



Avaya Solution & Interoperability Test Lab

A Sample Configuration for Avaya one-X[®] 9670G IP Telephone with Extreme Networks Summit 400-24p Switch for Power over Ethernet and Quality of Service - Issue 1.0

Abstract

These Application Notes describe the configuration details for the new Avaya one-X[®] 9670G IP Telephones to register with Avaya Communication Manager and Extreme Networks Summit 400-24p Switch for Power over Ethernet (PoE) and Quality of Service (QoS).

1. Introduction

These Application Notes describe the configuration details for the new Avaya one-X® 9670G IP Telephones to register with Avaya Communication Manager and Extreme Networks Summit 400-24p Switch for Power over Ethernet (PoE) and Quality of Service (QoS).

1.1. Power over Ethernet (PoE)

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.

Figure 1 shows the configuration used for PoE.

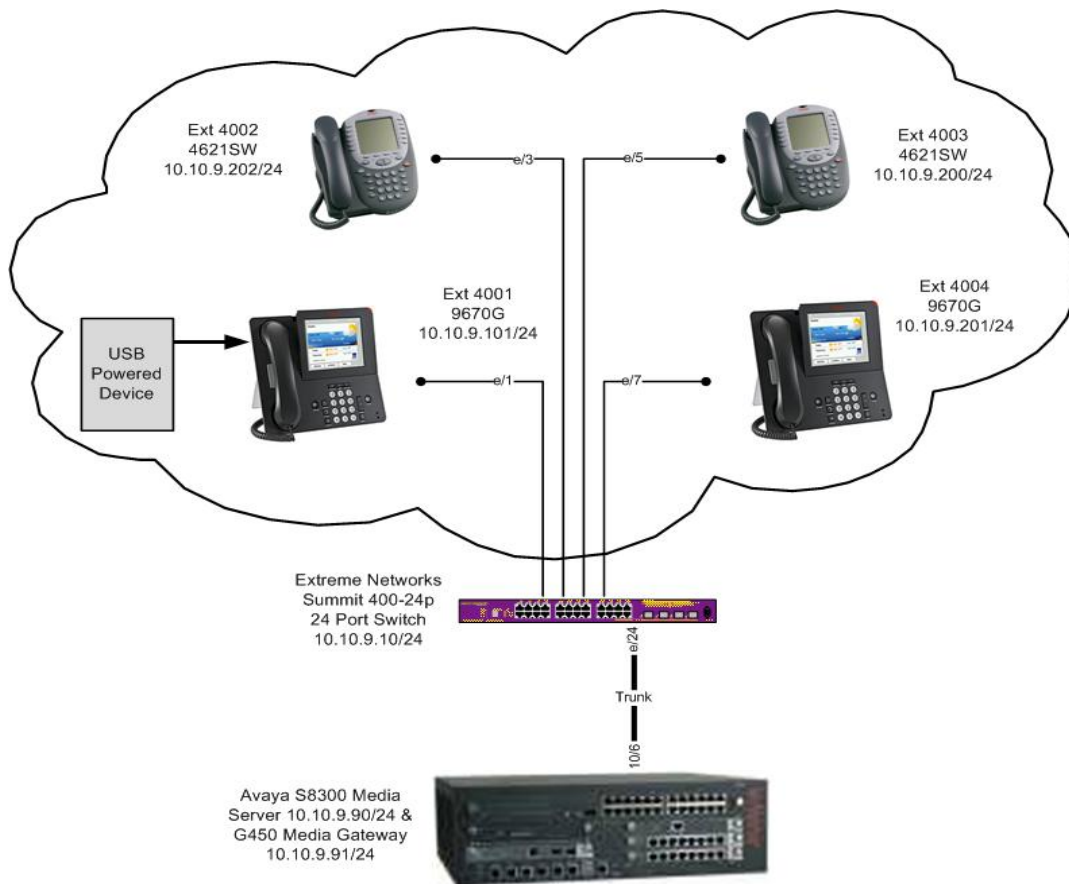


Figure 1: Power over Ethernet Network Configuration

1.2. Quality of Service (QoS)

IP network switches were originally designed to carry data on a best-effort delivery basis meaning that all traffic had equal priority and chance of being delivered in a timely manner. Consequently all network traffic also had an equal chance of being dropped when congestion occurred.

