



Configuring Avaya one-X[®] 1600 & 9600 Series IP Telephones with Avaya Ethernet Routing Switch 5520-24T- PWR for Power over Ethernet (PoE), Quality of Service (QoS) and VLAN's – Issue 1.1

Abstract

These Application Notes describe the configuration of the Avaya one-X[®] 1600 & 9600 Series IP Telephones with Avaya Ethernet Routing Switches 5520-24T-PWR for Power over Ethernet (PoE) & Quality of Service (QoS). Following Avaya one-X[®] Series IP Telephones were included in the testing: 1608, 1616, 9620, 9630, 9608, 9611G, 9621G, 9641G, 9640G. The configuration described here also applies to other 1600 & 9600 Series IP Telephones.

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1. Introduction

Quality of Service allows for the prioritization of voice traffic over data traffic, by tagging voice packets with priority tags that allow switches to differentiate the traffic and deliver it in a more expeditious manner. Two common methods are Diffserv (Layer 3) and 802.1p (Layer 2). 802.1p is particularly useful when there are a limited number of Ethernet ports thus requiring that PC's be connected to the data port on the Avaya IP telephones which are in turn connected to the Ethernet switch. In this way, the data switch can differentiate the traffic of two and potentially assign different priorities to each, with the Voice traffic typically receiving higher priority than the PC's data traffic. In order to make use of 802.1p in this manner, Voice and Data traffic must be assigned to separate VLAN's using 802.1q VLAN tagging. Avaya IP Telephones and Avaya Ethernet Routing Switches (ERS) support these protocols, and a sample configuration is covered in these Application Notes.

Power over Ethernet (PoE) allows both power and data to be simultaneously carried over standard Ethernet cables. PoE-enabled Ethernet switches can supply power directly to Ethernet devices, thereby simplifying installation and removing the need for separate power supplies for those devices. The IEEE 802.3af standard defines the mechanisms for Power Sourcing Equipment (PSE), such as PoE-enabled Ethernet switches, to detect, classify, and supply power to Powered Devices (PDs), such as PoE-enabled IP telephones. Avaya ERS5520-24T-PWR switch provides 24 PoE capable ports.

Important note: The intent of these Application Notes is to validate a particular method for configuring heritage Avaya IP Telephones with an IP address, VLAN/VLAN tag and QoS parameters using DHCP and HTTP in conjunction with the ERS2500 series data switches. It also validates the fact that these data switches are able to provide the appropriate PoE to the IP Telephones as well as route packets from the phones marked with the aforementioned QoS values into the WAN. Configuring QoS on an Enterprise scale is beyond the scope of this document.

The following Avaya powered devices were covered:

- Avaya one-X[®] Deskphone Value Edition 1608 IP Telephone (H.323)
- Avaya one-X[®] Deskphone Value Edition 1616 IP Telephone (H.323)
- Avaya one-X[®] Deskphone Edition 9608G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9611G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9621G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9641G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9620C IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9630G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9640G IP Telephone (SIP)
- Avaya one-X[®] Deskphone Edition 9650C IP Telephone (SIP)

Figure 1 shows Network topology used in the test environment.
Specific settings are as follows:

- **VLAN 55 (Voice):** 10.80.55.x/24 Default Gateway: 10.80.55.1
- **VLAN56 (Data):** 10.80.56.x/24 Default Gateway: 10.80.56.1
- **VLAN156 (Mgmt):** 10.80.156.x/24 Default Gateway: 10.80.156.1
- **Windows 2003 HTTP/DHCP server:** 10.80.111.30
- **QoS:**
 - VoIP (RTP): 802.1P= 6 DSCP=46 (Expedited Forwarding)
 - Signaling: 802.1P= 6 DSCP=34 (Assured Forwarding)
 - Data traffic: 802.1p=0, DSCP=0 (Best Effort)

