Avaya Solution & Interoperability Test Lab

Configuring Extreme Networks Summit X250e-48p and X250e-24p Switch to support Avaya Communication Manager – Issue 1.0

Abstract

These Application Notes describe the steps for configuring the Extreme Networks Summit X250e-48p and X250e-24p switches to support an Avaya VoIP solution consisting of an Avaya Server, an Avaya Media Gateway and Avaya IP Telephones in a network composed of both Extreme Networks, and Avaya Ethernet switches. Information in these Application Notes has been obtained through Developer*Connection* 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 configuring the Extreme Networks Summit X250e-48p and X250e-24p (X250) switches to support an Avaya Voice over IP (VoIP) solution consisting of an Avaya S8300 Server, Avaya G700 Media Gateway, and Avaya IP Telephones in a three-node network composed of Avaya C363T-PWR Converged Stackable Switch, Summit X250e-48p and X250e-24p.

The Avaya C363T-PWR, Extreme X250e-48p, and Extreme X250e-24p switches are connected to each other in a full mesh topology. Ethernet Automatic Protection Switching (EAPS) is configured in the X250e switches as a layer-2 loop avoidance mechanism instead of standard Spanning Tree Protocol (STP). The Avaya C363T-PWR switch will interoperate with EAPS as a Transit node. Avaya S8300 Server and Avaya G700 Media Gateway are directly connected into a switch within the cloud and the Avaya IP Telephones are connected to various switches.

Microsoft Internet Authentication Service (IAS) is used to provide 802.1X RADIUS authentications for Avaya IP Telephones and the PCs running Odyssey Client are connected to the X250s switches. The Avaya IP Telephones and PCs are individually authenticated through the X250 switch by the IAS via the X250's per port multi-supplicant support. LLDP, 802.1x and QoS are configured.

2. Configuration

Figure 1 illustrates the configuration used in these Application Notes. 802.1X authentication is enabled on the X250s only. All IP addresses are obtained via Dynamic Host Configuration Protocol (DHCP) unless noted. The "Resources" VLAN with IP network 172.28.10.0/24, the "voice-G700" VLAN with IP network 172.28.30.0/24, and the "data-G700" VLAN with IP network 172.28.31.0/24 are used in the sample network.

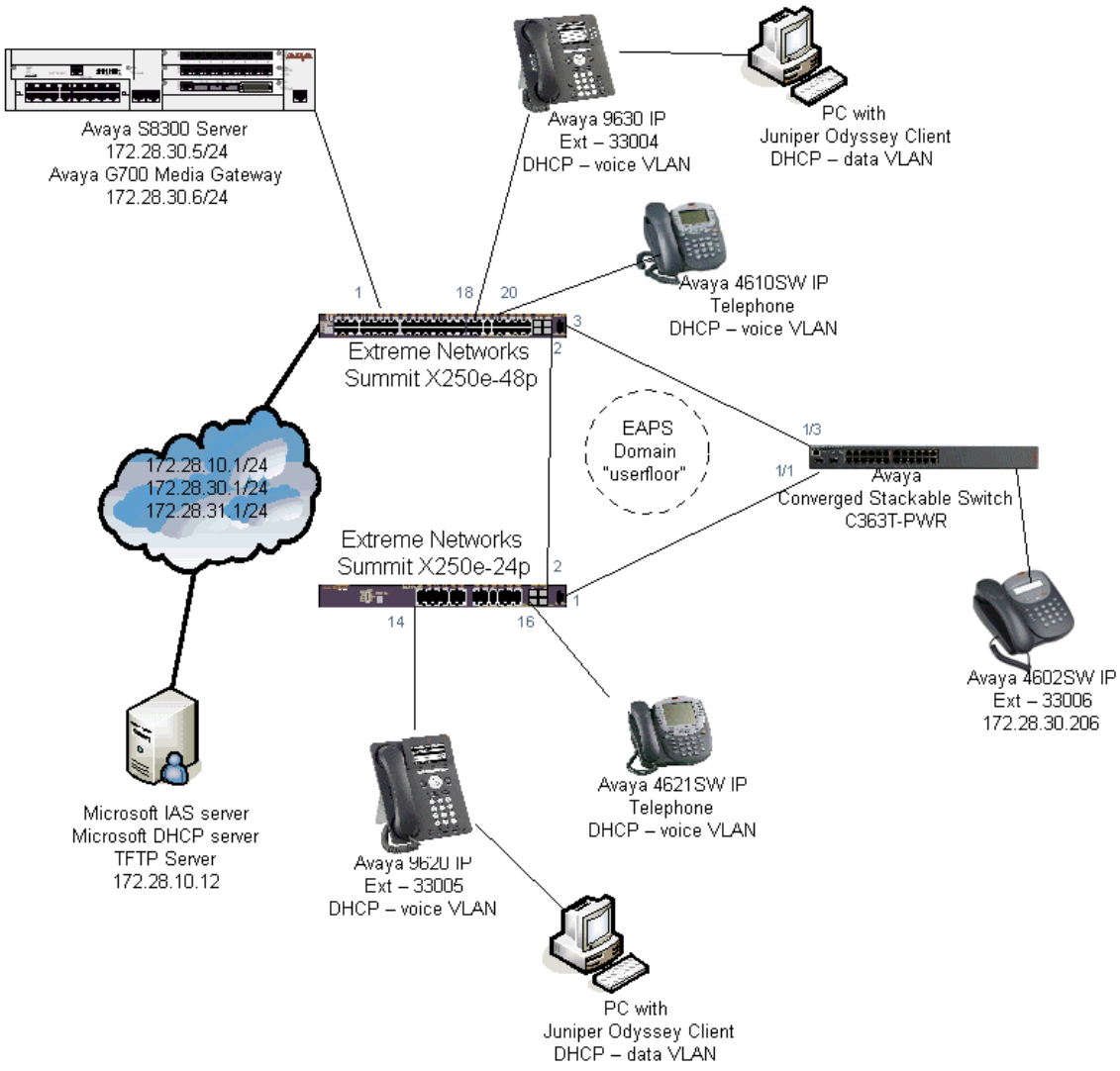


Figure 1: Sample Network Configuration

3. Equipment and Software Validated

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

DEVICE DESCRIPTION	VERSION TESTED
Avaya S8300 Server with G700 Media Gateway	Avaya Communication Manager R4.0 (R014.0.730.5)
Avaya 9630 IP Telephone	R 1.2.1
Avaya 9620 IP Telephone	R 1.2.1
Avaya 4621SW IP Telephone	R 2.8 (H.323)
Avaya 4610SW IP Telephone	R 2.8 (H.323)
Avaya 4602SW IP Telephone	R2.3 (H.323
Avaya C363T-PWR Converged Stackable Switch	SW Version 4.5.14
Extreme Networks X250e-24p	ExtremeXOS 12.0.1.11
Extreme Networks X250e-48p	ExtremeXOS 12.0.1.11
Microsoft Windows	2003 Server Enterprise Edition
Active Directory Users and Computers	5.2.3790.1830
Internet Authentication Service	5.2.3790.1830
DHCP Server	5.2.3790.1830
TFTP Server	
Juniper Networks Odyssey Client on PC running Microsoft Windows 2003 Server	4.50.0.2496

4. Configure Extreme Networks equipment

This section describes the configuration for Extreme Network X250e-48p and X250e-24p as shown in **Figure 1**. The configuration shows in this section assumes both Extreme Networks switches are in their factory default configuration.

4.1. Configure the X250e-48p

This section shows the necessary steps in configuring the X250e-48p as shown in the **Figure 1**.

Step	Description

1.	Connect to the X250e-48p switch and log in using the appropriate credentials.
	
	`login: ***username***`
	`password: ***xxxxxx***`

Step	Description

2.	Create VLANs on the switch. The IP address assignment is optional. All routing is performed by another switch within the cloud which serves as the default gateway for the voice-G700 and data-G700 VLAN and has the IP address of 172.28.30.1 and 172.28.31.1 respectively. VLAN "c1" is the control VLAN for EAPS. The "temp" VLAN is used as a temporary VLAN for 802.1X authentication.
	
	Note: It is important to precede the voice VLAN with the word "voice" as it is a required keyword.
	
	`X250e-48p # create vlan voice-G700`
	`X250e-48p # config vlan voice-G700 tag 30`
	`X250e-48p # config vlan voice-G700 ipaddress 172.28.30.2/24 (optional)`
	`X250e-48p # create vlan data-G700`
	`X250e-48p # config vlan data-G700 tag 31`
	`X250e-48p # config vlan data-G700 ipaddress 172.28.31.2/24 (optional)`
	`X250e-48p # create vlan c1`
	`X250e-48p # config vlan c1 tag 111`
	`X250e-48p # configure vlan c1 qosprofile qp8`
	`X250e-48p # create vlan temp`

3.	Configure VLAN assignment for the ports.
	
	Note: The VLAN assignment for the user port is dynamically assigned after the Avaya IP Telephone or user has been authenticated.
	
	`X250e-48p # config vlan default delete port all`
	`X250e-48p # config vlan c1 add port 2,3 tagged`
	`X250e-48p # config vlan voice-G700 add port 1,2,3 tagged`
	`X250e-48p # config vlan data-G700 add port 1,2,3 tagged`

4.	Configure a default route for the switch. `X250e-48p # configure iproute add default 172.28.31.1 vr vr-default`

5.	Configure EAPS as the layer-2 loop avoidance protocol. The sample network uses "userfloor" as the EAPS domain name.
	
	`X250e-48p # create eaps userfloor`
	`X250e-48p # configure eaps userfloor mode master`
	`X250e-48p # configure eaps userfloor primary port 2`
	`X250e-48p # configure eaps userfloor secondary port 3`
	`X250e-48p # configure eaps userfloor add control vlan c1`
	`X250e-48p # configure eaps userfloor add protected vlan data-G700`
	`X250e-48p # configure eaps userfloor add protected vlan voice-G700`
	`X250e-48p # enable eaps`
	`X250e-48p # enable eaps userfloor`

Step	Description

6.	Configure LLDP for the user ports. The call-server and file-server information are used by Avaya IP Telephone for registration and obtaining configuration information.
	
	`X250e-48p # configure lldp port 18,20 advertise vendor-specific dot1 vlan-name`
	`X250e-48p # configure lldp port 18,20 advertise vendor-specific avaya-extreme call-server 172.28.30.5`
	`X250e-48p # configure lldp port 18,20 advertise vendor-specific avaya-extreme file-server 172.28.10.12`
	`X250e-48p # configure lldp port 18,20 advertise vendor-specific avaya-extreme dot1q-framing tagged`
	`X250e-48p # enable lldp ports 18,20`

7.	Configure 802.1X authentication for the switch and user ports. The share-secret must match what is configured in IAS in **Section 6.1**, **Step 3**.
	
	`X250e-48p # configure radius netlogin primary server 172.28.10.12 1812 client-ip 172.28.31.2 vr VR-Default`
	`X250e-48p # configure radius netlogin primary shared-secret 1234567890`
	`X250e-48p # configure netlogin vlan temp`
	`X250e-48p # enable radius netlogin`
	`X250e-48p # enable netlogin dot1x`
	`X250e-48p # enable netlogin ports 18,20 dot1x`

8.	Configure QoS profile for Avaya VoIP traffic. The X250 switches only have qp1 and qp8 by default. The dot1p type should match the call control and audio 802.1p priority setting configured in the ip-network-region form in **Section 9**, **Step 2**.
	
	`X250e-48p # create qosprofile QP7`
	`X250e-48p # configure dot1p type 6 qosprofile QP7`

9.	Save the configuration `X250e-24p # save`

4.2. Configure the X250e-24p

This section shows the necessary steps in configuring the X250e-24p as shown in the **Figure 1**.

Step	Description

1.	Connect to the X250e-48p switch and log in using the appropriate credentials.
	
	`login: ***username***`
	`password: ***xxxxxx***`

2.	Create VLANs on the switch. The IP address assignment is optional. All routing is performed by another switch within the cloud which serves as the default gateway for the voice-G700 and data-G700 VLAN and has the IP address of 172.28.30.1 and 172.28.31.1 respectively. VLAN "c1" is the control VLAN for EAPS. The "temp" VLAN is used as a temporary VLAN for 802.1X authentication.
	
	Note: It is important to precede the voice VLAN with the word "voice" as it is a required keyword.
	
	`X250e-24p # ***create vlan voice-G700***`
	`X250e-24p # ***config vlan voice-G700 tag 30***`
	`X250e-24p # ***config vlan voice-G700 ipaddress 172.28.30.3/24 (optional)***`
	`X250e-24p # ***create vlan data-G700***`
	`X250e-24p # ***config vlan data-G700 tag 31***`
	`X250e-24p # ***config vlan data-G700 ipaddress 172.28.31.3/24 (optional)***`
	`X250e-24p # ***create vlan c1***`
	`X250e-24p # ***config vlan c1 tag 111***`
	`X250e-24p # ***configure vlan c1 qosprofile qp8***`
	`X250e-24p # ***create vlan temp***`

3.	Configure VLAN assignment for the ports.
	
	Note: The VLAN assignment for the user port is dynamically assigned after the Avaya IP Telephone or user has been authenticated.
	
	`X250e-24p # ***config vlan default delete port all***`
	`X250e-24p # ***config vlan c1 add port 1,2 tagged***`
	`X250e-24p # ***config vlan voice-G700 add port 1,2 tagged***`
	`X250e-24p # ***config vlan data-G700 add port 1,2 tagged***`

4.	Configure a default route for the switch. `X250e-24p # ***configure iproute add default 172.28.31.1 vr vr-default***`

Step	Description

5.	Configure EAPS as the layer-2 loop avoidance protocol. The sample network uses "userfloor" as the EAPS domain name.
	
	`X250e-24p # create eaps userfloor`
	`X250e-24p # configure eaps userfloor mode transit`
	`X250e-24p # configure eaps userfloor primary port 2`
	`X250e-24p # configure eaps userfloor secondary port 1`
	`X250e-24p # configure eaps userfloor add control vlan c1`
	`X250e-24p # configure eaps userfloor add protected vlan data-G700`
	`X250e-24p # configure eaps userfloor add protected vlan voice-G700`
	`X250e-24p # enable eaps`
	`X250e-24p # enable eaps userfloor`

6.	Configure LLDP for the user ports. The call-server and file-server information are used by Avaya IP Telephone for registration and obtaining configuration information.
	
	`X250e-24p # configure lldp port 14,16 advertise vendor-specific dot1 vlan-name`
	`X250e-24p # configure lldp port 14,16 advertise vendor-specific avaya-extreme call-server 172.28.30.5`
	`X250e-24p # configure lldp port 14,16 advertise vendor-specific avaya-extreme file-server 172.28.10.12`
	`X250e-24p # configure lldp port 14,16 advertise vendor-specific avaya-extreme dot1q-framing tagged`
	`X250e-24p # enable lldp ports 14,16`

7.	Configure 802.1X authentication for the switch and user ports. The share-secret must match what is configured in IAS in **Section 6.1**, **Step 3**.
	
	`X250e-24p # configure radius netlogin primary server 172.28.10.12 1812 client-ip 172.28.31.3 vr VR-Default`
	`X250e-24p # configure radius netlogin primary shared-secret 1234567890`
	`X250e-24p # configure netlogin vlan temp`
	`X250e-24p # enable radius netlogin`
	`X250e-24p # enable netlogin dot1x`
	`X250e-24p # enable netlogin ports 18,20 dot1x`

8.	Configure QoS profile for Avaya VoIP traffic. The X250 switches only have qp1 and qp8 by default. The dot1p type should match the call control and audio 802.1p priority setting configured in the ip-network-region form in **Section 9**, **Step 2**.
	