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). Avaya IP Telephones and Cisco switches support both, and a sample configuration is covered in these application notes.

Figure 2 shows the configuration used for QoS.

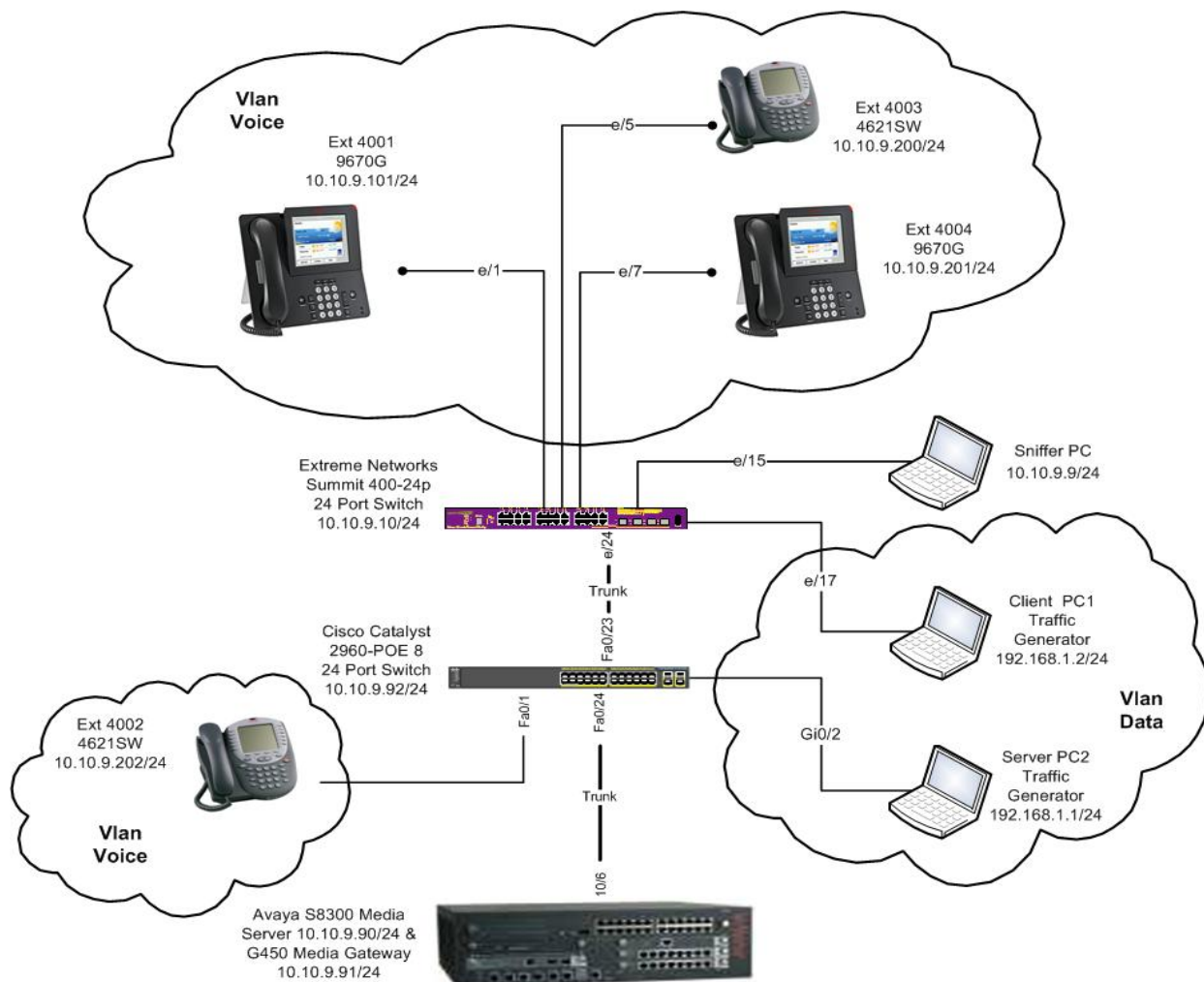


Figure 2: Quality of Service Network Configuration

2. Equipment and Software Validated

The following equipment and software was used for the Power over Ethernet and Quality of Service testing.

