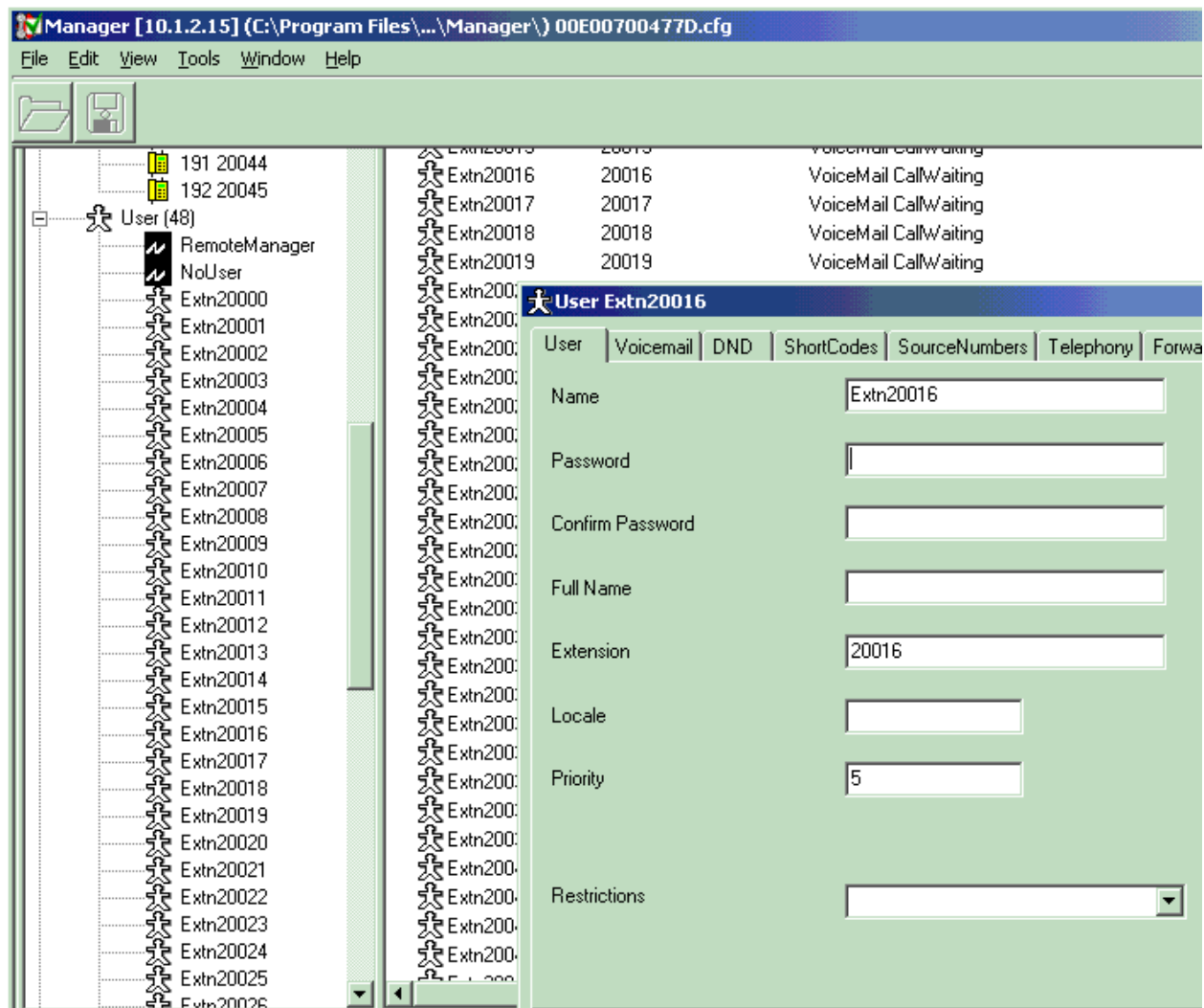
Incoming Routing Digits: 5

CRC Checking: ☒

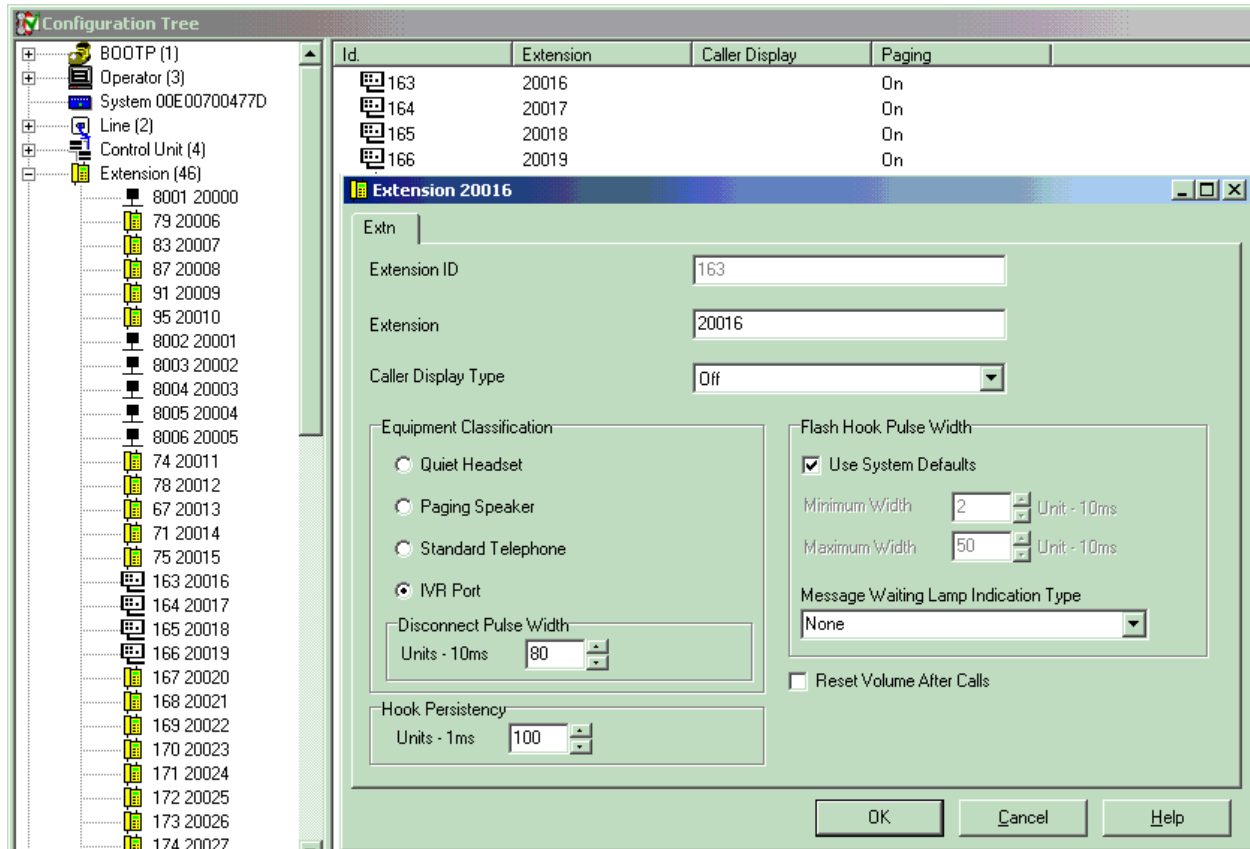
OK Cancel Help

4.3. Configuring Analog Ports

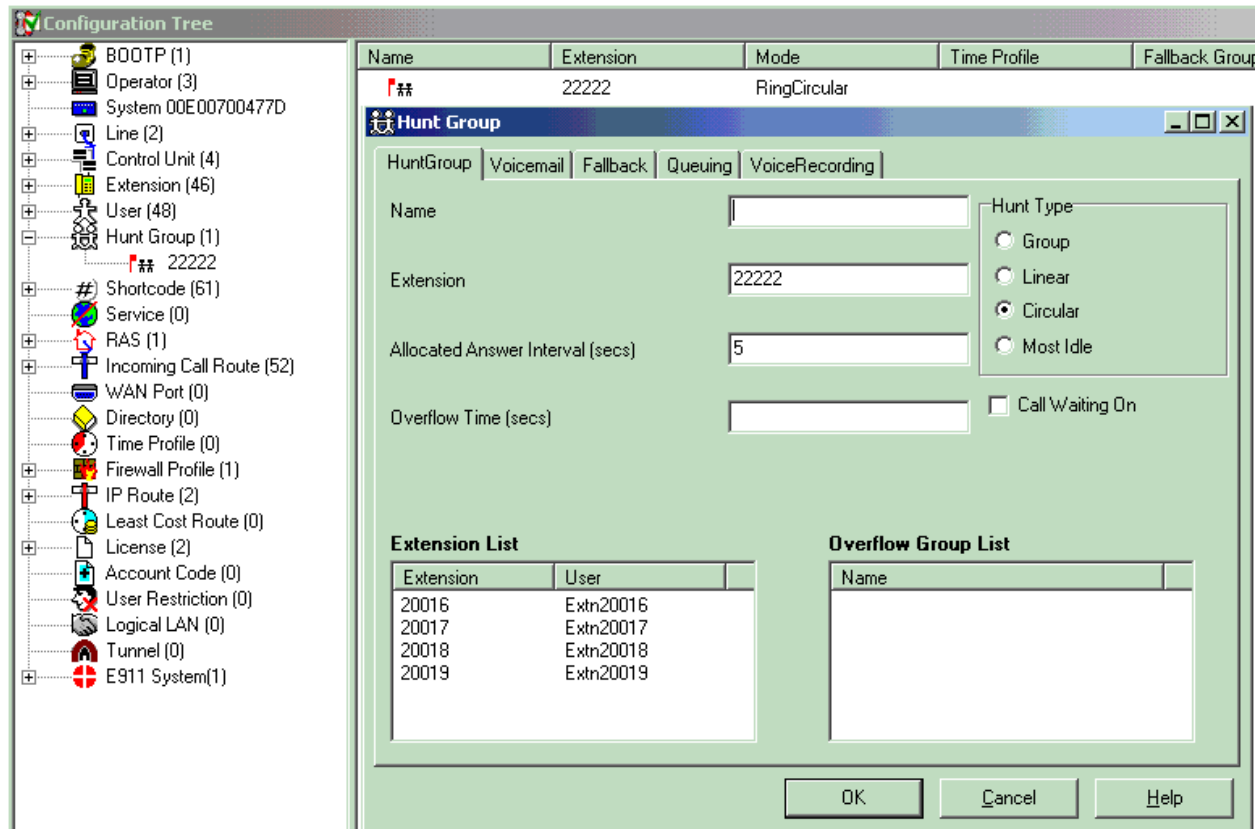
Integration with analog ports requires administering the appropriate number of Users and Extensions in Avaya IP Office, and assigning them to a hunt group. Users dialed the Hunt Group extension, 22222, to reach the Vocera Server. In this configuration, four stations were used. The user form is configured by selecting “Users” in the “Configuration Tree”, and double clicking on the appropriate user Name. This form allows you to associate a user Name to an Extension.