	`X250e-24p # create qosprofile QP7`
	`X250e-24p # configure dot1p type 6 qosprofile QP7`

9.	Save the configuration `X250e-24p # save`

5. Configure the Avaya C363T-PWR Converged Stackable Switch

This section shows the steps for configuring the Avaya C363T-PWR Converged Stackable Switch.

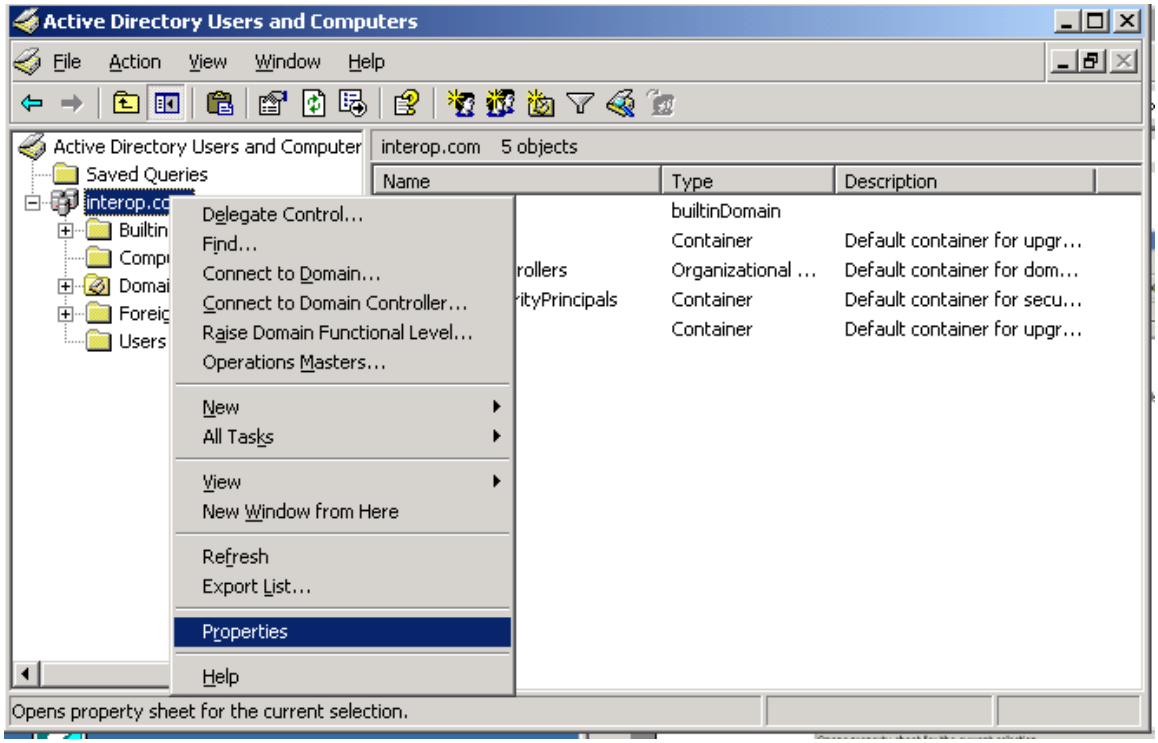
1.	Log in to the Avaya C363T-PWR Converged Stackable Switch using the appropriate credentials. Login: ***username*** Password: ***xxxxxx***

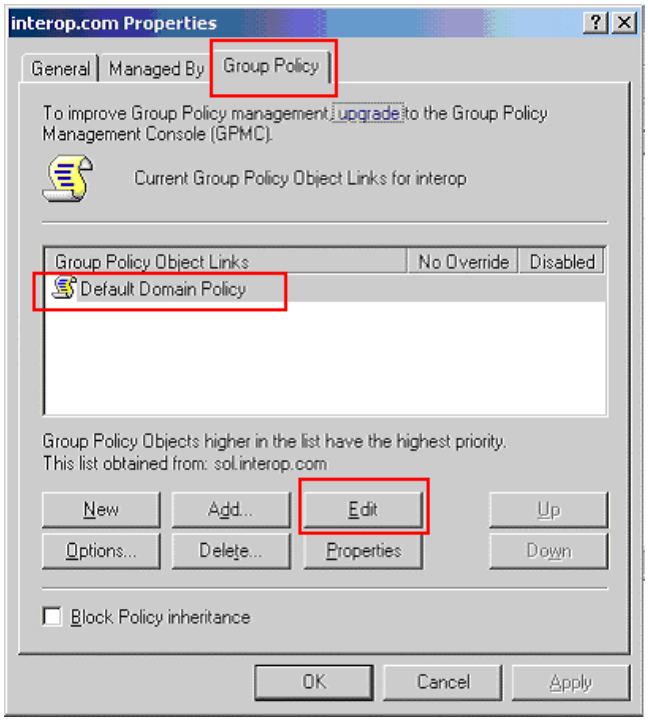
2.	Create the VLANs on the switch.
	
	Note: VLAN c1 must be created in order for the EAPS ring to function successfully.
	
	`C360-1(super)# set vlan 30 name voice-G700`
	`C360-1(super)# set vlan 31 name data-G700`
	`C360-1(super)# set vlan 111 name c1`

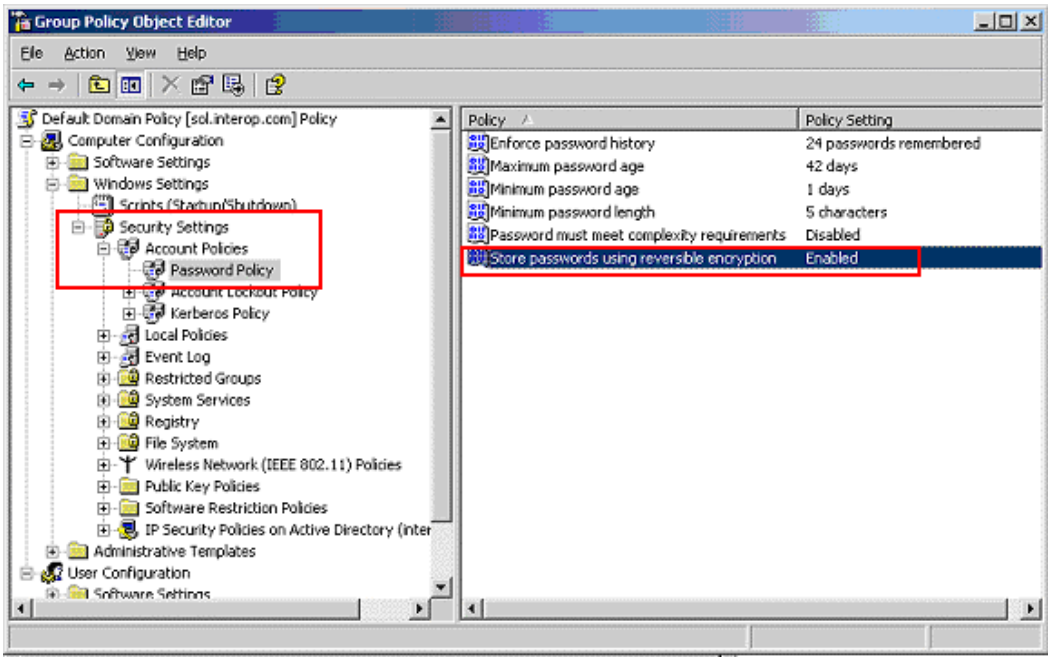
3.	Configure VLAN assignment for the ports.
	
	`C360-1(super)# set port vlan 31 1/10`
	`C360-1(super)# set trunk 1/1,1/3,1/10 dot1q`
	`C360-1(super)# set port vlan-binding-mode 1/1,1/3,1/10 bind-to-configured`

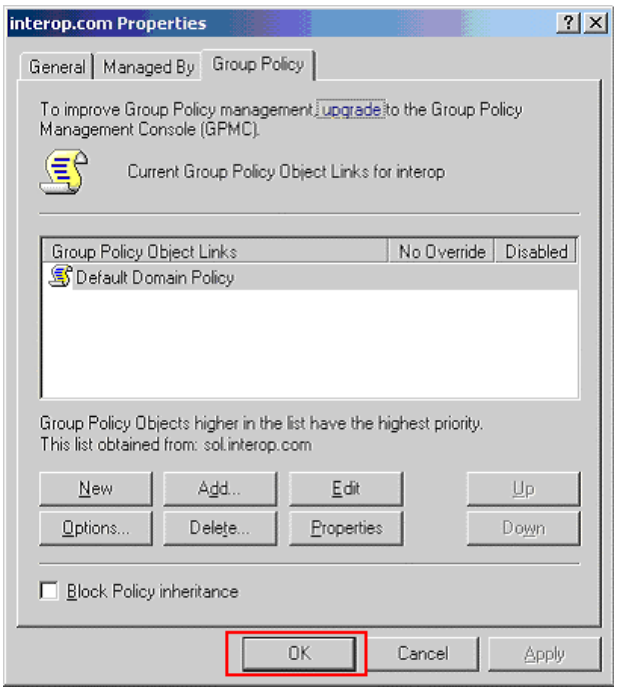
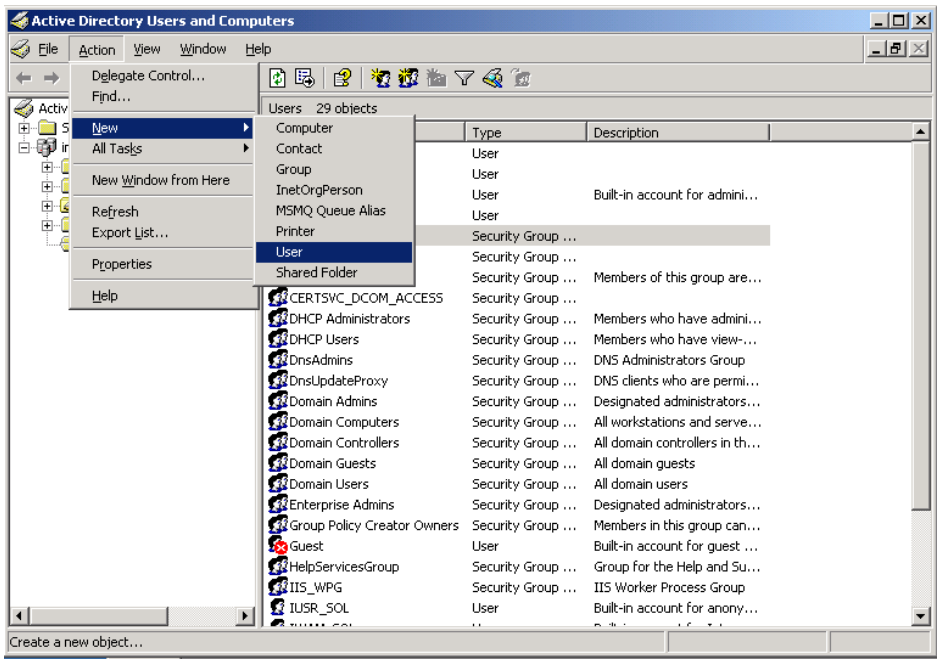
6. Configure Microsoft Active Directory Service

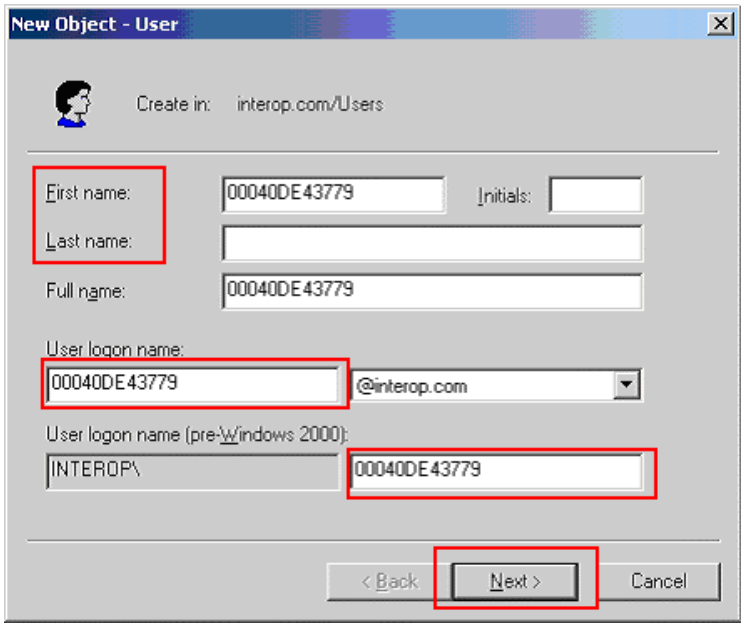
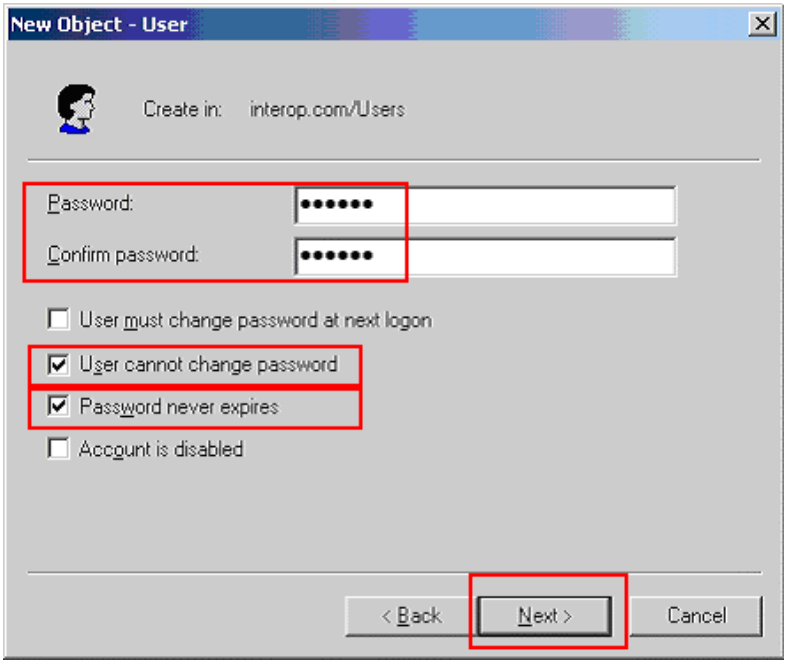
This section shows the necessary steps in configuring the Microsoft Active Directory server as shown in the **Figure 1** to support the Avaya IP Telephones and PC.

