ProCurve
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Wireless Edge Services zl Module Supplement
to the ProCurve zl Switch *Management and Configuration Guide*

This document provides supplemental information for the configuration, operation, and monitoring of ProCurve Wireless Edge Services zl Modules (J9051A) and the ProCurve Redundant Wireless Services zl Modules (J9052A) in ProCurve Series zl switches.

Related ProCurve zl Module publications include:

■ *ProCurve Wireless Edge Services zl Modules Getting Started Guide*

■ *ProCurve Wireless Edge Services zl Modules Management and Configuration Guide*

Related ProCurve zl Switch publications include:

zl Switch	Related Switch Publications
5400zl Series	• *ProCurve Switch zl Modules Installation Guide* • *ProCurve Series 5400zl Switches Installation and Getting Started Guide* • *ProCurve Series 5400zl Switches Management and Configuration Guide* • *ProCurve Series 5400zl Switches Access Security Guide* • *ProCurve Series 5400zl Switches Advanced Traffic Management Guide* • *Power over Ethernet Planning and Implementation Guide*
8200zl Series	• *ProCurve Switch zl Modules Installation Guide* • *ProCurve Series 8212zl Switch Installation and Getting Started Guide* • *ProCurve Series 8200zl Switches Management and Configuration Guide* • *ProCurve Series 8200zl Switches Access Security Guide* • *ProCurve Series 8200zl Switches Advanced Traffic Management Guide* • *Power over Ethernet Planning and Implementation Guide*

ProCurve Networking periodically updates switch software and product manuals, and posts them on the world-wide Web. For the latest software release and publications for your ProCurve Networking product, visit **www.procurve.com**. Click on **Software updates** to check on the latest software releases. To access latest product manuals, click on **Technical support** > **Product manuals (all)**, and then select the desired ProCurve product.

Applicable Products

ProCurve Switch 5406zl	(J8697A)
ProCurve Switch 5406zl-48G	(J8699A)
ProCurve Switch 5412zl	(J8698A)
ProCurve Switch 5412zl-96G	(J8700A)
ProCurve Switch 8212zl	(J8715A)
ProCurve Wireless Edge Services zl Module	(J9051A)
ProCurve Redundant Wireless Services zl Module	(J9052A)
ProCurve Wireless Services zl 12 RP License	(J9053A)
ProCurve Wireless Services zl 48 RP License	(J9090A)

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Applicable Switch Models

The ProCurve Wireless Edge Services zl Module (J9051A) and the ProCurve Redundant Wireless Services zl Module (J9052A) described in this supplement operate in ProCurve zl Series switches.

Minimum Software Version

The zl series switch software must be version K.12.40 or later.

This document describes a ProCurve Wireless Edge Services zl Module running software version number WT.01.03 or later.

Introduction

This supplement explains the set up and operation of the Wireless Edge Services zl Module and the Redundant Wireless Services zl Module as a part of a zl switch. It describes the switch features and capabilities that provide the support required for the Module's operation. Read this supplement for information on what is required to set up the Module and the switch to provide IEEE 802.11 wireless services in your network.

The ProCurve Wireless Edge Services zl Module (J9051A) enables a ProCurve zl switch to operate with ProCurve Radio Ports as a centrally-administered wireless LAN system. The switch can manage ProCurve Radio Ports to deliver IEEE 802.11 wireless network access to stations, such as wireless PCs and printers. With the addition of a Wireless Edge Services zl Module, virtually every wired port in a zl switch is able to support wireless or wired user traffic.

The ProCurve Redundant Wireless Services zl Module (J9052A) provides failover or high availability options within a wireless LAN system.

Licenses resident in the Wireless Edge Services zl Module, the primary Module, determine the number of radio ports supported by a wireless services-enabled switch. The Redundant Wireless Services zl Module does not contain any licenses itself. As a redundant Module, it uses a primary Module's licenses. A license for 12 radio ports is pre-installed at the factory. Additional license products can be purchased to increase the number of radio ports supported.

