



Avaya Solution & Interoperability Test Lab

Application Notes for CyberPath PowerPath POE4408 with Avaya IP Office - Issue 1.0

Abstract

These Application Notes describe the procedure for a CyberPath PowerPath POE4408 switch to successfully interoperate with Avaya IP Office in a converged network infrastructure. Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the *DeveloperConnection* Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe a compliance-tested configuration utilizing Avaya IP Office, Avaya 4600 IP Telephones and CyberPath PowerPath POE4408 switch.

The POE4408 switch provides a cost effective Layer 2 switching solution for small and medium converged network deployments. It has Layer 2 switching features such as 802.1p prioritization and 802.3af Power over Ethernet (PoE), which are important for supporting VoIP implementations in LAN environments.

The CyberPath PowerPath POE4408 switch is equipped with two priority queues, which can be used to differentiate IP telephony signaling and audio from traditional data traffic based on IEEE 802.1p priority values. In addition, the POE4408 is capable of providing inline power to Avaya IP Telephones using the 802.3af standard.

The configuration in **Figure 1** shows a network consisting of the Avaya IP Office, Avaya 4600 IP Telephones and PCs, and CyberPath PowerPath POE4408. The Extreme Networks Summit 400-24P switch was used to provide Layer 3 routing. An 802.1Q tagged trunk is used to uplink Layer 2 Virtual LAN (VLAN) traffic from the POE4408 switch to the Summit 400-24P switch's routing interfaces. See **Table 1** for detailed port configurations. Separate Application Notes describing the PoE configuration are listed in Section 11.

The tested configuration is shown in **Figure 1**.