Equipment	Software
Avaya S8300 Server	Avaya Communication Manager R5.1.2(R015x.01.0.415.1)
Avaya G450 Media Gateway	27.31.0
Avaya 9670G one-X IP Telephone	2.0
Avaya 9670G one-X IP Telephone	2.0
Avaya 4621SW IP Telephone	2.9
Avaya 4621SW IP Telephone	2.8.3
Extreme Networks Summit 400-24p switch	Extremeware Version 7.5e.2.8
Cisco Catalyst 2960 PoE-8 24 port switch	12.2(44)SE2

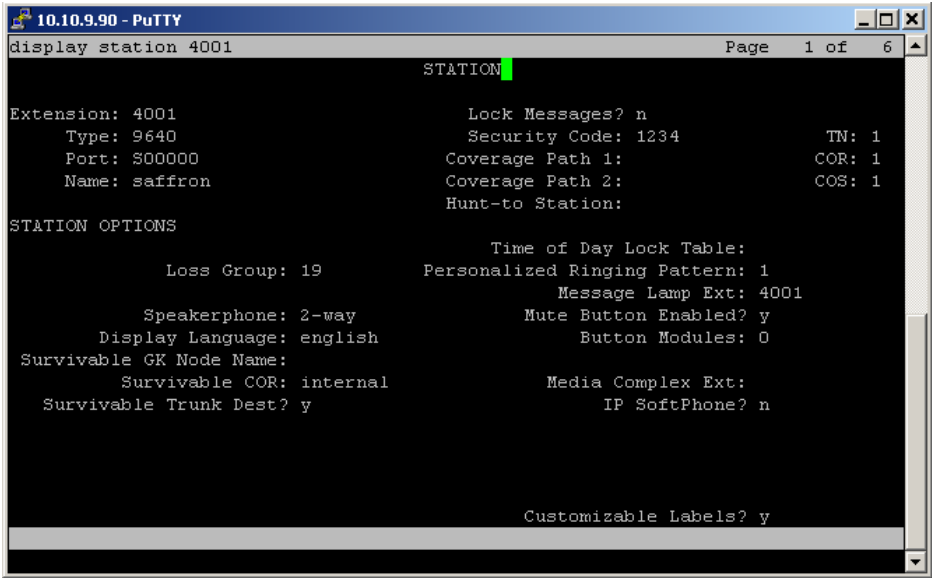
3. Configure Avaya G450 Media Gateway

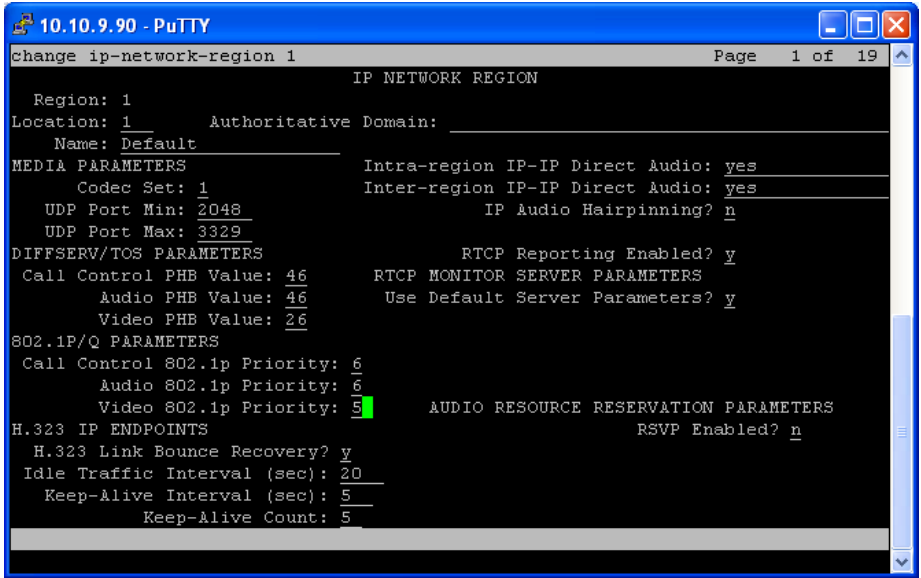
This section shows the necessary steps in configuring Avaya G450 Media Gateway.