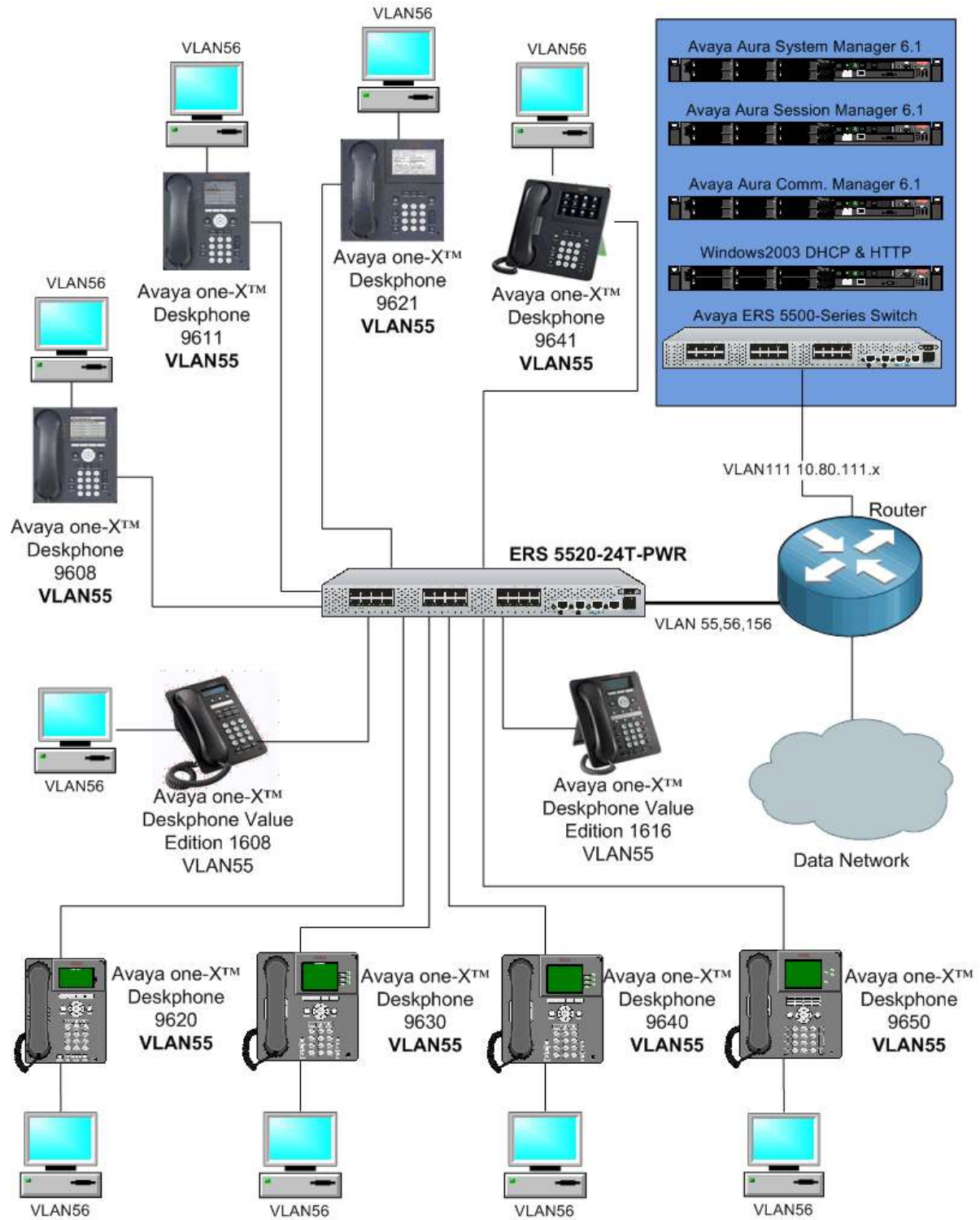


Figure 1: QoS Network Configuration

2. Equipment and Software Validated

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

Equipment	Version
Avaya S8800 Server running Avaya Aura™ Communication Manager Evolution Server with Avaya G450 Media Gateway	6.0.1 (R016x.00.1.345.0) + SP3
Avaya Aura™ Session Manager	6.1 SP3
Avaya Aura™ System Manager	6.1 SP3
Avaya one-X® Deskphone 9600-Series IP Telephones	SIP 2.6.4
Avaya one-X® Deskphone 96X1-Series IP Telephones	6.0.0 SIP (96x1_SALBR6_0r78_V4r52B.tar)
Avaya one-X® Deskphone Value Edition 1600-Series IP Telephones	V1.300B (H.323)
Avaya ERS 5520-24T-PWR Switch	FW:6.0.0.13 SW:v6.2.3.010
Windows 2003 HTTP & DHCP Server	Windows 2003 SP3

3. Configuration of the Avaya one-X® 1600 & 9600 Series Endpoints

3.1. Configuration for PoE

There is no configuration requirement on the Avaya endpoints to use PoE. For details on configuring Avaya Aura® Communication Manager Servers, Gateways, or Endpoints, consult the Administrator Guide for Avaya Aura® Communication Manager available on <http://support.avaya.com>.

3.2. Configuration for VLAN's and QoS

Avaya IP Telephones can receive VLAN assignment and QoS tagging information in several ways. These Application Notes cover a configuration where IP telephones (SIP and H.323) receive their VLAN and QoS values from a Windows 2003 DHCP server using Option 242 in the DHCP scope. In addition to this method, Avaya IP telephones can receive these settings using parameters in the settings file and/or when they register to Communication Manager via the ip-network-region form. See **Section 10**, references [6-8] for more information on this topic.

Out of the box, an Avaya 1600 & 9600 Series IP telephone are set to use DHCP to receive the necessary IP address information in order to connect to the network. Once connected to the network the phones can use HTTP/HTTPS to receive additional settings for connecting to a Call Server or registering with a SIP server. These Application Notes were written using DHCP and HTTP to provide the phone with all necessary settings thus requiring no manual administration on the phone itself. See **Section 10**, references [6-8] for more information on phone administration and settings options.

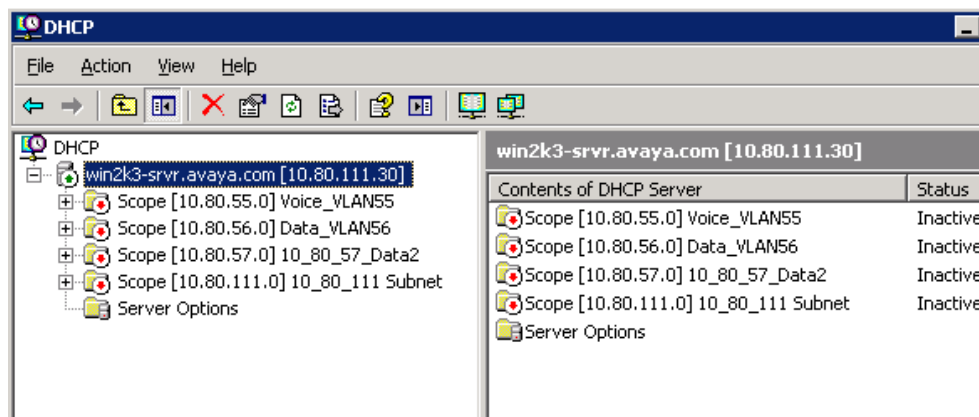
4. Configuring the DHCP and HTTP Server

In the test environment a Windows 2003 server was used as both a DHCP and HTTP server. Avaya places no restrictions on the platform used for these purposes, other than the fact they support similar options as what will be described in the next two sections.

4.1. Configuring DHCP

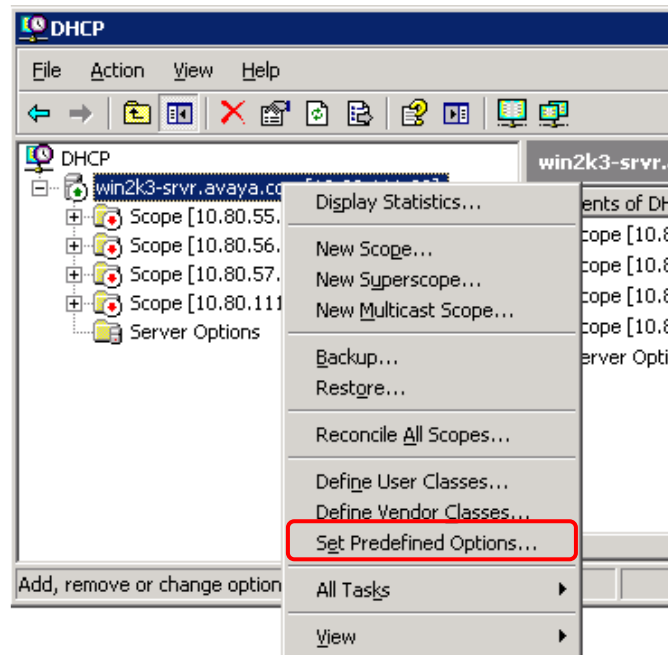
By default, Avaya 1600 & 9600 Series IP telephones are configured to use DHCP to receive their IP address information. In addition, these phones use DHCP Option 242 to receive additional parameters such as their HTTP server, VLAN and QoS settings. To configure these settings on a Windows 2003 Server, take the following steps.

From the Windows START button select Control Panel→ Administrative Tools→DHCP (not shown). A window similar to the one shown below should appear. As shown below, the DHCP Server service is running though all of the DHCP scopes are not.