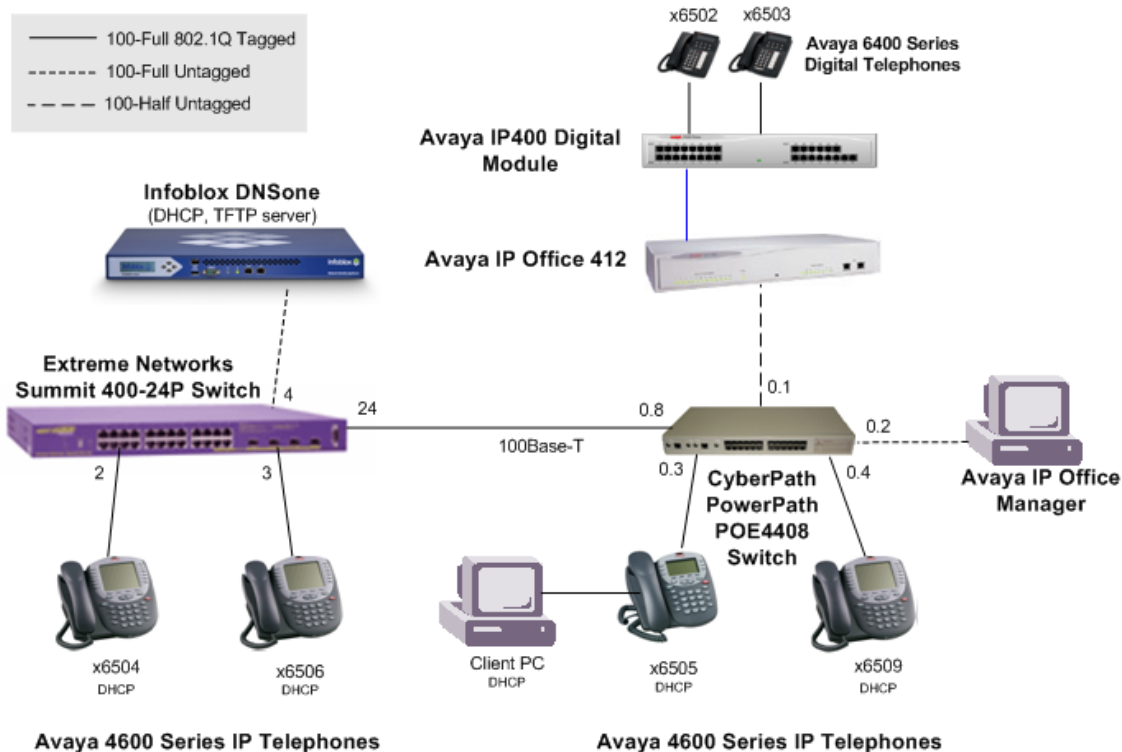


Figure 1 – Sample LAN Configuration

Device	Port	PVID	Port Priority	Static VLANs	IP Interface
Avaya IP Office 412	LAN1				40.1.1.1/24
IP Office Manager PC	NIC				40.1.1.36/24
POE4408	0.1	40	High		
POE4408	0.2	40	High		
POE4408	0.3	30	Low	40 tag	Mgmt vlan30 – 30.1.1.2/24
POE4408	0.4	10	Low	70 tag	Mgmt vlan30 – 30.1.1.2/24
POE4408	0.8	30	Low	10 tag 40 tag 70 tag	Mgmt vlan30 – 30.1.1.2/24
Summit 400-24P	2	30 untag		40 tag	vlan30 – 30.1.1.254/24 vlan40 – 40.1.1.254/24
Summit 400-24P	3	10 untag		70 tag	vlan10 – 10.1.1.254/24 vlan70 – 70.1.1.254/24
Summit 400-24P	4	20 untag			vlan20 – 20.1.1.254/24
Summit 400-24P	24	30 untag		10 tag 40 tag 70 tag	vlan10 – 10.1.1.254/24 vlan30 – 30.1.1.254/24 vlan40 – 40.1.1.254/24 vlan70 – 70.1.1.254/24
Infoblox DNSone	NIC				20.1.1.200/24

Table 1 – Connectivity Matrix

2. Equipment and Software Validated

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

Equipment	Software/Firmware
Avaya IP Office 412	3.1(65)
Avaya IP400 Digital Module	5.1(65)
Avaya IP Office Manager	5.1(65)
Avaya 4600 Series IP Telephones	2.2.3
Avaya 6400 Series Digital Telephones	-
CyberPath PowerPath POE4408 Switch	2.03.1.22PoE
Extreme Networks Summit 400-24P Switch	7.4e.1.5
Infoblox DNSone	3.2r1-1

Table 2 – Equipment and Software / Firmware Versions Validated

3. Configure CyberPath POE4408 Switch

The POE4408 switch provides a web interface, console menu and Command Line Interface (CLI) for administration. These Application Notes present administration via the CLI for configuring the POE4408 for this solution.

For all other provisioning information, please refer to CyberPath product documentation in reference [3].

Step	Description
1.	Configure VLAN dot1q tagging and strict priority queuing modes. (L2SW) > config vlan mode dot1q (L2SW) > config dot1p mode sp
2.	Create applicable Virtual LANs and associated names, vlan30 will be used for data and vlan40 will be used for voice. (L2SW) > config vlan create 10 vlan10 (L2SW) > config vlan create 30 vlan30 (L2SW) > config vlan create 40 vlan40 (L2SW) > config vlan create 70 vlan70
3.	Assign Port VLAN ID's (PVIDs) as described in Table 1 . (L2SW) > config vlan port pvid 40 0.1 (L2SW) > config vlan port pvid 40 0.2 (L2SW) > config vlan port pvid 30 0.3 (L2SW) > config vlan port pvid 10 0.4 (L2SW) > config vlan port pvid 30 0.8
4.	Configure the inband management VLAN and interface information for the switch. (L2SW) > config mgmtvlan 30 (L2SW) > config network params 30.1.1.2 255.255.255.0 30.1.1.254