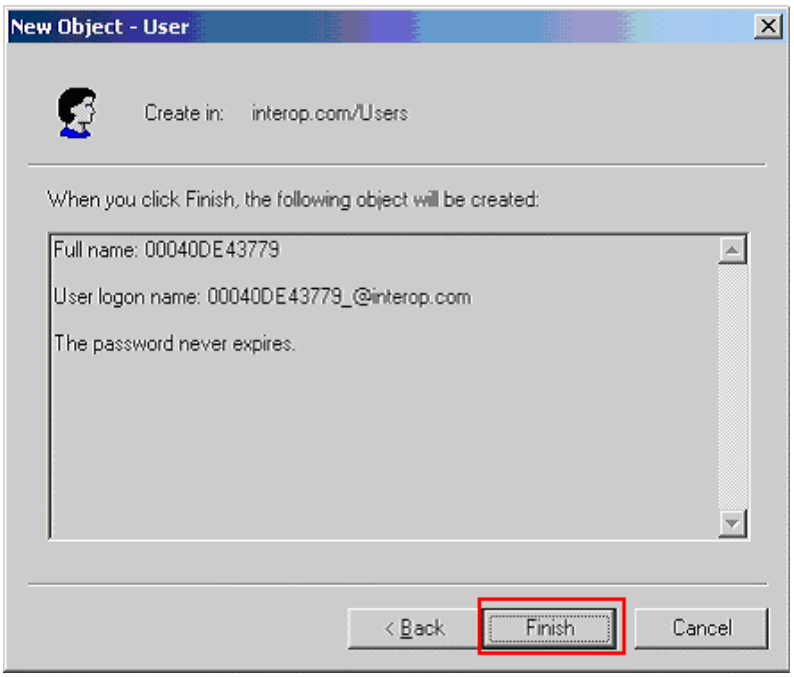
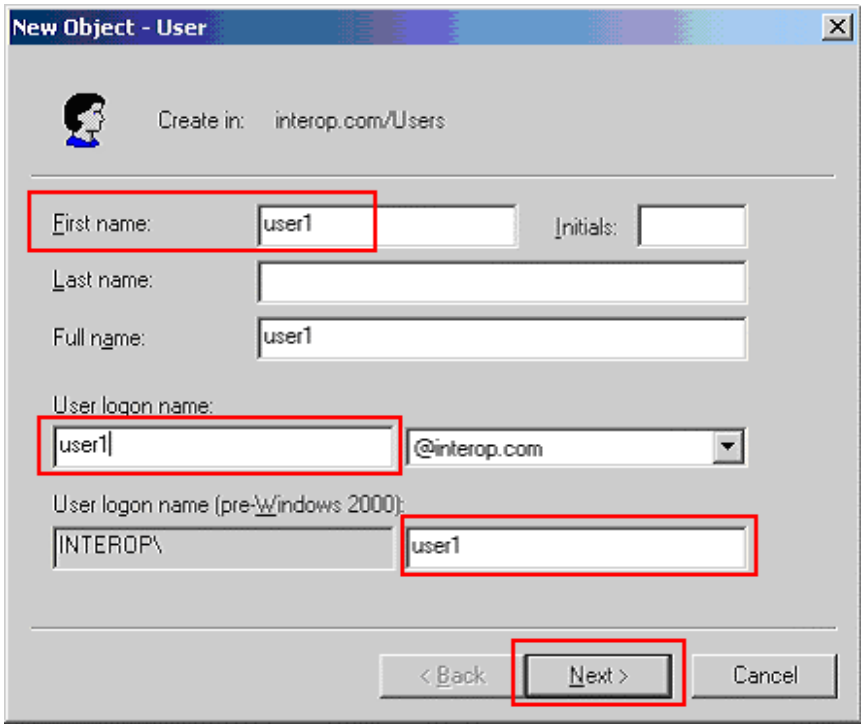
Step	Description
1.	Invoke the Active Directory Users and Computers window under Administrative Tools of a Microsoft Windows system. Configure the active directory domain properties by highlighting the Active Directory domain then right click and select **Properties**. 

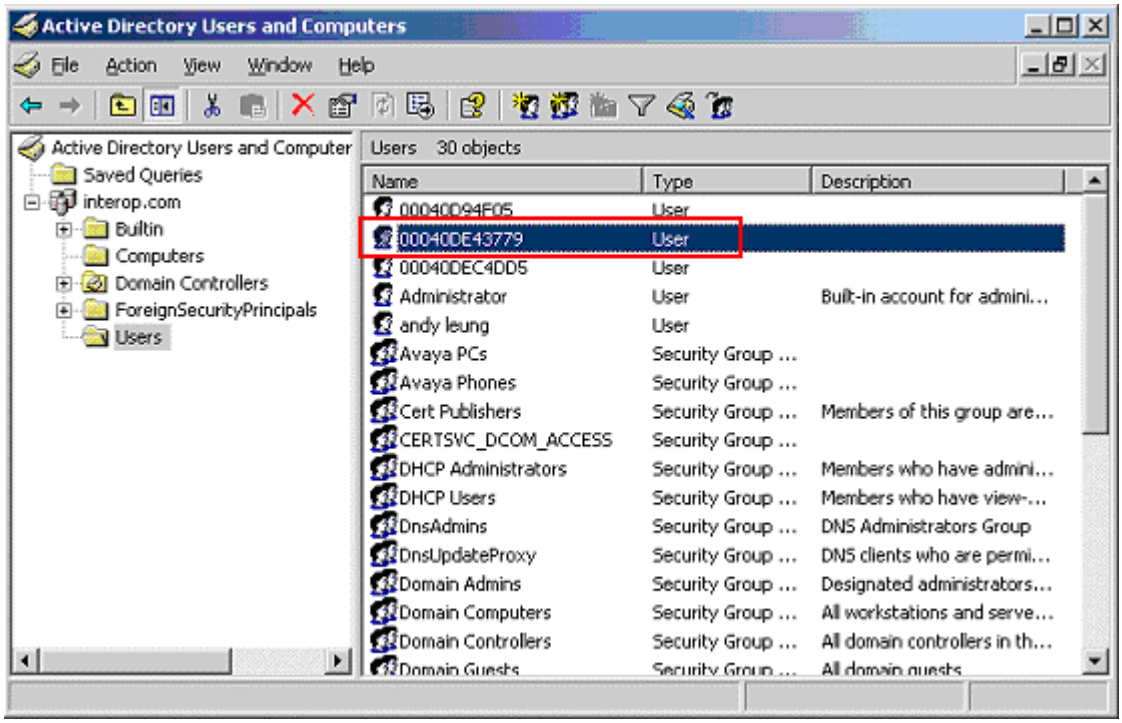
Step	Description
2.	Select the **Group Policy** tab in the properties window. Highlight the **Default Domain Policy** then click **Edit** to display the Group Policy Object Editor. 

Step	Description
3.	From the Group Policy Object Editor, navigate to **Computer Configuration → Windows Settings → Security Settings → Account Policies → Password Policy** on the left panel. Double click on **Store passwords using reversible encryption policy** on the right, and change the setting to **Enabled**. 

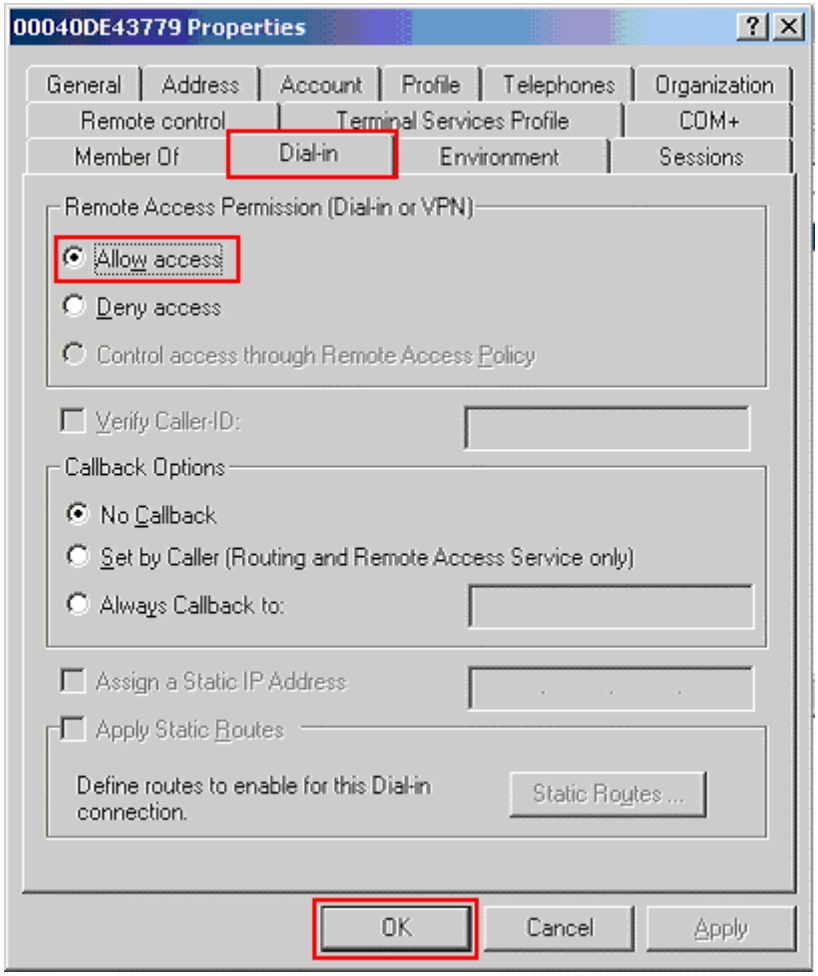
Step	Description
4.	Click **OK** on the domain properties pop-up window to complete. 
5.	Create a new user ID for an Avaya IP Telephone user and a PC user. From the Active Directory Users and Computers window menu, select **Action → New → User** to begin creating a new user ID. 

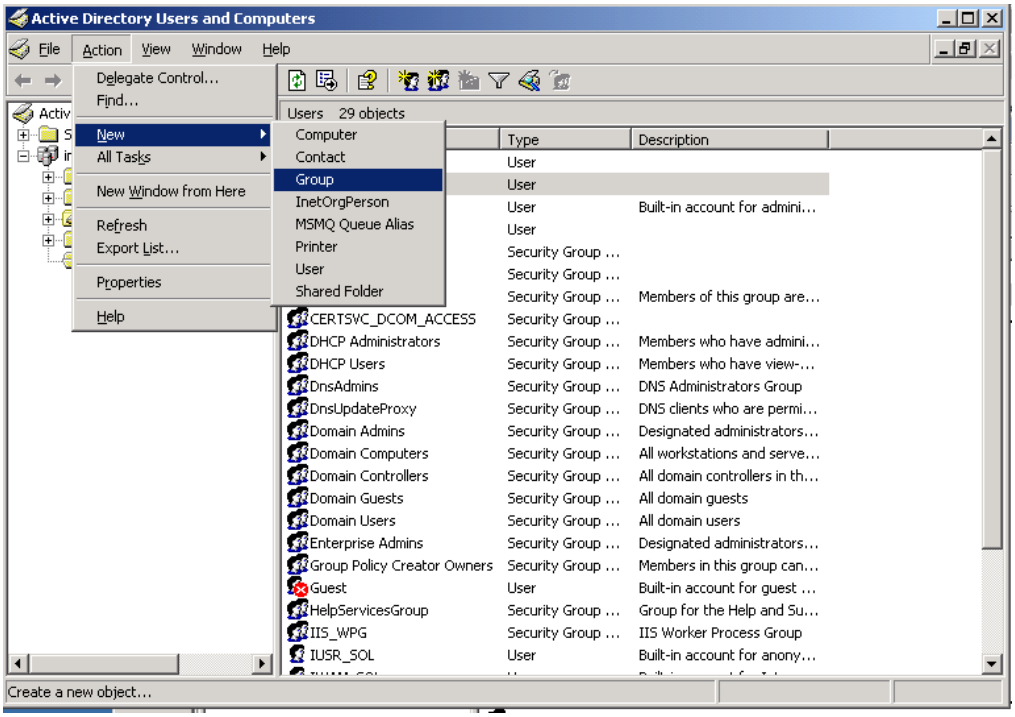
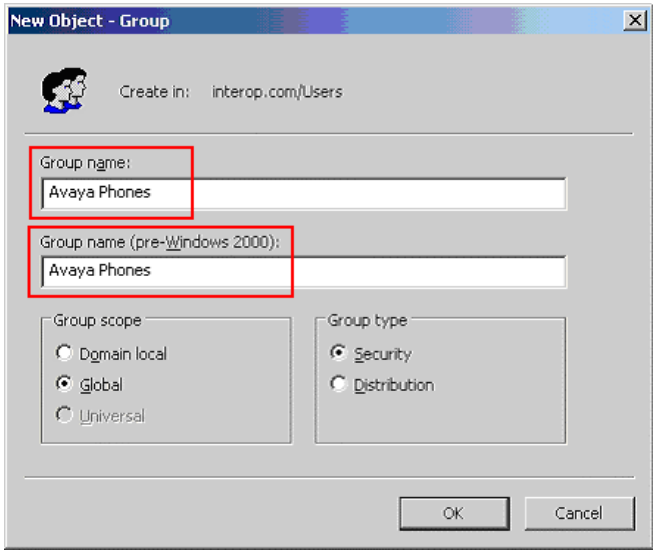
Step	Description
6.	For an Avaya IP Telephone, enter the phone's MAC address as the **User logon name**. The **First name** and **Last name** are for information only. Click **Next** to continue. 
7.	Enter a **Password** for the user ID. For an Avaya IP Telephone, enter a numeric password. Select the **User cannot change password** and **Password never expires** fields. Click **Next** to continue. 

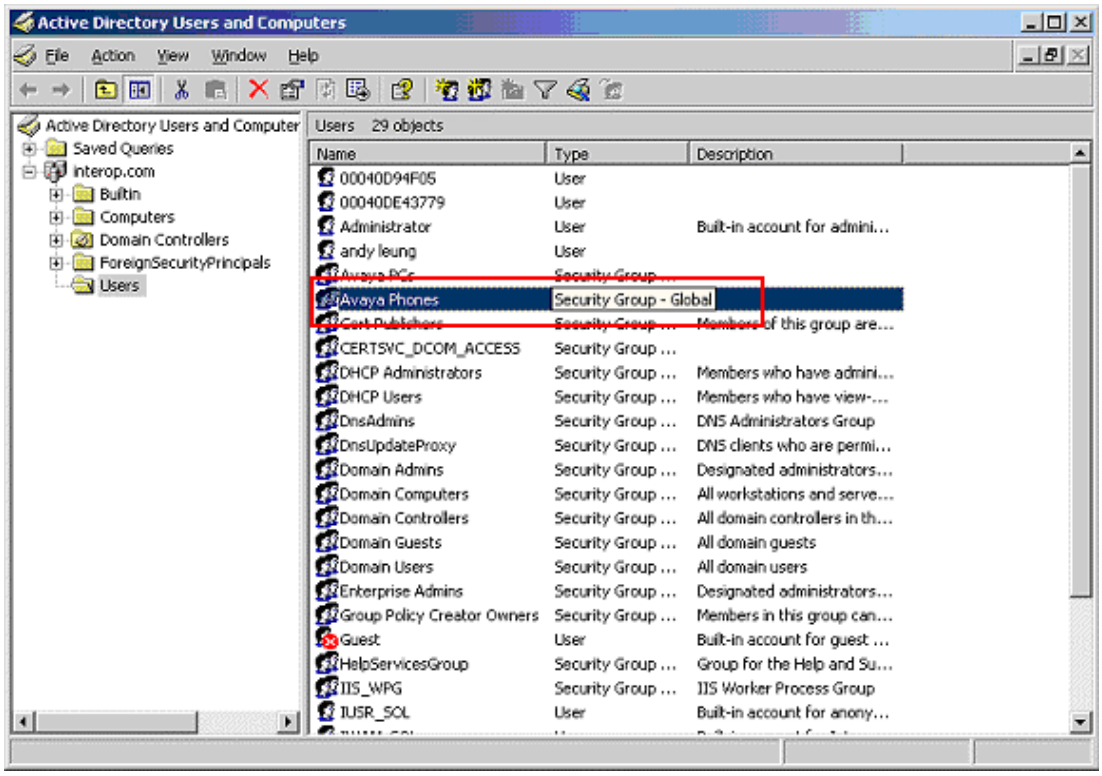
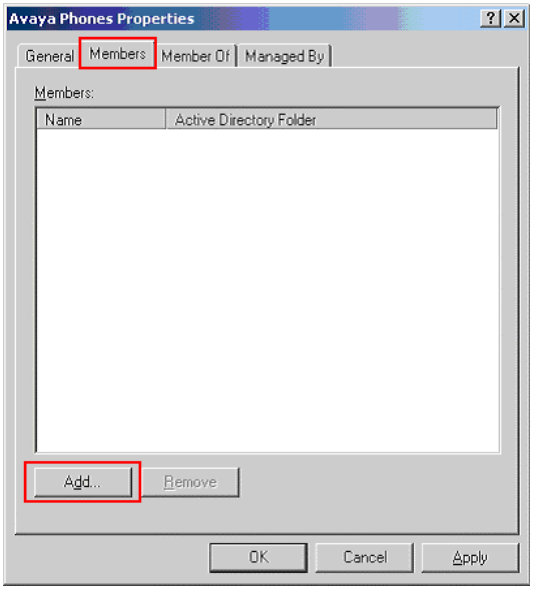
Step	Description
8.	Click **Finish** to complete. 
9.	Repeat Steps 5-8 to create a user ID for the PC. Below is a screen capture for user ID "user1" used for the PC for log in. 