4.1.1. Create Option 242

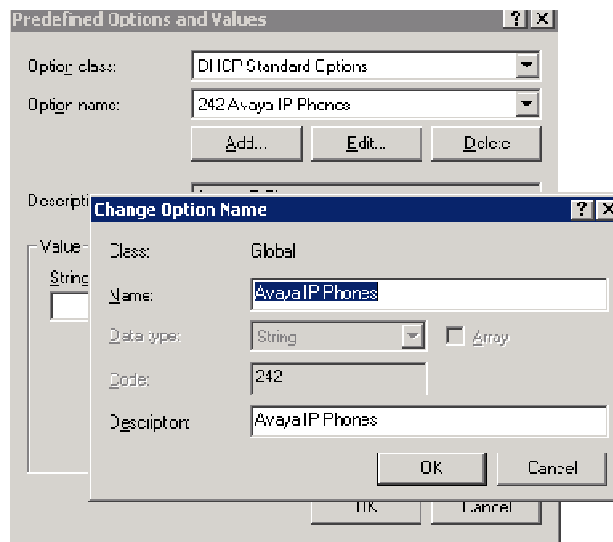
By default, Windows 2003 DHCP does not define an 'Option 242'. To add this option, right-click on the DHCP server name and select **Set Predefined Options** as shown below.



In the window that appears, select the **Add** button and create the 242 option as shown below. Be sure to set the following values:

- **Data Type:** String
- **Code:** 242

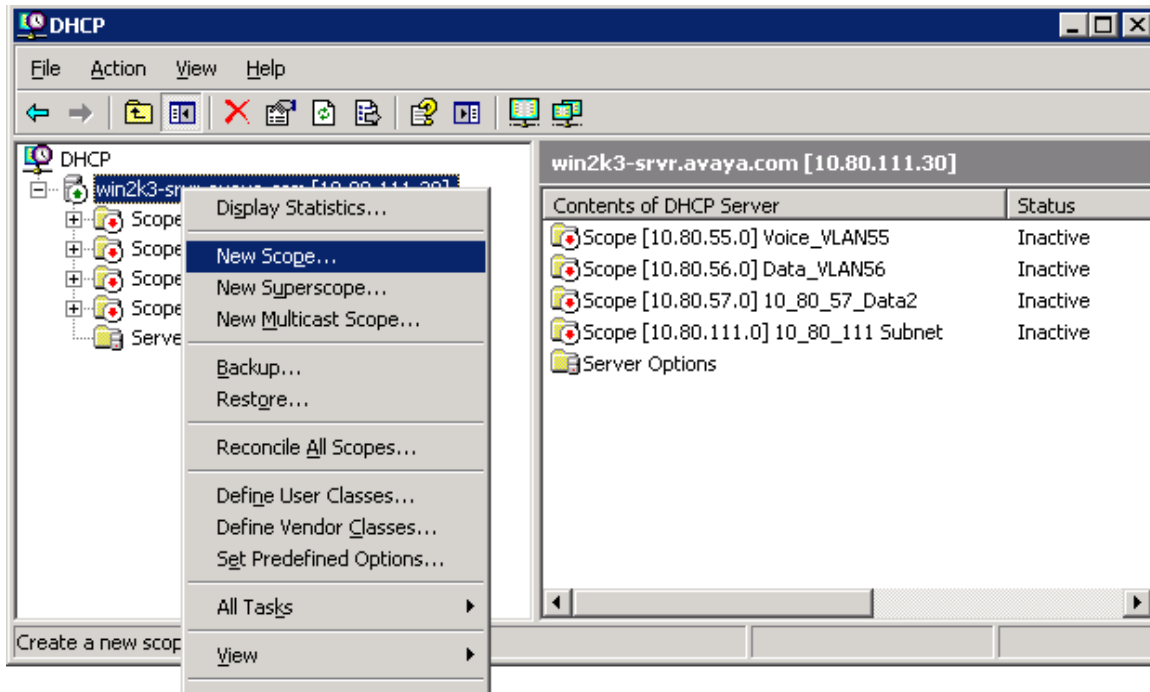
Set the remaining fields to some descriptive value.



Select the **OK** button in both windows to complete the changes.

4.1.2. Define Data VLAN DHCP Scope

The next step is to define the IP address ranges and other various settings specific for the Data VLAN . Begin by right-clicking on the DHCP server and selecting **New Scope**.



In the windows that appears click the **Next** button (not shown) and enter in descriptive names for the **Name** and **Description** fields as shown below.

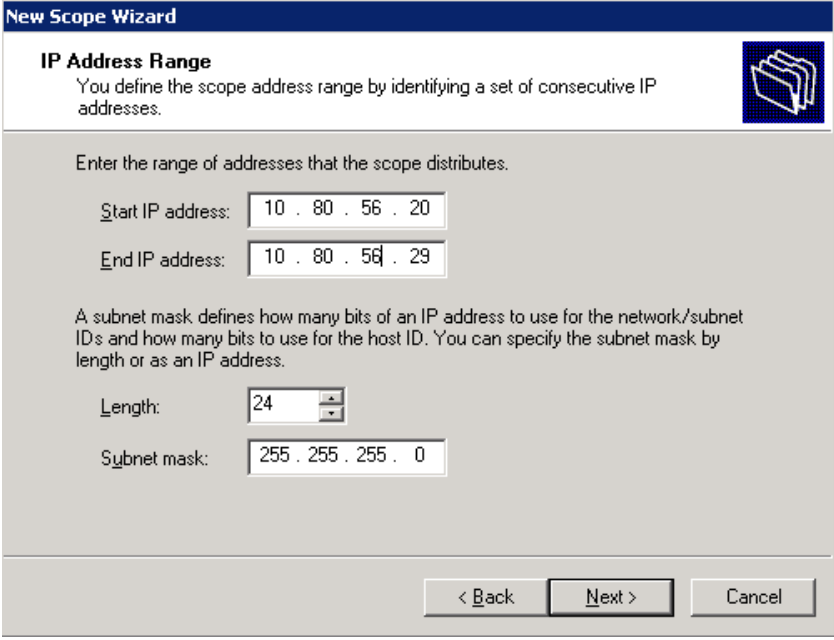
The 'New Scope Wizard' dialog box is shown, specifically the 'Scope Name' step. It contains instructions: 'You have to provide an identifying scope name. You also have the option of providing a description.' Below this, it says: 'Type a name and description for this scope. This information helps you quickly identify how the scope is to be used on your network.' There are two input fields: 'Name:' with the value 'Data_VLAN56' and 'Description:' with the value 'Data VLAN for PC's'. At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Click the **Next** button to continue

Next, enter in the range of IP addresses that the DHCP server will assign to devices in the Data VLAN as well as the appropriate subnet mask.