The extension configuration forms are under “Extension” in the “Configuration Tree”. It is important to set the “Equipment Classification” to “IVR Port” for proper disconnect handling on the Vocera analog ports.



The appropriate extensions need to be added to a hunt group. The hunt group forms are under “Hunt Group” in the “Configuration Tree”. On the right screen click the right mouse button and select “New” for a new hunt group. Provide an extension for the hunt group and select the “Hunt Type”; “Circular” was used in this configuration. In the “Extension List” screen, click the right mouse button and select “Add”. This allows you to scroll through the available User/Extensions. Click “OK” to finish.



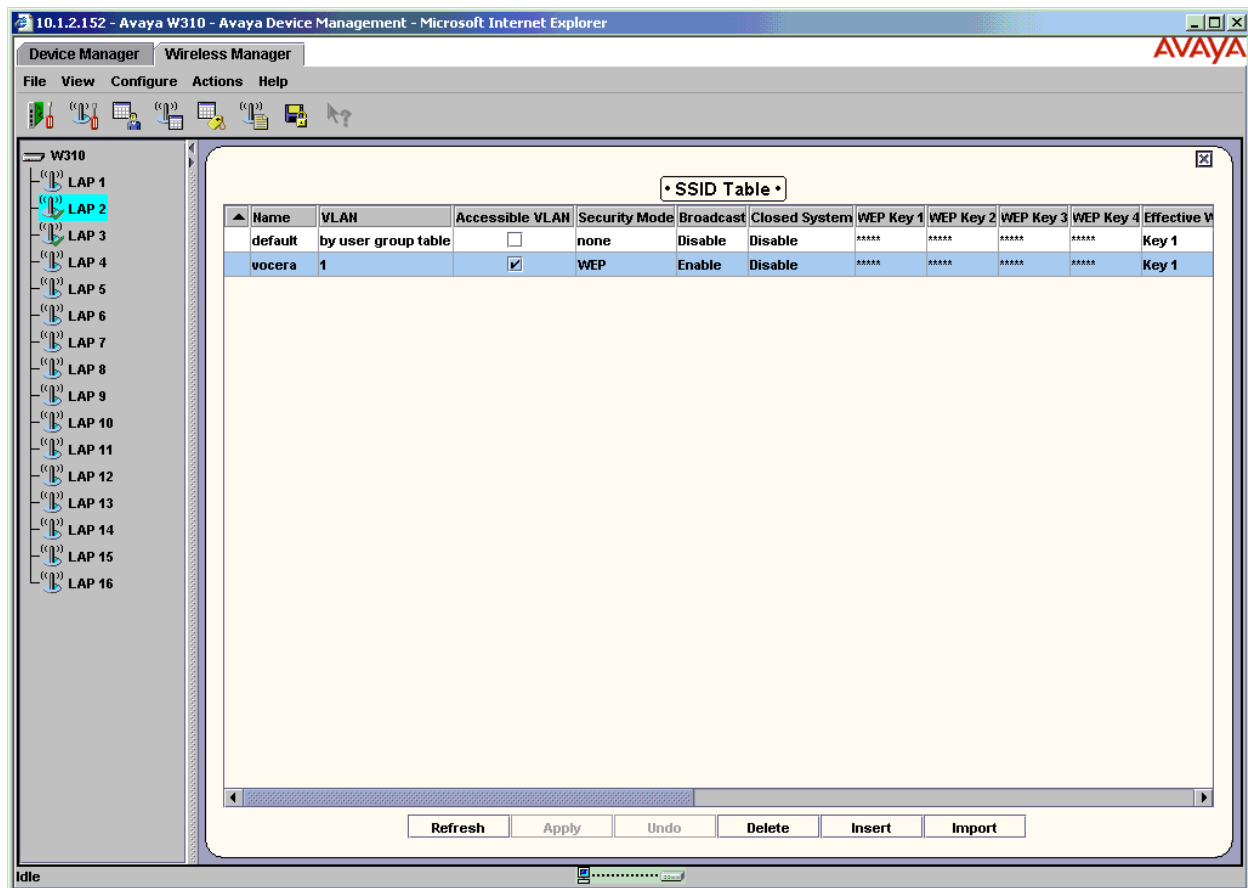
5. Configuring Avaya Wireless Access Points

Two types of Avaya wireless Access point were used: Avaya Wireless W110 Access Point and Avaya Wireless AP 4 Access Point.