Step	Description
1	<p>Configuring Avaya G450 Media Gateway</p> <p>Connect to the console port of the V10 module with serial cable provided for gateway. Start Hyperterminal session interface and log in using appropriate credentials.</p>
2	<p>Create a vlan</p> <p>G450-001(super)# set vlan 119 name voice</p>
3	<p>Assign an IP address to vlan</p> <p>G450-001(super)# int vlan 119 G450-001(super-if:Vlan 119)# ip address 10.10.9.91 255.255.255.0</p>
4	<p>Configure Ethernet port</p> <p>The set port command is used to configure port 10/6. Classify the port as valuable so if link fails a notification is generated.</p> <p>G450-001(super)# set port vlan enable10/6 G450-001(super)# set port duplex 10/6 full G450-001(super)# set port speed10/6 1GB G450-001(super)# set port vlan 119 10/6 G450-001(super)# set port classification 10/6 valuable</p>
5	<p>Configure port mode</p> <p>This command configures the port 10/6 to be bound to vlan VOICE which is the configured on the gateway</p> <p>G450-001(super)# set port vlan-binding-mode 10/6 bind-to-configured</p>
6.	<p>Create a trunk port</p> <p>This command sets the port 10/6 to be a trunk port. Use the set trunk command to configure the VLAN tagging mode of the port. The dot1q parameter specifies IEEE 802.1Q tagging on a Fast Ethernet or Gigabit Ethernet port.</p> <p>G450-001(super)# set trunk 10/6 dot1q</p>

4. Configure Endpoints

There is no configuration requirement on Avaya endpoints to use Power over Ethernet. For details on configuring Avaya Communication Manager Servers, Gateways or Endpoints, consult the Administrator Guide for Avaya Communication Manager [1].

Step	Description
1.	Start PuTTY session and connect to Avaya S8300 server IP address. Log in using appropriate credentials
2.	From the command line connect to sat (System Access Terminal). Log in using appropriate credentials
3.	<p>Add Stations</p> <p>A number of extension numbers needed to be defined for testing. The command add station 4001 is used to configure the parameters in the station field for phone extension 4001. The phone model type is selected from the database of models available for the release of software used in the testing scenario. For the 9670G phone tested the 9640 model is selected as the nearest representative model type. The name for the particular phone to be used at this extension can be given as a name or number.</p> <p>Type: 9640 Security Code: 1234 Name: Saffron</p> 

