Interoperability between Avaya IP phones and ProCurve switches

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1. Introduction

This document describes how ProCurve switches and Avaya 4600 Series IP phones interoperate to build a secure and easy-to-manage network. Both the switch and the phone rely on standard protocols:

- 802.3af, standard for Power-over-Ethernet (PoE) enables the switch to allocate up to 15.4W of power per port.
- Quality-of-Service (QoS) mechanisms enable the network to give voice flow—which is sensitive to delay, jitter and packet loss—priority over the data traffic, to guarantee that the communications will continue in case of congestion.
- LLDP-MED is a discovery protocol that enables switches to get some layer 2 information about a phone (such as its model, firmware, location, etc.) and automatically allocate certain network parameters (VLAN and QoS) to the phone.
- 802.1X is the most recommended authentication method for access control on the network. It is recognized as a standard, and is implemented by most IP telephony constructors. Multiple 802.1X authentication enables authentication both of a phone plugged into a switch and of a user plugged into the dual port of the phone, while assigning them different profiles (VLAN, QoS, bandwidth).

2. Architecture

The platform contains:

- One or more servers with the following services: Active Directory, DHCP, DNS, Certificate Authority, IAS.
- Latest versions of ProCurve Manager Plus (PCM+) and Identity-Driven Manager (IDM).
- Avaya 4625SW IP Telephone.
- A ProVision Switch 3500yl or 2610-PWR with the latest firmware version. A similar configuration can also be used with a ProCurve 5400zl series switch or a 8212zl series switch. The configuration commands are identical for these products and the 3500yl.
- A client laptop that can be plugged into the phone dual port for multiple authentication tests or used as a network analyzer (e.g., Wireshark).

3. Checking PoE compatibility

This section explains how to check power over Ethernet compatibility on the Avaya phone and the ProCurve switch.

ProVision switches support standard PoE (802.3af), and so do Avaya phones. When the phone is plugged into a port on the 3500yl switch, it boots up.

1. To view the power consumption of the phone, issue the following command on the switch:

```
show power-over-ethernet X
```

Where `X` is the port on which the phone is plugged.
2. On a 2610 switch, the command is:

```
show power-management X
```

For an Avaya 4625SW IP Telephone this consumption is around 6 watts (Power Class 3):

```
ProCurve Switch 2610-24/12PWR# show power-management 12
Status and Counters - Port Power Status for port 12
 Power Enable : Yes
 Priority : Low
 Detection Status : Delivering
 Over Current Cnt : 0
 Power Denied Cnt : 1
 Voltage : 470 mV
 Power : 5937 mW
```

4. Configuring QoS support

This section explains how to configure Quality of Service parameters.

4.1 Configure QoS on the Avaya phone

Avaya 4600 Series IP Telephones support 802.1p and DSCP configuration (except for the 4601 IP Telephone, which does not support setting QoS options).

To configure QoS on the Avaya phone:

1. Press Mute 7 6 7 # (for Mute QoS #). You see the following screen displayed:

```
L2 audio=d
New=_
```

2. Enter a value between 0 and 7 for the 802.1p priority of the voice signal. Then press #. You see the next screen displayed:

```
L2 signaling=d
New=_
```

3. Enter a value between 0 and 7 for the 802.1p priority of the signaling data. Then press #. You see the following screen displayed:

```
L3 audio=dd
New=_
```

4. Enter a value between 0 and 63 for the DSCP value of the voice signal. Then press #. You see the following screen displayed:

```
L3 signaling=dd
New=_
```

5. Enter a value between 0 and 63 for the DSCP value of the signaling data. Then press #. You see the question:

```
Save new values?
```

6. Click # to answer yes and save the values.
4.2 Configure QoS on the ProCurve switch
The recommended method is to have a dedicated VLAN for voice and configure the QoS parameters for the VLAN. The L2 and DSCP policy advertised are based on the actual QoS configuration for the voice VLAN. By default these values are:

- L2 priority 6
- DSCP 46, which corresponds to the Expedited Forwarding (EF) class

To modify the 802.1p or DSCP values:

```
Vlan <vid> qos priority <0-7>  Sets the 802.1p priority for the VLAN
Vlan <vid> qos dscp-map <codepoint> priority <0-7>
No vlan <vid> qos  Removes QoS for the VLAN
```

To view which DSCP and QoS values are configured:

```
Show qos vlan  Shows DSCP and QoS values
show qos dscp-map
```

For more information on QoS settings on ProCurve switches, please refer to the following documents:

- For switch 3500yl: http://cdn.procurve.com/training/Manuals/3500-5400-6200-8200-ATG-Jan08-6-Qos.pdf
- For switch 2610-POE: http://www.hp.com/rnd/support/manuals/2610.htm

5. Configuring LLDP-MED support
This section explains how to configure LLDP-MED support.

5.1 Configure LLDP-MED support on the Avaya phone
Avaya 4600 Series IP Telephones beginning with software Release 2.6+ support LLDP-MED. This protocol is enabled by default and initiated after reception of an LLDPU from network equipment; then the phone sends LLDPU us every 30 seconds. LLDP is not supported on the Dual Port.