5.1. Configuring Avaya W310/W110

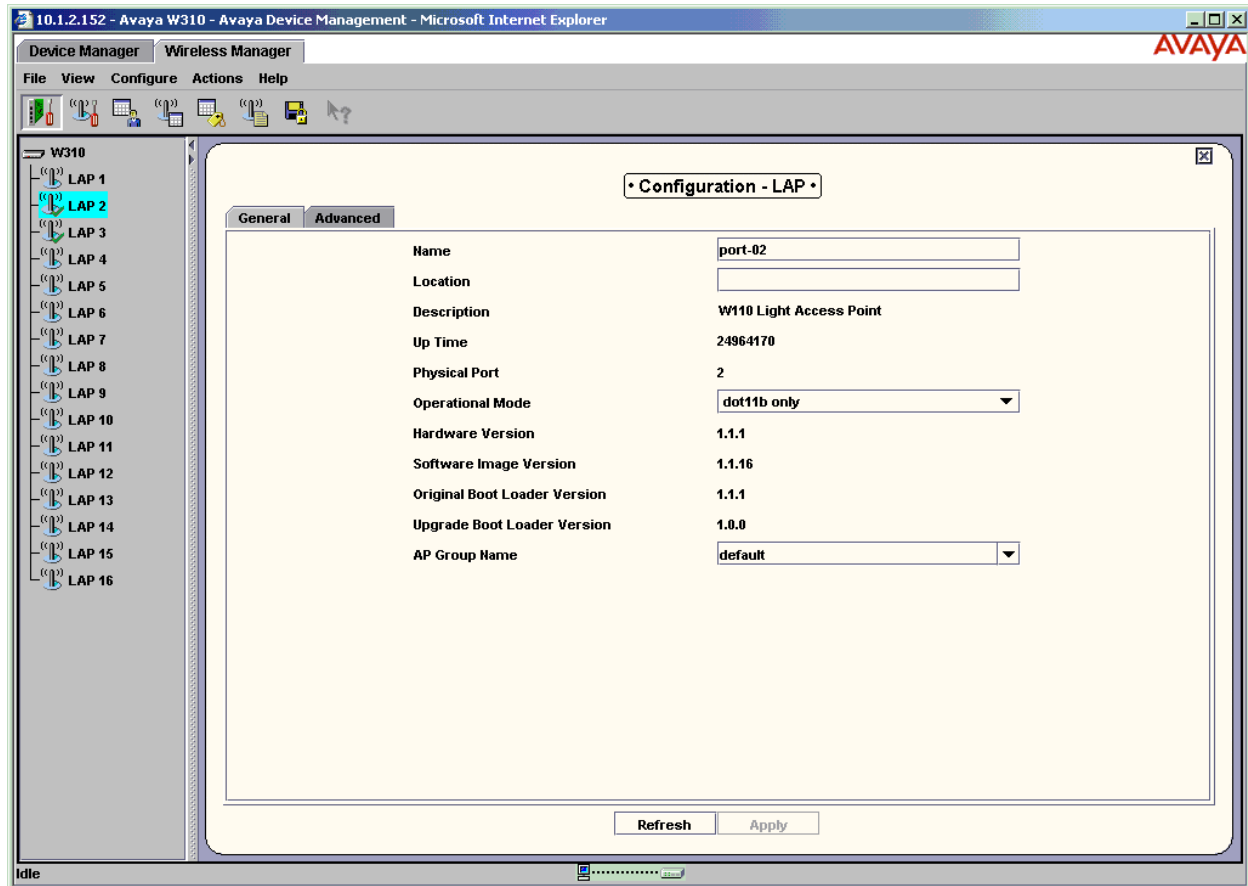
Configuration for the Avaya W110 Light Access Point is done through the Avaya W310 Mobility Gateway. The web interface was used to do the configuration. The configuration screens included here show how to configure the Operational Mode, SSID, and WEP encryption.

Use a web browser to access the Management IP address of the W310 and log in. Select the “Wireless Manager” tab. Click on “Configure” and select “SSID Table”, the following screen will appear. To create a new SSID, select “Insert”, and a new row will be created. To configure the columns in the row, either click or double click on the field to be changed. In some of the fields you enter text, in others you are required to choose from a pre-defined menu. Click on the “Name” column and type the SSID name “vocera”. Click on the “VLAN” column and enter the appropriate VLAN number, in this case “1”. Click on the “Accessible VLAN” column to check mark it. Click on the “Security Mode” column and select “WEP” from the menu. Click on the “Broadcast” column and select “Enable”. Click on the “Closed System” column and select “Disable”. Click on the “WEP Key 1” column and enter 13 characters to be used for the WEP 128 encryption key. Click on the “Effective WEP Key” column and select “Key 1”. Click on “Apply” for the configuration to be applied. Note that the same WEP encryption key needs to be used by all wireless devices to be able to communicate with the Access Points.