NOTE: At this point it's important to note that even though IP phones will ultimately end up in the Voice VLAN, when they first boot-up they will come up initially in the Data VLAN. Assuming there are PC's or other devices also in the Data VLAN and receiving their IP addresses from this DHCP server, make sure the range of IP addresses here is larger than the actual number of devices that will ultimately reside in the Data VLAN in order to allow for phones to temporarily exist in the Data VLAN. For the sample configuration a range of 10 IP addresses was sufficient.

For the sample configuration, the Data VLAN consists of IP addresses in the 10.80.56.x/24 subnet.

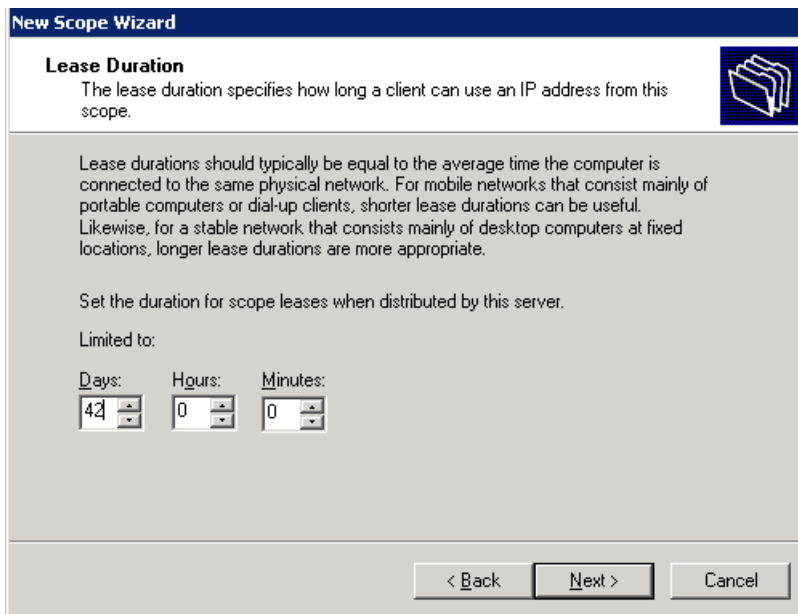


The image shows a 'New Scope Wizard' window with the title 'New Scope Wizard' and a folder icon. The main section is titled 'IP Address Range' and contains the instruction: 'You define the scope address range by identifying a set of consecutive IP addresses.' Below this, it says 'Enter the range of addresses that the scope distributes.' There are two input fields: 'Start IP address:' with the value '10 . 80 . 56 . 20' and 'End IP address:' with the value '10 . 80 . 56 . 29'. A note explains: 'A subnet mask defines how many bits of an IP address to use for the network/subnet IDs and how many bits to use for the host ID. You can specify the subnet mask by length or as an IP address.' There are two input fields: 'Length:' with a dropdown menu set to '24' and 'Subnet mask:' with the value '255 . 255 . 255 . 0'. At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Click the **Next** button to continue.

Next, add any IP address exclusions in the assigned range (not shown). For the sample config no exclusions were administered. Click the **Next** button to continue.

The next step is to configure the lease duration. As explained in the screenshot below, unless there is reason to expect phones and PC's to be frequently moved around, the longer the lease time the better. Longer lease times also cut down the amount of data traffic, as all IP hosts which receive their IP address via DHCP will renew their DHCP lease with the server at the half-way point in their total lease duration. Avaya recommends IP Phones have a 6-week lease time when they are expected to remain in one place.



New Scope Wizard

Lease Duration
The lease duration specifies how long a client can use an IP address from this scope.

Lease durations should typically be equal to the average time the computer is connected to the same physical network. For mobile networks that consist mainly of portable computers or dial-up clients, shorter lease durations can be useful. Likewise, for a stable network that consists mainly of desktop computers at fixed locations, longer lease durations are more appropriate.

Set the duration for scope leases when distributed by this server.

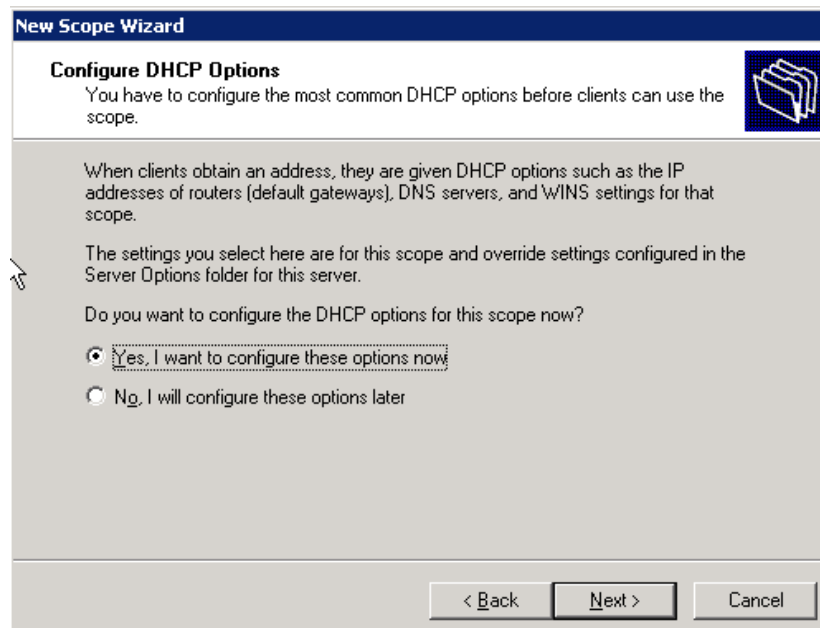
Limited to:

Days:	Hours:	Minutes:
42	0	0

< Back Next > Cancel

Click the **Next** button to continue.

Select **Yes** to configure DHCP Options



New Scope Wizard

Configure DHCP Options
You have to configure the most common DHCP options before clients can use the scope.

When clients obtain an address, they are given DHCP options such as the IP addresses of routers (default gateways), DNS servers, and WINS settings for that scope.

The settings you select here are for this scope and override settings configured in the Server Options folder for this server.

Do you want to configure the DHCP options for this scope now?

