Avaya Solution & Interoperability Test Lab

Configuring Cisco PIX Security Appliance using Cisco Adaptive Security Device Manager (ASDM) VPN Wizard to Support Avaya VPNremote™ Phones – Issue 1.0

Abstract

These Application Notes describe the steps to configure a Cisco PIX Security Appliance to support IPSec VPN tunnel termination and XAuth authentication of the Avaya VPNremote™ Phone. The configuration steps utilize the VPN Wizard tool of the Cisco Adaptive Security Device Manager.

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1. Introduction

These Application Notes describe the steps to configure a Cisco PIX Security Appliance, referred to as "PIX" throughout the remainder of these Application Notes, to support IPSec VPN (Virtual Private Network) tunnel termination and XAuth (eXtended Authentication) authentication of the Avaya VPNremote™ Phone. The configuration steps utilize the VPN Wizard tool of the Cisco Adaptive Security Device Manager (ASDM) application. The Cisco ASDM application provides a graphical user interface to the PIX. The VPN Wizard configures the following VPN elements on the PIX to support VPNremote Phones:

- VPN Tunnel Group
- Pre-shared Key
- User Authentication
- User Accounts
- IP Address Pool
- Security Associations
- IPSec Encryption and Authentication Algorithms

The Avaya VPNremote™ Phone is a software based IPSec VPN client integrated into the firmware of an Avaya 4600 Series IP Telephone. This capability allows the Avaya IP Telephone to be plugged in and used over a secure IPSec VPN from any broadband Internet connection. End user's experience the same IP telephone features as if the phone were being used in the office. Avaya IP Telephone models supporting the Avaya VPNremote Phone firmware include the 4610SW, 4620SW, 4621SW, 4622SW and 4625SW.

Release 2 of the Avaya VPNremote Phone, used in these Application Notes, extends the support of head-end VPN gateways to include Cisco security platforms. The configuration steps described in these Application Notes utilize a PIX model 525. However, these configuration steps can be applied to other PIX models using the software version specified in **Table 1**.

XAuth is a draft RFC developed by the Internet Engineering Task Force (IETF) based on the Internet Key Exchange (IKE) protocol. The VPNremote Phone communicates with the PIX using IKE with pre-shared key. XAuth allows security gateways to perform user authentication in a separate phase after the IKE authentication phase 1 exchange is complete. The VPNremote Phone uses the pre-shared key to authenticate with the PIX and create a temporary secure path to allow the VPNremote Phone user to present credentials (username/password) to the PIX. After the VPNremote Phone user authentication is successful, the PIX assigns an IP address to the VPNremote Phone from a pre-configured IP Address Pool. The PIX local user authentication mechanism is used in the sample configuration.

2. Network Topology

The sample network implemented for these Application Notes is shown in **Figure 1.** The Main Campus location contains the PIX functioning as perimeter security device and VPN head-end. The Phone Configuration File Server, DNS Server and Avaya WebLM License Manager are all running on the same physical server on the trusted enterprise LAN. The Avaya S8710 Media Server and Avaya G650 Media Gateway are also located at the Main Campus.

The Avaya VPNremote Phones are located in the public network and are configured to establish an IPSec tunnel to the Public (outside) IP address of the PIX. The PIX assigns IP addresses to the VPNremote Phones. The assigned IP addresses, also known as the inner addresses, will be used by the VPNremote Phones when communicating inside the IPSec tunnel and in the private corporate network to Avaya Communication Manager. Once the IPSec tunnel is established, the VPNremote Phone accesses the Phone Configuration File Server, DNS server, and WebLM server. The VPNremote Phone then initiates an H.323 registration with Avaya Communication Manager.

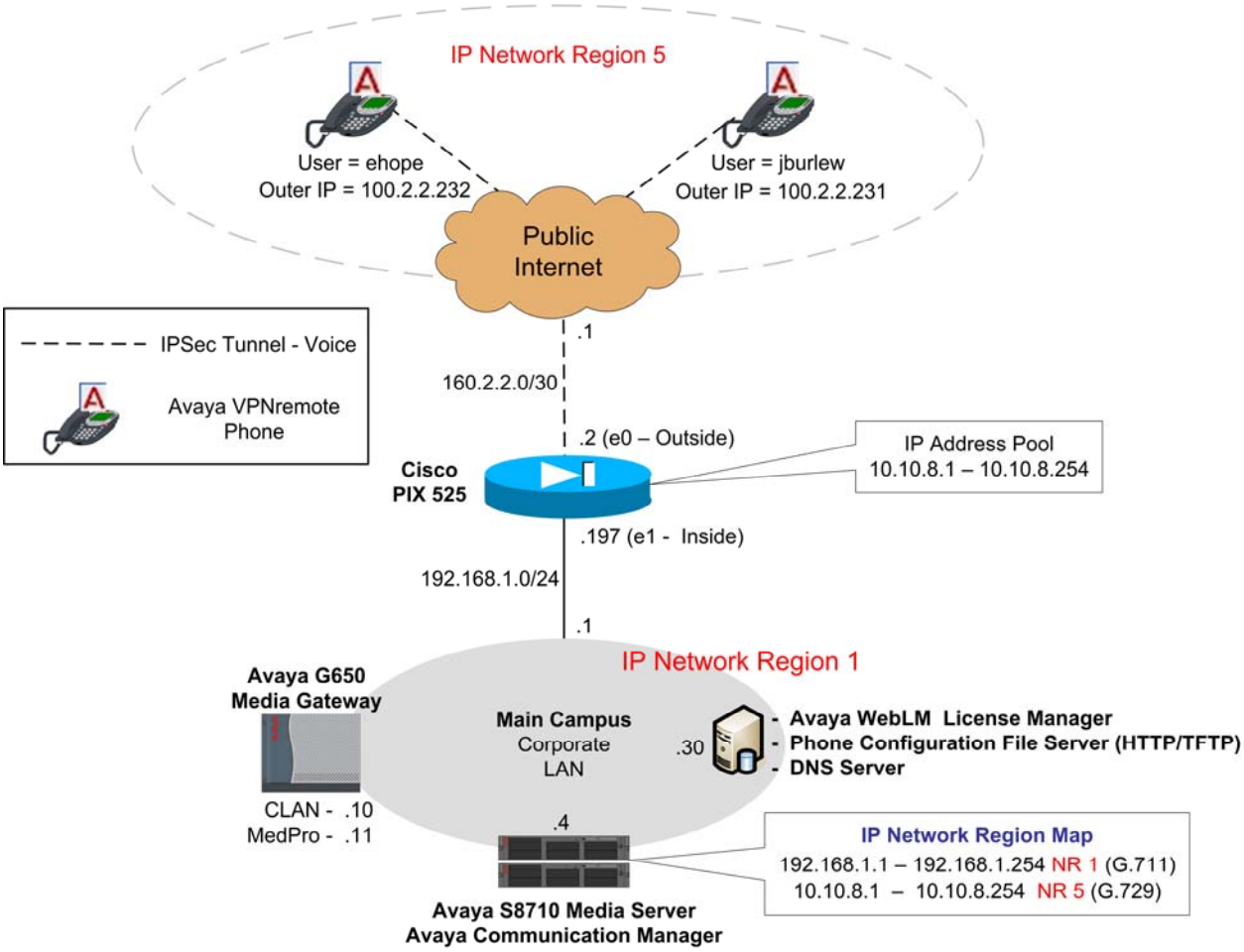


Figure 1: Network Diagram

3. Equipment and Software Validated

The information in these Application Notes is based on the software and hardware versions list in **Table 1** below.

Equipment	Software Version
Avaya S8710 Media Server	Avaya Communication Manager 3.1.2 (R013x.01.2.632.1)
Avaya G650 Media Gateway IPSI (TN2312BP) C-LAN (TN799DP) MedPro (TN2302AP)	 FW 022 (HW6) FW 016 (HW1) FW 108 (HW12)
Avaya 4610SW IP Telephones	R2.3.2 – **Release 2** (a10b**VPN**23**2**_1.bin)
Avaya 4625SW IP Telephones	R2.5.2 – **Release 2** (a25**VPN**25**2**_1.bin)
Avaya WebLM License Manager	V4.3
Cisco PIX model 525	7.2(1)
Cisco Adaptive Security Device Manager	5.2(1)

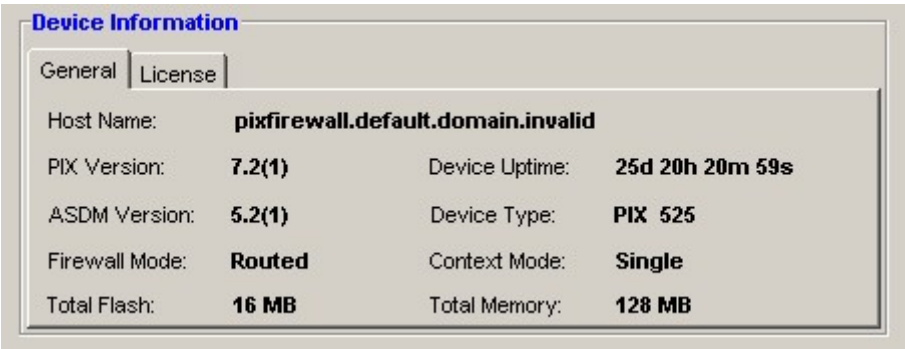
Table 1 – Software/Hardware Version Information

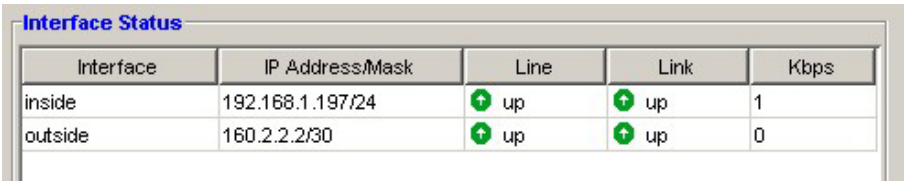
4. Cisco PIX Configuration

These Application Notes assume that the PIX is fully operational and configured to allow the Cisco ASDM to make configuration changes. See [8] for additional information.

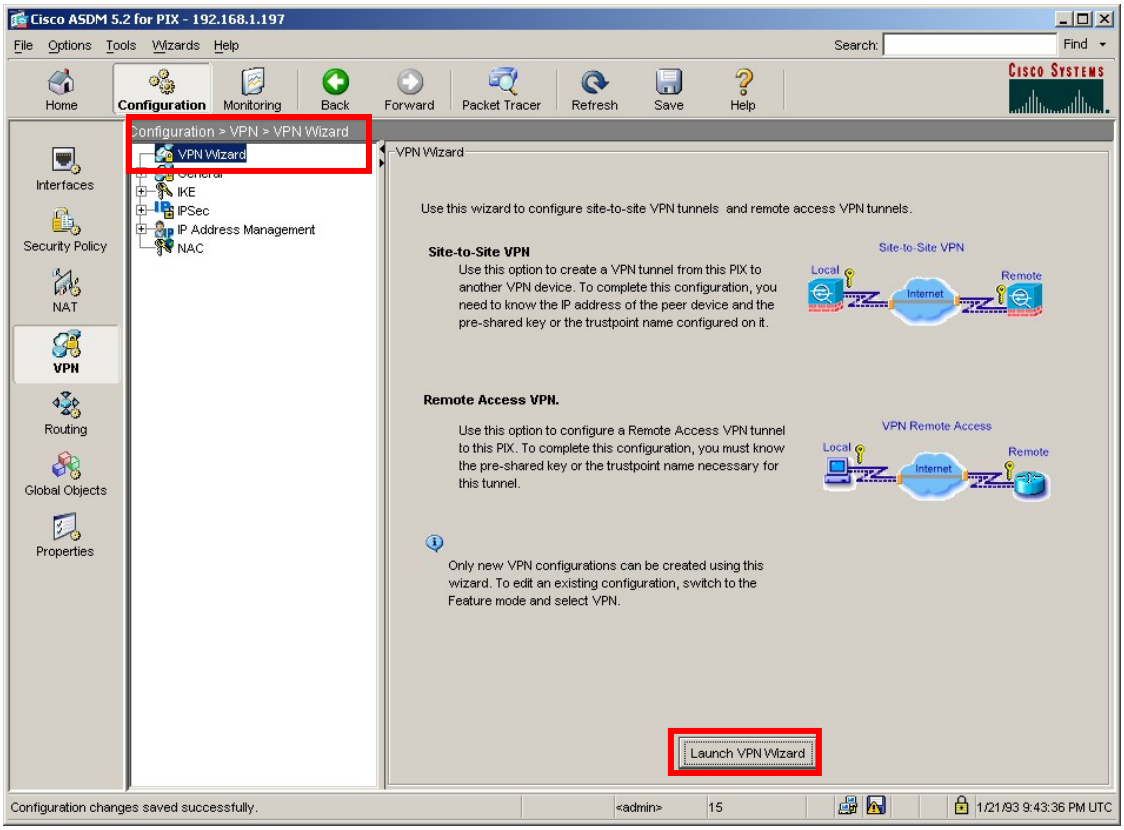
4.1. VPN Wizard

1. From the **ASDM Home** screen, compare the version of the PIX, as shown in the Device Information pane, with the PIX software version listed in Table 1. Select the **License** tab to identify the IPSec encryption algorithms licensed for use. Encryption algorithms other than DES require the installation of an enhanced encryption license from Cisco. See [9] for additional information. Also verify the status and configuration of the network interfaces as shown in the Interface Status pane.