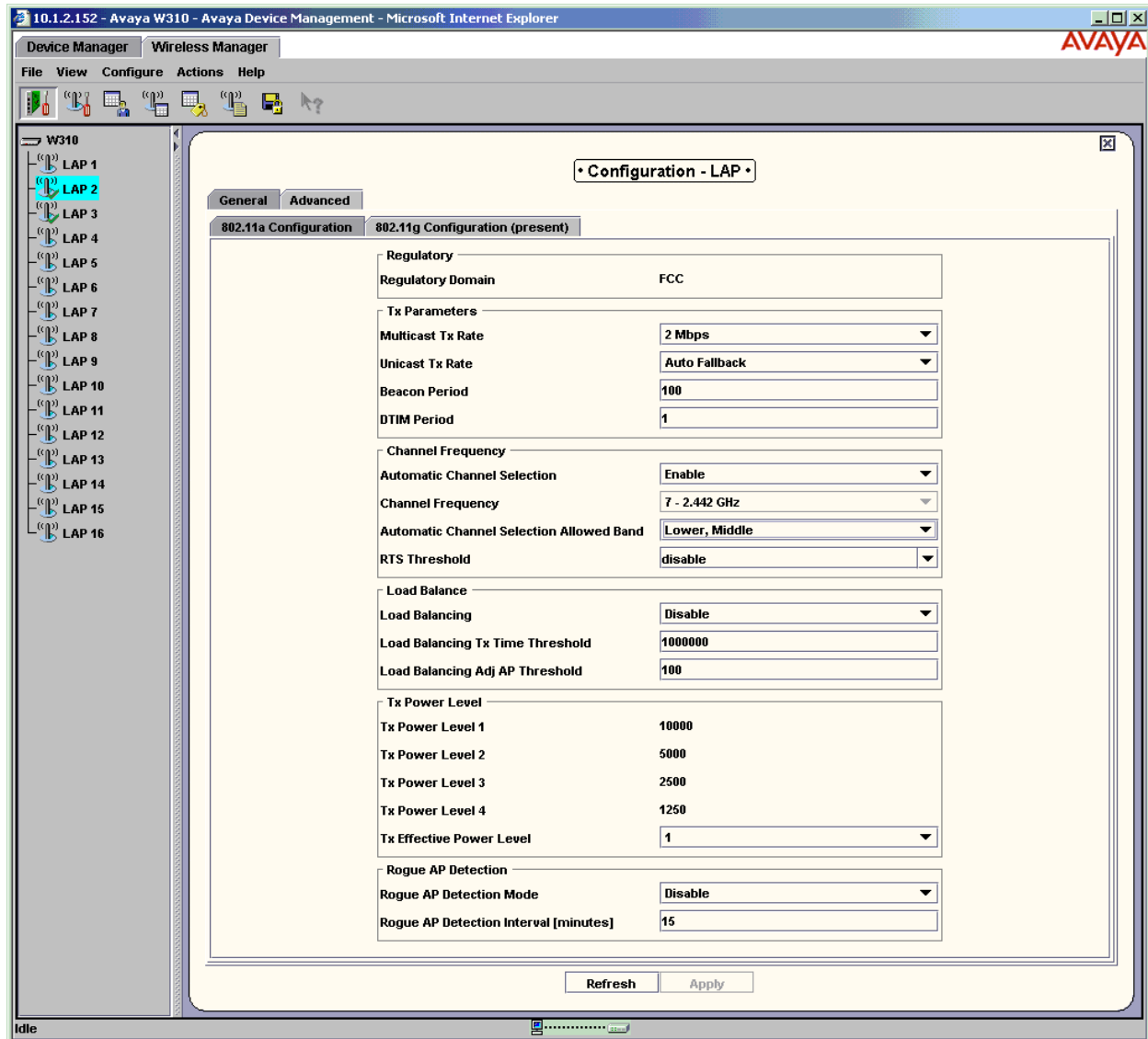


Note: Can be modified for more strict security policies.

To configure the W110 Light Access Points, follow the next steps for each LAP port. Click on “View” and select “Configuration”. Click on the “LAP” port to be configured. The following screen should appear. In the “General” tab set the “Operational Mode” to “dot11b only”. The Vocera Badges currently only support 802.11b. Click “Apply” to apply the configuration.

