



Avaya Solution & Interoperability Test Lab

Application Notes for using Link Layer Discovery Protocol (LLDP) with HP ProCurve Switches and Avaya IP Telephones - Issue 1.0

Abstract

These Application Notes describe the steps for configuring ProCurve 5400zl, 3500yl, 2910 and 2610 Series Switches by HP to use the Network Policy Type Length Value (TLV) within the Link Layer Discovery Protocol Media Endpoint Devices (LLDP-MED). The ProCurve Switches will be configured to assign VLAN and QoS information to Avaya 9600 Series IP Telephones running Avaya one-X Deskphone Edition, Avaya 9600 Series IP Telephones running Avaya one-X Deskphone SIP and Avaya 4600 Series IP Telephones (H.323).

Information in these Application Notes has been obtained through DevConnect compliance testing and additional technical discussions. Testing was conducted via the DevConnect Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes describe a sample configuration for using Link Layer Discovery Protocol (LLDP) to provision VLAN and QoS information to Avaya 9600 Series IP Telephones running Avaya one-X Deskphone Edition, Avaya 9600 Series IP Telephones running Avaya one-X Deskphone SIP and Avaya 4600 Series IP Telephones (H.323).

LLDP or 802.1AB is an IEEE standard designed for the discovery of directly attached adjacent network devices such as Ethernet switches, routers, and other LLDP capable devices such as the Avaya 9600 and 4600 Series IP Telephones. LLDP advertisements are encapsulated in LLDP Data Units (LLDPDU) in the format of Type Length Value or TLV for short. The IEEE 802.1AB specification defines different types of TLVs – Standard and Optional. LLDP capable devices must support the advertisement of Standard TLVs such as Chassis ID, Port ID, and Time to Live TLVs. The same LLDP capable device may also include Network Policy, IEEE 802.3 (MAC/PHY Configuration/Status) and other Vendor specific optional TLVs as part of its LLDP advertisement. The Avaya 9600 and 4600 Series IP Telephones supports the use of the Network Policy TLV as a means to accept VLAN and QoS assignment in addition to using vendor specific TLVs. For supported IP Telephones & versions, refer to the table in **Section 3**.

1.1. Interoperability Compliance Testing

The sample network outlined in these Application Notes consists of a 5400zl(*) Series Switch by HP, serving as the connection point for the Avaya IP Telephones to connect into the network. The Ethernet switch port is configured to support 2 VLANs, one for voice and one for data. The voice VLAN supports Avaya IP Telephone traffic and the data VLAN supports PC traffic. LLDP is enabled on these Ethernet ports and are configured to advertise the voice VLAN ID and QoS information using the Network Policy LLDP TLV.

(*) Since the syntax for configuring LLDP for the ProCurve 5400zl, 3500yl, 2910 and 2610 Series Switches is the same, only the configuration for the ProCurve 5400zl Switch is shown.

1.2. Support

For technical support on ProCurve products, consult the support pages at:
<http://www.procurve.com/customercare/support/manuals/index.htm>

2. Reference Configuration

Figure 1 illustrates the configuration used in these Application Notes. All Avaya IP Telephones are registered with Avaya Aura™ Communication Manager and Avaya Aura™ SIP Enablement Services (SES) which are connected to the enterprise IP network. All Avaya IP Telephones are assigned to the same IP network region within Communication Manager. VLAN ID, Layer 2 and Layer 3 QoS information for Avaya 9600 & 4600 Series IP Telephones is obtained through LLDP advertisement configured on the ProCurve Networked Switches.