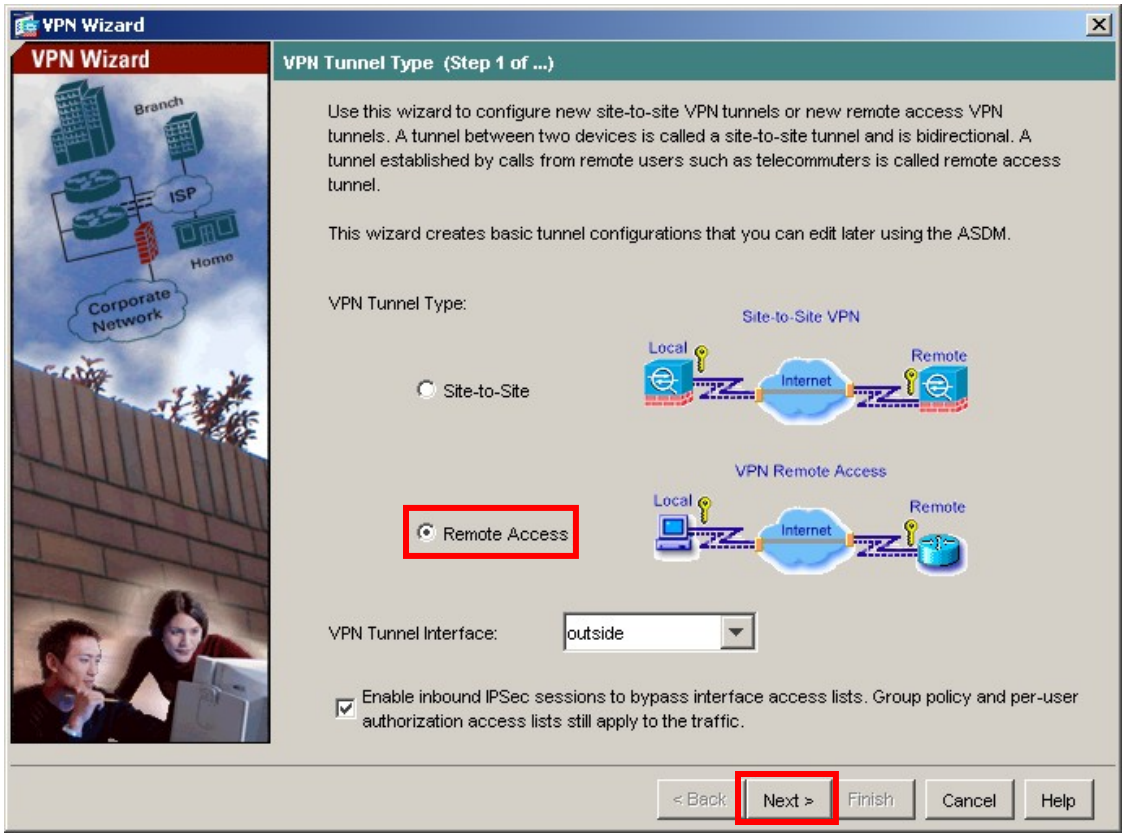




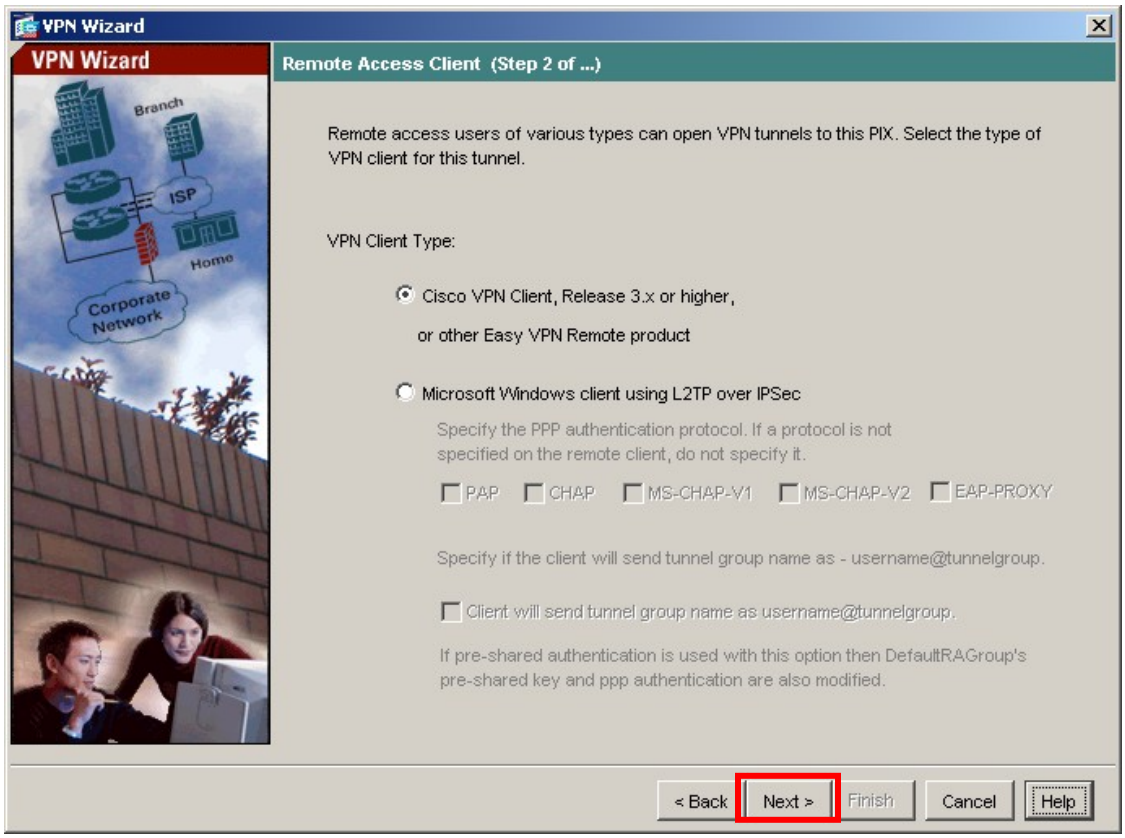
2. To start the VPN Wizard, select **Configuration > VPN > VPN Wizard** from the ASDM toolbars, then click the **Launch VPN Wizard** button.



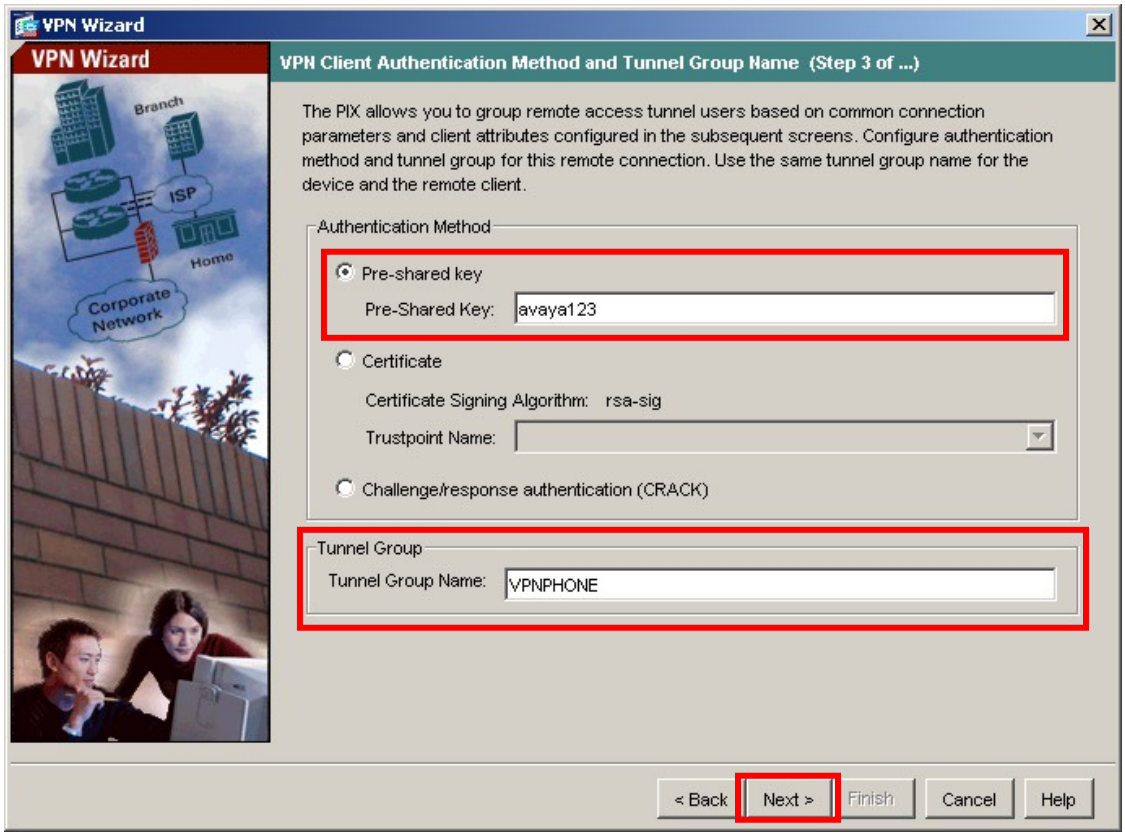
3. Select the **Remote Access** VPN Tunnel Type option, then click the **Next** button to continue. All remaining fields can be left as default.



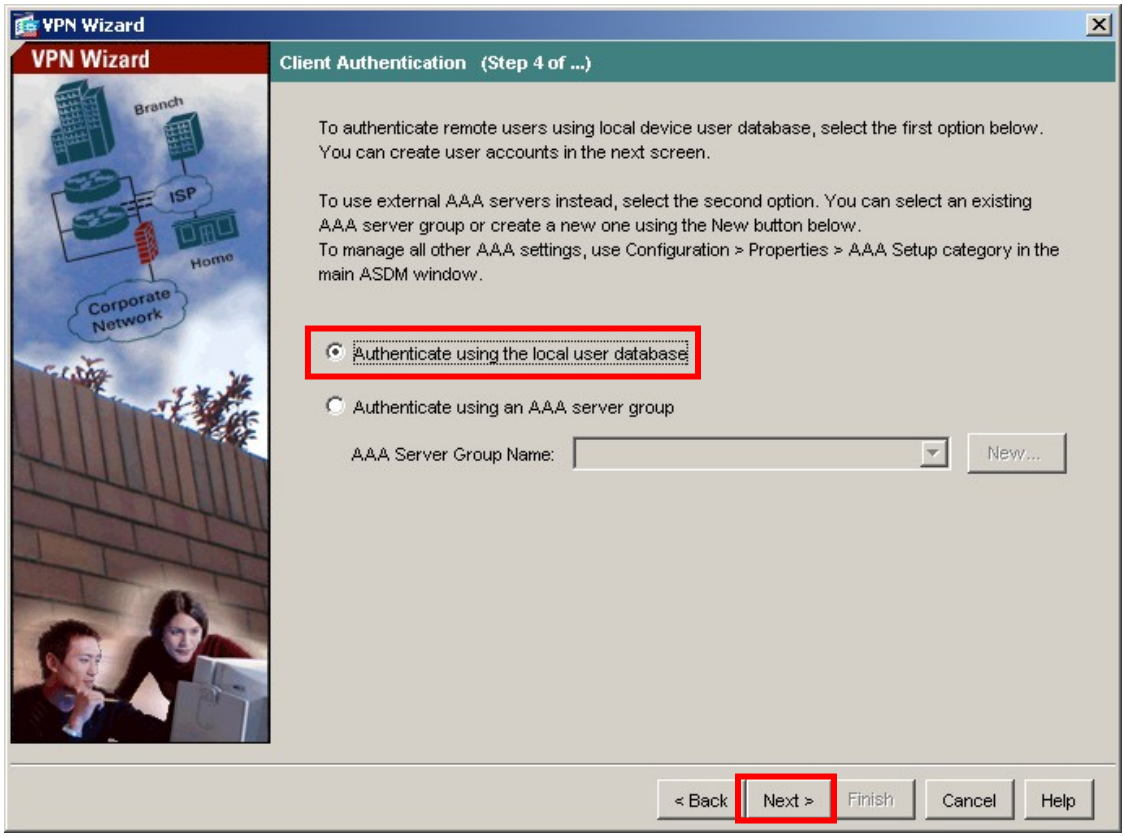
4. Maintain the default selection of **Cisco VPN Client, Release 3.x or higher, or other Easy VPN Remote product**. Click **Next** to continue.