Step	Description
4.	<p>Configure DiffServ /TOS and 802.1p/Q parameters in Avaya Communications Manager</p> <p>Avaya IP Telephones receive Quality of Service (QoS) tagging information when it registers with Avaya Communication Manager. The QoS values are configured using the change ip-network-region 1 command to access and set the DiffServ/TOS and 802.1p/Q parameters using sat interface into Avaya S8300 media server.</p> <p>In the example below the IP telephones are registered in network region 1. The Diffserv/Tos parameters are set at 46 for both Audio and Video packets. These values will appear on the phone as L3 Audio and Signalling values. Similarly for the 802.1P/Q parameters both are set at 6. These values will appear on the phone as L2 Audio and Signalling values. These values will be used in Section 6, Step 5.</p>  <pre> 10.10.9.90 - PuTTY change ip-network-region 1 Page 1 of 19 IP NETWORK REGION Region: 1 Location: 1 Authoritative Domain: Name: Default MEDIA PARAMETERS Codec Set: 1 Intra-region IP-IP Direct Audio: yes UDP Port Min: 2048 Inter-region IP-IP Direct Audio: yes UDP Port Max: 3329 IP Audio Hairpinning? n DIFFSERV/TOS PARAMETERS Call Control PHB Value: 46 RTCP Reporting Enabled? y Audio PHB Value: 46 RTCP MONITOR SERVER PARAMETERS Video PHB Value: 26 Use Default Server Parameters? y 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 H.323 Link Bounce Recovery? y Idle Traffic Interval (sec): 20 Keep-Alive Interval (sec): 5 Keep-Alive Count: 5 </pre>
5.	Use Save Translations command to save the settings.

5. Configure Extreme Networks Summit 400-24p Switch

This section shows the necessary steps in configuring the Extreme Summit 400-24p switch.

Step	Description
1.	Connect to the Extreme Summit 400-24p switch using Hyperterminal and log in using appropriate credential login: password:
2.	Create vlans on the switch * Summit400-24p:14 # create vlan voice tag v119 * Summit400-24p:14 # create vlan data1 tag v120
3.	Assign IP addresses to the voice and data1 vlans * Summit400-24p:13 # configure vlan voice ipaddress 10.10.9.10 255.255.255.0 * Summit400-24p:13 # configure vlan data1 ipaddress 10.10.9.10 255.255.255.0
4.	Create a range of trunk ports tagged to the voice vlan * Summit400-24p:66 # config vlan voice add port 1-8 tagged * Summit400-24p:67 # config vlan voice add port 21-24 tagged
5.	Create a range of access ports tagged to the voice vlan * Summit400-24p:68 # config vlan voice add port 9-16 untagged
6.	Create a range of access ports tagged to the data1 vlan * Summit400-24p:69 # config vlan data1 add port 17-20 tagged

7.	<p>Show the power available on ports</p> <p>This field illustrates the power being drawn on the range of ports 1 to 8 when a powered device is connected and idle.</p> <p>* Summit400-24p:70 #show inline-power info ports 1-8</p> <table><tr><th>Port</th><th>State</th><th>Class</th><th>Volts</th><th>Current (mA)</th><th>Power (Watts)</th><th>Fault</th></tr><tr><td>1</td><td>delivering</td><td>class2</td><td>50.2</td><td>96</td><td>4.8</td><td>None</td></tr><tr><td>2</td><td>searching</td><td>-----</td><td>0</td><td>0</td><td>0</td><td>None</td></tr><tr><td>3</td><td>delivering</td><td>class2</td><td>50.2</td><td>80</td><td>4.0</td><td>None</td></tr><tr><td>4</td><td>searching</td><td>-----</td><td>0</td><td>0</td><td>0</td><td>None</td></tr><tr><td>5</td><td>delivering</td><td>class2</td><td>50.2</td><td>95</td><td>4.8</td><td>None</td></tr><tr><td>6</td><td>searching</td><td>-----</td><td>0</td><td>0</td><td>0</td><td>None</td></tr><tr><td>7</td><td>delivering</td><td>class2</td><td>50.2</td><td>79</td><td>3.9</td><td>None</td></tr><tr><td>8</td><td>searching</td><td>-----</td><td>0</td><td>0</td><td>0</td><td>None</td></tr></table>	Port	State	Class	Volts	Current (mA)	Power (Watts)	Fault	1	delivering	class2	50.2	96	4.8	None	2	searching	-----	0	0	0	None	3	delivering	class2	50.2	80	4.0	None	4	searching	-----	0	0	0	None	5	delivering	class2	50.2	95	4.8	None	6	searching	-----	0	0	0	None	7	delivering	class2	50.2	79	3.9	None	8	searching	-----	0	0	0	None
Port	State	Class	Volts	Current (mA)	Power (Watts)	Fault																																																										
1	delivering	class2	50.2	96	4.8	None																																																										
2	searching	-----	0	0	0	None																																																										
3	delivering	class2	50.2	80	4.0	None																																																										
4	searching	-----	0	0	0	None																																																										
5	delivering	class2	50.2	95	4.8	None																																																										
6	searching	-----	0	0	0	None																																																										
7	delivering	class2	50.2	79	3.9	None																																																										
8	searching	-----	0	0	0	None																																																										
8	<p>Configure the port Quality of Service parameters for the range of voice vlan ports</p> <p>Use the QoS commands to set the quality of service profile levels for voice ports.</p> <p>* Summit400-24p 71 #configure ports 1-16 qosprofile QP6</p> <p>* Summit400-24p 72 #configure ports 21-24 qosprofile QP6</p>																																																															
9	<p>Configure the port Quality of Service parameters for the range of data1 vlan ports</p> <p>Use the QoS commands to set the quality of service profile levels for data1 vlan ports</p> <p>The value is set at a lower level then the setting used on the phones and Avaya Communication Manager so the data traffic will have a lower priority compared to the voice traffic</p> <p>* Summit400-24p 73 #configure ports 17-20 qosprofile QP5</p>																																																															
10	<p>Configure a port to monitor the uplink port traffic for use with traffic analysis program</p> <p>A single port 15 is configured as a trunk port to act as a mirror interface for the traffic being sent and received on the uplink port 24.</p> <p>* Summit400-24p 50 # enable mirroring to port 15</p> <p>* Summit400-24p 51 # configure mirroring add port 24</p>																																																															