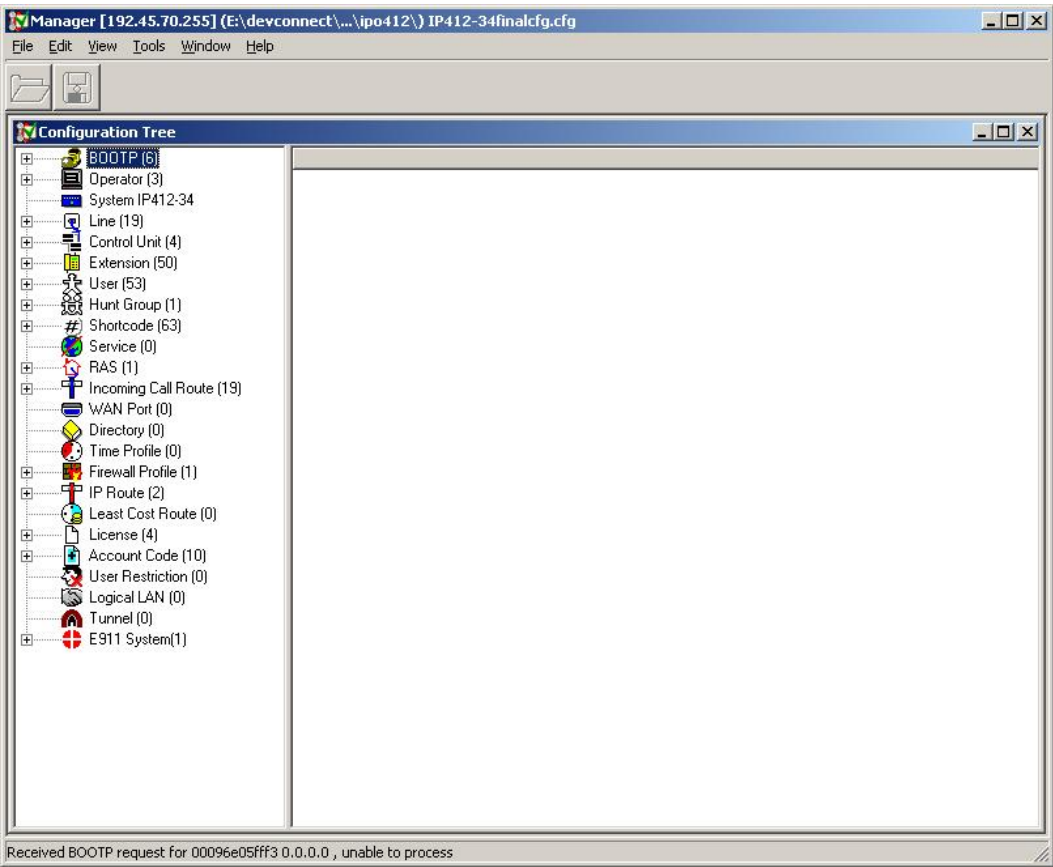
Step	Description
5.	Configure the port forwarding priority for all received untagged frames. Configure all ports with priority “low” first, and then selectively configure important Avaya IP Office ports with priority “high”. (L2SW) > config port priority all low (L2SW) > config port priority 0.1 high (L2SW) > config port priority 0.2 high
6.	Statically assign the voice VLAN 40 or VLAN 70 to all ports connected to Avaya 4600 IP Telephones as described in Table 1 . (L2SW) > config vlan addport 40 0.3 (L2SW) > config vlan addport 70 0.4
7.	Statically assign vlans to neighboring switch port as described in Table 1 . (L2SW) > config vlan addport 10 0.8 (L2SW) > config vlan addport 40 0.8 (L2SW) > config vlan addport 70 0.8
8.	Enable tagging as described in Table 1 . (L2SW) > config vlan port tagging enable 40 0.3 (L2SW) > config vlan port tagging enable 70 0.4 (L2SW) > config vlan port tagging enable 10 0.8 (L2SW) > config vlan port tagging enable 40 0.8 (L2SW) > config vlan port tagging enable 70 0.8
9.	Save the configuration. This completes configuration of the POE4408. (L2SW) > save config