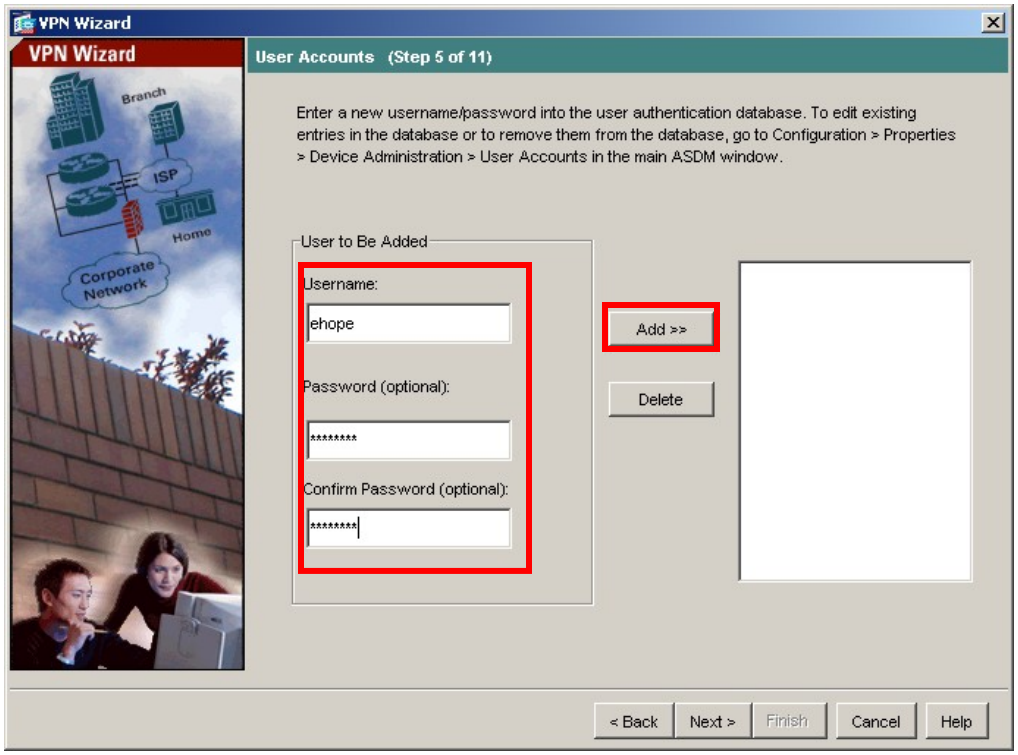
5. Enter the Pre-shared Key value and the name of a tunnel group to be used by the Avaya VPNremote Phones, then click **Next** to continue. VPNPHONE is the default group name used by the VPNremote Phones. However, any group name can be used as long as the VPNremote Phone configuration matches.

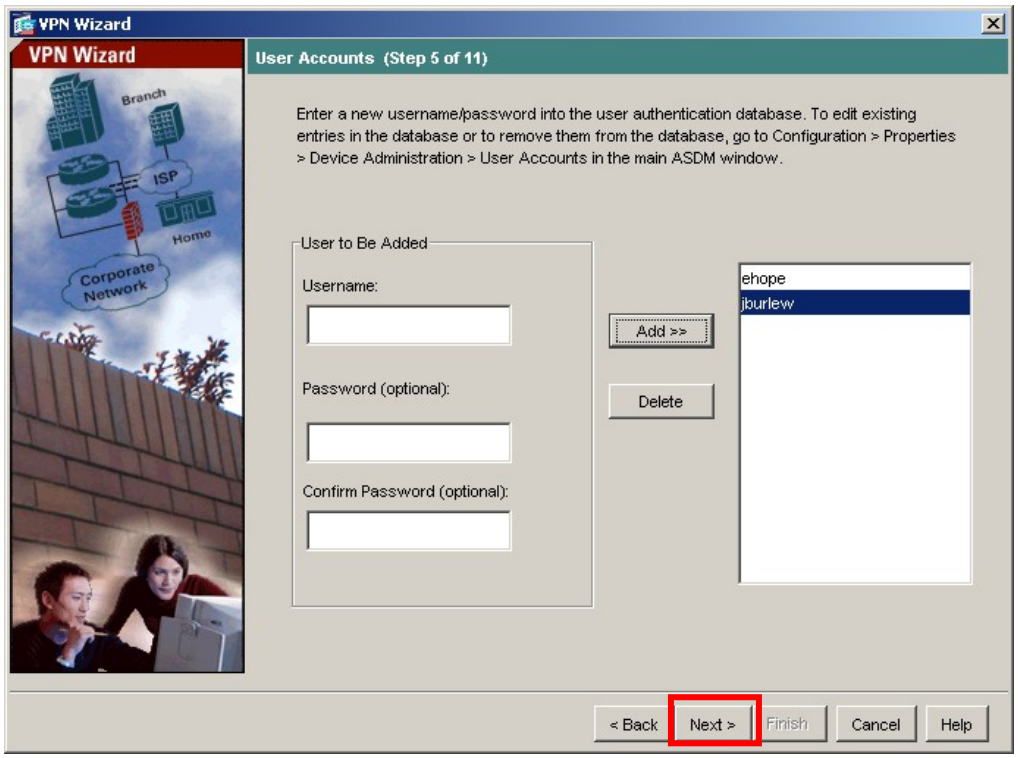


6. The internal PIX user authentication database is used in the sample configuration. However, an external authentication server can be used. Maintain the default **Authenticate using the local user database** and click **Next** to continue.

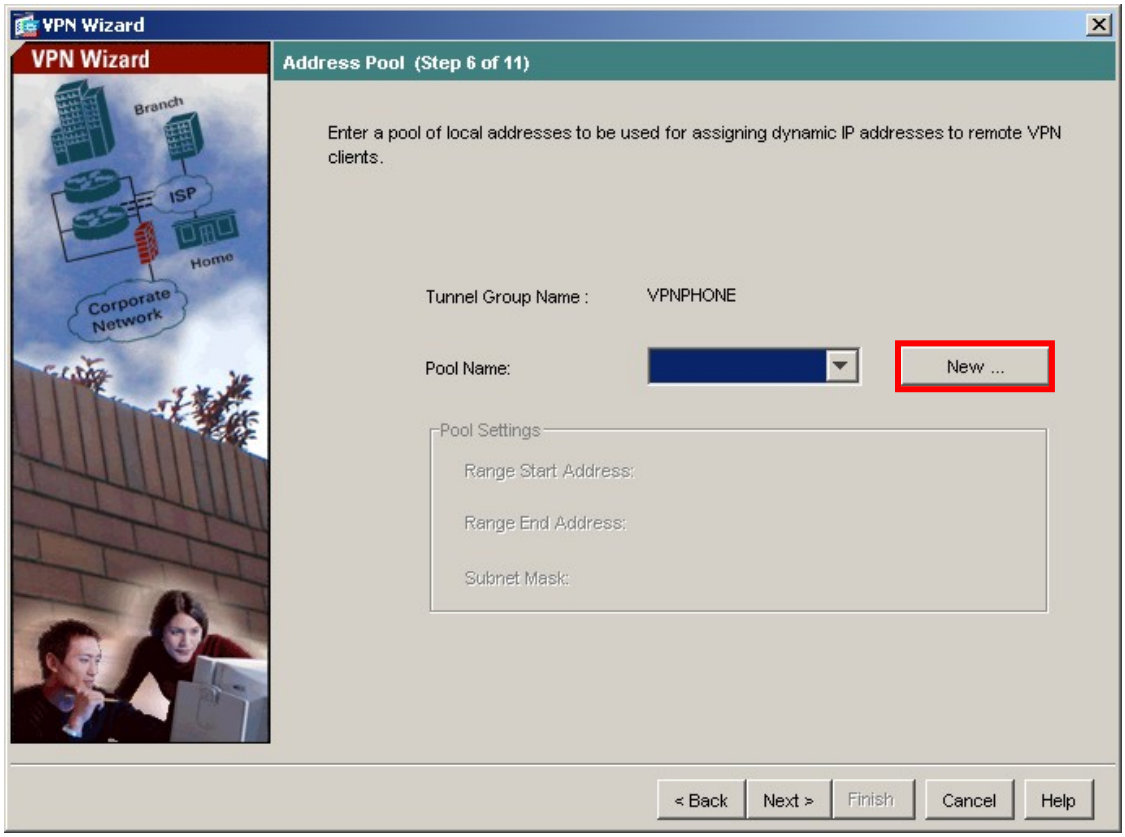


7. Enter the username and password of a VPNremote Phone user and click **Add**. Two user accounts, ehope and jburlew, are created in the sample configuration. When all VPNremote Phone user accounts have been entered, click **Next** to continue.

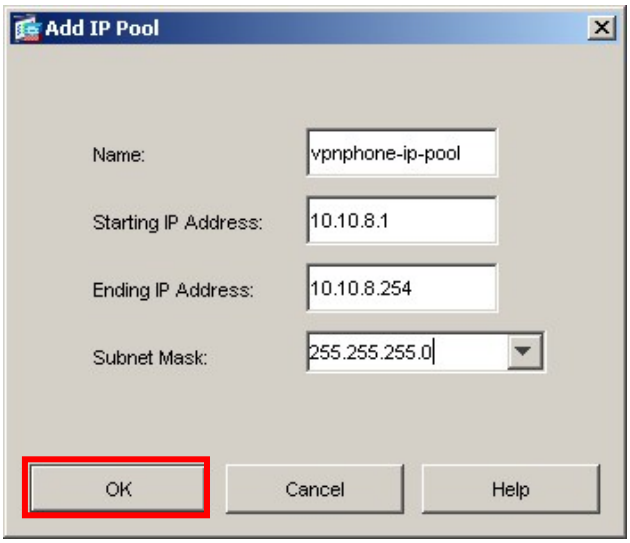




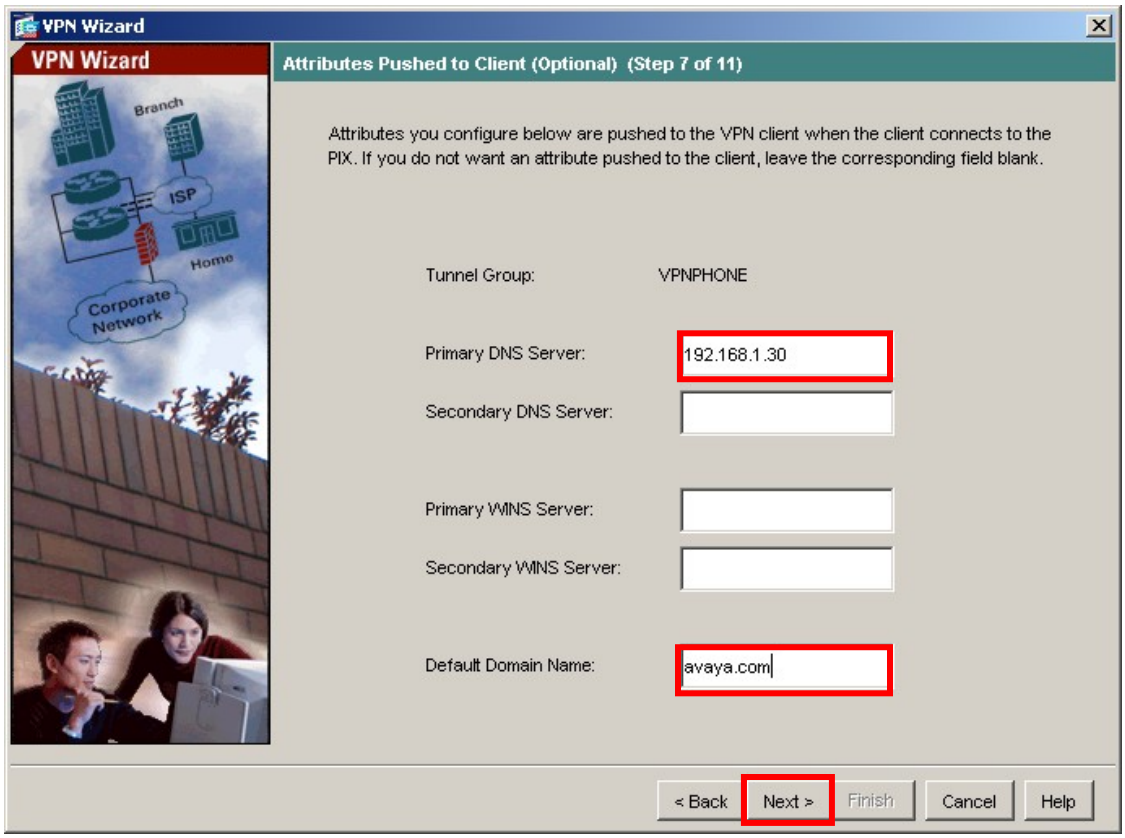
8. Click the **New** button to create a new IP address pool.