Note   Up to four zl Modules (primary or redundant) may be installed in a zl switch chassis.

General Operation

In a wireless services-enabled zl switch, the Wireless Edge Services zl Module and the Redundant Wireless Services zl Module use ports on the switch to pass wired and wireless traffic to and from the network. When a Module adopts a connected ProCurve Radio Port, it downloads configuration settings and operating instructions to it. A custom protocol encapsulates all wireless traffic, as well as management, status, and control communications with the radio port. WLANs, each of which is identified by a service set identifier (SSID), are configured and managed by the Module. WLANs define various network and security policies, including authentication and encryption, for the wireless services provided. A Web browser interface provides easy-to-use management for the Module and the wireless LAN.

Terminology

While the Wireless Edge Services zl Module (J9051A) and the Redundant Wireless Services zl Module (J9052A) differ in their roles, their configuration and support by the zl switch is nearly identical (*except* that a Redundant Wireless Services zl Module does not contain any radio port licenses, so it cannot adopt and control any radio ports on its own). Throughout this document, the term "Wireless Edge Services zl Module" is used to refer to both Modules, unless explicitly noted. Also, for brevity, the term "Module" is used throughout to refer to both of these products.

Term	Use in this Manual
Auto-VLAN	This is a special, automatically-created and configured, radio port VLAN (see radio port VLAN definition below) used by the zl switch to automatically enable communication between a zl Module's downlink port and a connected radio port. Only one radio port Auto-VLAN may exist on a zl switch. The Auto-VLAN is special in that it is automatically created and configured by the switch when a Module is installed into the switch, or when a radio port is connected to a PoE-enabled zl switch port. However, LLDP auto-provisioning must be enabled on the switch (it is enabled by default). When the switch creates the Auto-VLAN, it uses the first available VLAN ID (VID) starting from the provisioned **vlan-base** value, which is 2100 by default. Therefore, the VLAN ID for the radio port VLAN is normally 2100. After a radio port Auto-VLAN has been established, no additional radio port Auto-VLANs are created. The switch automatically configures this VLAN by adding the downlink ports (<*slot-ID*>DP) of subsequently installed zl Modules to this VLAN as tagged members. The uplink ports (<*slot-ID*>UP) of the above Modules are automatically added as tagged members to VLAN 1 (DEFAULT VLAN). When the switch detects LLDP data at a port identifying a newly-attached radio port, it automatically adds that port to the Auto-VLAN as an untagged member. The **lldp auto-provision radio-ports auto-vlan <*vid*>** command may be used to create or change the Auto-VLAN. See "Automatic RP VLAN Operation Using LLDP" on page 12 for more details on auto-provisioning.
Downlink Radio Ports	zl switch ports that share radio port VLAN membership (tagged or untagged) with the Module's downlink port. If a radio port is *directly* connected to the zl switch port, it must have an *untagged* membership in the radio port VLAN.
Downlink Port	The internal Module port that carries wireless station traffic to and from the Wireless Edge Services zl Module. This port is identified by the switch slot ID where the Module is installed, with 'DP' appended. For example, "CDP" is the downlink port for a Wireless Edge Services zl Module installed in slot C of a zl switch.
Infrastructure switch	A switch that provides connectivity between a Wireless Services-Enabled ProCurve zl Switch and a radio port. For management purposes, these switches should also be members of a separate VLAN.
Infrastructure switch port	A port in an intermediate switch that provides connectivity between a Wireless Services-Enabled ProCurve zl Switch and a radio port. If the radio port is connected *directly* to an infrastructure switch port, the port must be an *untagged* member of the radio port VLAN. If not connected directly to a radio port, the port may be a tagged or untagged member of the radio port VLAN, depending on network requirements.