5.2 Configure LLDP-MED on the ProCurve switch
1. Defining a VLAN as voice VLAN enables LLDP-MED:

```
(conf)# vlan 70 voice  Enables LLDP-MED
```

2. Then configure LLDP-MED. LLDP-MED must be configured on the switch to support MED TLVs, in particular network policy and capabilities:

```
(conf)# lldp run
(conf)# lldp config <port> medTlvEnable network_policy
(conf)# lldp config <port> medTlvEnable capabilities
```
3. To obtain information about the phone, issue the command:

```
show lldp info remote X
```

Where X is the port on which the phone is plugged. For example:

```
ProCurve Switch 2610-24/12PWRM sh lldp info remote 12
LLDP Remote Device Information Detail
  Local Port : 12
  ChassisType : network-address
  ChassisId : 10.3.100.100
  PortType : nac-address
  PortId : 00 14 0f 00 ef 87
  SysName : AUX00EF87
  System Descr :
  PortDescr :
  System Capabilities Supported : bridge, telephone
  System Capabilities Enabled : bridge

Remote Management Address
  Type : ip4
  Address : 10.3.100.100

MED Information Detail
  EndpointClass : Class3
  Media Policy VLAN id : 100
  Media Policy Priority : 6
  Media Policy Dscp : 46
  Media Policy Tagged : True
```

6. Configuring 802.1X support

This section explains how to configure 802.1X support.

6.1 About 802.1X support on the Avaya phone

Beginning with software Release 2.6 Avaya 4600 Series IP Telephones support 802.1X authentication, with three modes:

- **Pass-through**: The telephone forwards 802.1X multicast packets between the switch and the PC attached to the dual port.
- **Pass-through with proxy logoff**: Same mode as pass-through, but with proxy logoff supported. This function enables the phone to send the switch an EAPOL-Logoff packet on behalf of the PC if the PC becomes disconnected.
- **Supplicant**: The telephone forwards packets between the switch and the telephone only, and ignores 802.1X multicast packets from the attached PC. Proxy logoff is not supported. This supplicant mode supports EAP-MD5.

A Supplicant identity (ID) and password of no more than 12 numeric characters are stored in reprogrammable non-volatile memory. The default ID is the MAC address of the telephone, converted to ASCII format without colon separators, and the default password is null.

When a telephone is installed for the first time and 802.1X is in effect, the dynamic address process prompts the installer to enter the Supplicant identity and password. The IP telephone does not accept null value passwords. The IP telephone stores 802.1X credentials when successful authentication is achieved. Post-installation authentication attempts occur using the stored 802.1X credentials, without prompting the user for ID and password entry.

Unicast packets between the switch and the telephone or the PC are always properly forwarded, regardless of the mode.
6.2 Configure 802.1X on the Avaya phone
To configure 802.1X on the Avaya IP Telephone:

- Press Mute 8 0 2 1 9 # (for Mute 802.1X). You see the following screen:

```
802.1X= setting
*=Change    #=OK
```

Where `setting` is the current value of the system value DOTIX (802.1X Supplicant Mode), defined as:

- Unicast Supplicant operation only with PAE multicast pass-through, without logoff if `setting = 0`
- Unicast Supplicant operation only with PAE multicast pass-through and proxy logoff if `setting = 1`
- Unicast or multicast Supplicant operation without PAE multicast pass-through or proxy logoff if `setting = 2`

6.3 Configure 802.1X on the ProCurve switch
To configure 802.1X on the switch:

1. Enable 802.1X on the phone ports:

```
# aaa port-access authenticator B12  Selects port B12 to act as an authenticator
# aaa port-access authenticator active  Activates the previous command
# aaa authentication port-access eap-radius  Selects the authentication protocol
  (eap-radius or chap-radius)
```

2. Enter the RADIUS information in the switch configuration:

```
# radius-server host 10.50.10.170 key procurve  Gives the switch the address and
key of the radius server
```
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**Example**: This shows the results when a username of 12345 and a password of 12345 are configured on the Avaya phone. The authentication success appears in the IAS RADIUS log:

![Event Properties](image)

6.4 Configure multiple 802.1X sessions

To configure multiple 802.1X sessions:

1. Modify the switch configuration for the port connected to the phone. Configure it so the voice VLAN is tagged and the data VLAN untagged.