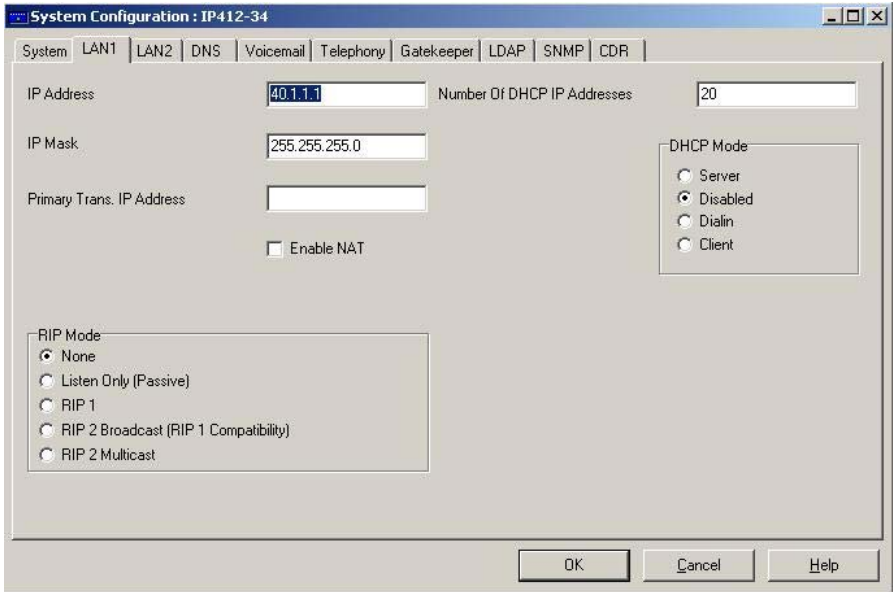
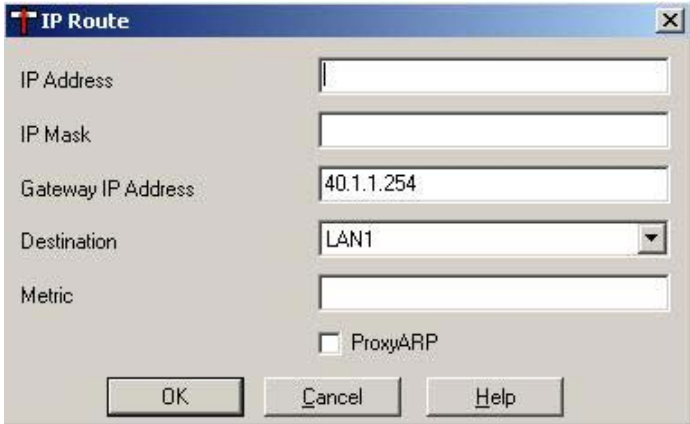
4. Configure Avaya IP Office

The information provided in this section describes the steps required setting up Avaya IP Office for the configuration described in these Application Notes.

For all other provisioning information, please refer to the Avaya IP Office product documentation in reference [1].

Step	Description
1.	Log into the IP Office Manager PC and go to Start → Programs → IP Office → Manager to launch the Manager application. Log into the Manager application using the appropriate credentials.
2.	In the Manager window that appears, select File → Open to search for the IP Office system in the network.
3.	Log into the IP Office system using the appropriate login credentials to receive its configuration.

Step	Description
4.	<p>In the Manager window that appears, go to the Configuration Tree and double-click System. In the System tab of the System Configuration window that appears, select the LAN1 tab.</p>  <p>The screenshot shows the Manager application window titled "Manager [192.45.70.255] (E:\devconnect\...\ipo412\...) IP412-34finalcfg.cfg". The Configuration Tree on the left lists various system components, with "System IP412-34" selected. The status bar at the bottom displays the message: "Received BOOTP request for 00096e05fff3.0.0.0.0 , unable to process".</p>

Step	Description
5.	<p>In the LAN1 tab that appears, verify IP Address is set to the IP address defined for Avaya IP Office in Table 1, select Disabled for DHCP Mode. Click OK.</p> 
6.	<p>In the Manager window, go to the Configuration Tree and double-click IP Route. In the right-hand pane, right-click Add to add a route.</p>
7.	<p>In the IP Route window that appears, set Gateway IP Address to 40.1.1.254 and Destination to LAN1. Click OK.</p> 
8.	<p>In the Manager window, select File → Save to send the new configuration back to the IP Office. Set the Reboot Mode to Immediate since the changes entered cannot be merged. Wait for the system to update. This completes configuration of Avaya IP Office.</p>

5. Configure Extreme Summit 400-24P Switch

The Extreme Summit 400-24P switch provides a web interface and Command Line Interface (CLI) for administration. These Application Notes present administration via the CLI for configuring the Summit 400-24P for this solution.