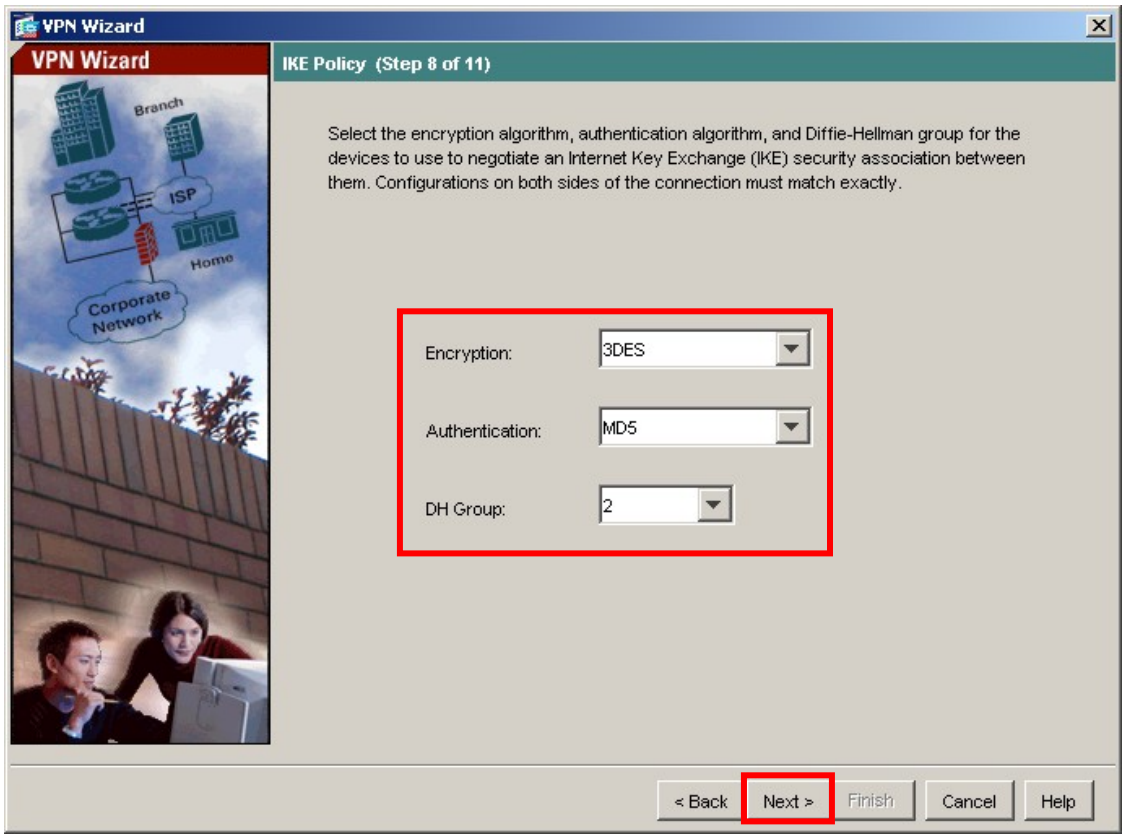
9. Enter a descriptive name and the IP address range to be assigned to VPNremote Phones as the "inner address". This address range must not overlap with any addresses on the private enterprise network and must be routable within the enterprise network. Click **OK,** then click **Next** at the Address Pool window to continue.



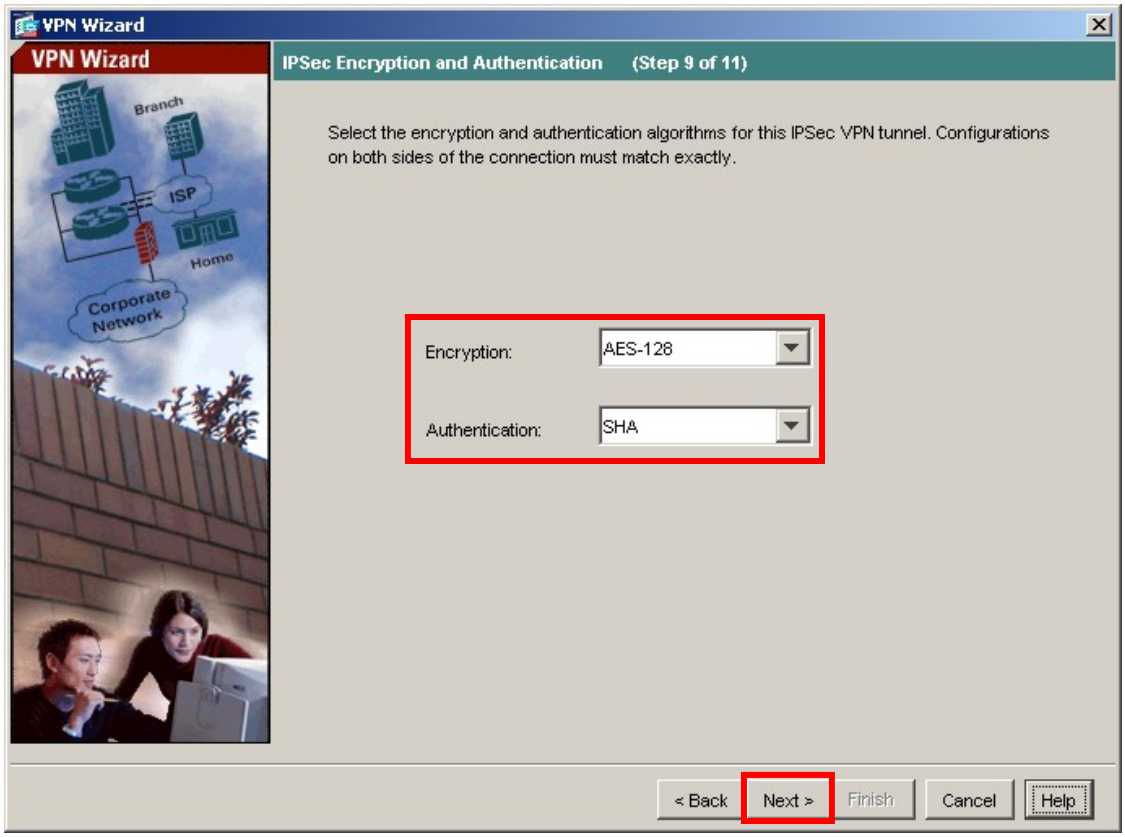
10. Enter the DNS, WINS and Domain information to be used by the VPNremote Phone while accessing enterprise network through the IPSec tunnel. Values entered below are specific to the sample network used for these Application Notes. Click **Next** when complete.



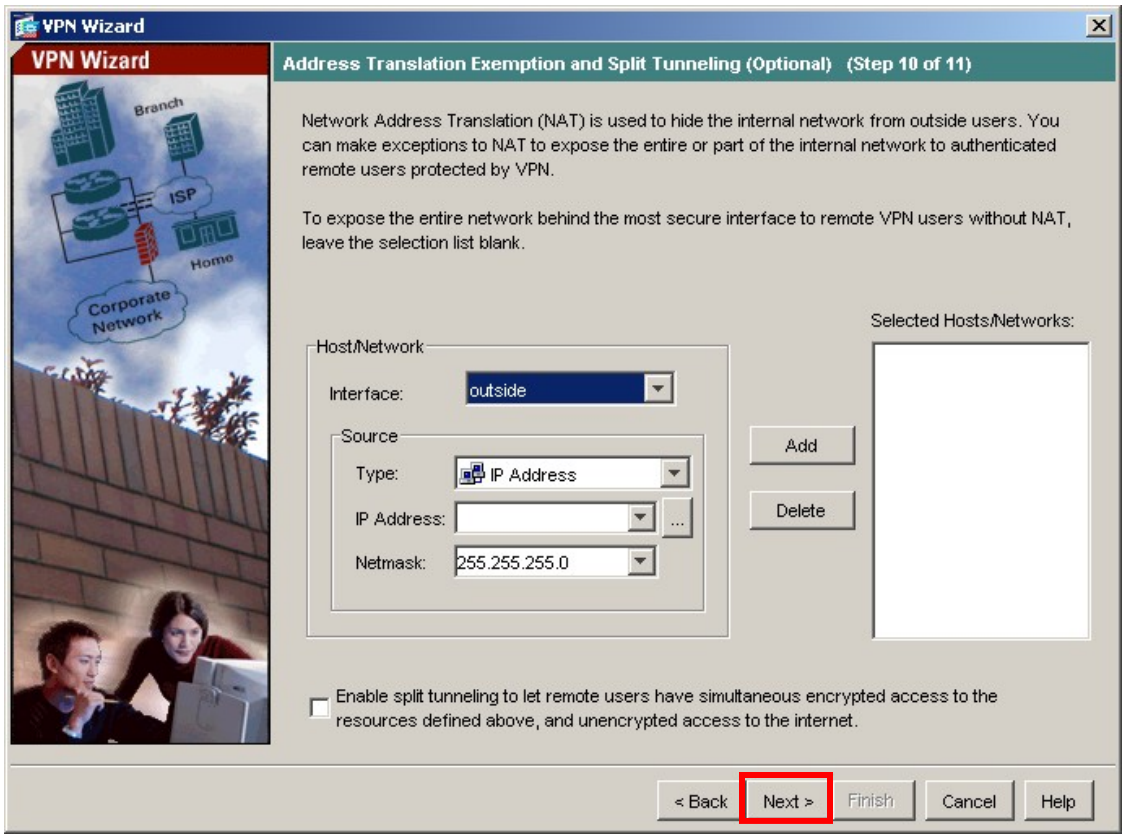
11. Select the appropriate IKE security association parameters from the drop-down lists. Click **Next** to continue.



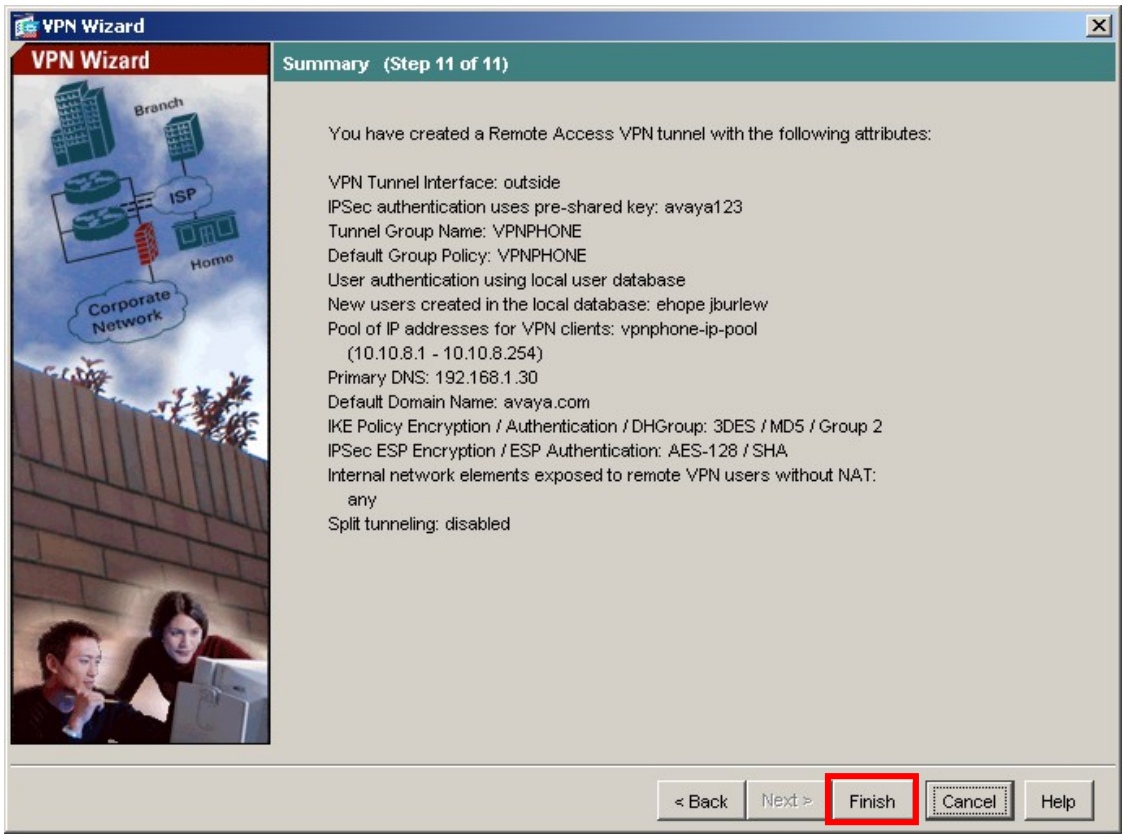
12. Select the appropriate IPSec VPN encryption and authentication parameters from the drop-down lists. Encryption algorithms other then DES require the installation of an enhanced encryption license from Cisco [9]. Click **Next** to continue.



13. Maintain the default **Address Translation Exemption and Split Tunneling** options and click **Next** to continue.



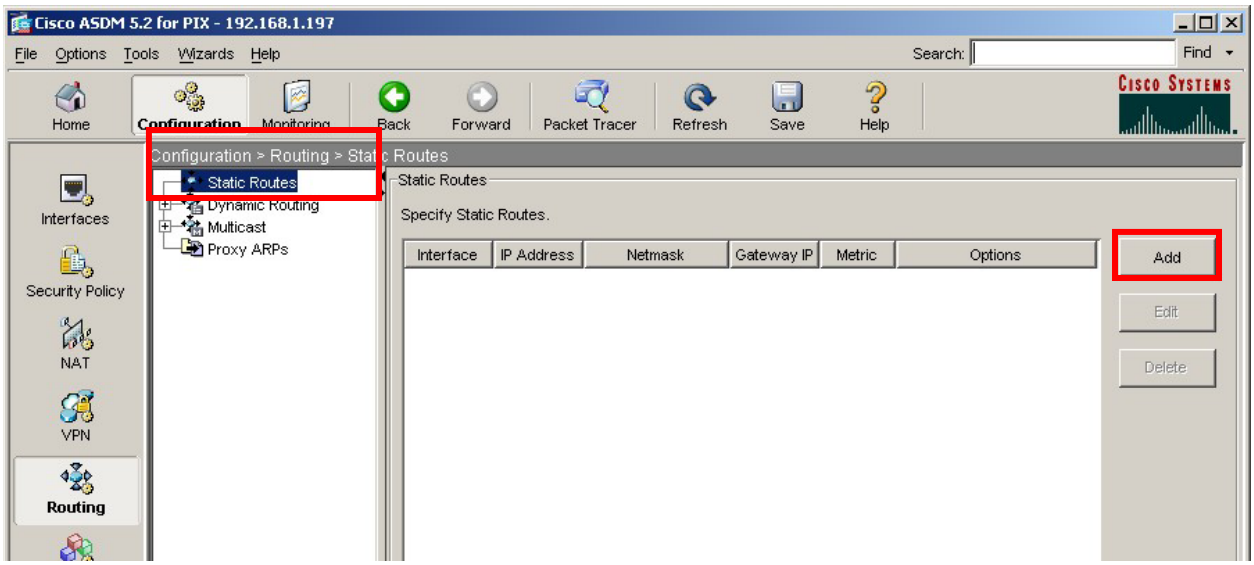
14. Verify the VPN Tunnel options and click **Finish** to complete.