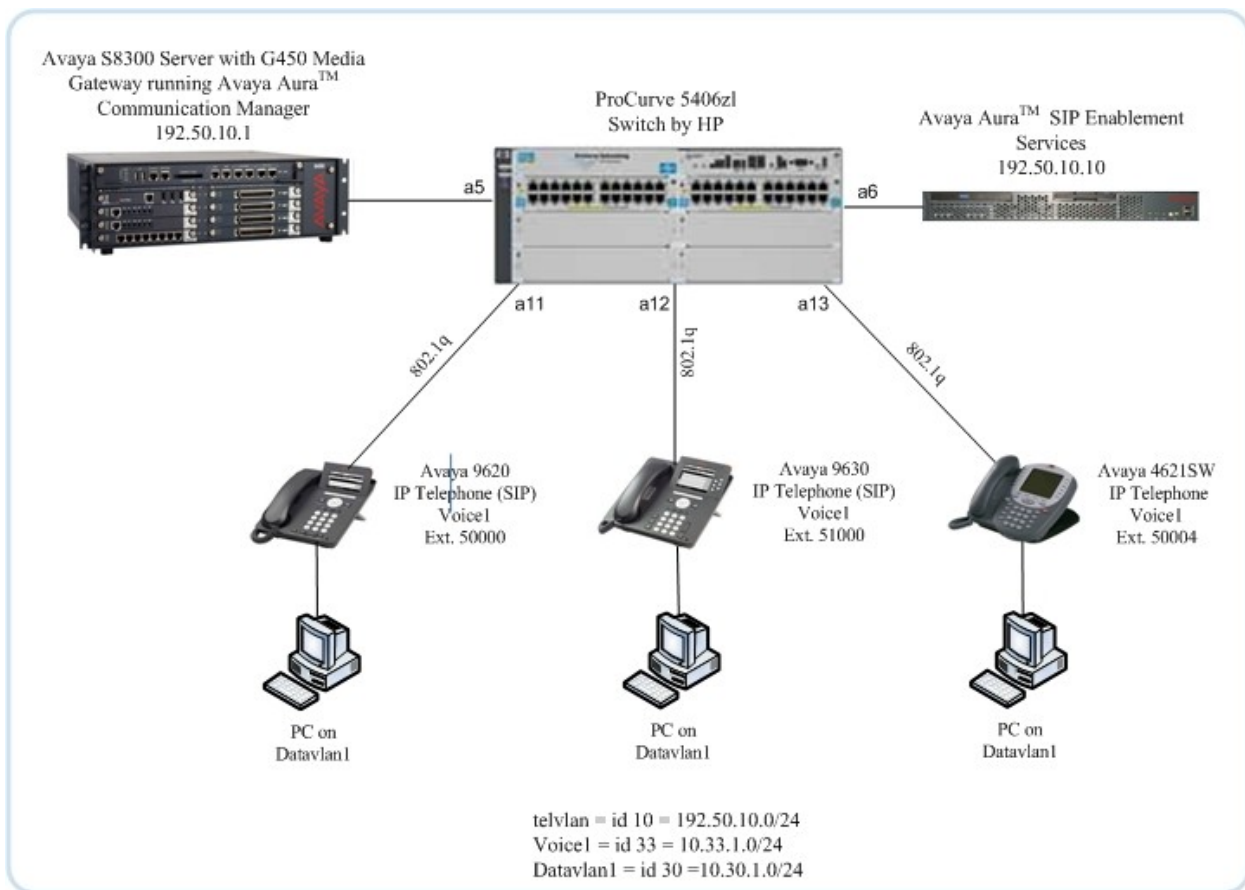


Figure 1: Avaya/ProCurve Network Diagram

3. Equipment and Software Validated

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

Equipment	Software/Firmware
Avaya PBX Products	
Avaya S8300 Server running Avaya Aura™ Communication Manager	Avaya Aura™ Communication Manager 5.2 (*)
Avaya G450 Media Gateway MGP MM712 DCP Media Module	28.22.0 HW9
Avaya SIP Enablement Services (SES)	
Avaya Aura™ SIP Enabled Services (SES) Server	5.2 (*)
Avaya Telephony Sets	
Avaya 9600 Series IP Telephones	Avaya one-X Deskphone Edition 3.0
Avaya 9600 Series IP Telephones	Avaya one-X Deskphone SIP 2.0.0
Avaya 4600 Series IP Telephones	2.9 (H.323)
ProCurve Products	
ProCurve 6600ml-24G Switch	FW-K.14.09
ProCurve 5406zl by HP with J8705A module and RJ45 (J8177C Transceiver)	FW-K.14.09
ProCurve 3500yl-24-PWR by HP	FW-K.14.09
ProCurve 2910al by HP	W.14.28
ProCurve 2610-24-PWR by HP	R.11.25

(*)Avaya Communication Manager 5.1.2 and Avaya SIP Enabled Services Server 5.1.2 were also compliance tested but will not be covered in this document.

4. Configuration of the ProCurve Switches

This section addresses how to configure the 5400zl Series Switch by HP as shown in **Figure 1** using the Command Line Interface (CLI). Since the syntax for configuring the 5400zl, 3500yl, 2910 and 2610 Series Switches by HP is the same, only the configuration for the 5400zl Switch is shown. Basic router configuration is assumed, only information that pertains to the LLDP setup is covered in these Application Notes. For basic router setup information, refer to **Section 8**.