Step	Description
1.	Create, name and assign tag values to applicable Virtual LANs. <pre># create vlan vlan10 # configure vlan vlan10 tag 10 # create vlan vlan20 # configure vlan vlan20 tag 20 # create vlan vlan30 # configure vlan vlan30 tag 30 # create vlan vlan40 # configure vlan vlan40 tag 40 # create vlan vlan70 # configure vlan vlan70 tag 70</pre>
2.	Configure the priority for all VLANs with priority “low”. Any individual ports requiring higher priority could then be selectively assigned a higher priority if necessary. <pre># configure vlan vlan10 priority 0 # configure vlan vlan20 priority 0 # configure vlan vlan30 priority 0 # configure vlan vlan40 priority 0 # configure vlan vlan70 priority 0</pre>
3.	Assign VLANs to physical ports as described in Table 1 . <pre># configure vlan Default delete port 2 # configure vlan Default delete port 3 # configure vlan Default delete port 4 # configure vlan Default delete port 24 # configure vlan vlan20 add port 4 untagged # configure vlan vlan30 add port 2 untagged # configure vlan vlan40 add port 2 tagged # configure vlan vlan10 add port 3 untagged # configure vlan vlan70 add port 3 tagged # configure vlan vlan10 add port 24 tagged # configure vlan vlan30 add port 24 untagged # configure vlan vlan40 add port 24 tagged # configure vlan vlan70 add port 24 tagged</pre>
4.	Assign IP interfaces to VLANs and enable IP forwarding globally for all VLANs. <pre># configure vlan vlan10 ipaddress 10.1.1.254 255.255.255.0 # configure vlan vlan20 ipaddress 20.1.1.254 255.255.255.0 # configure vlan vlan30 ipaddress 30.1.1.254 255.255.255.0 # configure vlan vlan40 ipaddress 40.1.1.254 255.255.255.0 # configure vlan vlan70 ipaddress 70.1.1.254 255.255.255.0 # enable ipforwarding</pre>
5.	Globally enable DHCP Relay and administer the target DHCP server for the relayed requests. <pre># enable bootprelay # configure bootprelay add 20.1.1.100</pre>
6.	Save the configuration. This completes configuration of the Summit 400-24P. <pre># save config</pre>

6. Configure Infoblox DNSone (DHCP/TFTP Server)

The requirements for the DHCP server used in this configuration are to provide two scopes to support voice and data hosts on different VLANs simultaneously. For information on how to configure the Infoblox DNSone (20.1.1.100/24) to provide DHCP and TFTP services for this configuration, please refer to the Application Notes in reference [2]. A summary of the information required for the configuration in these Application Notes follows below.

The “DataEdge1” scope includes the appropriate default gateway option 003 and custom option 176, which informs Avaya 4600 IP Telephones attempting to boot on native PVID 10 that the Avaya 4600 IP Telephones must tag on VLAN 70 and rediscover an appropriate IP address on the newly assigned voice VLAN.

```
Scope [10.1.1.0] DataEdge1
  Address Pool
    Start Address = 10.1.1.120
    End Address = 10.1.1.130
    Option 003 Router = 10.1.1.254
    Option 176 IP Telephone = L2Q=1,L2QVLAN=70
```

The “VoiceEdge1” scope includes the default gateway option 003 and the custom 176 option, which informs Avaya 4600 IP Telephones of the Avaya IP Office 412 Server, registration port and TFTP server IP address.

```
Scope [70.1.1.0] VoiceEdge1
  Address Pool
    Start Address = 70.1.1.120
    End Address = 70.1.1.130
    Option 003 Router = 70.1.1.254
    Option 176 IP Telephone =
      MCIPADD=40.1.1.1,MCPOR=1719,TFTPDIR=/ipoffice/,TFTPSRVR=20.1.1.100
```

The “DataEdge2” scope includes the appropriate default gateway option 003 and custom option 176, which informs Avaya 4600 IP Telephones attempting to boot on native PVID 30 that the Avaya 4600 IP Telephones must tag on VLAN 40 and rediscover an appropriate IP address on the newly assigned voice VLAN.

```
Scope [30.1.1.0] DataEdge2
  Address Pool
    Start Address = 30.1.1.120
    End Address = 30.1.1.130
    Option 003 Router = 30.1.1.254
    Option 176 IP Telephone = L2Q=1,L2QVLAN=40
```