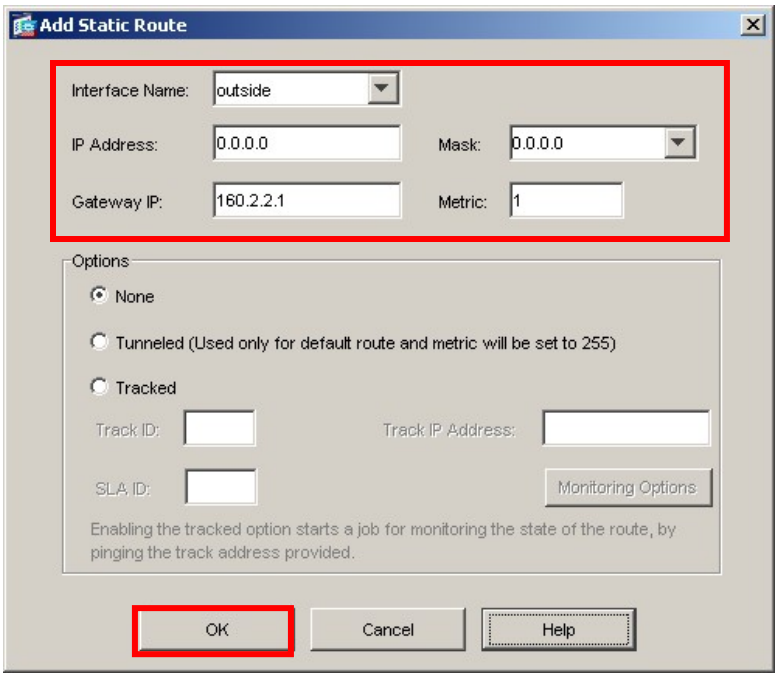
4.2. Default Route

The default route must be set on the PIX. The default route was set to the outside (public) interface for the sample configuration.

1. Navigate to **Configuration > Routing > Static Routes** and click the **Add** button.



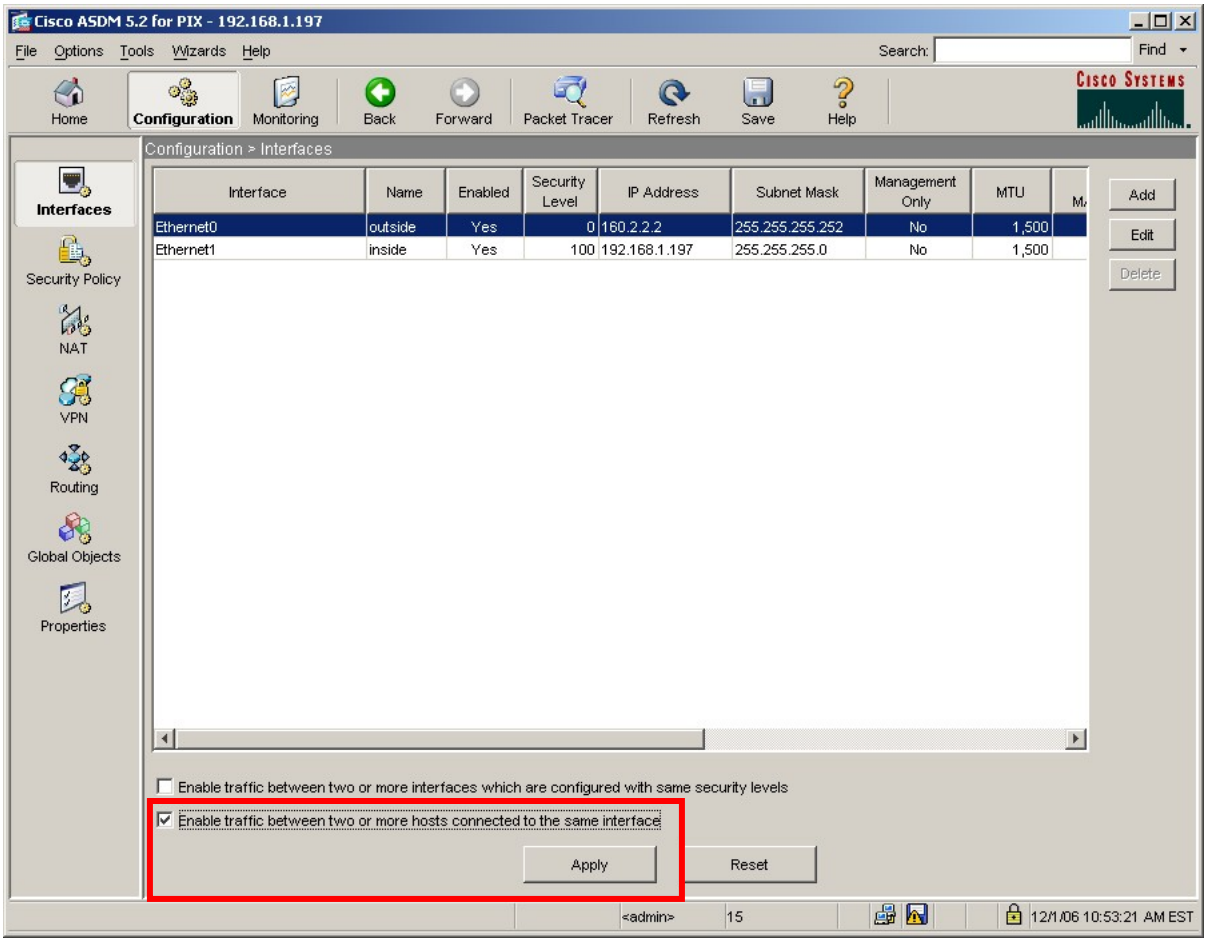
2. The IP Address of 0.0.0.0 with a Mask of 0.0.0.0 signifies the default route. The IP address of 160.2.2.1 is the ISP next hop router as shown **Figure 1**. Click **OK**.



4.3. VPNremote Phone to VPNremote Phone Direct Audio

The path taken by RTP audio packets of a VPNremote Phone can be controlled in the same way as a traditional Avaya IP Phone using the IP-IP Direct Audio features of Avaya Communication Manager. If it is desirable for the RTP audio packets to go directly between two VPNremote Phones with VPN tunnels to the same PIX, the **Enable traffic between two or more hosts connected to the same interface** PIX configuration option must be enabled. This is in addition to configuring the proper IP-IP Direct Audio options on Avaya Communication Manager.

1. Navigate to **Configuration > Interfaces** and select the check box next to **Enable traffic between two or more hosts connected to the same interface.** Click **Apply** to save.



5. Avaya Communication Manager Configuration

This section shows the necessary steps to configure Avaya Communication Manager for VPNremote Phones. It is assumed that the basic configuration on Avaya Communication Manager has already been completed. See [3] for additional information. All commands discussed in this section are executed on Avaya Communication Manager using the System Access Terminal (SAT).

As shown in **Figure 1**, VPNremote Phones are assigned to IP Network Region 5 using the IP address range of the PIX IP Address Pool. IP Network Region 5 is then assigned a codec set configured with the G.729 codec. The Main Campus is assigned to IP Network Region 1 using the G.711 codec.

5.1. IP Codec Set Configuration

Use the **`change ip-codec-set n`** command to configure IP Codec Set parameters where ***n*** is the IP Codec Set number. Configure the highlighted fields shown below. All remaining fields can be left at the default values.

1. Use the **`change ip-codec-set 1`** command to define a codec set for the G.711 codec as shown below.

```
change ip-codec-set 1                                          Page   1 of   2

                           IP Codec Set

    Codec Set: 1

    Audio        Silence      Frames   Packet
    Codec        Suppression  Per Pkt  Size(ms)
 1: G.711MU           n         2        20
 2:
 3:
```

2. Use the **`change ip-codec-set 2`** command to define a codec set for the G.729 (30ms) codec as shown below.

```
change ip-codec-set 2                                          Page   1 of   2

                           IP Codec Set

    Codec Set: 2

    Audio        Silence      Frames   Packet
    Codec        Suppression  Per Pkt  Size(ms)
 1: G.729             n         3        30
 2:
 3:
```

3. Use the **`list ip-codec-set`** command to verify the codec assignments.

```
list ip-codec-set

                                IP CODEC SETS

Codec  Codec 1     Codec 2     Codec 3     Codec 4     Codec 5
Set

  1    G.711MU
  2    G.729
  3
  4
```

5.2. IP Network Map Configuration

Use the **`change ip-network-map`** command to define the IP address to Network Region mapping for VPNremote Phones.

```
change ip-network-map                                          Page   1 of  32
                         IP ADDRESS MAPPING

                                                               Emergency
                                        Subnet                 Location
 From IP Address  (To IP Address   or Mask)  Region    VLAN   Extension
 10 .10 .8  .1    10 .10 .8  .254             5        n
    .   .   .        .   .   .                          n
    .   .   .        .   .   .                          n
    .   .   .        .   .   .                          n
```

5.3. IP Network Region Configuration

Use the **`change ip-network-region n`** command to configure IP Network Region parameters where ***n*** is the IP Network Region number. Configure the highlighted fields shown below. All remaining fields can be left at the default values.

Intra-region and **Inter-region IP-IP Direct Audio** determines the flow of RTP audio packets. Setting these fields to "yes" enables the most efficient audio path to be taken. **Codec Set 1**, defined in **Section 5.1**, is used within IP Network Region 1.

```
change ip-network-region 1                                      Page   1 of  19


                              IP NETWORK REGION
  Region: 1
Location: 1       Authoritative Domain: avaya.com
    Name: Main Campus
MEDIA PARAMETERS                Intra-region IP-IP Direct Audio: yes
      Codec Set: 1              Inter-region IP-IP Direct Audio: yes
   UDP Port Min: 2048                     IP Audio Hairpinning? y
   UDP Port Max: 3029
DIFFSERV/TOS PARAMETERS                 RTCP Reporting Enabled? y
 Call Control PHB Value: 46      RTCP MONITOR SERVER PARAMETERS
        Audio PHB Value: 46       Use Default Server Parameters? y
        Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 6
        Audio 802.1p Priority: 6
        Video 802.1p Priority: 5      AUDIO RESOURCE RESERVATION PARAMETERS
H.323 IP ENDPOINTS                                       RSVP Enabled? n
  H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
   Keep-Alive Interval (sec): 5
            Keep-Alive Count: 5
```

Page 3 of the IP-Network-Region form, shown below, defines the codec set to use for inter-region calls. Avaya VPNremote Phones are mapped to Region 5. Calls within IP Network Region 1 use Codec Set 1 (G.711MU) while calls between IP Network Region 1 and IP Network Region 5 use Codec Set 2 (G.729).

```
change ip-network-region 1                                      Page   3 of  19

                    Inter Network Region Connection Management

 src dst  codec  direct                                      Dynamic CAC
 rgn rgn   set    WAN    WAN-BW-limits  Intervening-regions    Gateway   IGAR
 1   1     1
 1   2
 1   3
 1   4
 1   5     2       y           :NoLimit                                     n
```

Use the **`change ip-network-region 5`** command to configure IP Network Region 5 parameters. Configure the highlighted fields shown below. Calls within IP Network Region 5 (i.e., a VPNremote Phone calling another VPNremote Phone) use Codec Set 2 (G.729). All remaining fields can be left at the default values.

```
change ip-network-region 5                                    Page   1 of  19


                                IP NETWORK REGION
  Region: 5
Location:         Authoritative Domain: avaya.com
    Name: VPNphones - PIX
MEDIA PARAMETERS                Intra-region IP-IP Direct Audio: yes
      Codec Set: 2              Inter-region IP-IP Direct Audio: yes
   UDP Port Min: 2048                      IP Audio Hairpinning? y
   UDP Port Max: 3029
DIFFSERV/TOS PARAMETERS                  RTCP Reporting Enabled? y
 Call Control PHB Value: 46      RTCP MONITOR SERVER PARAMETERS
        Audio PHB Value: 46       Use Default Server Parameters? y
        Video PHB Value: 26
802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 6
        Audio 802.1p Priority: 6
        Video 802.1p Priority: 5      AUDIO RESOURCE RESERVATION PARAMETERS
H.323 IP ENDPOINTS                                     RSVP Enabled? n
  H.323 Link Bounce Recovery? y
 Idle Traffic Interval (sec): 20
   Keep-Alive Interval (sec): 5
            Keep-Alive Count: 5
```

Page 3 defines the codec set to use for inter-region calls. Avaya VPNremote Phones are mapped to Region 5. Calls between IP Network Region 5 and IP Network Region 1 will also use Codec Set 2 (G.729).

```
change ip-network-region 5                                    Page   3 of  19

                    Inter Network Region Connection Management

 src dst  codec  direct                                     Dynamic CAC
 rgn rgn   set    WAN    WAN-BW-limits  Intervening-regions    Gateway   IGAR
 5   1     2       y           :NoLimit                                     n
 5   2
 5   3
 5   4
 5   5     2
```

5.4. Add Station

An Avaya VPNremote Phone is administered the same as any other IP telephone within Avaya Communication Manager. Even though the Avaya VPNremote Phone is physically located remote from the corporate network, the Avaya VPNremote Phone will behave the same as other Avaya IP telephones located locally on the corporate LAN once the VPN tunnel has been established. The VPNremote Phone can be administered as a bridged extension, typically bridged to the user's phone in the corporate office, or as a single dedicated extension. The latter is used for the VPNremote phone in the sample configuration.