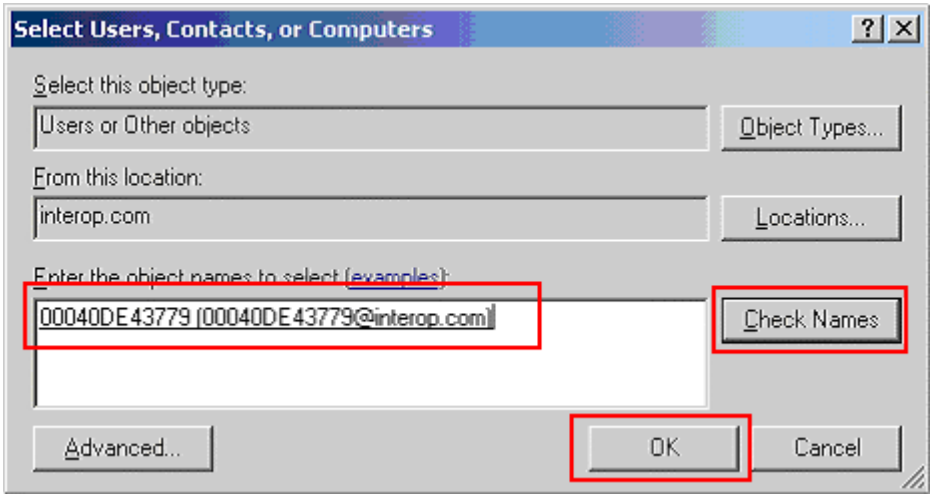
Step	Description
10.	After creating the user ID, begin editing its properties by double clicking on the user ID in the Active Directory Users and Computers window. 

Step	Description
11.	Select the **Dial-in** tab in the user properties window. Enable remote access by clicking on the **Allow access** radio button. Click **OK** to complete. Repeat this step for all Avaya IP Telephone and PC user IDs.



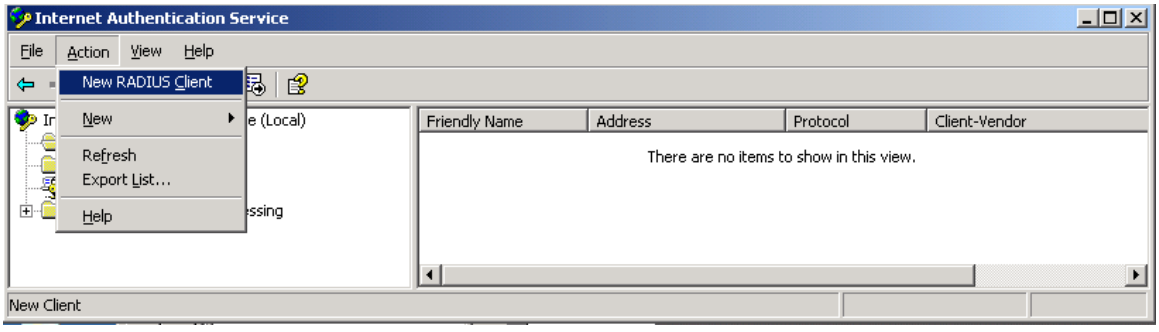
Step	Description
12.	Create a new user Group by selecting **Action → New → Group** from the drop-down menu. The use of a Group facilitates the assignment and management of additional user IDs. 
13.	Create a group for Avaya IP Telephones. The sample network uses the name Avaya Phones for this group. Click **OK** to complete. 
14.	Repeat Steps 12 and 13 to create another user Group for the PC.

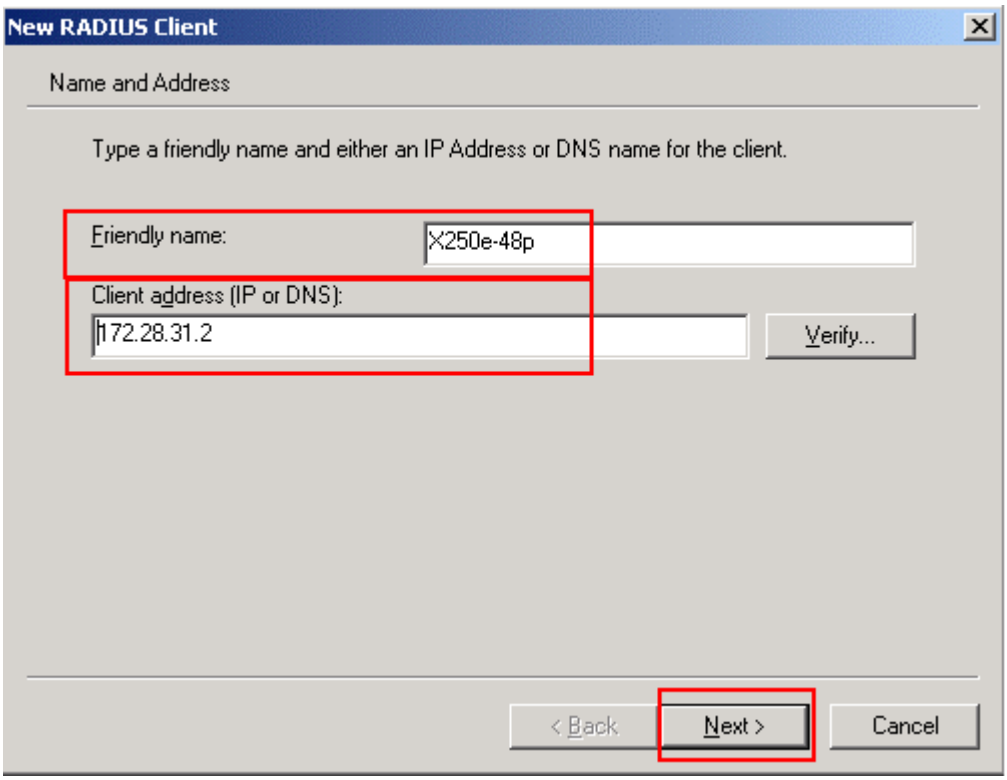
Step	Description
15.	After creating the user Group, begin editing its properties by double clicking on the Group in the Active Directory Users and Computers window. 
16.	Select the **Members** tab in the group Properties window. Click **Add** to continue. 

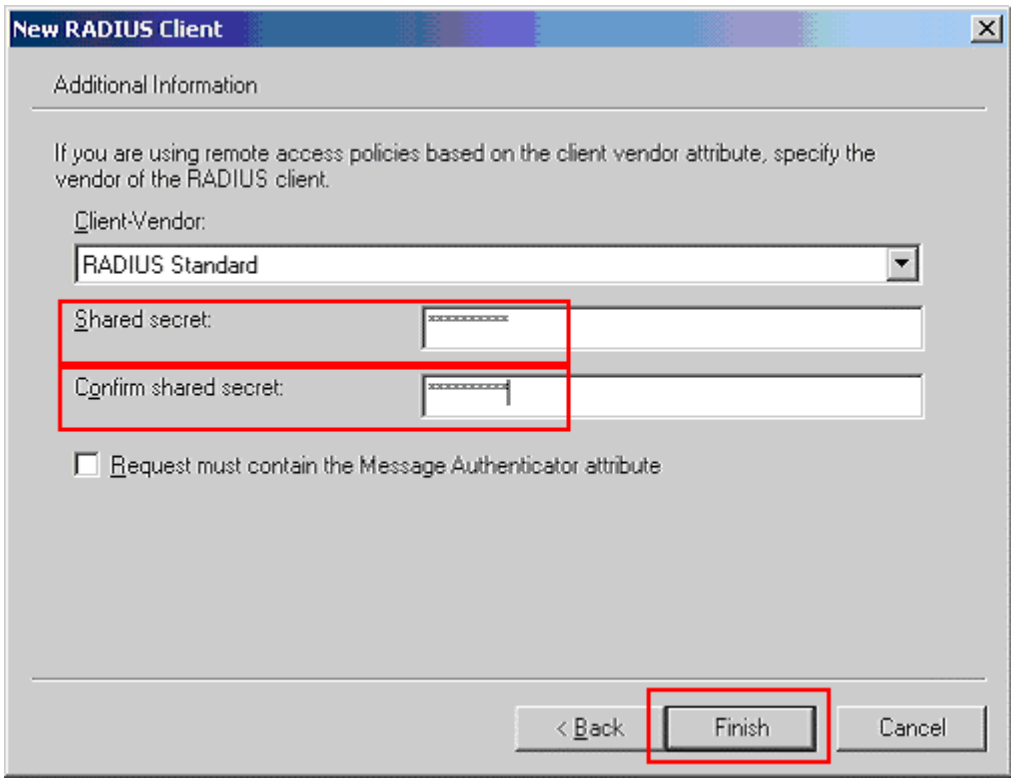
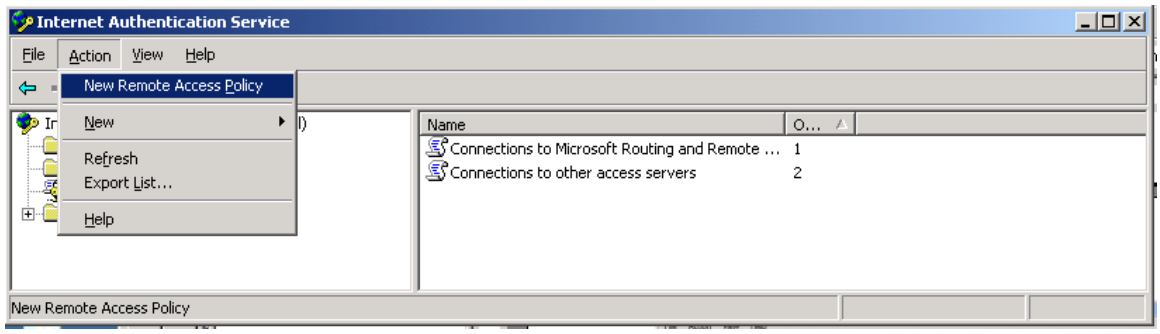
Step	Description
17.	Enter the user ID that should be assigned to the Avaya Phones group. This should be the user ID for the Avaya IP Telephone. Use **Check Names** to assist in searching for the user ID. Click **OK** to complete. 
18.	Repeat Steps 15-17 to add members to the PCs user group.

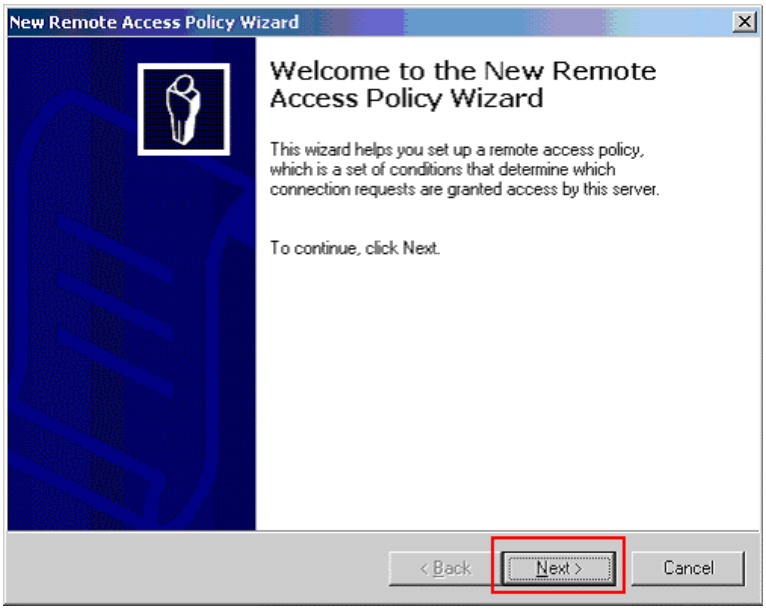
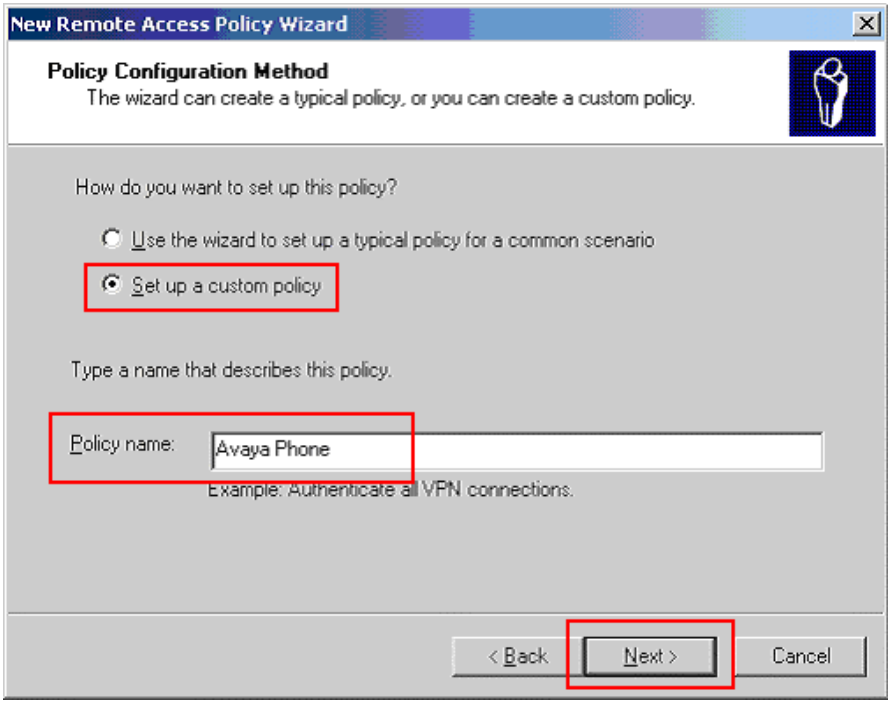
6.1. Configure Microsoft Internet Authentication Services (IAS) Server

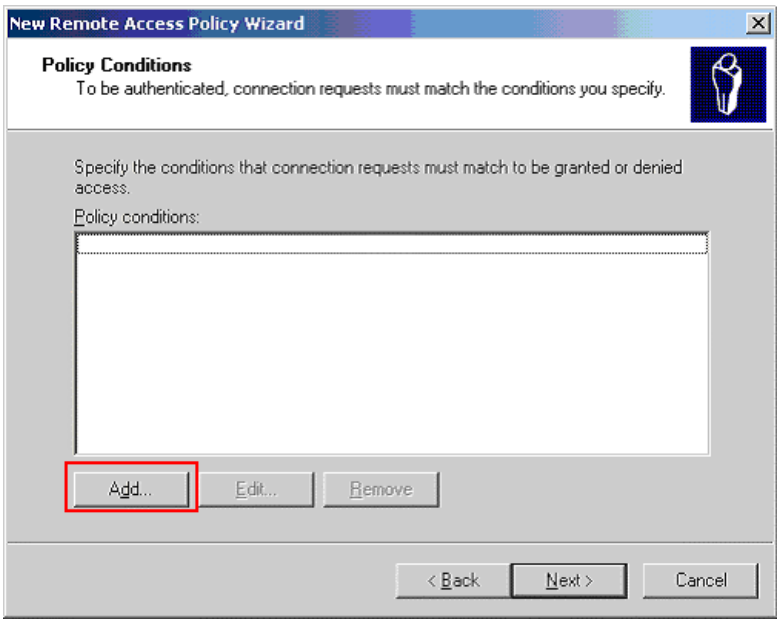
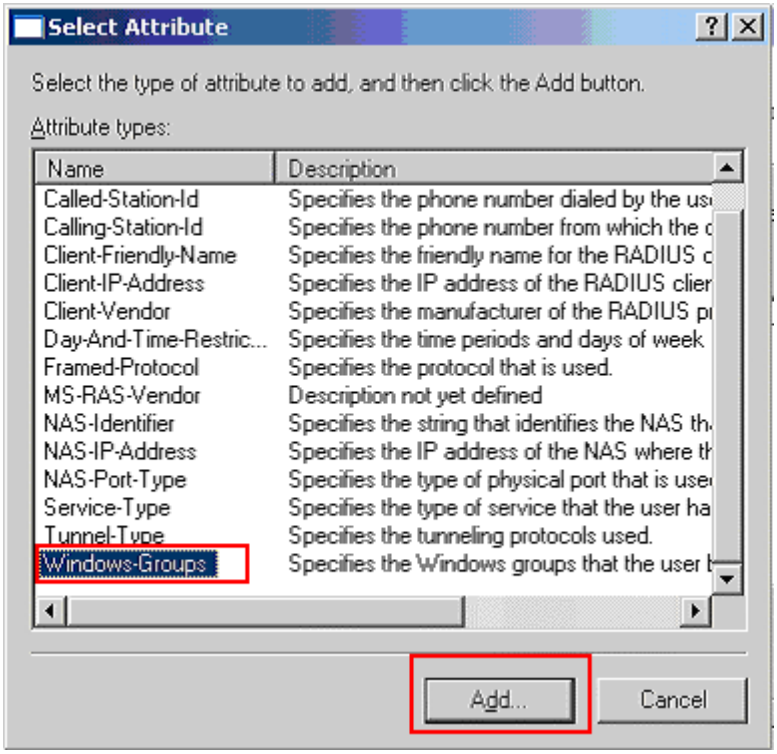
This section shows the steps for configuring the IAS server to support 802.1X authentication for an Avaya IP Telephone and a PC.