2. Set the client-limit parameter on the switch to 3 to enable both the PC and the phone to authenticate. For example:

   ```
   (config-vlan-1)# untagged 7
   (config-vlan-12)# tagged 7
   (config)# aaa port-access authenticator 7 client-limit 3
   ```

3. On the Avaya IP Telephone, ensure the 802.1X mode is set to 1 (pass-through with proxy-logoff) to enable both the PC and the phone to authenticate.
After configuration, you can see both authentications. On the phone:

**Event Properties**

**Event**
- **Date:** 7/29/2008
- **Source:** IAS
- **Time:** 2:35:56 PM
- **Category:** None
- **Type:** Information
- **Event ID:** 1
- **User:** N/A
- **Computer:** PROCURVE SERVER

**Description**
- **User:** 12345 was granted access.
- **Fully-Qualified-User-Name:** picoactive.hpintelco.org/Users/12345
- **NAS-IP-Address:** 10.3.108.206
- **NAS-Identifier:** ProCurve Switch 2610-24/12PWR
- **Client-Friendly-Name:** switch 2610
- **Client-IP-Address:** 10.3.108.206
- **Calling-Station-Identifier:** 00-1b-4f-0c-61-87
- **NAS-Port-Type:** Ethernet
- **NAS-Port:** 12
- **Proxy-Policy-Name:** Use Windows authentication for all users

**Date:** 00 00 00 00 00 00

![Event Properties](image1)

On the PC:

**Event Properties**

**Event**
- **Date:** 7/29/2008
- **Source:** IAS
- **Time:** 2:46:21 PM
- **Category:** None
- **Type:** Information
- **Event ID:** 1
- **User:** N/A
- **Computer:** PROCURVE SERVER

**Description**
- **User:** PICOACTIVE\john was granted access.
- **Fully-Qualified-User-Name:** picoactive.hpintelco.org/Users/john
- **NAS-IP-Address:** 10.3.108.206
- **NAS-Identifier:** ProCurve Switch 2610-24/12PWR
- **Client-Friendly-Name:** switch 2610
- **Client-IP-Address:** 10.3.108.206
- **Calling-Station-Identifier:** 00-1b-4f-29-17-bb
- **NAS-Port-Type:** Ethernet
- **NAS-Port:** 12
- **Proxy-Policy-Name:** Use Windows authentication for all users

**Date:** 00 00 00 00 00 00

![Event Properties](image2)
The data VLAN can also be dynamically assigned using Identity Driven Manager. For example:

<table>
<thead>
<tr>
<th>Severity</th>
<th>Status</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info...</td>
<td>7/29/09 2...</td>
<td>User John Logged In Remotely: proactive1.intelco.org Access Policy Group: Marketing Access Policy Rule Used: 0 Access Profile Used Info...</td>
<td>7/29/09 1... Daily Statistics cleanup</td>
</tr>
<tr>
<td>Info...</td>
<td>7/30/08 5...</td>
<td>User 123456 Logged In Remotely: proactive1.intelco.org Access Policy Group: Default Access Policy Group Access Policy Rule Used Info...</td>
<td>7/30/08 1... Daily Statistics cleanup</td>
</tr>
</tbody>
</table>

7. Upgrading the Avaya phone firmware version

Firmware versions of the switches used for this application note are as follows:

- K.13.09 for the ProCurve ProVision switches (5406zl, 3500yl, 8212zl)
- R.11.07 for the ProCurve Switch 2610-PWR

Firmware version of the Avaya 4600 IP Telephone is Release 042108 (46xxH323_042108). The Avaya firmware is available from:


To upgrade the Avaya phone’s firmware:

1. Copy and extract the files to a TFTP server.

2. Configure the Avaya phone with a static IP address; and at the Fileserver? question, use the IP address of the TFTP server.

   -or-

   Use the following DHCP options:

   - Option 1: Subnet Mask
   - Option 3: Router IP Address
   - Option 6: DNS Server(s)
   - Option 15: DNS Domain Name
   - Option 51: DHCP Lease time (optional)
   - Option 52: Overload Option (optional)
   - Option 58: DHCP lease renew time (optional)
   - Option 59: DHCP lease rebind time (optional)
   - Option 66: TFTP Server
8. Reference documents

This concludes the procedures for interoperating ProCurve switches and Avaya telephones.

For further information about how to configure ProCurve switches to support convergence, please refer to the following links:

- For user manuals for ProCurve 3500yl-5400zl-8212zl switches:
  http://www.hp.com/rnd/support/manuals/3500-6200-5400-ChapterFiles.htm
- For ProCurve Switch 2610 series manuals:
  http://www.hp.com/rnd/support/manuals/2610.htm
- For PCM+ and IDM manuals:
  http://www.hp.com/rnd/support/manuals/ProCurve-Manager.htm
  http://www.hp.com/rnd/support/manuals/IDM.htm

For information on Avaya phones please refer to the following links:

- For general information:
  http://support.avaya.com
- For the Avaya 4600 Series IP Telephone LAN Administrator Guide:
- For information about 802.1X Authentication, Link Layer Discovery Protocol (LLDP), LLDP- Media Endpoint Discovery and Avaya IP Telephones:

For further information, please visit www.procurve.eu

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