The “VoiceEdge2” scope includes the default gateway option 003 and the custom 176 option, which informs Avaya 4600 IP Telephones of the Avaya IP Office 412 Server, registration port and TFTP server IP address.

```
Scope [40.1.1.0] VoiceEdge2
  Address Pool
```

```

Start Address = 40.1.1.120
End Address = 40.1.1.130
Option 003 Router = 40.1.1.254
Option 176 IP Telephone =
MCIPADD=40.1.1.1,MCPOR=1719,TFTPDIR=/ipoffice/,TFTPSRVR=20.1.1.100

```

7. Interoperability Compliance Testing

The Interoperability Compliance Test included feature functionality and performance testing. Feature functionality testing examined the POE4408 switch's ability to forward Voice over IP (VoIP) signaling, audio and data without any impact on voice quality. In addition support for providing power to Avaya 4600 IP Telephones via Power over Ethernet (PoE) was validated. Performance tests verified that the configuration remained stable under load.

7.1. General Test Approach

Feature functionality testing was performed manually. Calls were made between stations that were registered to Avaya IP Office. While calls were being made, a protocol analyzer was used to monitor call signaling and audio flows to ensure that proper QoS markers at Layer 2 and Layer 3 were being relayed. Performance testing was done using a data traffic generator to stress the QoS functionality of the devices over a one-hour period.

7.2. Test Results

All feature functionality and performance test cases passed successfully. A one-hour test was conducted with 200 Mbps of 64-byte traffic saturating the 100 Mbps LAN link between the POE4408 switch and Summit 400-24P switch. Various calls were placed between phones without any call loss or voice quality degradation.

8. Verification Steps

- Verify connectivity from the POE4408 to the Summit 400-24P using ping command.

```

(L2SW) >ping 30.1.1.254
Send count=3, Received count=3, from 30.1.1.254

```

- Verify that the POE4408 switch auto negotiates speed and duplex with Avaya IP Office.

```

(L2SW) >show port 0.1

```

Port	Type	Admin Enable	Auto	Spd Dpx	Spd State	Link Status	FC Cfg	FC State	Rate(100K) In	Out	Pri	Sec
0.1	100TX	Enable	Auto	100F	100H	Up	On	On	0	0	High	Off

- Verify the IP Telephone power up.
- Verify that the IP Telephone tags on the voice VLAN based on Option 176 values.

- Verify that the IP Telephone successfully completes the registration process.
- Place IP-to-IP calls and verify audio quality.
- Place IP-to-Digital calls and verify audio quality.

9. Support

For technical support on the CyberPath PowerPath POE4408 Switch, contact the CyberPath Tech Support Directory at 732-463-7700 ext. 221. Technical support email can be sent to support@cyberpathinc.com.

10. Conclusion

These Application Notes describe administration steps, which allowed the CyberPath PowerPath POE4408 switch to interoperate with Avaya IP Office for the purposes of providing basic network connectivity and Layer 2 Quality of Service (QoS) via 802.1p prioritization. Features and functionality were successfully validated.

11. Additional References

Available from Avaya:

[1] Avaya IP Office Installation Manual, 40DHB0002USCL, Issue 10c (5/11/2004)

[2] Application Notes for Infoblox DNSone in an Avaya IP Office IP Telephony Infrastructure – Issue 1.0, March 2006

Available from CyberPath:

[3] CyberPath PowerPath POE4408 User Manual, CP-UM-0085, Version 1.6.5 (3/2005)

©2006 Avaya Inc. All Rights Reserved.

Avaya and the Avaya Logo are trademarks of Avaya Inc. All trademarks identified by ® and ™ are registered trademarks or trademarks, respectively, of Avaya Inc. All other trademarks are the property of their respective owners. The information provided in these Application Notes is subject to change without notice. The configurations, technical data, and recommendations provided in these Application Notes are believed to be accurate and dependable, but are presented without express or implied warranty. Users are responsible for their application of any products specified in these Application Notes.

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.