Term	Use in this Manual
Layer 2 adoption	A radio port is adopted by a Module in the same Layer 2 domain (subnet). Software version WT.01.03 (or later) supports both Layer 2 and Layer 3 adoption.
Layer 3 adoption	A radio port is adopted by a Module in a different Layer 2 domain (subnet), separated from the radio port by a router or routing switch. **Note:** Layer 3 adoption requires the radio port to be running an updated bootloader code, which is installed automatically when a radio port is adopted. However, depending on the current bootloader code version in the radio port, adoption may need to occur at Layer 2 first, before it can be adopted at Layer 3.
Radio Port (RP)	ProCurve Radio Ports support the 802.1X protocol for port-based access control as well as LLDP, in the transmit-only mode of operation. Radio ports receive their configuration and operating information when adopted by the zl Module. • Layer 2 adoptions: A radio port operates as a Layer 2, IEEE 802.3af-compliant device, using Link Layer Discovery Protocol (LLDP) and 'Hello' messages to announce its presence to any available Module in the Layer 2 domain (subnet). If an available Module has sufficient licenses, the radio port is adopted. IP addresses are not used, and there is no user interface available. • Layer 3 adoption: When a radio port is first powered up in a network, it initially operates as a Layer 2, IEEE 802.3af-compliant device, as described above. If an available Module has sufficient licenses, a Layer 2 adoption occurs. However, if no Module replies at Layer 2, a radio port then initiates a Layer 3 adoption, which requires an IP address for the radio port and an IP address of an available Module. When these are supplied (through DHCP), a Layer 3 adoption of the radio ports occurs. A Layer 3 adopted radio port has an IP address, but no user interface. For more information, see "Radio Port Adoption" in the latest *Management and Configuration Guide* for your ProCurve Wireless Edge Services zl Module.
Radio Port VLAN (Layer 2 Adoption)	A VLAN that carries wireless traffic as well as management, control, and status information between the Module and radio ports. This VLAN may span multiple switches. This VLAN includes: • the Module's downlink port (<*slot-id*>DP) configured with *tagged* VLAN membership, • other ports connecting infrastructure switches (when applicable) tagged or untagged, according to the network topology, and • switch ports to which radio ports are directly attached, as *untagged* members. The Auto-VLAN is an automatically-created and configured radio port VLAN used for Layer 2 adoption. While there can be multiple radio port VLANs, there can be only one radio port Auto-VLAN.

Term	Use in this Manual
Radio Port VLAN (Layer 3 Adoption)	When a radio port is placed in a Layer 2 domain different from the Module's, and the domains are separated by a router or routing switch, Layer 3 Adoption must be used. For Layer 3 Adoption, a radio port must be able to acquire an IP address from a DHCP server. A VLAN with the Wireless Module's IP address carries wireless traffic as well as management, control, and status information sent between the Module and radio ports. This VLAN contains either the Module's internal uplink or downlink port (but not both) as a tagged member. This VLAN may span multiple switches and domains. Infrastructure switches need to be configured with the necessary IP helper addresses to ensure that the radio port can acquire the Module's IP address (for example, through special DHCP option 189 messages or DNS). For detailed information on configuring Layer 3 Adoption, see "Radio Port Adoption" in the latest *Management and Configuration Guide* for the Wireless Edge Services zl Module.
Station	A device (such as a wireless PC or printer) containing an IEEE 802.11-conformant medium access control (MAC) and physical layer (PHY) interface to the wireless medium.
Uplink Port	The internal Module port that carries traffic to and from the network. The uplink port may be a member of multiple VLANs; it must be a tagged member of any uplink VLAN. This port is identified by the slot ID where the Module is installed, appended with 'UP.' For example, "CUP" is the uplink port for a Wireless Edge Services zl Module installed in slot C of a zl switch.
Uplink Network Ports	Any zl switch port that is a member of an uplink VLAN.
Uplink VLAN	A VLAN containing the uplink port as a tagged member. By default, this is the **DEFAULT_VLAN** (VLAN 1) on the zl switch. There may be more than one uplink VLAN.
Wireless Services-Enabled ProCurve Switch	A ProCurve zl switch with a Wireless EDGE Services zl Module (or Redundant Module) installed, capable of managing ProCurve Radio Ports to deliver 802.11 wireless access to stations.