11	Save the running configuration * Summit400-24p:72 #save configuration
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6. Configure Avaya one-X 9670G IP Phone

This section provides the procedure for configuring Avaya one-X 9670 IP Phone

Step	Description
1.	To access the telephone touch screen for modification of telephone settings, select the hard key pad button on the front panel labeled Home
2.	Select touch screen menu Settings→Main Menu→Network Information→IP Parameters tab. This field outlines all the IP Parameters to configure the phone.
3.	Log in to the telephone by selecting the Mute, CRAFT and # This will present the Craft Procedures screen. Configurable fields are accessible from this interface. Some fields are selectable across a range of modes and values. Using the touch screen access the ADDR tab which is the Address Procedures screen
4.	Complete the following Address Procedures fields to configure the phone to operate on the network. In this configuration, the following values were used. Phone: 10.10.9.101 Call Server: 10.10.9.90 Router: 10.10.9.10 Mask: 255.255.255.0 802.1q: Auto Vlan Id: 119 Vlan test: 60
5.	Select Settings→Main Menu→Network Information→Network Info→Quality of Service The Quality of Service values displayed on the phone are derived from the Diffserv and 802.1p/Q values configured in the change ip-network-region 1 field as shown previously in Section 4, Step 4 . In this configuration, the following values were used. L2 Audio: 6 L2 Signalling: 6 L3 Audio: 46 L3 Signalling: 46

7. Verification Steps

The general Power over Ethernet and Quality of Service test approach was to:

- Connected Avaya one-X 9670G IP Telephone and Avaya 4621SW IP Telephones to ports on the Extreme Summit 400-24p switch and verify that they could successfully boot.
- Calls were made with background data to verify that power and data can simultaneously be carried on the Power over Ethernet connections. Phone calls were made with data traffic also being generated.
- Testing the power requirement for Avaya one-X 9670G when interfacing additional power devices via its USB port.
- During the testing process it was noticed that there is an inability of the configured Layer 2 priority values [L2QSIG and L2QAUD] to set properly and propagate to the endpoints as expected. The L2 AUDIO and L2 SIGNALING parameters were configured manually for the endpoints by editing the L2QAUD and L2QSIG fields of the 46xxsetting file.