The screens below show the first two **add station** pages for the 4610SW VPNremote Phone used for these Application Notes. The **Direct IP-IP Audio Connections** option on page 2 must be set to **y** to take advantage of the configuration in Section 4.3.

```
add station 50003                                          Page   1 of   4
                                     STATION

Extension: 50003                          Lock Messages? n          BCC: 0
     Type: 4610                           Security Code: 1234        TN: 1
     Port: IP                           Coverage Path 1:            COR: 1
     Name: VPNphone                     Coverage Path 2:            COS: 1
                                        Hunt-to Station:
STATION OPTIONS
              Loss Group: 19            Personalized Ringing Pattern: 1
                                                     Message Lamp Ext: 50003
            Speakerphone: 2-way                  Mute Button Enabled? y
        Display Language: english
 Survivable GK Node Name:
          Survivable COR: internal                  Media Complex Ext:
   Survivable Trunk Dest? y                               IP SoftPhone? n

                                                 Customizable Labels? y
```

```
add station 50003                                          Page   2 of   4
                                     STATION
FEATURE OPTIONS
           LWC Reception: spe              Auto Select Any Idle Appearance? n
          LWC Activation? y                          Coverage Msg Retrieval? y
  LWC Log External Calls? n                                Auto Answer: none
            CDR Privacy? n                               Data Restriction? n
   Redirect Notification? y                     Idle Appearance Preference? n
 Per Button Ring Control? n                   Bridged Idle Line Preference? n
   Bridged Call Alerting? n                       Restrict Last Appearance? y
  Active Station Ringing: single          Conf/Trans on Primary Appearance? n
                                                        EMU Login Allowed? n
        H.320 Conversion? n          Per Station CPN - Send Calling Number?
       Service Link Mode: as-needed
         Multimedia Mode: enhanced
    MWI Served User Type:                        Display Client Redirection? n
              AUDIX Name:                       Select Last Used Appearance? n
                                                  Coverage After Forwarding? s

                                             Direct IP-IP Audio Connections? y
 Emergency Location Ext: 50003     Always Use? n      IP Audio Hairpinning? y
```

6. Avaya VPNremote Phone Configuration

6.1. VPNremote Phone Firmware

The Avaya VPNremote Phone firmware must be installed on the phone prior to the phone being deployed in the remote location. See [1] and [2] for details on installing VPNremote Phone firmware. The firmware version of Avaya IP telephones can be identified by viewing the version displayed on the phone upon boot up or when the phone is operational by selecting the **OPTIONS** hard button **> View IP Settings** soft button **> Miscellaneous** soft button **> Right arrow** hard button. The Application file name displayed denotes the installed firmware version.

As displayed in **Table 1,** VPNremote Phone firmware includes the letters **VPN** in the name. This allows for easy identification of firmware versions incorporating VPN capabilities.

6.2. Configuring Avaya VPNremote Phone

The Avaya VPNremote Phone configuration can be administered centrally from an HTTP/TFTP server or locally on the phone. These Application Notes utilize the local phone configuration method for all VPNremote Phone parameters with the exception of the WebLM License Manager URL. The WebLM License Manager URL cannot be set from the local phone configuration menu as of the firmware release used in these Application Notes and must be set from a centralized HTTP/TFTP server. The **NVWEBLMURL** variable of the 46xxvpnsetting.txt script file located on the HTTP/TFTP sever defines the WebLM License Manger URL, which the VPNremote Phones use to acquire a license. See [1], [2] and [5] for additional information.

The following shows the NVWEBLMURL setting used in the 46xxvpnsetting.txt script file for these Application Notes:

SET NVWEBLMURL http://192.168.1.30:8080/webLM/LicenseServer

The following steps describe how to configure the VPNremote Phone VPN parameters locally from the telephone.

1. There are two methods available to access the **VPN Configuration Options** menu from the VPNremote Phone.

   a. **During Telephone Boot:**

      During the VPNremote Phone boot up, the option to press the * key to enter the local configuration mode is displayed on the telephones screen as shown below.

```
DHCP
* to program
```

When the * key is pressed, several configuration parameters are presented such as the phone's IP Address, the Call Server's IP Address, etc. Press the # key to accept the current settings, or enter an appropriate value and press the # key. The final configuration option displayed is the VPN Start Mode option shown below. Press the * key to enter the VPN Options menu.

```
VPN Start Mode: Boot
*=Modify  #=OK
```

b. During Telephone Operation:

While the VPNremote Phone is in an operational state, registered with Avaya Communication Manager, press the following key sequence on the telephone to enter VPN configuration mode:

Mute-V-P-N-M-O-D-# (Mute-8-7-6-6-6-3-#)

The following is displayed:

```
VPN Start Mode: Boot
*=Modify  #=OK
```

Press the * key to enter the VPN Options menu.

2. The VPN configuration options menu is displayed. The configuration values for the VPNremote Phone of user ehope, used in the sample configuration, are shown in **Table 2** below.

Note: The values entered below are case sensitive.

Press the ► hard button on the Phone to access the next screen of configuration options. Phone models with larger displays (e.g., 4621SW) will present more configuration options per page.

Configuration Options	Value	Description
Server:	**160.2.2.2**	IP address of the PIX Public interface
User Name:	**ehope**	User created in **PIX VPN Wizard**
Password:	********	Must match user password entered in **PIX VPN Wizard**
Group Name:	**VPNPHONE**	Group name created in **PIX VPN Wizard**
Group PSK:	******** (avaya123)	Must match pre-shared key entered in **PIX VPN Wizard**

Configuration Options	Value	Description
VPN Start Mode:	**BOOT**	IPSec tunnel dynamically starts on Phone power up
Password Type:	**Save in Flash**	User is not prompted at phone boot up.
Encapsulation	**4500-4500**	Default value to enable NAT Traversal
Syslog Server:	**-**	Locally log phone events
IKE Parameters:	**DH2-3DES-MD5**	Must match IKE SA set in **PIX VPN Wizard**.
IKE ID Type:	**KEY-ID**	Specifies the format of the Group Name
Diffie-Hellman Grp	**2**	Can be set to "Detect" to accept PIX settings
Encryption Alg:	**3DES**	Can be set to "Any" to accept PIX settings
Authentication Alg:	**MD5**	Can be set to "Any" to accept PIX settings
IKE Xchg Mode:	**Aggressive**	Mode used for Phase 1 Negotiations
IKE Config Mode:	**Enable**	Enables IKE
IPSec Parameters:	**NOPFS-AES128-SHA1**	Must match IPSec proposals from **PIX VPN Wizard**
Encryption Alg:	**AES-128**	Can be set to "Any" to accept PIX settings
Authentication Alg:	**SHA1**	Can be set to "Any" to accept PIX settings
Diffie-Hellman Grp	**NONE**	Can be set to "Detect" to accept PIX settings
Protected Net:		
Remote Net #1:	**0.0.0.0/0**	Access to all private nets
Copy TOS:	**Yes**	Maintain Phones TOS setting on Corp Network for QoS
File Srvr:	**192.168.1.30**	TFTP/HTTP Phone File Srv
Connectivity Check:	**First Time**	Test initial IPSec connectivity

Table 2 – VPNremote Phone Configuration

3. The VPNremote Phone can interoperate with several VPN head-end vendors. The VPNremote Phone must be configured with the VPN head-end vendor to be used so the appropriate protocol dialogs can take place. This is done by setting the **VPN Configuration Profile** on the VPNremote Phone.

   Press the **Profile** soft button at the bottom of the VPNremote Phones display while in the VPN Options mode. The **VPN Configuration Profile** options, shown below, are displayed. If a profile other then Cisco is already chosen, press the Modify soft button to see this list:

   - Avaya Security Gateway
   - Cisco Xauth with PSK
   - Juniper Xauth with PSK
   - Generic PSK

   Press the button aligned with the **Cisco Xauth with PSK** profile option, and then press the **Done** soft button.

   When all VPN configuration options have been set, press the **Done** soft button. The following is displayed. Press # to save the configuration and reboot the phone.

```
Save new values ?
*=no  #=yes
```

7. Verification

7.1. VPNremote Phone IPSec Statistics

Once the Avaya VPNremote Phone establishes an IPSec tunnel, registers with Avaya Communication Manager and becomes functional, from the telephone keypad, press the **OPTIONS** hard button (with √ icon). From the telephone keypad, press the ► hard button until the **VPN Status…** option appears. Select **VPN Status…** The VPN statistics of the active IPSec tunnel will be displayed. Press the ► hard button to access the next screen. Press the **Refresh** soft button to update the displayed statistics.

The list below shows the statistics from the VPNremote phone used in the sample configuration.

VPN Status…	
PKT S/R	**448/419**
FRAG RCVD	**0**
Comp/Decomp	**0/0**
Auth Failures	**0**
Recv Errors	**0**
Send Errors	**0**
Gateway	**160.2.2.2**
Outer IP	**100.2.2.232**
Inner IP	**10.10.8.1**
Gateway Version	**0.0.0**
Inactivity Timeout	**0**
AES128-SHA-1 days	

7.2. PIX Logging

The PIX **Real-time Log Viewer** displays the current event log contents of the PIX. The Real-time Log Viewer snapshots shown in this section contain key log events specific to the VPNremote Phone. Log entries of particular interest are highlighted in bold.

To access the PIX Real-time Log Viewer, select **Monitoring > Logging > Real-time Log Viewer,** and then click the **View** button.

7.2.1. Successful IKE Phase1, IKE Phase2 and XAuth User Authentication

This section shows events logged for a single Avaya VPNremote Phone successfully authenticating and establishing an IPSec tunnel. The log entries containing the text **unknown** or **unsupported transaction mode** are a normal result of the IPSec negotiation exchange between the PIX and the VPNremote Phone (i.e., not indicative of a problem).

Message Text
AAA user authentication Successful : local database : user = ehope
AAA group policy for user ehope is being set to VPNPHONE
AAA retrieved user specific group policy (VPNPHONE) for user = ehope
AAA retrieved default group policy (VPNPHONE) for user = ehope
AAA transaction status ACCEPT : user = ehope
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Received unsupported transaction mode attribute: 5
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Received unsupported transaction mode attribute: 6
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Client Type: Client Application Version:
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Received unsupported transaction mode attribute: 13
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Received unknown transaction mode attribute: 14
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, **Assigned private IP address 10.10.8.1 to remote user**
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, **PHASE 1 COMPLETED**
IP = 100.2.2.232, Keep-alives configured on but peer does not support keep-alives (type = None)
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Overriding Initiator's IPSec rekeying duration from 86400 to 28800 seconds
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, Security negotiation complete for User (ehope) Responder, Inbound SPI = 0x6b5e3272, Outbound SPI = 0xca40f294
IPSEC: An outbound remote access SA (SPI= 0xCA40F294) between 160.2.2.2 and 100.2.2.232 (user= ehope) has been created.
IPSEC: An inbound remote access SA (SPI= 0x6B5E3272) between 160.2.2.2 and 100.2.2.232 (user= ehope) has been created.
Group = VPNPHONE, Username = ehope, IP = 100.2.2.232, **PHASE 2 COMPLETED** (msgid=57b6abdd)
NAC is disabled for host - 10.10.8.1.

7.2.2. QTest Attempts

The Avaya VPNremote Phone **Quality Test** feature is used to test the quality of the network between the VPNremote Phone and VPN Head-end through the IPSec tunnel. The VPNremote Phone runs a short QTest sanity test against the VPN Head-end in quiet mode just after the IPSec tunnel has been established. If this QTest sanity test is executed successfully (i.e., if the VPN Head-end responded to the QTest packets), the QTest soft button is made available to the VPNremote Phone user. If this QTest sanity test does not complete successfully, the QTest soft button is not presented to the VPNremote Phone user.

The PIX characterizes the QTest packets sent by the VPNremote phone as a "Land Attack" type of Denial of Service attack due to the makeup of the QTest packets. **The PIX drops these QTest packets without responding, resulting in the QTest feature being disabled** on the VPNremote Phone. The PIX log entries shown below are the QTest packets being denied.

Src IP	Dest IP	Message Text
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1
10.10.8.1	10.10.8.1	**Deny IP due to Land Attack** from 10.10.8.1 to 10.10.8.1

7.2.3. TFTP Server Access

The following events are logged as the VPNremote Phone accesses the TFTP server on the enterprise network.