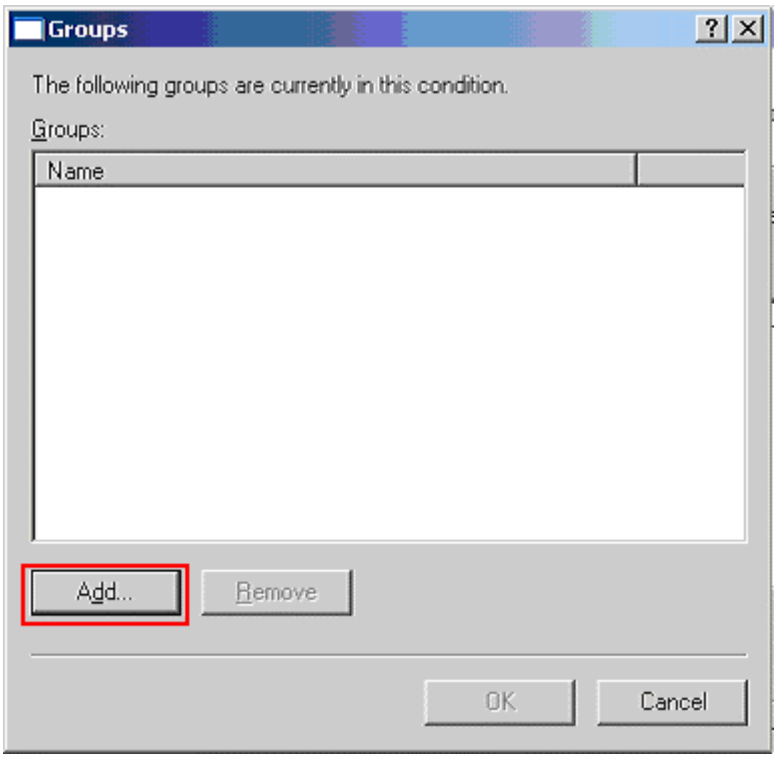
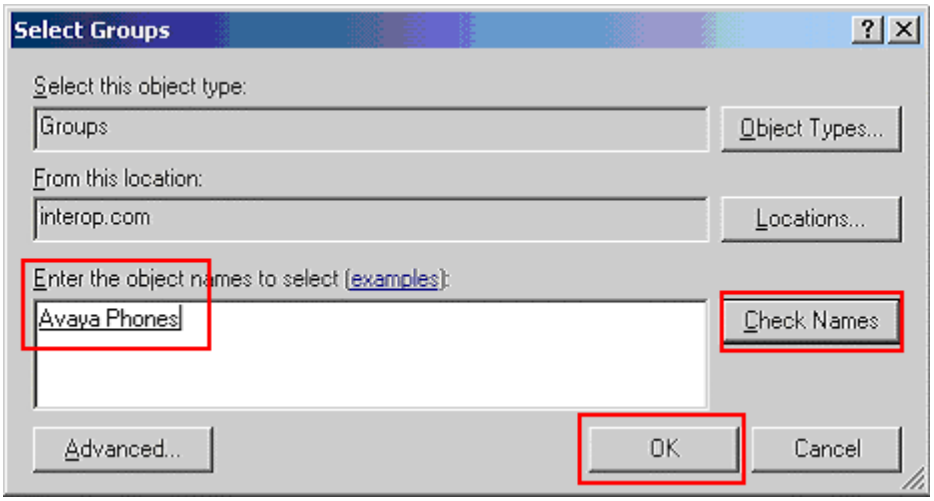
Step	Description
1.	Invoke the Internet Authentication Service window under Administrative Tools of the Microsoft Windows system. Create a new RADIUS client by selecting **Action → New RADIUS Client** from the drop down menu in Internet Authentication Service window. 

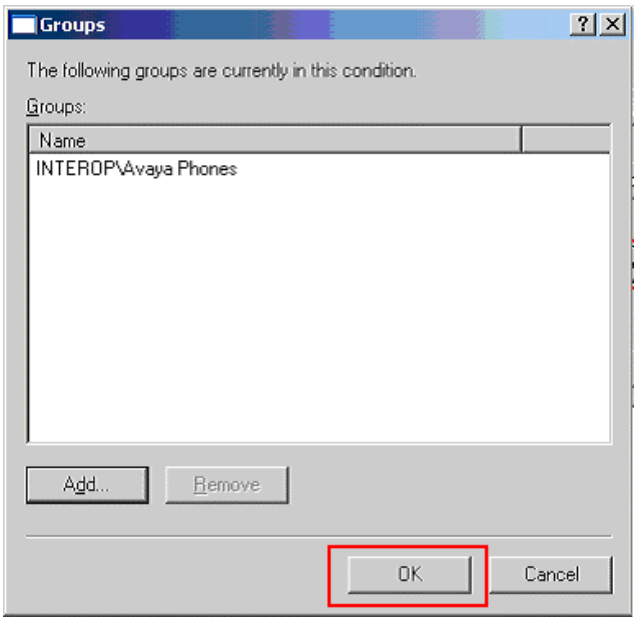
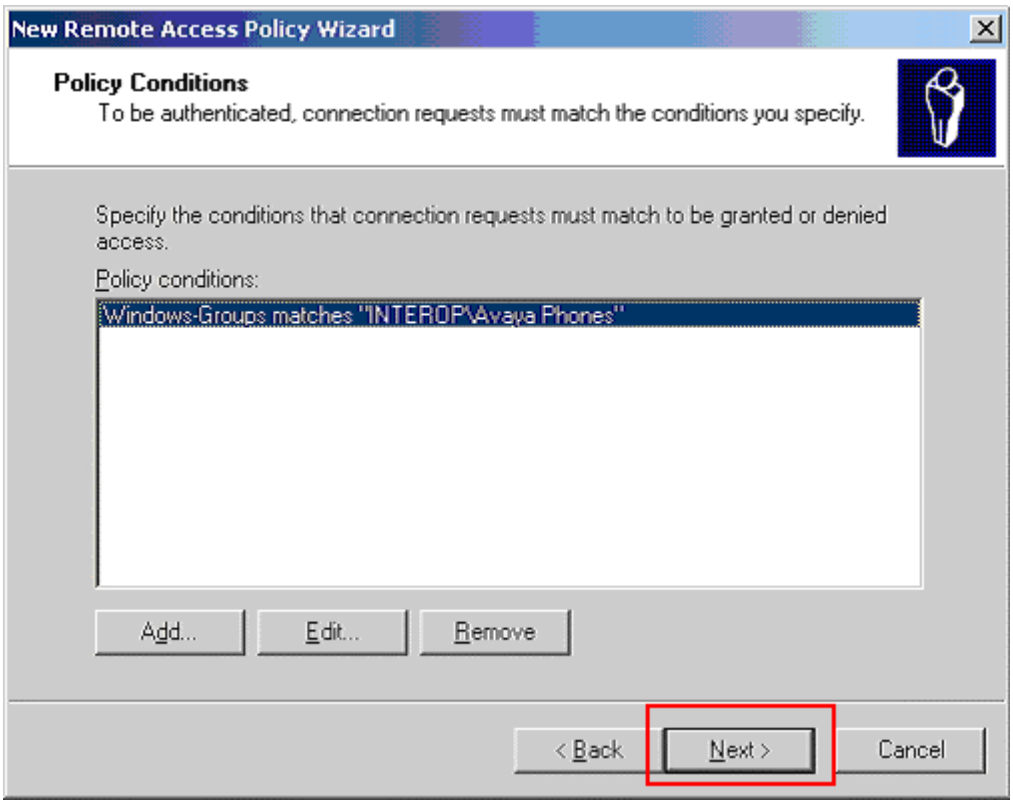
Step	Description
2.	Enter the name and IP address of the X250e-48p switch to create a new RADIUS client. This must match the IP address configured in **Section 4.1**, **Step 4**. Click **Next** to continue. 

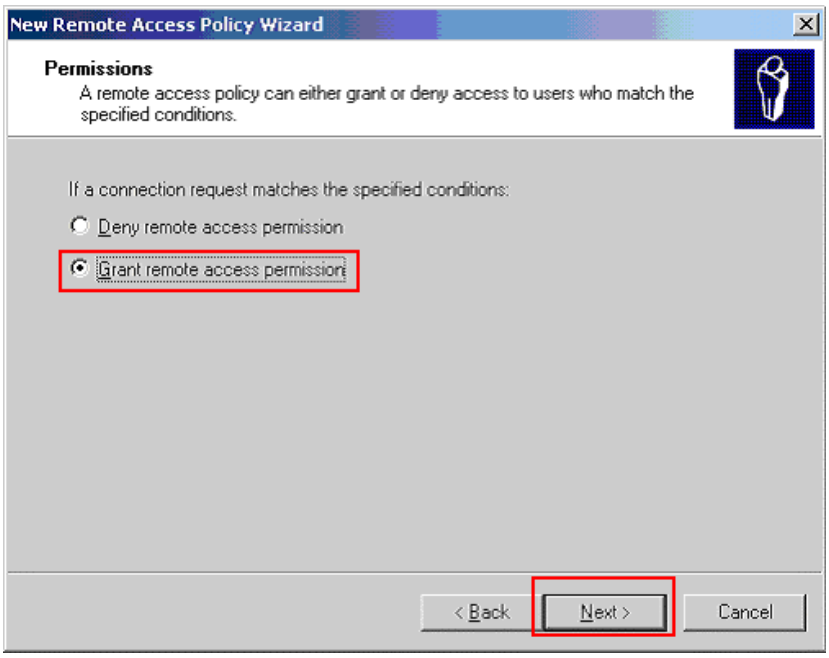
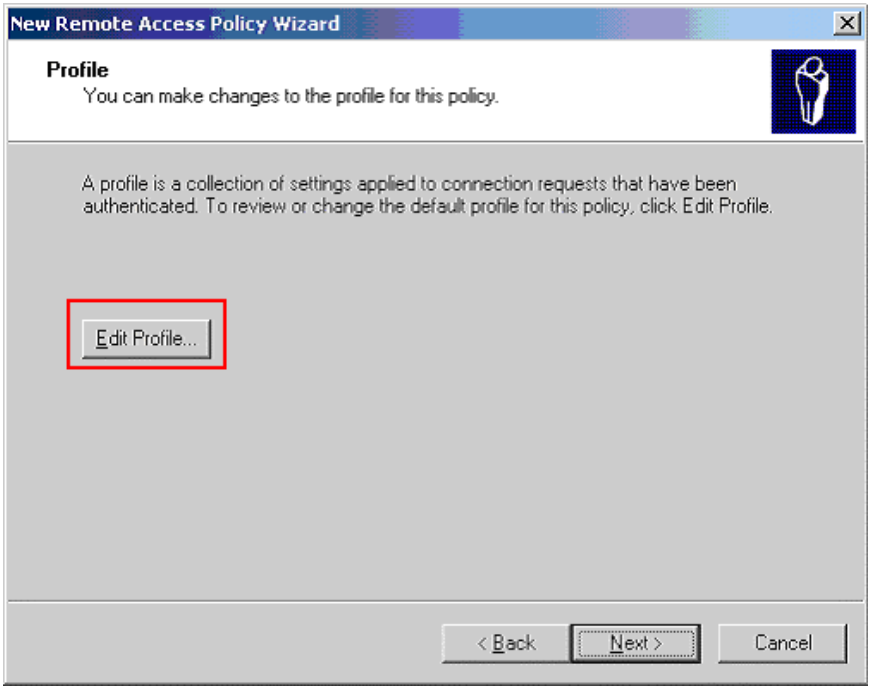
Step	Description
3.	Enter the Shared secret that will be used for this client. This shared secret must match the information configured in the switch in **Section 4.1** and **Section 4.2**, **Step 7**. Click **Finish** to complete. 
4.	Create a new access policy for the Avaya IP Telephones by clicking on **Action → New Remote Access Policy**. 

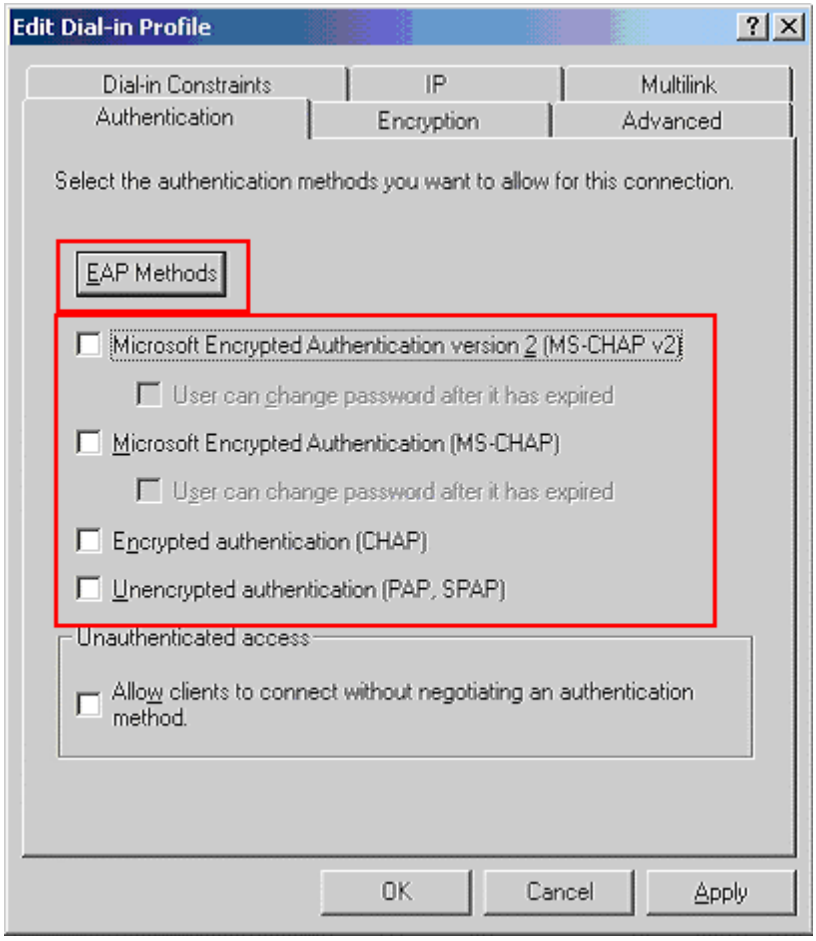
Step	Description
5.	Click **Next** in the **New Remote Access Policy Wizard**. 
6.	Select **Set up a custom policy** radio button and enter a **Policy name**. The sample network uses the name Avaya Phone. Click Next to continue. 