As shown in **Figure 1**, The PCs in the network are directly connected to the Avaya 9600 & 4600 Series IP Telephones. The ProCurve interfaces that the Avaya IP Telephones are connected to are trunked, which allows both the data and voice VLANs to share the same wire. For this example, the Datavlan ID is 30 and the Voice ID is 33.

To configure the ProCurve 5406zl Switch, connect a PC or laptop to the serial port of the ProCurve 5406zl Switch. Run a terminal emulation program with the following configuration:

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow Control: None

1. Log into the ProCurve 5406zl Switch using the appropriate Login ID and Password.

```
Login:  
Password:  
ProCurve Switch 5406zl#
```

2. Create and configure the telephony VLAN where all of the Avaya telephony equipment will run.
 - Assign a VLAN ID for the telephony VLAN.
 - Assign a name for the telephony VLAN.
 - Assign an IP address for the telephony VLAN.
 - Assign ports to the telephony VLAN.

```
ProCurve Switch 5406zl# configure  
ProCurve Switch 5406zl(config)# vlan 1050  
ProCurve Switch 5406zl (vlan-10)#vlan 1050 name vlan1050  
ProCurve Switch 5406zl (vlan-10)#ip address 192.50.10.254/24  
ProCurve Switch 5406zl (vlan-10)# untagged a5-a6  
ProCurve Switch 5406zl (vlan-10)# exit
```

3. Create and configure the voice VLAN.
 - Assign a VLAN ID for the voice VLAN.
 - Assign a name for the voice VLAN.
 - Assign an IP address for the voice VLAN.
 - Assign priority 6 to DSCP CodePoint 101110
 - Enable voice/LLDP option
 - Assign QoS value, this value will be passed to the Avaya IP Telephone
 - Set an IP helper address for DHCP.
 - Assign ports to the voice VLAN.

```
ProCurve Switch 5406zl# configure
ProCurve Switch 5406zl(config)# vlan 33
ProCurve Switch 5406zl (vlan-33)# vlan 33 name Voice1
ProCurve Switch 5406zl (vlan-33)# ip address 10.33.1.254/24
ProCurve Switch 5406zl (vlan-33)# qos dscp-map 101110 priority 6
ProCurve Switch 5406zl (vlan-33)# voice
ProCurve Switch 5406zl (vlan-33)# qos dscp 101110
ProCurve Switch 5406zl (vlan-33)# ip helper-address 10.20.20.250
ProCurve Switch 5406zl (vlan-33)# tagged a11-a13
ProCurve Switch 5406zl (vlan-33)# exit
```

4. Create and configure the data VLAN.
 - Assign a VLAN ID for the data VLAN.
 - Assign a name for the data VLAN.
 - Assign an IP address for the data VLAN.
 - Set an IP helper address for DHCP.
 - Assign ports to the data VLAN.

```
ProCurve Switch 5406zl# configure
ProCurve Switch 5406zl(config)# vlan 30
ProCurve Switch 5406zl (vlan-30)# vlan 30 name Datavlan1
ProCurve Switch 5406zl (vlan-30)# ip address 10.30.1.254/24
ProCurve Switch 5406zl (vlan-30)# ip helper-address 10.20.20.250
ProCurve Switch 5406zl (vlan-30)# untagged a11-a13
ProCurve Switch 5406zl (vlan-30)# exit
```

5. Save the running configuration to the startup configuration.

```
ProCurve Switch 5406zl# configure
ProCurve Switch 5406zl(config)# write memory
```

5. Test Results

The ProCurve 5400zl, 3500yl, 2910 and 2610 Series Switches by HP, serving as the connection point for the Avaya IP Telephones, were able to configure the voice VLAN ID and QoS information using the Network Policy LLDP TLV.

6. Verification Steps

The following steps may be used to verify the configuration:

1. Use the **show lldp status** to verify that LLDP is running. If LLDP is not running, refer to **Section 4 Step 3**.

```
ProCurve Switch 5406zl(config)# show lldp stats

LLDP Device Statistics

Neighbor Entries List Last Updated : 21 days
New Neighbor Entries Count : 59
Neighbor Entries Deleted Count : 51
Neighbor Entries Dropped Count : 0
Neighbor Entries AgeOut Count : 12

LLDP Port Statistics

Port | NumFramesRecvd NumFramesSent NumFramesDiscarded
-----+-----
A1 | 61404          61368          0
A2 | 61404          61368          0
A3 | 0              0              0
A4 | 0              0              0
A5 | 0              61377          0
A6 | 0              61377          0
A7 | 0              1              0
A8 | 0              0              0
A9 | 0              0              0
A10 | 18029          18030          0
A11 | 40644          44111          0
A12 | 43881          60415          0
A13 | 0              0              0
```