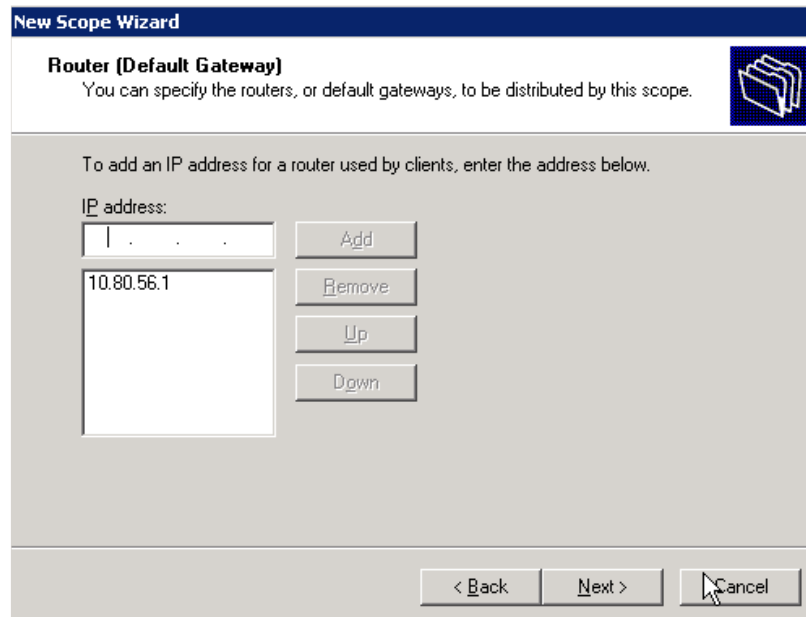
☒ Yes, I want to configure these options now

☐ No, I will configure these options later

< Back Next > Cancel

Click the **Next** button to continue.

Enter in a Router (Default Gateway) address for the Data VLAN. As shown below, for the sample network this value is **10.80.56.1**.



The image shows a screenshot of the 'New Scope Wizard' window, specifically the 'Router (Default Gateway)' step. The window has a title bar 'New Scope Wizard' and a subtitle 'Router (Default Gateway)'. Below the subtitle, it says 'You can specify the routers, or default gateways, to be distributed by this scope.' There is a small icon of a folder with a plus sign. The main area contains the text 'To add an IP address for a router used by clients, enter the address below.' Below this, there is a label 'IP address:' followed by a text input field containing '10.80.56.1'. To the right of the input field are four buttons: 'Add', 'Remove', 'Up', and 'Down'. At the bottom of the window, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Click the **Next** button to continue.

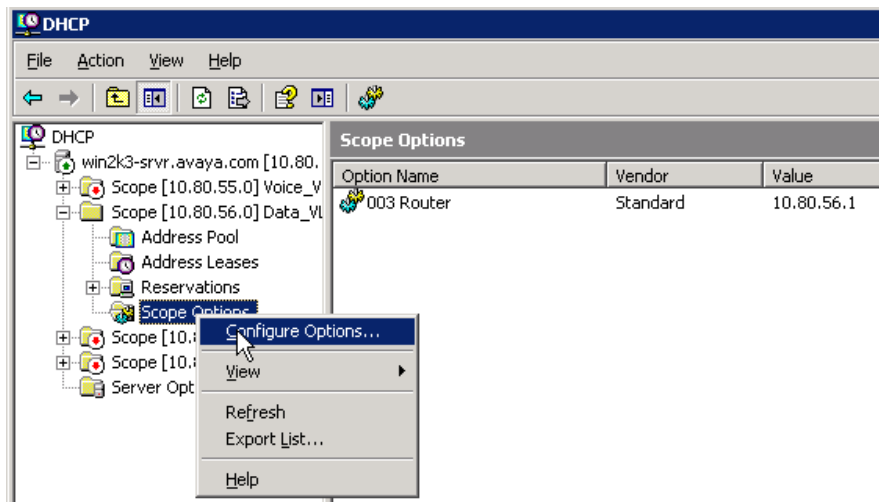
The next two screens (not shown) allow for the entry of DNS and WINS information. Enter in the information appropriate to the configuration, selecting the **Next** button to go on to the next screen.

The final windows that appears asks whether or not to activate the scope. Select **Yes** to activate immediately, or **No** to activate later



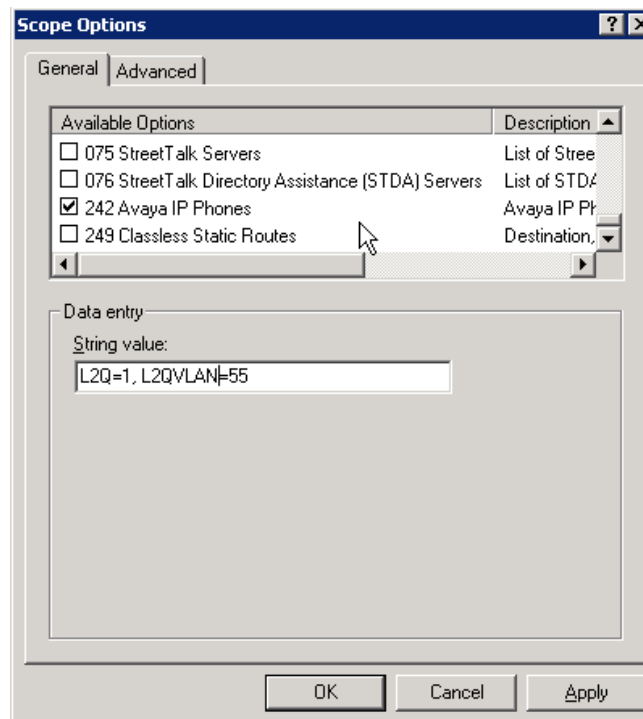
Click the **Next** button to complete the creation of the new DHCP scope.

Once the basic DHCP scope has been created, the remaining step is to configure **Option 242**. Begin by selecting the + symbol next to the newly created Scope to expand it then right-click on **Scope Option** to bring up a small menu. From this menu select **Configure Options**.



In the Scope Options window scroll down until **Option 242** is visible. Place a checkmark in the checkbox by selecting it and enter the following parameters into the **String value** field

- **L2Q=<X>** Tells the phones to use VLAN tagging.
0=Auto, 1=On, 2=Off
- **L2QVLAN=<X>** Tells the phones which VLAN they belong to. **55** for the sample configuration.



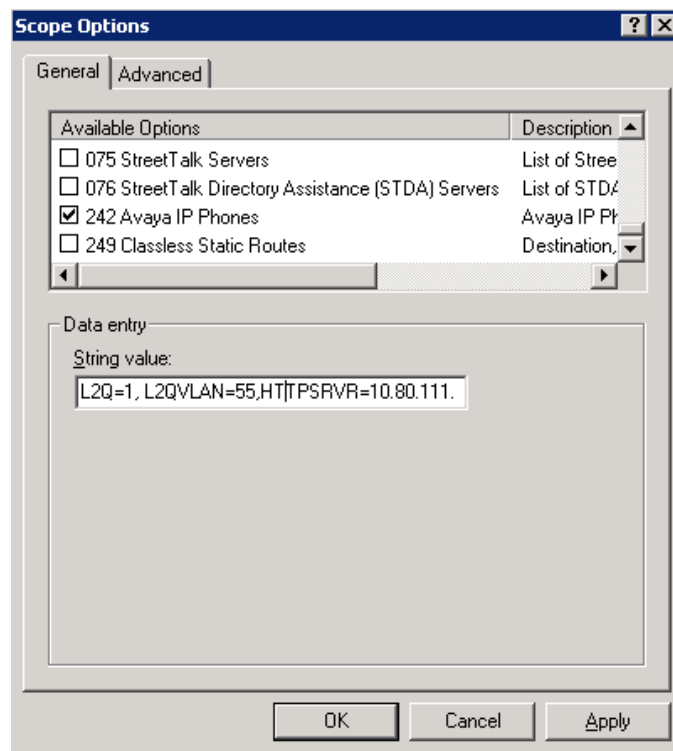
Click the **OK** button to complete the DHCP scope configuration.