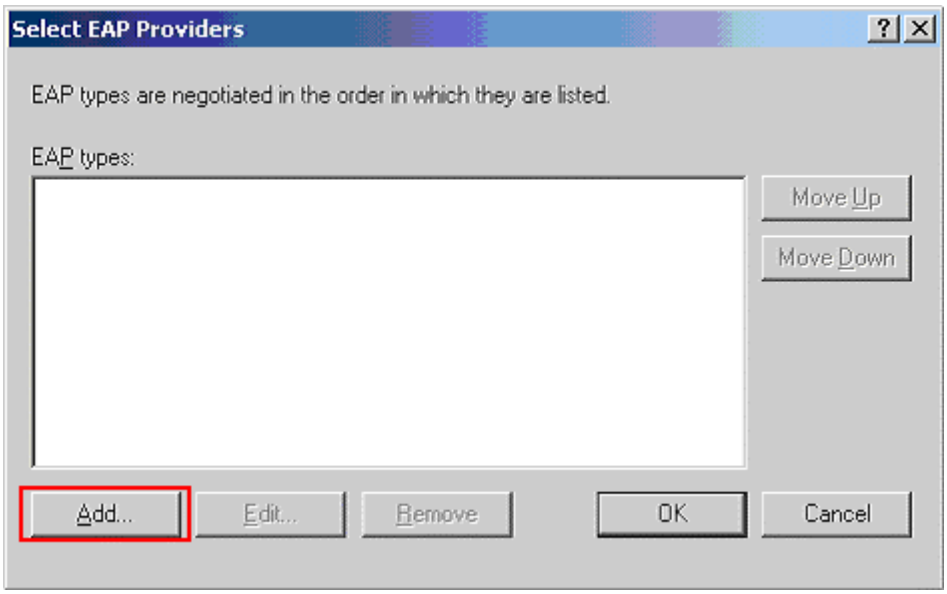
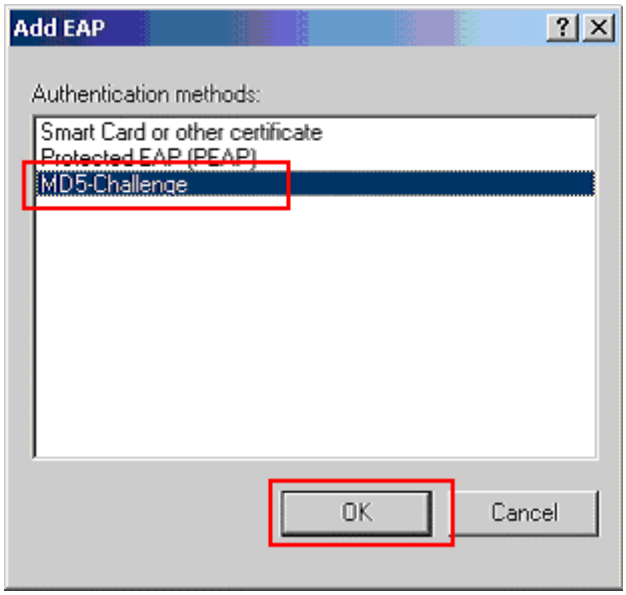
Step	Description
7.	Click the **Add** button to add a new policy condition. 
8.	Highlight **Windows-Groups** from the Select Attribute pop-up window. Click **Add** to continue. 

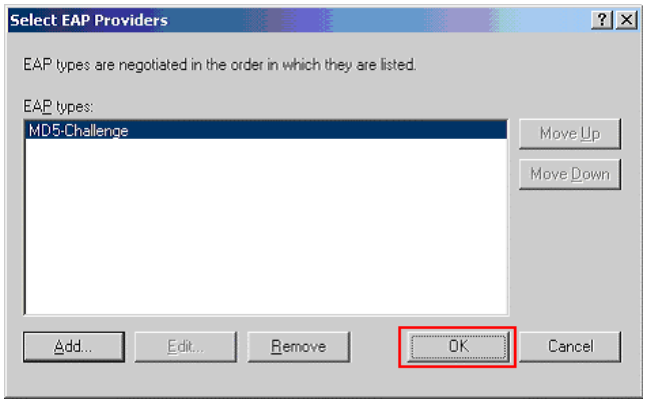
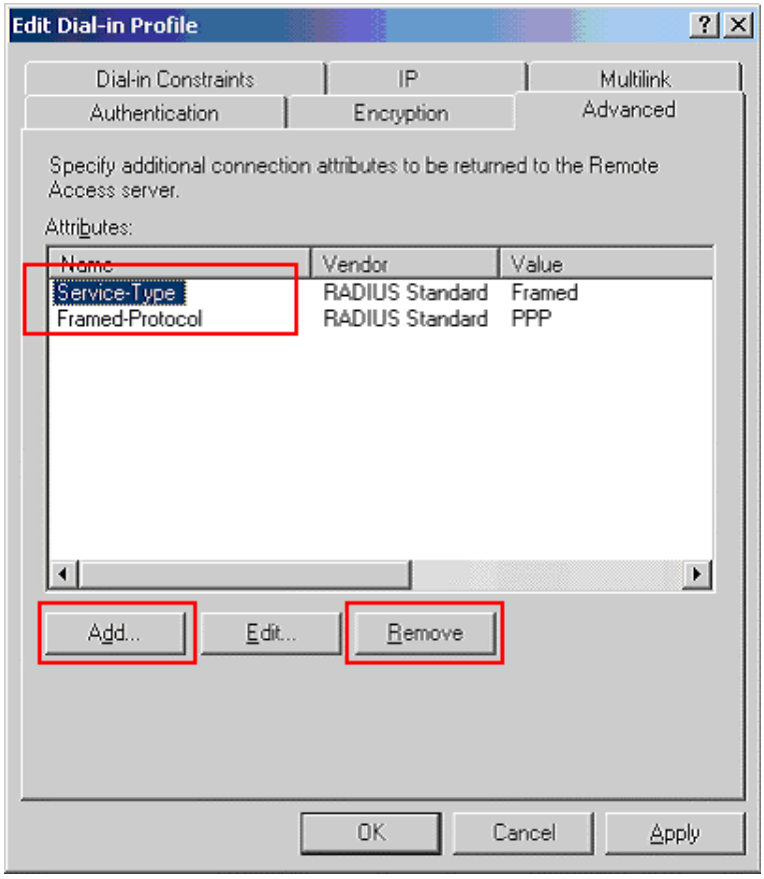
Step	Description
9.	Click **Add** in the Groups pop-up window to add a Windows group. 
10.	Enter the Active Directory user group created in **Section 5.1**, **Steps 12-13**. Use **Check Names** to assist in searching for the user group. Click **OK** to complete. 

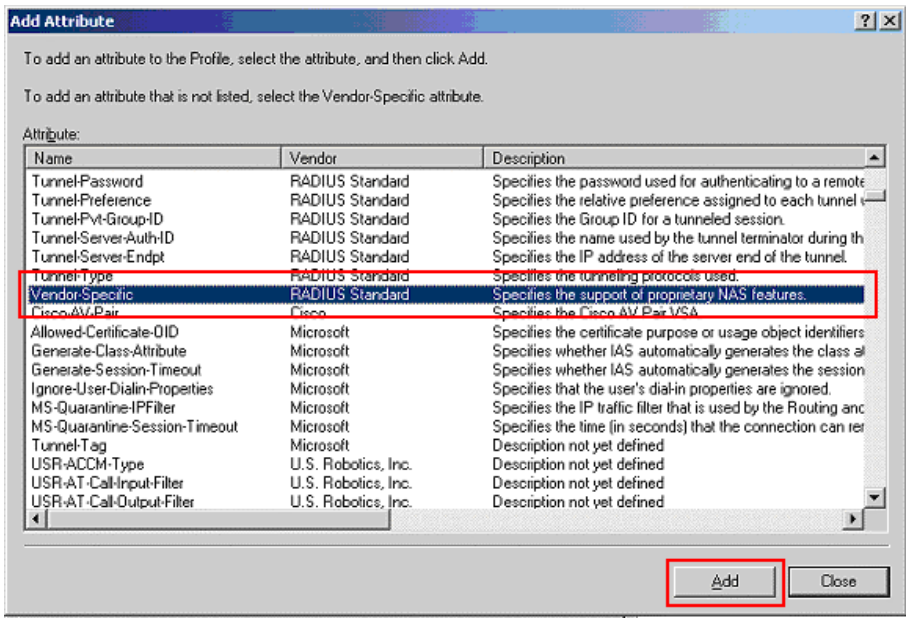
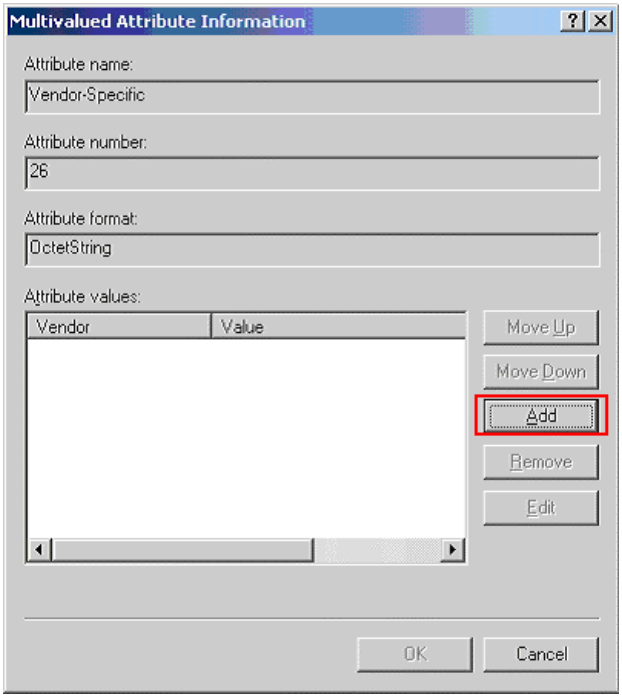
Step	Description
11.	Click **OK** in the Groups pop-up window to complete. 
12.	Once the Windows user group has been added via **Steps 8-11**, click **Next** to continue. 

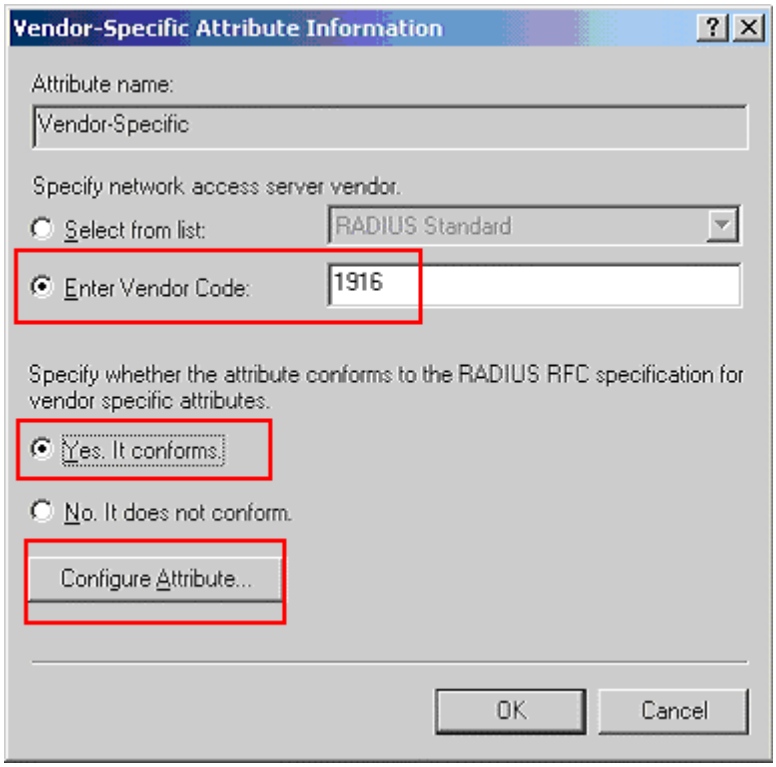
Step	Description
13.	Click the **Grant remote access permission** radio button. Click **Next** to continue. 
14.	Click **Edit Profile** to configure the profile for this access policy. This will display the Edit Dial-in Profile pop-up window. 

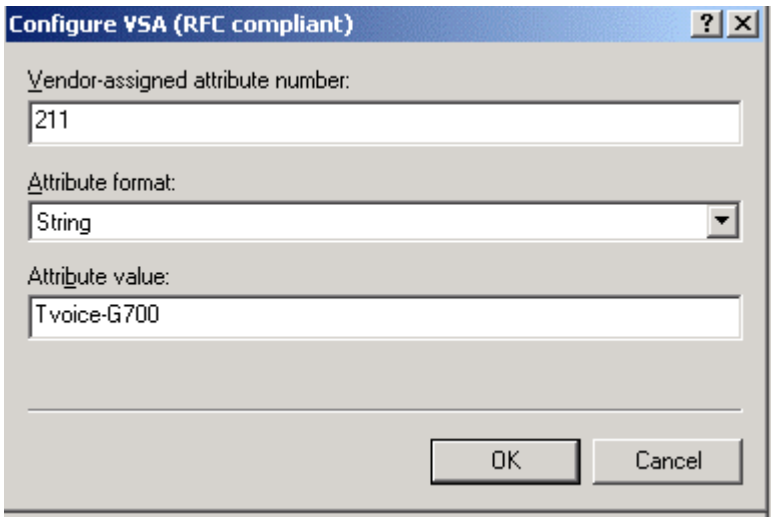
Step	Description
15.	Select the **Authentication** tab in the Edit Dial-in Profile pop-up window. Uncheck all Microsoft authentication protocols as shown in the screen capture below. Click **EAP Methods** to continue. This will display the Select EAP Providers pop-up window. 