2. Use the **show lldp info remote-device** command to verify LLDP neighbors.

```
ProCurve Switch 5406z1(config)# show lldp info remote-device

LLDP Remote Devices Information

  LocalPort | ChassisId                               PortId PortDescr SysName
  -----+-----
A1          | 00 23 47 51 bb 40                       1      1          ProCurve 2910al-48G...
A2          | 00 23 47 51 bb 40                       2      2          ProCurve 2910al-48G...
A19         | 00 16 35 b6 30 c0                       19     19          ProCurve Switch 350...
A20         | 00 16 35 b6 30 c0                       20     20          ProCurve Switch 350...
A21         | 00 23 47 55 c5 80                       24     24          ProCurve Switch 660...
B15         | 10.33.1.126                              00 ...    AVTB7160B
B16         | 10.33.1.144                              00 ...    AVAF88916
B17         | 10.33.1.130                              00 ...    AVAEC9396
```

3. Use the **show lldp neighbors detail** command to verify LLDP neighbors detailed information.

```
ProCurve Switch 5406z1(config)# show lldp info remote-device b15

LLDP Remote Device Information Detail

Local Port      : B15
ChassisType    : network-address
ChassisId      : 10.33.1.126
PortType       : mac-...
PortId         : 00 07 3b b7 16 0b
SysName        : AVTB7160B
System Descr   :
PortDescr     :

System Capabilities Supported : bridge, telephone
System Capabilities Enabled   : bridge

Remote Management Address
Type      : ipv4
Address   : 10.33.1.126

MED Information Detail
EndpointClass :Class3
Media Policy Vlan id :33
Media Policy Priority :6
Media Policy Dscp    :46
Media Policy Tagged  :True
```

* Class information is not being displayed properly and will be fixed in update to the Avaya Phone firmware. For correct power class information use the **show power-over-ethernet** command shown below.


```
ProCurve Switch 5406zl(config)# show power-over-ethernet ethernet b15
```

```
Status and Counters - Port Power Status for port B15
```

```
Power Enable      : Yes
Priority          : low
AllocateBy       : usage
Detection Status : Delivering
LLDP Detect      : disabled
Configured Type  :
Value           : 17 W
Power Class      : 2
Over Current Cnt : 0
Power Denied Cnt : 0
MPS Absent Cnt  : 0
Short Cnt       : 0
Voltage         : 51.2 V
Power           : 2.0 W
Current         : 41 mA
```

7. Conclusion

These Application Notes describe the administration steps required to configure the ProCurve 5400zl, 3500yl, 2910 and 2610 Series Switches to use LLDP-MED advertisement to assign VLAN ID, Layer 2 and Layer 3 QoS information to Avaya 9600 Series IP Telephones running Avaya one-X Deskphone Edition, Avaya 9600 Series IP Telephones running Avaya one-X Deskphone SIP and Avaya 4600 Series IP Telephones.

8. Additional References

The documents referenced below were used for additional support and configuration information.

The following Avaya product documentation can be found at <http://support.avaya.com>.

- [1] *Administering Avaya Aura™ Communication Manager*, May 2009 , Issue 5.0, Document Number 03-300509..
- [2] *Administering Avaya Aura™ SIP Enablement Services*, May 2009, Issue 2.1, Document 03-602508.
- [3] *Avaya Aura™ SIP Enablement Services (SES) Implementation Guide*, May 2009, Issue 6, Document 16-300140.
- [4] *Avaya one-X Deskphone Edition for 9600 Series IP Telephones Administrator Guide Release 3.0*, Document Number 16-300698.
- [5] *Avaya one-X Deskphone SIP for 9600 Series IP Telephones Administrator Guide, Release 2.0*, Document Number 16-601944.
- [6] 4600 Series IP Telephone LAN Administrator Guide, Document Number: 555-233-507.

The HP product documentation can be found at:

<http://www.procurve.com/customercare/support/manuals/index.htm>

- [7] *Command Line Interface Reference Guide for the ProCurve Series 3500yl, 6200yl, 5400zl, and 8212zl Switches.*
- [8] *Management and Configuration Guide for the ProCurve Series 3500yl, 6200yl, 5400zl, and 8200zl Switches.*
- [9] *Management and Configuration Guide for the ProCurve Series 2910 Switches.*
- [10] *Management and Configuration Guide for the ProCurve Series 2610 Switches.*

9. Change History

Issue	Date	Reason
1.0	6/24/2009	Initial issue

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