7.1. Avaya one-X 9670G IP Phone and Extreme 400-24P switch Power over Ethernet Test Results

All Power over Ethernet test cases completed successfully. Avaya one-X 9670G IP telephones were successfully powered by the Extreme Networks Summit 400-24p switch.

Table 1 and **Table 2** below list the IEEE 802.3af class allocated power and measured power of the selected Avaya IP telephones when connected to the Extreme Networks Summit 400-24p Switch. Power to the phones is listed for when phones are in idle mode.

Avaya Powered Device	802.3af Class	Volts	Current (mA)	Measured Power (Watts)	Oper Limit
4621SW	2	50.2	96	4.8	15.4
Avaya one-X 9670G	2	50.2	80	4.0	15.4

Table 1: 802.3af Class and Measured Power with Extreme Networks Summit 400-24P

Table 2 below summarizes the 802.3af Classes

Class	PSE Output Max Power (W)
0	15.4
1	4.0
2	7.0
3	15.4
4	Treat as Class 0

Table 2: IEEE 802.3af Power Classifications.

7.2. Avaya one-X 9670G IP Phone and Extreme 400-24P Switch Quality of Service Test Results

Quality of Service test cases were performed using equipment set up as outlined previously in **Figure 2**.

An IP network comprising 2 computers was used to generate data traffic using **Jperf**, a third party network analysis application. **Jperf** generated a stream of traffic to saturate the bandwidth allowed on the trunking port between the two switches **Jperf** was set up on computers PC1 (192.168.1.1) as a server connecting to Extreme Summit 400-24P switch via Ethernet port 17 for data vlan. **Jperf** was set up on computer PC2 (192.168.1.2) as a client connecting to Cisco 2960 switch via the Gigabit Ethernet port 2 on data vlan.

A network sniffer, **Wireshark**, was employed to monitor all the traffic on the uplink trunk connection between the switches. Port 15 of the Extreme 400-24P Switch was configured as a traffic monitoring port for this purpose. The following was confirmed

- The L2 Class of Service values on the Ethernet frame originated from the phone are aligned with the value set.
- The Diffserv value in the IP packet generated from the phone is aligned with the value setting.
- The Class of Service values of the frames generated by Avaya Communication Manager reflect the **ip-network-region** setting.
- The Diffserv value in the IP packet generated from Avaya Communication Manager is aligned with the values set.
- The Extreme Summit 400-24p correctly set the Class of Service and Quality of Service values on the packets coming from test computer PC1

While the traffic generator was running a call has been placed between the two Avaya one-X 9670G phones residing on the voice vlan. The voice quality was not affected by the traffic on the data vlan as data traffic had a lower priority setting .The phone reports from the menu

Setting→Network Information:

- Packet loss: 0%
- One way network delay: 0ms
- Network Jitter: 0ms

8. Conclusion

These Application Notes described the configuration of Avaya one-X 9670G IP Telephone with Extreme Networks Summit 400-24p switch for Power over Ethernet and Quality of Service.

9. Additional References

This section references the product documentation relevant to these Application Notes.

1. *Administrator Guide for Avaya Communication Manager*, Document 03-300509, Issue 4.0, Release 5.0, January 2008, available at: <http://support.avaya.com>
2. *Cisco Catalyst 2960 Switch Getting Started Guide OL-9368-02*, available at:<http://www.cisco.com>
3. *Cisco Catalyst 2960 Switch Software Configuration Guide* Release 12.2(46) SE August 2008 available at: <http://www.cisco.com>
4. *Cisco Catalyst 2960 Switch Command Reference Cisco IOS Release 12.2(44) SE* January 2008, available at: <http://www.cisco.com>
5. *ExtremeWare Command Reference Software Version 7.8 100282-00 Rev 01May 2008* available at: <http://www.extremenetworks.com/>
6. *ExtremeWare User Guide Software Version 7.8 100282-00 Rev 01May 2008* available at: <http://www.extremenetworks.com/>

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