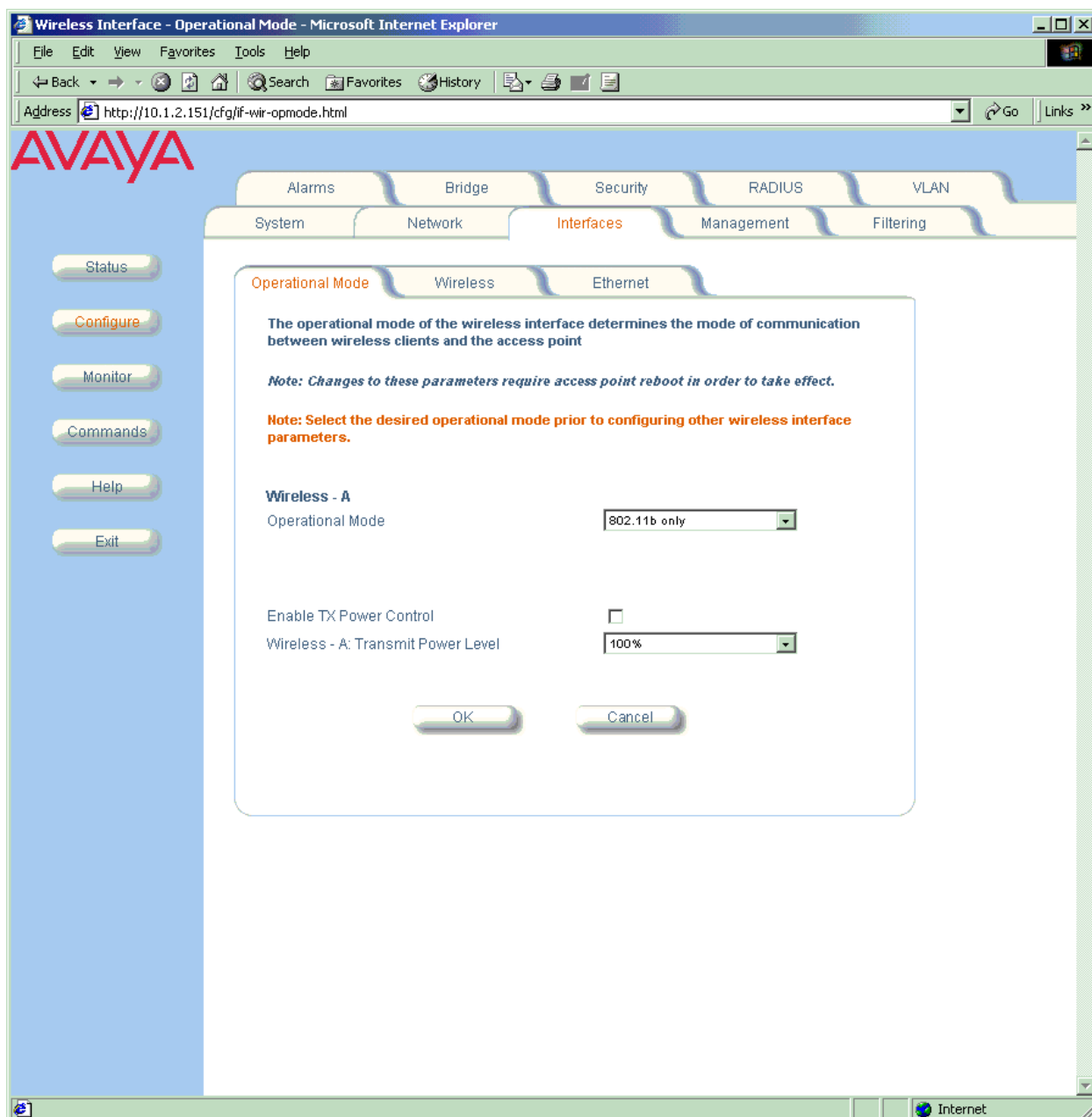


Click the “Advanced” Tab, and then the “802.11g Configuration” tab. When the operational mode is 802.11b, the 802.11g tab is used to configure the W110 Light Access Point. In this screen you can choose the desired “Channel Frequency”. In this example, Automatic Channel Selection was enabled. The other parameters were left at their default values. Click “Apply” to apply the configuration. Each time a W110 Light Access Point is rebooted the W310 Media Gateway sends it the appropriate configuration.



5.2. Configuring Avaya AP 4

The Avaya AP 4 is a standalone Access Point. The web interface was used to do the configuration. The configuration screens included here show how to configure the Operational Mode, SSID, and WEP encryption. Use a web browser to access the Management IP address of the Avaya AP 4 Access Point. Select the “Configure” button, and then the “Interfaces” tab. Under the “Operational Mode” tab, set the “Operational Mode” to “802.11b only”.



Select the “Wireless” Tab. Enter the SSID name “vocera” in the “Network Name (SSID)” field”. Select the desired “Frequency Channel” to be used. In this example, Frequency Channel 11 was used.

Wireless Interface - Slot A Configuration

File Edit View Favorites Tools Help

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Address http://10.1.2.151/cfg/lf-wirA-11ag.html

AVAYA

Alarms Bridge Security RADIUS VLAN

System Network **Interfaces** Management Filtering

Status

Configure

Monitor

Commands

Help

Exit

Operational Mode **Wireless** Ethernet

Wireless interface properties determine the characteristics of the wireless medium as well as how wireless clients will communicate with the access point.

Verify configuration of the desired operational mode prior to configuring the wireless interface properties below.

Note: Changes to these parameters require access point reboot in order to take effect.

Physical Interface Type 802.11b (DSSS 2.4 GHz)

MAC Address 00:20:A6:50:EA:62

Regulatory Domain USA (FCC)

Network Name (SSID) vocera

Enable Auto Channel Select ☐

Frequency Channel 11 - 2.462 GHz

Transmit Rate Auto Fallback

DTIM Period (1-255) 1

RTS/CTS Medium Reservation (2347=off) 2347

Enable Closed System ☐

OK Cancel

Wireless Distribution System (WDS)

WDS can be used to establish point-to-point (i.e. wireless backhaul) connections with other access points. This table is used to configure WDS partner access points.

Edit

Port Index	Partner MAC Address	Status
1	00:00:00:00:00:00	Disable
2	00:00:00:00:00:00	Disable
3	00:00:00:00:00:00	Disable

Internet

Select the “Security” Tab, and then the “Encryption” tab. Click the box next to the field “Enable Encryption (WEP) for Wireless Interface” to turn on WEP encryption. Enter 13 characters, to be used as the WEP 128 encryption key, in the “Encryption Key 1” field. Set the “Encrypt Data Transmissions Using” field to “Key 1”. Click “OK” to accept the configuration. Note that the same WEP encryption key needs to be used by all wireless devices to be able to communicate with the Access Points.

AVAYA

System Network Interfaces Management Filtering

Alarms Bridge **Security** RADIUS VLAN

MAC Access **Encryption** Authentication RAD

This tab is used to configure encryption (WEP) in the access point. This is used to provide data security for wireless communication between the access point and wireless clients. Encryption settings can be configured for both wireless interfaces.

Note: The access point supports 64, 128 and 152 bit keys depending on the wireless PC card in the device. 152 bit keys are supported for 802.11a and 802.11g cards running in non-802.1x mode only. The following table provides information on how to configure encryption keys using HEX or ASCII values.

	Configuration in Hex	Configuration in ASCII
64 bit encryption key	10 characters (0-F)	5 alphanumeric characters
128 bit encryption key	26 characters (0-F)	13 alphanumeric characters
152 bit encryption key	32 characters (0-F)	16 alphanumeric characters

Warning: Connectivity requires that encryption keys on the access point and the wireless clients be identical.

Note: Changes to these parameters require access point reboot in order to take effect.

Enable Encryption (WEP) for Wireless Interface ☒

Wireless Interface

Encryption Key 1

Encryption Key 2

Encryption Key 3

Encryption Key 4

Encrypt Data Transmissions Using

OK Cancel

For the new configuration to take effect, the Avaya AP 4 Access Point must now be rebooted. Click the “Commands” button, and then select “Reboot” to reboot the Access Point.