4.1.3. Define Voice VLAN DHCP Scope

The process for creating the Voice VLAN is nearly identical to the steps described in the previous section. The major differences are the IP address and range and Option 242 parameters. For the sample configuration a similar address range of 10.80.55.20-29 with a 24-bit subnet mask was defined.

In the Scope Options window scroll down until **Option 242** is visible. Place a checkmark in the checkbox by selecting it and enter the following parameters into the **String value** field

- **L2Q=<X>** Tells the phones to use VLAN tagging.
0=Auto, **1=On**, 2=Off
- **L2QVLAN=<X>** Tells the phones which VLAN they belong to. **55** for the sample configuration.
- **HTTPSRVR=<X>** IP address of the HTTP server. **10.80.111.30** for the sample configuration.
- **MCIPADDR=<X>** (not shown) Call controller IP address for H.323 phones.
10.80.111.111 for the sample configuration



4.1.4. Configure HTTP and Settings File

Avaya IP Deskphones download upgrade files, settings files, language files, certificate files, and software files from a file server. All of the file types can be downloaded either via HTTP or HTTPS except the software files, which can only be downloaded via HTTP.

One the IP phone receives its IP address via DHCP it then queries the file server, which transmits a **96x1Supgrade.txt** file (SIP protocol) or **96x1Hupgrade.txt** file (H.323 protocol) to the telephone (9600-series phones use a **96xxUpgrade.txt** file & 1600-series phones use a **16xxupgrade.txt** file). The upgrade file tells the IP phone which software files it should use and also instructs the phone to download a settings file (typically named **46xxsettings.txt**). This settings file contains additional parameters which may be necessary for the phones to function on the data network. For more information about the settings file see **Section 10**, references [6-8] for complete information on configuring the settings file.

For the purposes of these application notes, there are four parameters that were set in the **46xxsettings.txt** file in order for the IP phones to make use of QoS.

- DSCPAUD DSCP (layer 3) value for audio. Values range from 0 to 63.
- DSCPSIG DSCP (layer 3) value for signaling. Values range from 0 to 63.
- L2QAUD 802.1p (layer 2) value for audio. Range from 0 to 7.
- L2QSIG 802.1p (layer 2) value for signaling. Range from 0 to 7.

For the sample config the following values were used in the **46xxsettings.txt** file:

SET DSCPAUD=46

SET DSCPSIG=34

SET L2QAUD=6

SET L2QSIG=6

SET HTTPSRVR="10.80.111.30"

Note: See **Observations** section for more info on why HTTPSRVR was included in the settings file.

5. Configure VLAN's & QoS on the Avaya ERS Switches

Avaya data switches support prioritization based on both Diffserv (a.k.a DSCP) and 802.1p.

In the ERS switch, IP Telephones were configured for VLAN 55 (10.80.55.x) and these endpoints were set to send VLAN 55 tags. The PC's connected to the switch port on the IP telephones were in VLAN56 (10.80.56.x) and will send untagged traffic to the ERS switch. Additionally a 3rd VLAN, VLAN 156, is configured for management access only.

5.1. Configure VLAN's

The following commands show the VLAN configuration on the ERS 5520-24T-PWR switch.

NOTE: The ERS-5500 series of data switches provide 3 modes of administration; Menu-based, CLI-based, and Web-based. For these Application Notes, CLI-based administration is shown. See **Section 10**, references [3 &4] for more information on setting up these devices for remote access.

```
5520-24T-PWR>enable
5520-24T-PWR#config terminal
5520-24T-PWR(config)#vlan create 55 type port
5520-24T-PWR(config)#vlan create 56 type port
5520-24T-PWR(config)#vlan create 156 type port
5520-24T-PWR(config)#vlan name 55 "voice55"
5520-24T-PWR(config)#vlan name 56 "data56"
5520-24T-PWR config)#vlan name 56 "mgmt156"
5520-24T-PWR(config)#vlan ports 1-23 tagging untagpvidOnly
5520-24T-PWR(config)#vlan ports 24 tagging tagAll
5520-24T-PWR(config)#vlan configcontrol automatic
5520-24T-PWR(config)#vlan members add 55 1-24
5520-24T-PWR(config)#vlan members add 56 1-24
5520-24T-PWR(config)#vlan members add 156 24
5520-24T-PWR(config)#vlan port 1-23 pvid 56
5520-24T-PWR(config)#vlan members remove 1 1-24
```

5.2. Configure Quality of Service (QoS)

A QoS interface-group, named "trustall" was created with class "trusted". Care should be taken when using 'trusted' as an interface group class as current operating systems and ethernet cards can also mark data traffic, and therefore savvy users could prioritize their traffic on the network that honors the markings. In this configuration the ports connected to IP Telephones were assigned to the "trustall" if-group. In doing so, the switch will trust the Diffserv and/or 802.1p tags originated by the phones. All data endpoints connected to one of those ports, or to the phone was set to not tag, and therefore defaults to the priority assigned to the Data VLAN, in this case 0.

The following commands were used to create the if-group and assign ports to it.

```
5520-24T-PWR(config)#qos if-group name trustall class trusted
5520-24T-PWR(config)#qos if-assign port 1-24 name trustall
```

On the ERS5000 series switches its recommended to define a queue set other than the default of '2' which only uses two queues. At a minimum, it is recommended to use queue set 4 which will provide three weighted queues and one strict queue. The command **qos agent queue-set 4** can be used to set this parameter (a switch reset is required for the change to take effect). Use the CLI command **show qos queue-set** to view the make up for each queue set.

For additional information or different methods to implement QoS on ERS 5500 series switches see **Section 10**, references [1], [2].