Src IP	Dest IP	Message Text
10.10.8.1	192.168.1.30	Built inbound UDP connection 928 for outside:10.10.8.1/1026 (10.10.8.1/1026) to inside:192.168.1.30/1297 (192.168.1.30/1297)
10.10.8.1	192.168.1.30	Built inbound UDP connection 927 for outside:10.10.8.1/1026 (10.10.8.1/1026) to inside:192.168.1.30/69 (192.168.1.30/69) (ehope)
10.10.8.1	192.168.1.30	Built inbound UDP connection 926 for outside:10.10.8.1/1025 (10.10.8.1/1025) to inside:192.168.1.30/1296 (192.168.1.30/1296)
10.10.8.1	192.168.1.30	Built inbound UDP connection 925 for outside:10.10.8.1/1025 (10.10.8.1/1025) to inside:192.168.1.30/69 (192.168.1.30/69) (ehope)
10.10.8.1	192.168.1.30	Built inbound UDP connection 923 for outside:10.10.8.1/1024 (10.10.8.1/1024) to **inside:192.168.1.30/1295 (192.168.1.30/1295)**
10.10.8.1	192.168.1.30	Built inbound UDP connection 922 for outside:10.10.8.1/1024 (10.10.8.1/1024) to **inside:192.168.1.30/69 (192.168.1.30/69) (ehope)**

7.2.4. DNS Server Access

The following events are logged as the VPNremote Phone accesses the DNS server on the enterprise network.

Src IP	Dest IP	Message Text
10.10.8.1	192.168.1.30	Teardown UDP connection 934 for outside:10.10.8.1/1032 to inside:192.168.1.30/53 duration 0:00:00 bytes 131 (ehope)
10.10.8.1	192.168.1.30	Teardown UDP connection 933 for outside:10.10.8.1/1031 to inside:192.168.1.30/53 duration 0:00:00 bytes 131 (ehope)
10.10.8.1	192.168.1.30	Teardown UDP connection 932 for outside:10.10.8.1/1030 to inside:192.168.1.30/53 duration 0:00:00 bytes 131 (ehope)
10.10.8.1	192.168.1.30	Teardown UDP connection 931 for outside:10.10.8.1/1029 to inside:192.168.1.30/53 duration 0:00:00 bytes 131 (ehope)
10.10.8.1	192.168.1.30	Teardown UDP connection 930 for outside:10.10.8.1/1028 to inside:192.168.1.30/53 duration 0:00:00 bytes 133 (ehope)
10.10.8.1	192.168.1.30	Teardown UDP connection 929 for **outside:10.10.8.1/1027 to inside:192.168.1.30/53** duration 0:00:00 bytes 133 **(ehope)**

7.2.5. WebLM Server Access

The following events are logged as the VPNremote Phone accesses the WebLM License Manager server on the enterprise network.

Src IP	Dest IP	Message Text
10.10.8.1	192.168.1.30	Teardown TCP connection 937 for outside:10.10.8.1/1038 to inside:192.168.1.30/8080 duration 0:00:00 bytes 532 TCP FINs (ehope)
10.10.8.1	192.168.1.30	Teardown TCP connection 936 for outside:10.10.8.1/1037 to inside:192.168.1.30/8080 duration 0:00:00 bytes 568 TCP FINs (ehope)
10.10.8.1	192.168.1.30	Teardown TCP connection 935 for outside:10.10.8.1/1036 to inside:192.168.1.30/8080 duration 0:00:00 bytes 384 TCP FINs (ehope)
10.10.8.1	192.168.1.30	Built inbound TCP connection 937 for outside:10.10.8.1/1038 (10.10.8.1/1038) to inside:192.168.1.30/8080 (192.168.1.30/8080) (ehope)
10.10.8.1	192.168.1.30	Built inbound TCP connection 936 for outside:10.10.8.1/1037 (10.10.8.1/1037) to inside:192.168.1.30/8080 (192.168.1.30/8080) (ehope)
10.10.8.1	192.168.1.30	**Built inbound TCP connection** 935 for outside:10.10.8.1/1036 (10.10.8.1/1036) to **inside:192.168.1.30/8080 (192.168.1.30/8080) (ehope)**

7.2.6. H.323 Registration with Avaya Communication Manager

The following events are logged as the VPNremote Phone registers with Avaya Communication Manager via the CLAN interface of the G650 Media Gateway.

Src IP	Dest IP	Message Text
10.10.8.1	192.168.1.10	Built inbound **TCP** connection 939 for outside:10.10.8.1/3108 (10.10.8.1/3108) to **inside:192.168.1.10/1720 (192.168.1.10/1720) (ehope)**
10.10.8.1	192.168.1.10	Built inbound **UDP** connection 938 for outside:10.10.8.1/49300 (10.10.8.1/49300) to **inside:192.168.1.10/1719 (192.168.1.10/1719) (ehope)**

7.2.7. Call Between Two VPNremote Phones

The following events are logged as the VPNremote Phone of user "ehope" calls VPNremote Phone of user "jburlew" with IP-IP Direct Audio set to "yes" on Avaya Communication Manager for the IP Network Region to which the VPNremote Phones are assigned. The log shows the following:

- A connection between ehope VPNremote Phone (10.10.8.6) to the G650 MedPro (192.168.1.11) for dial tone RTP packets.

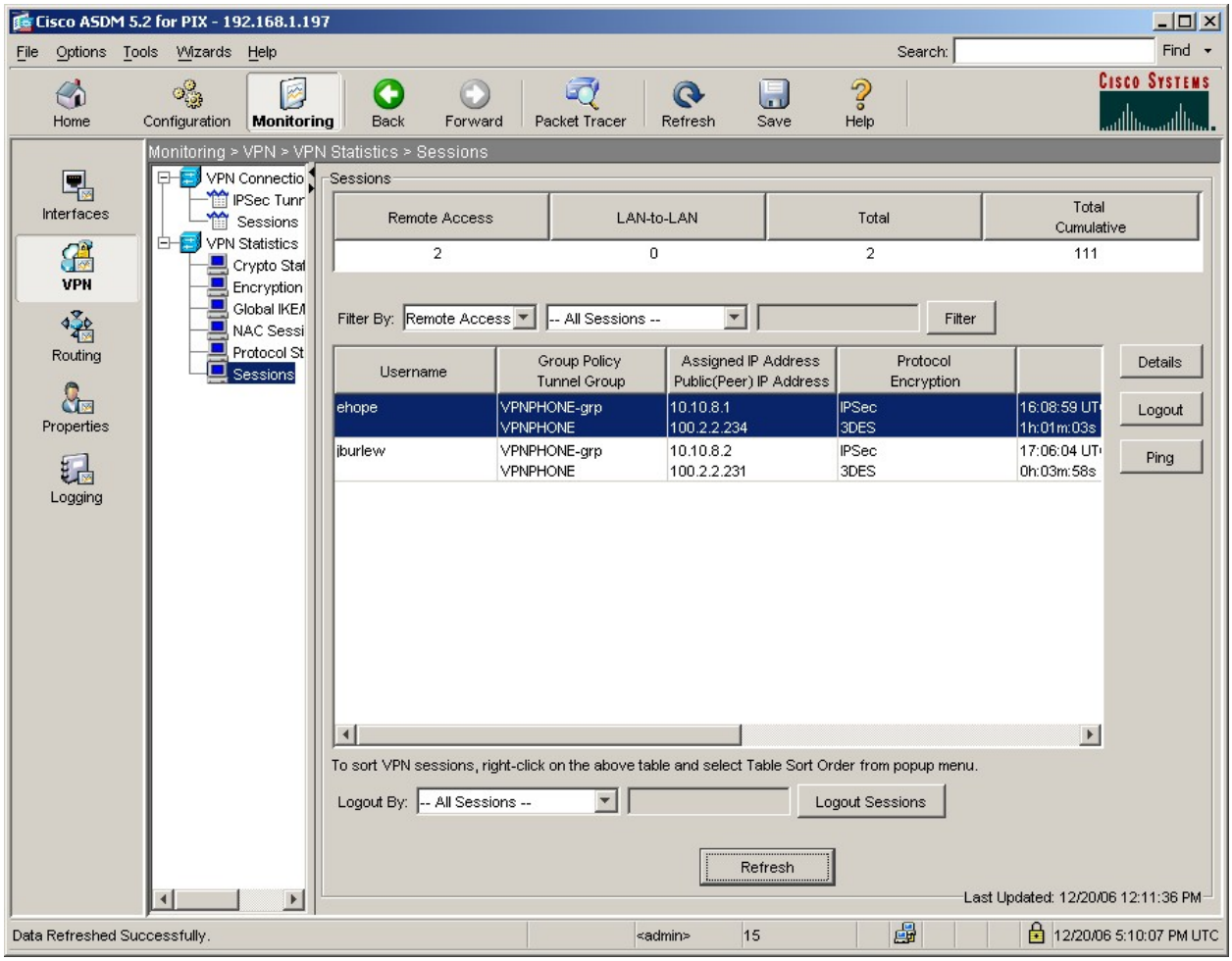
- A connection between jburlew VPNremote Phone (10.10.8.5) to the G650 MedPro (192.168.1.11) while the phone is alerting.
- A connection between ehope VPNremote Phone (10.10.8.6) and jburlew VPNremote Phone (10.10.8.5) for IP to IP Direct Audio RTP packets.

Src IP	Dest IP	Message Text
10.10.8.6	10.10.8.5	Built inbound UDP connection 7043 for **outside:10.10.8.6/2625 (10.10.8.6/2625) to outside:10.10.8.5/2903 (10.10.8.5/2903) (ehope)**
10.10.8.5	10.10.8.6	Built inbound UDP connection 7041 for **outside:10.10.8.5/2902 (10.10.8.5/2902) to outside:10.10.8.6/2624 (10.10.8.6/2624) (jburlew)**
10.10.8.6	192.168.1.25	Built inbound UDP connection 7048 for outside:10.10.8.6/2627 (10.10.8.6/2627) to inside:192.168.1.25/5005 (192.168.1.25/5005) (ehope)
10.10.8.5	192.168.1.25	Built inbound UDP connection 7047 for outside:10.10.8.5/2905 (10.10.8.5/2905) to inside:192.168.1.25/5005 (192.168.1.25/5005) (jburlew)
10.10.8.5	192.168.1.11	Built inbound UDP connection 7040 for **outside:10.10.8.5/2903 (10.10.8.5/2903) to inside:192.168.1.11/2993 (192.168.1.11/2993) (jburlew)**
10.10.8.6	192.168.1.11	Pre-allocate **H323 UDP** backconnection for faddr **10.10.8.6 to laddr 192.168.1.11/2989**
10.10.8.6	192.168.1.11	Pre-allocate **H323 UDP** backconnection for faddr **10.10.8.6 to laddr 192.168.1.11/2988**
10.10.8.5	10.10.8.6	Pre-allocate **H323 UDP** backconnection for faddr **10.10.8.5 to laddr 10.10.8.6/2625**
10.10.8.5	10.10.8.6	Pre-allocate **H323 UDP** backconnection for faddr **10.10.8.5 to laddr 10.10.8.6/2624**
10.10.8.5	192.168.1.11	Pre-allocate H323 UDP backconnection for faddr 10.10.8.5 to laddr 192.168.1.11/2993
10.10.8.5	192.168.1.11	Pre-allocate H323 UDP backconnection for faddr 10.10.8.5 to laddr 192.168.1.11/2992
10.10.8.6	192.168.1.11	Built inbound UDP connection 7034 for outside:10.10.8.6/2624 (10.10.8.6/2624) to inside:192.168.1.11/2988 (192.168.1.11/2988)
10.10.8.6	192.168.1.11	Built inbound UDP connection 7035 for outside:10.10.8.6/2625 (10.10.8.6/2625) to inside:192.168.1.11/2989 (192.168.1.11/2989)
10.10.8.6	192.168.1.11	Pre-allocate H323 UDP backconnection for faddr 10.10.8.6 to laddr 192.168.1.11/2989
10.10.8.6	192.168.1.11	Pre-allocate H323 UDP backconnection for faddr **10.10.8.6 to laddr 192.168.1.11/2988**