6. Configuring the Vocera Communications System

The Vocera Communications System is configured using a web based console interface.

The following screen shows the telephony configuration used when the Vocera Telephony Server places outbound calls through the PBX. The “Local Area Code” should match the local PBX area code. The “Default Local Access Code” should match the Automatic Route Selection (ARS) code in Avaya Communication Manager, or the appropriate dialout shortcode in Avaya IP Office. The “Default Long-Distance Access Code” is typically the same followed by a “1”.

The screenshot shows the Vocera Administrator web interface in a Microsoft Internet Explorer browser window. The address bar shows `http://localhost:8080/console/SiteController#`. The page title is "Vocera Administrator | Telephony - Microsoft Internet Explorer". The interface includes a navigation menu on the left with options like "Badge Status Monitor", "Sites", "Users", "Groups", "Departments", "System", "Defaults", "Locations", "Email", "Telephony" (selected), "Reports", "Maintenance", "Address Book", and "Documentation". The main content area is titled "Telephony" and has tabs for "Basic Info", "Access Codes", "Toll Info", and "PIN". The "Access Codes" tab is active. It features a "Select Site" dropdown menu set to "Global". Below this are input fields for "Local Area Code*" (containing "732"), "Default Local Access Code" (containing "9"), "Default Long-Distance Access Code" (containing "91"), and "Company Voicemail Access Code". A checkbox labeled "Omit Area Code when Dialing Locally" is checked. Below these fields is a section titled "Access Code Exceptions" with a table for defining exceptions. The table has three columns: "Area Code", "Range of Numbers", and "Access Code". To the right of the table are "Add", "Edit", and "Delete" buttons. At the bottom of the page are "Save Changes" and "Reset" buttons. The footer indicates "Vocera Server 3.0 [Build 913] Console [Build 913]".

Vocera Administrator | Telephony - Microsoft Internet Explorer

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vocera
COMMUNICATIONS

ADMINISTRATOR Log Out

Telephony

Badge Status Monitor
Sites
Users
Groups
Departments
System
Defaults
Locations
Email
Telephony
Reports
Maintenance
Address Book
Documentation

Basic Info Access Codes Toll Info PIN

Select Site Global

Local Area Code*
732

Default Local Access Code
9

Default Long-Distance Access Code
91

Company Voicemail Access Code

☒ Omit Area Code when Dialing Locally

Access Code Exceptions

By default, numbers in the local area code use the Default Local Access Code and all others use the Default Long-Distance Access Code. Enter exceptions in the table below:

Area Code	Range of Numbers	Access Code

Add
Edit
Delete

Save Changes Reset

Vocera Server 3.0 [Build 913] Console [Build 913]

Done Local intranet

6.1. Configuring the Vocera Badges

A script is typically 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 Access Points.

AuthenticationType	Open
EncryptionType	WEP128
SSID	vocera
ServerIPAddr	10.1.2.230
ShortPreamble	FALSE
UpdaterIPAddr	10.1.2.230
WEPKey1	31323334353637383930313233
WEPKeySlot	1

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

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager. The “Integration Type” was set to “Digital”. The Vocera Telephony Server T1 was set to emulate the user side of the ISDN protocol, by setting the “ISDN Protocol” to “5ESS”.

The screenshot displays the Vocera Administrator web interface within a Microsoft Internet Explorer browser window. The browser's address bar shows the URL: `http://localhost:8080/console/AdminController?formAction=telephonyoptions`. The page title is "Vocera Administrator | Telephony - Microsoft Internet Explorer".

The interface features a sidebar on the left with a menu of options: Badge Status Monitor, Sites, Users, Groups, Departments, System, Defaults, Locations, Email, **Telephony** (highlighted), Reports, Maintenance, Address Book, and Documentation. The main content area is titled "Telephony" and includes a "Basic Info" tab, "Access Codes", "Toll Info", and "PIN" tabs. A "Select Site" dropdown menu is set to "Global".

Under the "Basic Info" tab, the following configuration options are visible:

- ☒ Enable Telephony Integration
- Vocera Hunt Group Number:
- Number of Lines*:

The "Integration Type" section shows two radio buttons: "Analog" and "Digital" (selected). Below this, a table of configuration options is displayed:

Configuration Option	Value
Signaling Protocol	ISDN PRI
ISDN Protocol	5ESS
Framing	ESF
Line Code	B8ZS

At the bottom of the configuration area, there are "Save Changes" and "Reset" buttons. The footer of the page indicates "Vocera Server 3.0 [Build 913] Console [Build 913]".

The following screen shows the configuration used when Vocera was connected to Avaya IP Office. The “Integration Type” was set to “Digital”. The Vocera Telephony Server T1 was set to emulate the network side of the ISDN protocol, by setting the “ISDN Protocol” to “NT1”.

The screenshot displays the Vocera Administrator web interface within a Microsoft Internet Explorer browser window. The browser's address bar shows the URL: `http://localhost:8080/console/AdminController?formAction=telephonyoptions`. The page header includes the Vocera logo, the word "ADMINISTRATOR", and a "Log Out" button. A navigation sidebar on the left lists various system components, with "Telephony" currently selected. The main content area is titled "Telephony" and contains several configuration sections. The "Basic Info" tab is active, showing a "Select Site" dropdown set to "Global", a checked "Enable Telephony Integration" checkbox, a "Vocera Hunt Group Number" field with the value "2776", and a "Number of Lines*" field with the value "23". Below this, the "Integration Type" section has two radio buttons: "Analog" and "Digital", with "Digital" selected. A table of configuration options follows, with all dropdown menus set to specific values: Signaling Protocol (ISDN PRI), ISDN Protocol (NT1), Framing (ESF), and Line Code (B8ZS). At the bottom of the configuration area are "Save Changes" and "Reset" buttons. The footer of the page indicates the software versions: "Vocera Server 3.0 [Build 913] Console [Build 913]".