5.3. Configuring PoE on the Avaya ERS Switches

By default, the switch will send a trap when the overall power consumption reaches 80% or above of the overall available power on a per slot basis. The threshold can be changed from 1 to 99% by typing in the following commands:

```
5520-24T-PWR>enable
5520-24T-PWR#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
5520-24T-PWR(config)#poe poe-power-usage-threshold ?
  <1-99> Power usage threshold in percentage
unit      Set power usage threshold of an unit in stack
```

If notification messages are not needed, issue the command “no snmp-server notification-control <description or SNMP notification OID>”

By default, the switch PoE power detection mode is set to **802.3af** and **legacy**. This was the setting used during testing. The switch PoE power detection mode can be changed with the following commands:

```
5520-24T-PWR(config)#poe poe-pd-detect-type ?
  802dot3af          Set PD detection mode in 802.3af
  802dot3af_and_legacy Set PD detection mode in 802.3af and legacy
  unit               Set PD detection mode of an unit in stack
```

PoE is enabled by default in the Avaya ERS switches. If the configuration has changed, PoE can be enabled on a port by using the command “no poe-shutdown port <port #>” at the interface configuration level. The example below enables PoE on port 2.

```
5520-24T-PWR(config)#interface fastEthernet all
5520-24T-PWR(config)#no poe-shutdown port 2
5520-24T-PWR(config)#
```

Alternatively, the following commands could have been used to achieve the behavior described above.

```
5520-24T-PWR(config)#interface fastEthernet 2
5520-24T-PWR(config-if)#no poe-shutdown
5520-24T-PWR(config-if)#
```

The command “`pe poe-shutdown port <port #>`” can be used to disable PoE on any or all ports when a device attached to these ports does not use PoE. The example below disables PoE on all ports

```
5520-24T-PWR(config)#interface fastEthernet all
5520-24T-PWR(config-if)#poe poe-shutdown
5520-24T-PWR(config-if)#
```

Alternatively, the following commands could have been used to disable PoE on port 2 only.

```
5520-24T-PWR(config)#interface fastEthernet 2
5520-24T-PWR(config-if)#poe poe-shutdown
5520-24T-PWR(config-if)#
```

By default, the PoE priority level is set to low on all ports. It is recommended to change this setting to either **high** or **critical** for all VoIP ports. The command “`poe poe-priority port <port #> <critical, high, low>`” can be used to set PoE priority on a port when a PoE device attached to it. The example below sets the PoE priority on port 2 to high.

```
5520-24T-PWR(config)#interface fastEthernet all
5520-24T-PWR(config-if)#poe poe-priority port 2 high
5520-24T-PWR(config-if)#
```

Alternatively, the following commands could have been used to achieve the behavior described above.

```
5520-24T-PWR(config)#interface fastEthernet 2
5520-24T-PWR(config-if)#poe poe-priority high
5520-24T-PWR(config-if)#
```

Also, by default PoE power limit is set to 16W maximum per port. The value can be changed from 3 to 16 watts using the command “`poe poe-limit port <port #> <3-16>`”. The example below sets the PoE power limit to 16.

```
5520-24T-PWR(config)#interface fastEthernet all
5520-24T-PWR(config-if)#poe poe-limit port 2 16
5520-24T-PWR(config-if)#
```

Alternatively, the following commands could have been used to achieve the behavior described above.

```
5520-24T-PWR(config)#interface fastEthernet 2
5520-24T-PWR(config-if)#poe poe-limit 16
5520-24T-PWR(config-if)#
```

5.4. Disable Link Layer Discovery Protocol (LLDP)

Similar to DHCP, Link Layer Discovery Protocol (LLDP) can also be used to configure Avaya IP Telephones with various parameters such as QoS and an HTTP Server IP address. By default, LLDP is enabled on ERS data switches. Since LLDP values can overwrite those set via DHCP, it is recommended to disable LLDP when it is not being used.

The following commands can be used to disable LLDP on all switch ports.

```
5520-24T-PWR(config)#interface fastEthernet ALL
5520-24T-PWR(config-if)#no lldp port ALL status
5520-24T-PWR(config-if)#no lldp tx-tlv port ALL sys-cap
5520-24T-PWR(config-if)#exit
```

6. Router Configuration

In the sample configuration an Extreme Networks Alpine router was configured to support VLAN's and QoS. There are many brands of router including, Cisco, Juniper Networks and, of course, **Avaya**. Configuring the router is beyond the scope of this document though its important to note that Routers ultimately require a complimentary configuration to what will be used by the ERS switches in order to ensure support for VLAN's and QoS.

7. Observations

With the combination of phone and switch firmware used for this testing it was observed that even though Avaya IP Telephones were able to receive the value for HTTSRVR via DHCP, contact the HTTP server and download the necessary upgrade and settings files, they would not retain this value once the bootup sequence was complete. This was a result of HTTSRVR parameter being overwritten by LLDP. This should not occur if LLDP is disabled on the data switch (see [Section 5.4](#)).

8. Verification Steps

8.1. PoE Verification

When the IP Telephones are properly powered, the IP Telephones should register and receive dial tone when they are off-hook. If the IP Telephones are not receiving power, check the cable used and check the port configuration to ensure PoE was enabled on the port.

The “show poe-main-status” command can be used to show the global PoE switch status.

```
5520-24T-PWR#show poe-main-status
PoE Main Status - Stand-alone
-----
Available DTE Power      : 168 Watts
DTE Power Status         : Normal
DTE Power Consumption    : 52 Watts
DTE Power Usage Threshold : 80 %
Traps Control Status     : Enable
PD Detect Type           : 802.3af and Legacy
Power Source Present     : AC Only
AC Power Status          : Present
DC Power Status          : Not Present
5520-24T-PWR#
```

The “show poe-port-status” or “show poe-port-status <port | unit/port>” commands can be used to show the port PoE status. The example below shows this information for port 2.

```
5520-24T-PWR#show poe-port-status 2
      Admin      Current      Limit
Port  Status    Status      Classification (Watts) Priority
----  -
2     Enable    Delivering Power      2          16      High
5520-24T-PWR#
```

The “show poe-power-measurement” or “show poe-power-measurement <port | unit/port>” commands can be used to show the power used on a PoE port. The example below shows this information for ports 1-6.

```
5520-24T-PWR#show poe-power-measurement 1-6
Port  Volt (V)  Current (mA)  Power (Watt)
----  -
1     49.5      45           2.200
2     49.5      43           2.100
3     49.5      42           2.100
4     49.5      97           4.700
5     49.5      58           2.900
6     49.5      76           3.800
```

The following table shows power classification and measured power reported by the ERS5520-24T-PWR switch. IP Telephones were connected directly to the switch. Cables of different lengths were used. Cable length and impedance affects power usage, so the measurements listed here may vary based on the cable used. The power measurements reported here are only for reference purposes.