7.3. PIX Active VPN Sessions

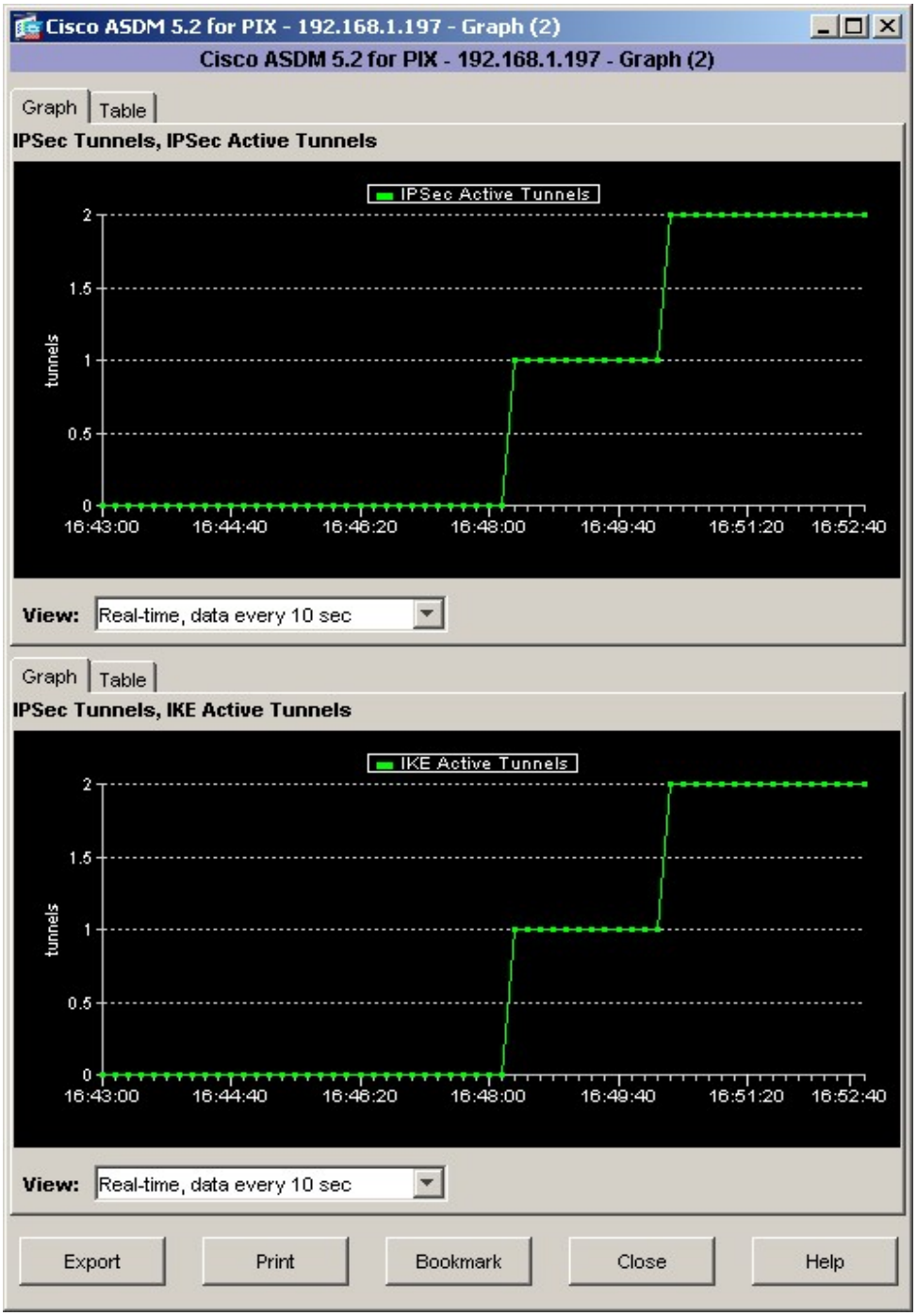
7.3.1. VPN Session Statistics

The active VPN sessions to the PIX can be viewed by selecting **Monitoring > VPN > VPN Statistics > Sessions**. The screen shot below shows sessions of two VPNremote Phones with active tunnels to the PIX.



7.3.2. VPN Session Graph

The active VPN sessions to the PIX can be shown in a graph by selecting **Monitoring > VPN > VPN Connection Graphs > IPSec Tunnels**. Add **IPSec Active Tunnels** and **IKE Active Tunnels** to the Selected Graphs list and click the **Show Graphs** button to display the graph. The screen shot below shows the IPSec and IKE sessions of two VPNremote Phones with active tunnels to the PIX.



8. Troubleshooting

This section offers some common configuration mismatches to assist in troubleshooting. The key events of the logs are highlighted in bold.

8.1. Incorrect VPNremote Phone User Name

VPNremote Phone display:

Initial display shows the following:
`Invalid password, enter password below`
`Password:`
 	
After a short period of time with no input (5 minutes) the display shows the following:
Invalid password OR user name
 	
Press the **More** soft button to display the following:
`Error Code: 3997700:0`
`Module: IKECFG:340`

PIX Log:
AAA user **authentication Rejected** : reason = Invalid password : local database : **user = bclinton**

8.2. Incorrect VPNremote Phone User Password

VPNremote Phone display:

Initial display shows the following:
`Enter Username and Password`
`Password:`
 	
After a short period of time with no input (5 minutes) the display shows the following:
Invalid password OR user name
 	
Press the **More** soft button to display the following:
`Error Code: 3997700:0`
`Module: IKECFG:340`

PIX Log:
AAA user **authentication Rejected** : reason = **Invalid password** : local database : **user = ehope**

8.3. Incorrect Group Name

VPNremote Phone display:

```
Invalid PSK or Group Password
```

Press the **More** soft button to display the following:

```
IKE PSK mismatch
Error Code: 0:0
Module: HASH:227
```

Press the **Next** soft button to display the following:

```
Invalid PSK or Group Password
Error Code: 3997700:0
Module: IKECFG:316
```

PIX Log:

```
Group = DefaultRAGroup, IP = 100.2.2.234, Error: Unable to remove
PeerTblEntry
Group = DefaultRAGroup, IP = 100.2.2.234, Removing peer from peer table
failed, no match!
```

8.4. Incorrect Pre-Shared Key

VPNremote Phone display:

```
Invalid PSK or Group Password
```

Press the **More** soft button to display the following:

```
IKE PSK mismatch
Error Code: 3997700:0
Module: HASH:227
```

Press the **Next** soft button to display the following:

```
Error Code: 3997700:0
Module: IKECFG:316
```

PIX Log:

```
Group = DefaultRAGroup, IP = 100.2.2.234, Error: Unable to remove
PeerTblEntry
Group = DefaultRAGroup, IP = 100.2.2.234, Removing peer from peer table
failed, no match!
```

8.5. Mismatched IKE Phase 1 Proposal

VPNremote Phone display:

```
IKE Phase 1 no response
```

Press the **More** soft button to display the following:

```
Error Code: 3997700:0
Module: IKMPD:164
```

Press the **Next** soft button to display the following:

```
Error Code: 3997700:0
Module: IKECFG:321
```

PIX Log:

```
Group = VPNPHONE, IP = 100.2.2.234, Error: Unable to remove
PeerTblEntry
Group = VPNPHONE, IP = 100.2.2.234, Removing peer from peer table
failed, no match!
```

8.6. Mismatched IPSec Phase 2 Proposal

VPNremote Phone display:

```
IKE Phase 2 no response
```

Press the **More** soft button to display the following:

```
Error Code: 3997700:14
Module: NOTIFY:243
```

Press the **Next** soft button to display the following:

```
Error Code: 3997700:0
Module: IKECFG:834
```

PIX Log: (log entries that are not relevant have been removed for brevity)

```
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Session
disconnected. Session Type: IPSec, Duration: 0h:00m:00s, Bytes xmt: 0,
Bytes rcv: 0, Reason: Phase 2 Mismatch
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, All IPSec SA
proposals found unacceptable!
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, PHASE 1 COMPLETED
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Assigned private
IP address 10.10.8.6 to remote user
AAA transaction status ACCEPT : user = ehope
AAA retrieved default group policy (VPNPHONE) for user = ehope
AAA retrieved user specific group policy (VPNPHONE) for user = ehope
AAA group policy for user ehope is being set to VPNPHONE
AAA user authentication Successful : local database : user = ehope
```

8.7. No IP Pool Addresses Available

VPNremote Phone display:

```
Missing ike configuration
```

Press the **More** soft button to display the following:

```
Error Code: 3997700:0
Module: IKECFG:498
```

PIX Log: (some none relevant log entries removed for brevity)

```
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Error: Unable to
remove PeerTblEntry
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Removing peer
from peer table failed, no match!
Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Cannot obtain an
IP address for remote peer
AAA transaction status ACCEPT : user = ehope
AAA retrieved default group policy (VPNPHONE) for user = ehope
AAA retrieved user specific group policy (VPNPHONE) for user = ehope
AAA group policy for user ehope is being set to VPNPHONE
AAA user authentication Successful : local database : user = ehope
```

8.8. Graceful Reboot of VPNremote Phone

VPNremote Phone display:

```
Rebooting...
```

PIX Log: (some none relevant log entries removed for brevity)

```
IPSEC: An outbound remote access SA (SPI= 0xCA40F294) between 160.2.2.2
and 100.2.2.234 (user= ehope) has been deleted.

IPSEC: An inbound remote access SA (SPI= 0x6B5E3272) between 160.2.2.2
and 100.2.2.234 (user= ehope) has been deleted.

Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Session
disconnected. Session Type: IPSec, Duration: 0h:15m:15s, Bytes xmt:
28023, Bytes rcv: 55233, Reason: User Requested

Group = VPNPHONE, Username = ehope, IP = 100.2.2.234, Connection
terminated for peer ehope.  Reason: Peer Terminate  Remote Proxy
10.10.8.1, Local Proxy 0.0.0.0
```

8.9. Avaya Communication Manager "list registered-ip-stations"

The Avaya Communication Manager **list registered-ip-stations** command, run from the SAT, can be used to verify the registration status of the VPNremote Phones and associated parameters as highlighted below.

```
list registered-ip-stations

                            REGISTERED IP STATIONS

Station  Set     Product    Prod  Station         Net Orig    Gatekeeper     TCP
Ext      Type    ID         Rel   IP Address      Rgn Port    IP Address     Skt
24074    4625    IP_Phone   2.500 10.10.8.1       5           192.168.1.10    y
50003    4610    IP_Phone   2.300 10.10.8.2       5           192.168.1.10    y
50020    4602+   IP_Phone   2.300 192.168.1.242   1           192.168.1.10    y
```

8.10. Avaya Communication Manager "status station"

The Avaya Communication Manager **status station *nnn*** command, where ***nnn*** is a station extension, can be run from the SAT to verify the current status of an administered station. The **Service State: in-service/off-hook** shown on Page 1 below indicates the VPNremote Phone with extension 50003 is participating in an active call.

```
status station 50003                                          Page   1 of   6
                              GENERAL STATUS
     Administered Type: 4610               Service State: in-service/off-hook
        Connected Type: 4610           TCP Signal Status: connected
             Extension: 50003
                  Port: S00004        Parameter Download: complete
           Call Parked? no                 SAC Activated? no
      Ring Cut Off Act? no            CF Destination Ext:
Active Coverage Option: 1

          EC500 Status: N/A        Off-PBX Service State: N/A
       Message Waiting:
   Connected Ports: S00029


 User Cntrl Restr: none                        HOSPITALITY STATUS
Group Cntrl Restr: none                      Awaken at:
                                              User DND: not activated
                                             Group DND: not activated
                                           Room Status: non-guest room
```

Page 4, abridged below, displays the audio status of an **active call between two VPNremote Phones**. The highlighted fields shown below indicate the following:

- Other-end IP Addr value is from the PIX IP Address Pool indicating the call is with another VPNremote Phone.
- Audio RTP packets are going direct between VPNremote Phones.
- Both stations are in IP Network Region 5.
- G.729A codec is being used.

```
status station 50003                                          Page   4 of   6

                                  AUDIO CHANNEL
                                  Port: S00004
                    Switch                        IP                      IP
                    Port     Other-end IP Addr :Port   Set-end IP Addr:Port
G.729A      Audio:            10. 10.  8.  1   :2138    10. 10.  8.  2:2934
        Node Name:
   Network Region:          5                          5
   Audio Connection Type: ip-direct
```

Page 4, abridged below, displays the audio status of an **active call between a VPNremote Phone and a Main Campus IP telephone**. The highlighted fields indicate the following:

- Other-end IP Addr value indicates the call is with an IP telephone at the Main Campus.
- Audio RTP packets are going direct between VPNremote Phone and the IP telephone.
- Call is between IP Network Region 1 and IP Network Region 5.
- G.729A codec is being used.

```
status station 50003                                          Page   4 of   6

                                  AUDIO CHANNEL
                                  Port: S00004
                    Switch                        IP                      IP
                    Port     Other-end IP Addr :Port   Set-end IP Addr:Port
G.729A      Audio:           192.168.  1.242   :2678    10. 10.  8.  2:2934
        Node Name:
   Network Region:          1                          5
   Audio Connection Type: ip-direct
```

9. Conclusion

The Avaya VPNremote Phone combined with the Cisco PIX Security Appliance provides a secure solution for remote worker telephony over any broadband Internet connection. The Avaya VPNremote Phone XAuth implementation for Cisco security appliances (utilizing the **Cisco Xauth with PSK** profile) demonstrated successful interoperability with the Cisco PIX model 525 Security Appliance.

10. Additional References

[1] ***Avaya VPNremote for the 4600 Series IP Telephones Release 2.0 Administrator Guide,*** Doc ID: 19-600753

[2] ***VPNremote for 46xx Series IP Telephone Installation and Deployment Guide,*** Doc ID: 1022006

[3] ***Administrators Guide for Avaya Communication Manager*****,** Doc ID: 03-300509

[4] ***Configuring Cisco VPN Concentrator to Support Avaya VPNremote™ Phones – Issue 1.0,*** Avaya Application Note

[5] ***Application Notes for Configuring Avaya WebLM License Manager for Avaya VPNremote™ Phone Release 2 – Issue 1.0,*** Avaya Application Note

[6] **Avaya Application Notes and Resources Web Site:**

http://www.avaya.com/gcm/master-usa/en-us/resource/

[7] **Avaya Product Support Web Site:**

http://support.avaya.com/japple/css/japple?PAGE=Home

[8] ***Cisco PIX Security Appliance Command Line Configuration Guide, Version 7.1;*** *Allowing HTTPS Access for ASDM*

[9] ***How to obtain a VPN-3DES-AES feature activation key (license) for the PIX 500 Series Firewall;*** Cisco *TAC case number: K28895190*

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 Solution & Interoperability Test Lab at interoplabnotes@list.avaya.com