Vocera Administrator | Telephony - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print W Address http://localhost:8080/console/AdminController?formAction=telephonyoptions Go Links

vocera[®] COMMUNICATIONS

ADMINISTRATOR Log Out

Telephony

Badge Status Monitor Sites Users Groups Departments System Defaults Locations Email **Telephony** Reports Maintenance Address Book Documentation

Basic Info Access Codes Toll Info PIN

Select Site Global

☒ Enable Telephony Integration

Vocera Hunt Group Number 2776

Number of Lines* 23

Integration Type

☐ Analog ☒ Digital

Signaling Protocol	ISDN PRI
ISDN Protocol	NT1
Framing	ESF
Line Code	B8ZS

Save Changes Reset

Vocera Server 3.0 [Build 913] Console [Build 913]

Done Local intranet

6.3. Configuring the Vocera Telephony Server for T1 Robbed Bit or E & M trunks

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager and Avaya IP Office using T1 trunks, without ISDN-PRI. The “Integration Type” was set to “Digital”. The “Signaling Protocol” was set to “Wink Start”. Note that the “ISDN Protocol” field is grayed-out and not applicable in this configuration.

Vocera Administrator | Telephony - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost:8080/console/AdminController?formAction=telephonyoptions

vocera[®] COMMUNICATIONS ADMINISTRATOR Log Out

Telephony

Badge Status Monitor
Sites
Users
Groups
Departments
System
Defaults
Locations
Email
Telephony
Reports
Maintenance
Address Book
Documentation

Basic Info Access Codes Toll Info PIN

Select Site Global

☒ Enable Telephony Integration

Vocera Hunt Group Number 2776

Number of Lines* 24

Integration Type

☐ Analog
☒ Digital

Signaling Protocol Wink Start

ISDN Protocol SESS

Framing ESF

Line Code B8ZS

Save Changes Reset

Vocera Server 3.0 [Build 913] Console [Build 913]

javascript:resetForm(form1); Local intranet

6.4. Configuring the Vocera Telephony Server for Analog Ports

The following screen shows the configuration used when Vocera was connected to Avaya Communication Manager and Avaya IP Office using four analog Ports. The “Integration Type” was set to “Analog”. Note that the “Digital” settings are grayed-out and are not applicable when the “Integration Type” is set to “Analog”.

Vocera Administrator | Telephony - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print Mail

Address http://localhost:8080/console/AdminController?formAction=telephonyoptions Go Links

vocera[®]
COMMUNICATIONS

ADMINISTRATOR Log Out

Telephony

Badge Status Monitor
Sites
Users
Groups
Departments
System
Defaults
Locations
Email
Telephony
Reports
Maintenance
Address Book
Documentation

Basic Info Access Codes Toll Info PIN

Select Site Global

☒ Enable Telephony Integration

Vocera Hunt Group Number 2776

Number of Lines* 4

Integration Type

☒ Analog
☐ Digital

Signaling Protocol Wink Start

ISDN Protocol NT1

Framing ESF

Line Code B8ZS

Save Changes Reset

Vocera Server 3.0 [Build 913] Console [Build 913]

Done Local intranet

7. Interoperability Compliance Testing

Interoperability compliance testing covered connectivity, error recovery, and feature functionality. Feature functionality testing verified the ability of the Vocera Server to communicate with Avaya Communication Manager, and Avaya IP Office to make and receive calls, transfer calls, and conference calls. Connectivity functionality testing verified that the Vocera Server was able to connect to Avaya Communication Manager and Avaya IP Office over T1, ISDN-PRI, and Analog ports. It also verified that the Vocera Badges were able to connect to Avaya Wireless Mobility Gateways and Avaya Wireless Access Points, and roam between access points. Error recovery testing verified that the Vocera Server was able to recover connectivity to Avaya under different link failure scenarios.

7.1. General Test Approach

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

- T1 connectivity, including ISDN-PRI
- Analog Port connectivity
- WEP128 encryption
- Layer 2 Roaming
- Transfers and Conference calls

7.2. 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 and Avaya IP Office over T1, ISDN-PRI, and Analog ports.

8. Verification Steps

To verify that the solution was properly configured in the field, the following steps can be taken.

Place calls between 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 Access Point.

To verify calls between Vocera Badges and Avaya Communication Manager or Avaya IP Office, place calls in both directions between Vocera and Avaya. If the calls are not successful, verify the proper configuration for the trunk or analog ports between the Avaya equipment and the Vocera Telephony Server.

9. Support

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

10. Conclusion

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

11. 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] *Administration for Network Connectivity for Avaya Communication Manager*, Issue 8, June 2004, Document Number 555-233-504.
- [2] *Administrator's Guide for Avaya Communication Manager*, Issue 8, June 2004, Document Number 555-233-506.
- [3] *Avaya Voice Priority Processor*, Issue 4, May 2004, Document Number 555-301-102.
- [4] *IP Office 2.1 Manager*, Issue 15c, May 2004.
- [5] *Phone Manager 2.1 Installation & Maintenance*, Issue 1, April 2004.

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

- [6] *Vocera Administration Guide*, Version 3.0.
- [7] *Vocera Installation Guide*, Version 3.0.

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