Avaya Powered Device	802.3af Class	Measured Power While Idle (W)
Avaya one-X [®] Deskphone Edition 9620L IP Telephone	Class 1	2.0
Avaya one-X [®] Deskphone Edition 9620C IP Telephone	Class 2	4.0
Avaya one-X [®] Deskphone Edition 9630 IP Telephone	Class 2	4.8
Avaya one-X [®] Deskphone Edition 9630G IP Telephone	Class 2	4.1
Avaya one-X [®] Deskphone Edition 9640 IP Telephone	Class 2	4.0
Avaya one-X [®] Deskphone Edition 9640G IP Telephone	Class 2	3.1
Avaya one-X [®] Deskphone Edition 9650 IP Telephone	Class 2	4.2
Avaya one-X [®] Deskphone Edition 9650C IP Telephone	Class 2	4.2
Avaya one-X [®] Deskphone Edition 9670G IP Telephone	Class 2	4.3
Avaya one-X [®] Deskphone Value Edition 1608 IP Telephone	Class 2	4.0
Avaya one-X [®] Deskphone Value Edition 1616 IP Telephone	Class 2	3.2

8.2. VLAN and QoS Verification

The following screenshots were taken using Wireshark. The packets being captured were from a port on the ERS5520-24T-PWR mirroring the traffic being sent between the switch and the router.

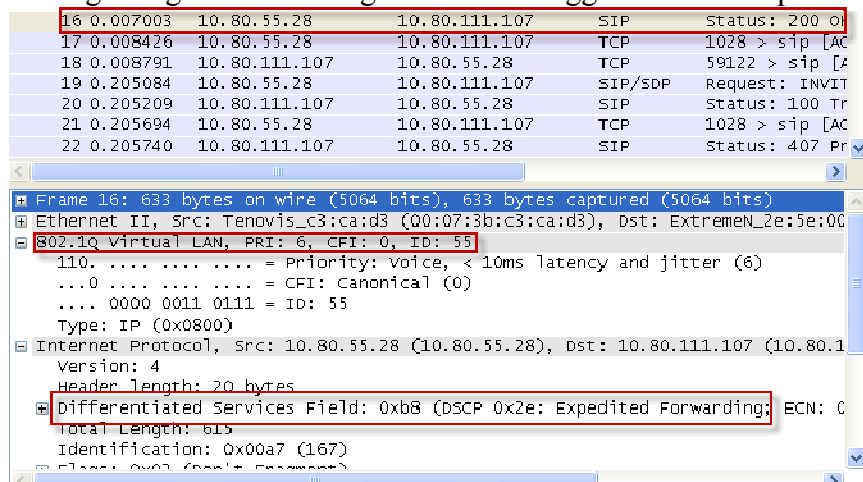
The packet highlighted in the screenshot below shows the following two hosts:

- **10.80.55.28** 9611 SIP Phone
- **10.80.111.107** Avaya Aura Session Manager

As shown below the 9611 SIP phone is sending a 200-OK SIP status message to Session Manager. Further dissection of the packet shows both the Layer 2 (802.1p & q) and Layer 3 (DSCP) QoS information.

- Layer 2: **PRI: 6** indicates an 802.1p value of 6. **ID: 55** indicates VLAN 55.
- Layer 3: **DSCP 0x2e** indicates a DSCP value of 46 (2e is hexadecimal value for 46)

This indicates that Signaling traffic is being marked and tagged with the expected values.



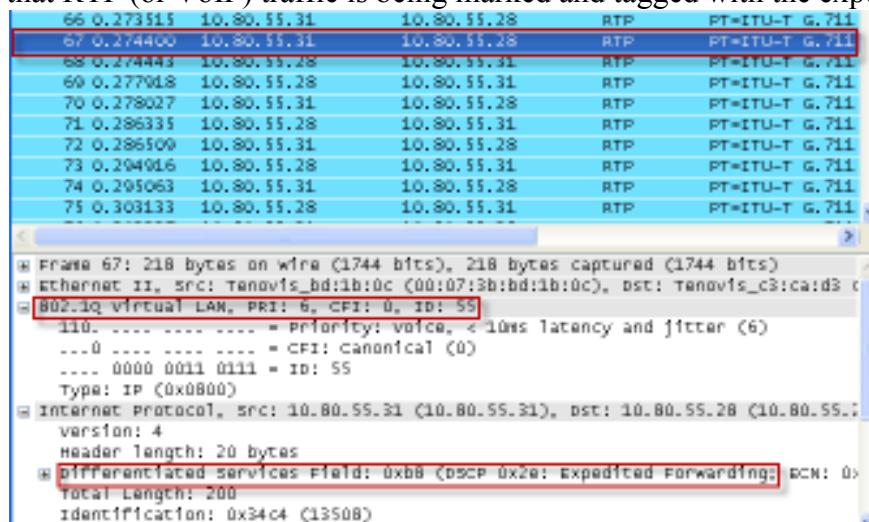
The packet highlighted in the next screenshot below shows the following two hosts:

- **10.80.55.31** 1608 H.323 Phone
- **10.80.55.28** 9611 SIP Phone

As shown below the 1608 H.323 phone is sending an RTP packet (or VoIP) packet to the 9611 SIP Phone. Further dissection of the packet shows both the Layer 2 (802.1p & q) and Layer 3 (DSCP) QoS information.

- Layer 2: **PRI: 6** indicates an 802.1p value of 6. **ID: 55** indicates VLAN 55.
- Layer 3: **DSCP 0x2e** indicates a DSCP value of 46 (2e is hexadecimal value for 46)

This indicates that RTP (or VoIP) traffic is being marked and tagged with the expected values.



9. Conclusion

These Application Notes described the configuration of the Avaya IP Telephones with Avaya ERS 5520-24T-PWR. The 5500-series switches are able to provide PoE, VLAN's & QoS for the Avaya IP Telephones to work properly and efficiently on a data network with a mix of VoIP and data traffic.

10. References

- [1] Ethernet Routing Switch 5000 Series: Configuration- Quality of Service, *NN47200-504, Revision 06.03, December, 2010.*
- [2] Ethernet Routing Switch 5000 Series: Configuration- VLANs, Spanning Tree, and Link Aggregation, *NN47200-502, Revision 06.02, December, 2010.*
- [3] Ethernet Routing Switch 2500 Series: Configuration- Quality of Service, *NN47215-504, Revision 05.01, July 2011*
- [4] Ethernet Routing Switch 2500 Series: Configuration- VLANs, Spanning Tree, and Multi-Link Trunking, *NN472215-501, Revision 05.03, August 2011.*
- [5] Avaya IP Telephony Deployment Technical Configuration Guide, *NN48500-517, Revision 7.1, January 2011*
- [6] Avaya one-X[®] Deskphone SIP 9608, 9611G, 9621G, 9641G Administrator Guide, *16-603813, Issue 1 May 2011*
- [7] Avaya one-X[®] Deskphone SIP Administrator Guide Release 6.1, *16-603818, Issue 1 Dec. 2010*
- [8] Avaya 1600 Series IP Deskphones Administrator Guide Release 1.3, *16-6-1443, Issue 4, April 2010.*

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