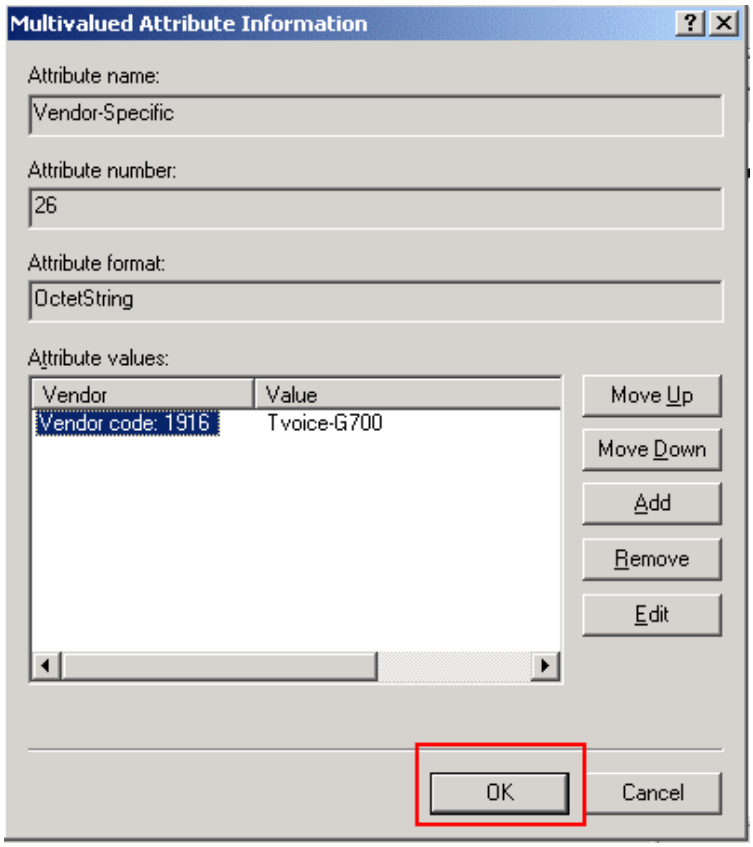
Step	Description
16.	Click **Add** in the Select EAP Providers pop-up window to add a new EAP type. 
17.	Select **MD5-Challenge** in the Add EAP pop-up window. Click **OK** to continue. 

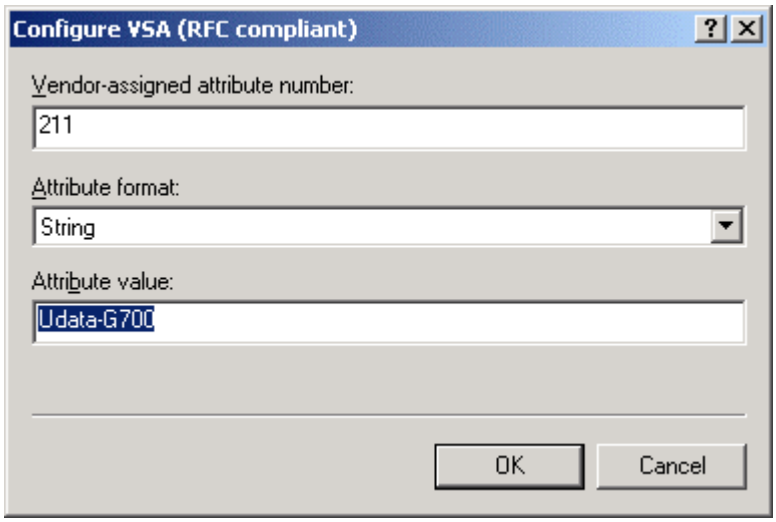
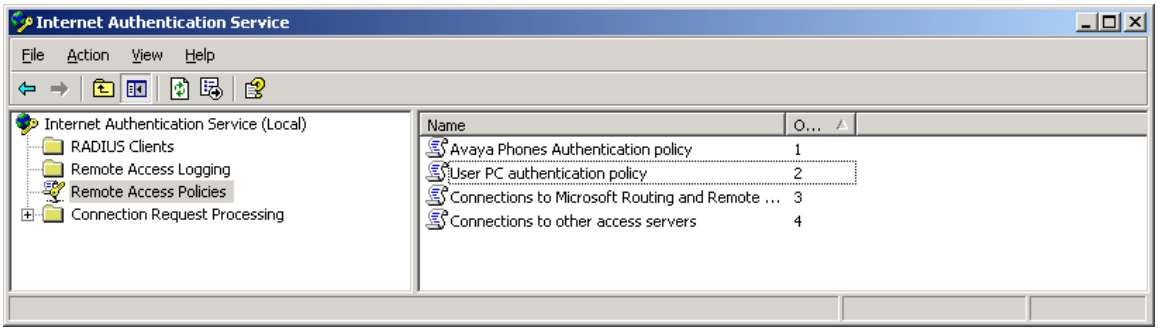
Step	Description
18.	Once the MD5-Challenge EAP type is added, Click **OK** to complete the EAP authentication selection. 
19.	Select the **Advanced** tab in the Edit Dial-in Profile pop-up window. Highlight each existing attribute, then click **Remove** to delete it. Click **Add** after all existing attributes have been removed to enter a new attribute. This will display the Add Attribute pop-up window. 

Step	Description
20.	Highlight the **Vendor Specific** attribute name from the list of attributes displayed in the Add Attribute pop-up window. Click **Add** to continue. This will display the Multi-valued Attribute Information pop-up window. 
21.	Click **Add** to enter a new Attribute in the Multi-valued Attribute Information pop-up window. This will display the Vendor-Specific Attribute Information pop-up window. 

Step	Description
22.	In the Vendor-Specific Attribute Information pop-up window, click on the **Enter Vendor Code** radio button, and enter string **1916** (Extreme Networks Vendor Code). Click on the **Yes, It conforms** radio button. Click **Configure Attribute** to continue. This will display the Configure VSA (RFC compliant) pop-up window. 

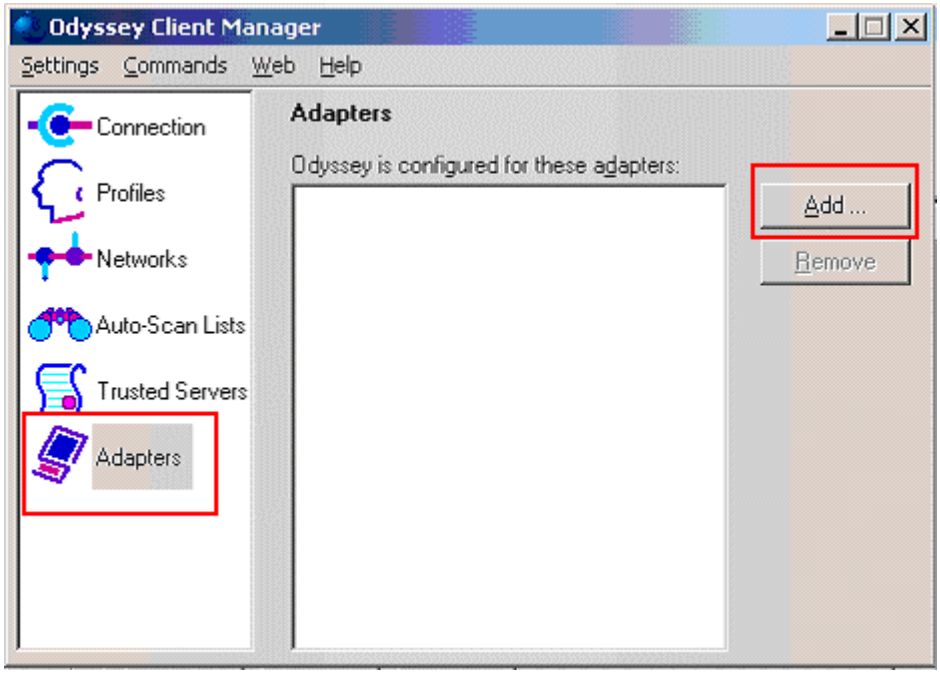
Step	Description
23.	Enter the following field information in the Configure VSA (RFC compliant) pop-up window. The Attribute value "**Tvoice-G700**" signifies that the port should be configured as "Tagged" with "voice-G700" VLAN assigned. The voice VLAN was created on the switch in **Section 4.1**, **Step 2**. Click **OK** to complete. 

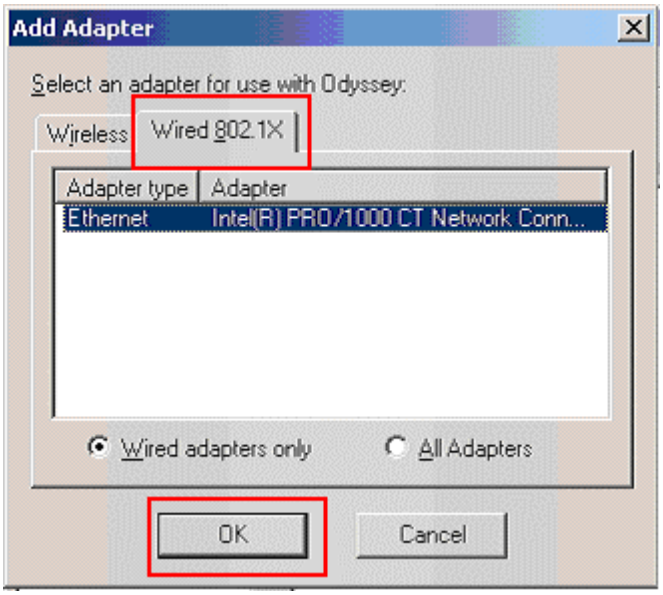
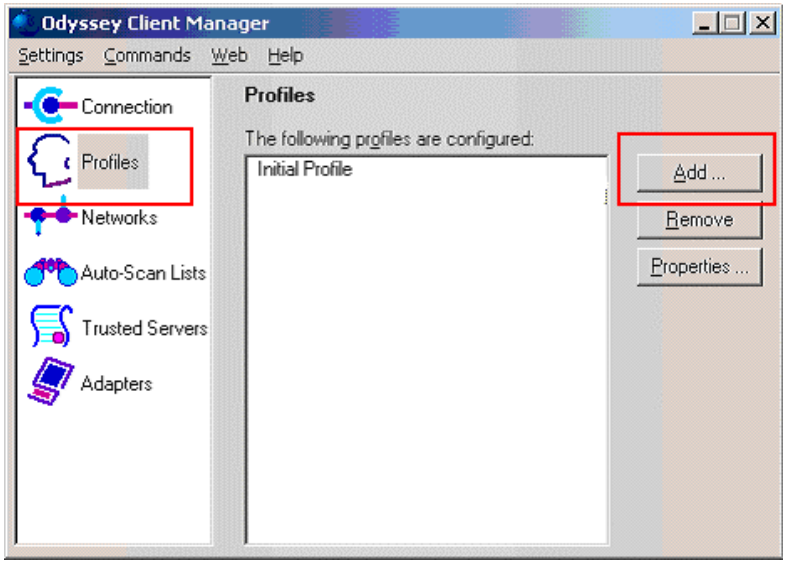
Step	Description
24.	Once all attributes have been entered in Steps 21-24, click **OK** to continue. 
25.	Click **OK** on all preceding pop-up windows to complete the configuration of this access policy.

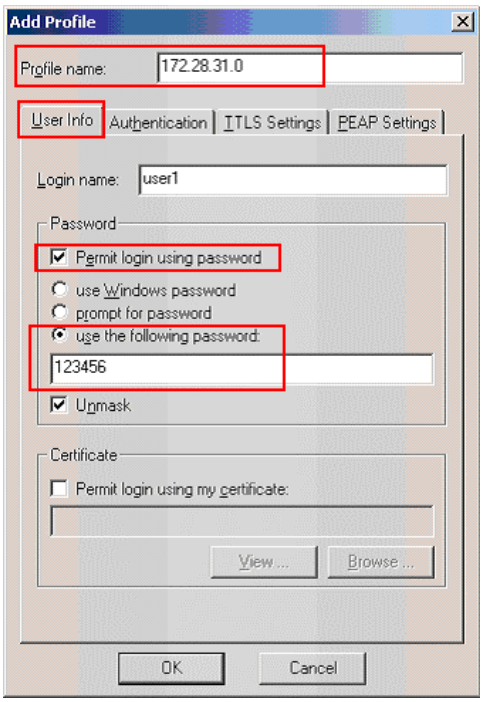
Step	Description
26.	Repeat Steps 4-23 to create a separate policy for a PC. The sample network uses the name **User PC authentication policy** for this new policy. Use the **Udata-G700** value in lieu of what is in **Step 23**. The **Udata-G700** value indicates to the switch the switch port should be assigned to the "data-G700" VLAN as Untagged. The data VLAN was created on the switch in **Section 4.1**, **Step 2**. 
27.	After completing the above steps, there should be a total of 4 Remote Access Polices. 

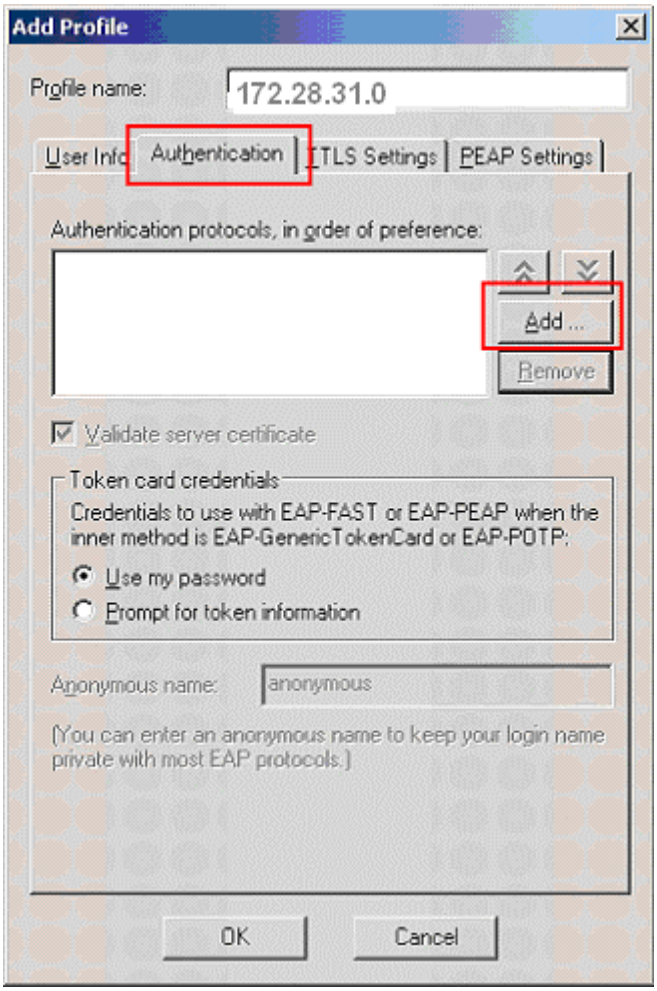
7. Configure the Odyssey client

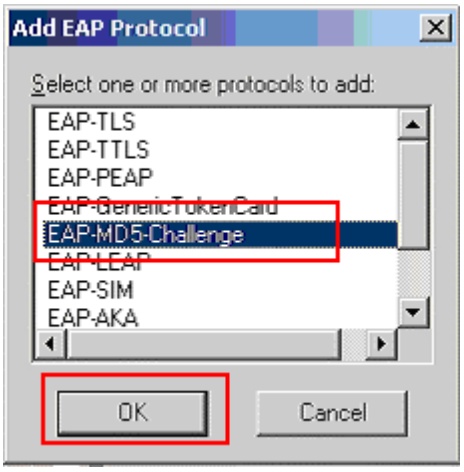
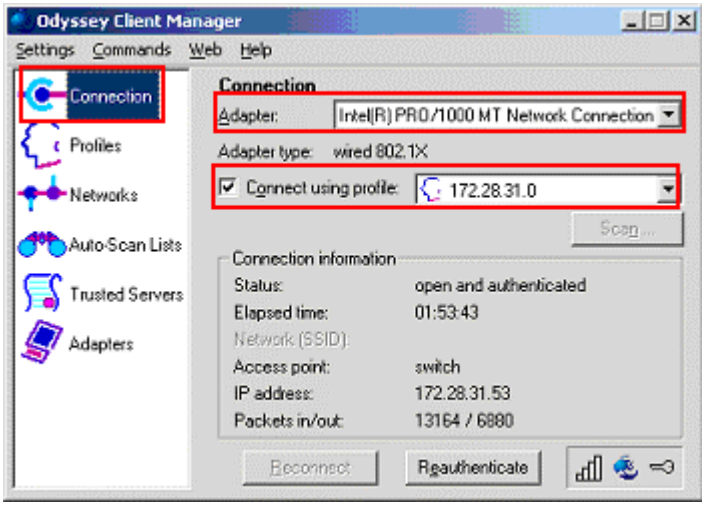
This section shows the steps for configuring the Odyssey client running on the PC.

1.	Start the Odyssey Client by clicking **Start > Programs > Juniper Networks > Odyssey Access Client > Odyssey Access Client Manager.** Add a network adapter by selecting **Adapters** on the left panel then click **Add** from the Odyssey Client Manager window. 

2.	Click on the **Wired 802.1X** tab in the Add Adapter pop-up window. Select the desire network adapter and click **Ok** to complete. 
3.	Add a profile by selecting **Profiles** on the left panel then click **Add** to continue. 

4.	From the User Info tab in the Add Profile pop-up window. Enter the **Login name** and **password**. The Login name and password must match what was setup in Section 6 Step 5. Click on the **Authentication** tab to continue. 

5.	Under the **Authentication** tab, click **Add** to Add to add a new authentication protocol. 

6.	In the Add EAP Protocol pop-up window, select **EAP-MD5 Challenge**. Click **Ok** to complete. 
7.	To connect the PC onto the network, click on Connection in the Odyssey Client Manager left panel. Select the appropriate adapter and connection profile that was configured in Step 2 and 3. Once successfully authenticated, the Status should read **open and authenticated**. 

8. Configure the Avaya IP Phone

This section shows the steps for configuring the Avaya 4610 SW IP Phone connected into the X250e-48p switch.

Avaya IP telephones support three 802.1X operational modes. The operational mode can be changed by pressing “mute80219#” (“mute 8021x”) on the Avaya 4600-Series IP telephones or “mute27237#” (mute craft) on the Avaya 9600-Series IP telephones.

- **Pass-thru Mode** – Unicast supplicant operation for the IP telephone itself, with PAE multicast pass-through for the attached PC, but without proxy Logoff (default)

- **Pass-thru with logoff Mode (p-t w/Logoff)** – Unicast supplicant operation for the IP telephones itself, with PAE multicast pass-through and proxy Logoff for the attached PC. When the attached PC is physically disconnected form the IP telephone, the phone will send an EAPOL-Logoff for the attached PC.

- **Supplicant Mode** – Unicast or multicast supplicant operation for the IP telephone itself, without PAE multicast pass-through or proxy Logoff for the attached PC.

Since most 802.1X clients use the multicast MAC address for the Extensible Authentication Protocol over LAN (EAPOL) messages, the IP telephone must be configured to the **Pass-thru** or **p-t w/Logoff** mode to pass-through these multicast messages. It is recommended to use the **p-t w/Logoff** mode. When the phone is in the **p-t w/Logoff** mode, the phone will do proxy logoff for the attached PC when the PC is physically disconnected. When the X250e-48p receives the logoff message, the PC will be removed from the authorized MAC list.

1.	Press the following key on the Avaya 4610SW IP phone. Mute82019#
2.	Press the "*****" key on the key pad until **p-t w/Logoff** is displayed, then press "**#**" key to complete the configuration.

9. Configure Avaya Communication Manager

This section shows the necessary steps in configuring Avaya Communication Manager. For detailed information on the installation, maintenance, and configuration of Avaya Communication Manager, please consult reference [1], [2], [3] and [4]. The following steps describe the configuration of Avaya Communication Manager. The following screens are from the System Access Terminal (SAT). Log in with the appropriate credentials.

Step	Description
1.	Add a new station for the Avaya IP Telephones to the Avaya Communication Manager using the **add station** command. Configure the following fields. • **Extension:** ***33004*** (Extension number for the Avaya Telephone) • **Type:** ***9630*** (Avaya Telephone type used for this extension) • **Port:** ***IP*** (Type of connection for the Avaya Telephone) • **Security Code:** ***1234*** (Security code used by the Avaya Telephone to register with Avaya Communication Manager) • **Direct IP-IP Audio Connections:** ***y*** (Enable Shuffling) The first two pages of the **add station 33004** configuration are shown below. Repeat this step for each station.

```
add station 33004                                          Page   1 of   4
                                    STATION

Extension: 33004                        Lock Messages? n              BCC: 0
     Type: 9630                         Security Code: 123456          TN: 1
     Port: S00003                     Coverage Path 1: 99              COR: 1
     Name: Ext-33004                  Coverage Path 2:                 COS: 1
                                      Hunt-to Station:
STATION OPTIONS
                                           Time of Day Lock Table:
             Loss Group: 19           Personalized Ringing Pattern: 1
                                                Message Lamp Ext: 33004
           Speakerphone: 2-way                Mute Button Enabled? y
       Display Language: english                 Button Modules: 0
 Survivable GK Node Name:
         Survivable COR: internal                Media Complex Ext:
   Survivable Trunk Dest? y                           IP SoftPhone? n




                                         Customizable Labels? y
```

Step	Description
2.	Use the "display ip-network-region" command to display the 802.1P setting configured in the Avaya Communication Manager. Verify that both **Call Control 802.1p Priority** and **Audio 802.1P Priority** are set to 6.

```
display ip-network-region 1                                   Page   1 of
                              IP NETWORK REGION
  Region: 10
Location:         Authoritative Domain:
    Name:
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: 3329
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
```

10. Interoperability Compliance Testing

The interoperability compliance testing focused on assessing the ability of the X250s in supporting Avaya Communication Manager, Avaya Media Gateway and Avaya IP Phones in a network composed of both Extreme Networks and Avaya switches.

10.1. General Test Approach

Quality of Service was verified by injecting simulated traffic into the network using a traffic generator while calls were being established and maintained using Avaya IP Telephones. The objectives were to verify the X250e-48p and X250e-24p supports the following:

- 802.1X multiple supplicant support
- interoperability of basic 802.1D and 802.1w spanning tree
- Layer-2, and Layer-3 based Quality of Service
- Basic calling performed by Avaya IP Phones (e.g., place/receive call, transfer, DTMF pass-through)
- EAPS
- Link Layer Discovery Protocol (LLDP) for configuring the Avaya 4600 and 9600 series IP Telephones
- Ethernet Automatic Protection Switching (EAPS)

10.2. Test Results

The Extreme Networks X250e-48p and X250e-24p switches successfully achieved the above objectives. Quality of Service for VoIP traffic was maintained throughout testing in the presence of competing simulated traffic. 802.1D and 802.1w spanning tree as well as EAPS correctly converged when active link was disconnected or when bridging priority was changed. LLDP also correctly reported the attributes of both Avaya 4600 and 9600 series IP Telephones.

11. Verification Steps

The following steps may be used to verify the configuration:

- Use the "show eaps <eaps domain>" command on the Extreme switches to verify the operation of EAPS.

```
X250e-48p # show eaps userfloor

  Name: userfloor
  State: Complete                                  Running: Yes
  Enabled: Yes    Mode: Master
  Primary port:   2             Port status: Up Tag status: Tagged
  Secondary port: 3             Port status: Blocked    Tag status: Tagged
  Hello timer interval: 1  sec  0  millisec
  Fail timer interval:  3  sec
  Fail Timer expiry action: Send alert
  Last update: From Master Id 00:04:96:27:7f:e3, at Fri Apr 13 21:17:55 2007
  EAPS Domain has following Controller Vlan:
    Vlan Name                    VID
    c1                           111
  EAPS Domain has following Protected Vlan(s):
    Vlan Name                    VID
    data-G700                    31
    voice-G700                   30
  Number of Protected Vlans: 2
```

- Use the "show radius" command on the X250e-48p and X250e-24p to verify whether RADIUS setting such as **IP address** and **Client address** are correct. A successful log in by an 802.1X client shows 2 Access Requests, 1 Access Accepts, and 1 Access Challenges in the counter.

```
X250e-48p # show radius
Switch Management Radius: enabled
Switch Management Radius server connect time out: 3 seconds
Switch Management Radius Accounting: disabled
Switch Management Radius Accounting server connect time out: 3 seconds
Netlogin Radius: enabled
Netlogin Radius server connect time out: 3 seconds
Netlogin Radius Accounting: disabled
Netlogin Radius Accounting server connect time out: 3 seconds

Primary Netlogin Radius server:
    Server name   :
    IP address    :  172.28.10.12
    Server IP Port:  1812
    Client address:  172.28.31.2 (VR-Default)
    Shared secret :  3>:>?75<;5
```

```
Access Requests   :  2              Access Accepts    :  1
Access Rejects    :  0              Access Challenges :  1
Access Retransmits:  0              Client timeouts   :  0
Bad authenticators:  0              Unknown types     :  0
Round Trip Time   :  0
```

- Use the "show netlogin" command on the X250e-48p and X250e-24p to verify if 802.1X is enabled or if the PC or Avaya IP Phone has successfully been authenticated. The output also shows which VLAN the client is authenticated onto. Note that the Avaya IP Phones (MAC address 00:04:0d:e4:37:79) is only authenticated in the voice VLAN even though its MAC address is displayed in the data VLAN.

```
X250e-48p # show netlogin

NetLogin Authentication Mode : web-based DISABLED;  802.1x ENABLED;  mac-based D
ISABLED
NetLogin VLAN                : "temp"
NetLogin move-fail-action    : Deny
NetLogin Client Aging Time   : 5 minutes
Dynamic VLAN Creation        : Disabled
Dynamic VLAN Uplink Ports    : None

------------------------------------------------
        Web-based Mode Global Configuration
------------------------------------------------
Base-URL                 : network-access.com
Default-Redirect-Page    : http://www.extremenetworks.com
Logout-privilege         : YES
Netlogin Session-Refresh : ENABLED; 3 minutes
------------------------------------------------

------------------------------------------------
        802.1x Mode Global Configuration
------------------------------------------------
Quiet Period                    : 60
Supplicant Response Timeout     : 30
Re-authentication period        : 3600
RADIUS server timeout           : 30
EAPOL MPDU version to transmit  : v1
------------------------------------------------

Port: 18,  Vlan: data,  State: Enabled,  Authentication: 802.1x,  Guest Vlan <No
t Configured>: Disabled

MAC               IP address       Auth  Type    ReAuth-Timer   User
00:04:0d:e4:37:79  0.0.0.0          No            0              00040DE43779
00:12:3f:25:26:60  0.0.0.0          Yes   802.1x  3593           user1
------------------------------------------------

Port: 18,  Vlan: voice,  State: Enabled,  Authentication: 802.1x,  Guest Vlan <N
ot Configured>: Disabled

MAC               IP address       Auth  Type    ReAuth-Timer   User
00:04:0d:e4:37:79  172.28.50.225    Yes   802.1x  3463           00040DE43779
------------------------------------------------
```

- Use the “show lldp neighbors detail” command on the X250 switch to LLDP information.

```
X250e-48p # show lldp neighbors detail

------------------------------------------------------------------
LLDP Port 18 detected 1 neighbor
  Neighbor: (5.1)172.28.30.51/00:04:0D:EC:92:AB, age 13 seconds
    - Chassis ID type: Network address (5); Address type: IPv4 (1)
      Chassis ID     : 172.28.30.51
    - Port ID type: MAC address (3)
      Port ID     : 00:04:0D:EC:92:AB
    - Time To Live: 120 seconds
    - System Name: "AVAEC92AB"
    - System Capabilities : "Bridge, Telephone"
      Enabled Capabilities: "Bridge"
    - Management Address Subtype: IPv4 (1)
      Management Address        : 172.28.30.51
      Interface Number Subtype  : System Port Number (3)
      Interface Number          : 1
      Object ID String          : "1.3.6.1.4.1.6889.1.69.2.2"
    - IEEE802.3 MAC/PHY Configuration/Status
      Auto-negotiation       : Supported, Enabled (0x03)
      Operational MAU Type   : 100BaseTXFD (16)
    - MED Capabilities: "MED Capabilities, Network Policy, Inventory"
      MED Device Type : Endpoint Class III (3)
    - MED Network Policy
      Application Type  : Voice (1)
      Policy Flags      : Known Policy, Tagged (0x1)
      VLAN ID           : 30
      L2 Priority       : 6
      DSCP Value        : 46
    - MED Hardware Revision: "9630D01A"
    - MED Firmware Revision: "hb96xxua1_21.bin"
    - MED Software Revision: "ha96xxua1_21.bin"
    - MED Serial Number: "06N534779862"
    - MED Manufacturer Name: "Avaya"
    - MED Model Name: "9630"
    - Avaya/Extreme Conservation Level Support
      Current Conservation Level: 0
      Typical Power Value       : 0.0 Watts
      Maximum Power Value       : 0.0 Watts
      Conservation Power Level  : 1=0.0W
    - Avaya/Extreme Call Server(s): 172.28.30.5
    - Avaya/Extreme IP Phone Address: 172.28.30.51 255.255.255.0
      Default Gateway Address       : 172.28.30.1
    - Avaya/Extreme CNA Server: 0.0.0.0
    - Avaya/Extreme File Server(s): 172.28.10.12
    - Avaya/Extreme IEEE 802.1q Framing: Tagged
```

- Use the “show dot1p” command on the X250e-48p and X250e-24p switch has the correct 802.1P to QoS Profile assignment.

```
X250e-48p # show dot1p
   802.1p Priority Value     QOS Profile
            0                QP1
            1                QP1
            2                QP1
            3                QP1
            4                QP1
            5                QP1
            6                QP7
            7                QP8
```

- Use the “show trunk” command on the Avaya C363T-PWR Converged Stackable Switch to verify trunk settings.

```
C360-1(super)# set trunk

Port   Mode  Binding mode              Native vlan
------ ----- ------------------------- -----------
 1/1   dot1q bound to configured vlans     1
 1/2   off   statically bound              1
 1/3   dot1q bound to configured vlans     1
 1/4   off   statically bound              1
 1/5   off   statically bound              1
 1/6   off   statically bound              1
 1/7   off   statically bound              1
 1/8   off   statically bound              1
 1/9   off   statically bound              1
 1/10  dot1q bound to configured vlans     31
 1/11  off   statically bound              1
 1/12  off   statically bound              1
```

12. Support

For technical support on the Extreme Networks product, contact Extreme Networks at (800) 998-2408, or refer to http://www.extremenetworks.com

13. Conclusion

These Application Notes have described the administration steps required to configure the Extreme Networks X250e-48p and X250e-24p switch to support an Avaya VoIP solution depicted in **Figure 1** which is composed of an Avaya Server, Avaya Media Gateway, and Avaya IP Phones.

14. Additional References

Product documentation for Avaya products may be found at http://support.avaya.com

[1] *Administrator Guide for Avaya Communication Manager*, Doc # 03-300509, Issue 3.1, February 2007
[2] *Avaya Communication Manager Advanced Administration Quick Reference*, Doc # 03-300364, Issue 3, February 2007
[3] *Administration for Network Connectivity for Avaya Communication Manager*, Doc # 555-233-504, Issue 12, February 2007
[4] *Avaya IP Telephony Implementation Guide*, May 1, 2006
[5] *Configuring Link Layer Discovery Protocol (LLDP) and 802.1X Protocol on Extreme Networks BlackDiamond 8810 for an Avaya IP Telephone with an Attached PC*, Issue 1.1, Dec 18, 2006

Product documentation for Extreme Networks products may be found at http://www.extremenetworks.com

[1] *ExtremeXOS Concepts Guide, Software Version 12.0*, Part number 100262-00 Rev. 01, 2007
[2] *ExtremeXOS Command Reference Guide, Software Version 12.0*, Part number 100261-00 Rev. 01, 2007

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