Related Publications

This supplement describes the setup and configuration of the ProCurve Wireless Edge Services zl Modules in a Wireless Services-Enabled ProCurve zl Switch. The focus is on Module operation as part of a zl switch. Other documentation describes the operation of these Modules in providing wireless services. The following manuals provide further information:

■ For information on the Module's specifications, hardware features, and installation, refer to the *ProCurve Switch zl Modules Installation Guide* provided with the Module.

■ Additional information on the initial setup of the Modules in the zl switch can be found in the *Installation and Getting Started Guide* for your particular zl switch model.

■ For initial setup instructions with examples, see the *ProCurve Wireless Edge Services zl Modules Getting Started Guide* provided with the Module.

■ For detailed information and instructions on how to configure and manage a Module and wireless services in your network, refer to the *ProCurve Wireless Edge Services zl Modules Management and Configuration Guide.*

The latest versions of these documents are available on the ProCurve Networking Web site at www.procurve.com (click on **Technical support**, then **Product manuals (all)**, and select your ProCurve zl switch model.).

General Operating Rules with zl Switches

■ Use the **show vlans** command to check the maximum number of VLANs allowed. Use the **max-vlans** *<1-2048>* command to change the number, if required.

■ Shut down the Module
   • before resetting or reloading the zl switch chassis
   • before turning off the zl switch chassis.
   • before removing the Module from the zl switch chassis.

See the **shutdown** command in "CLI Configuration Commands Overview and Syntax" on page 28.

Radio Ports

Installing a ProCurve Wireless Edge Services zl Module or a ProCurve Redundant Wireless Services zl Module in a zl switch creates a wireless services-enabled switch that centrally configures and manages ProCurve Radio Ports, distributed throughout a network, to provide 802.11 wireless services.

A Module has no visible external ports. It communicates with the wired (uplink) and wireless (downlink) sides of the network through the VLAN connectivity of its internal ports. An Uplink VLAN, containing the Module's uplink port, communicates with the wired side of the network; Downlink Radio Port VLANs, containing the Module's downlink port, communicate with the wireless side of the network. The internal Module ports are tagged members of their respective VLANs.

Note   It is recommended that any infrastructure switch connecting a radio port and the wireless services-enabled zl switch also be a member of a management VLAN that includes that zl switch. This provides management of these switches through the wireless services-enabled zl switch.

Licenses

Licenses installed on the Wireless Edge Services zl Module, the primary Module, determine how many radio ports can be controlled. When shipped from the factory, the primary Module contains a license for 12 Radio Ports. Additional licenses can be purchased.

The Redundant Wireless Services zl Module supplies failover or availability options within a wireless LAN, and uses the licenses of the primary Module.

Radio Ports as Layer 2 Devices

ProCurve Radio Ports are typically Layer 2 devices that use IEEE 802.3af-compliant Power over Ethernet (PoE). For Layer 2 operation, they have no IP address and no user interface. ProCurve Radio Ports, attached either directly to wireless services-enabled zl switch or directly to infrastructure switches, communicate with a Wireless Edge Services zl Module over an *untagged* interface using a custom protocol. This protocol encapsulates station wireless traffic as well as management, control, and status information sent between a radio port and a Module.

To control a radio port, a Module must have network connectivity to it. A radio port VLAN supplies this connectivity. This VLAN contains the Module's internal downlink port as a tagged member, and the downlink radio port (the port connected directly to the radio port on the local, or on an infrastructure, switch) as an untagged member.

See Figure 1 for a summary of the VLAN configurations required to support Layer 2 radio port and the internal Module uplink and downlink port communications.

Figure 1.   VLAN Support for Layer 2 Radio Port Adoption

Layer 2 Radio Port Adoption
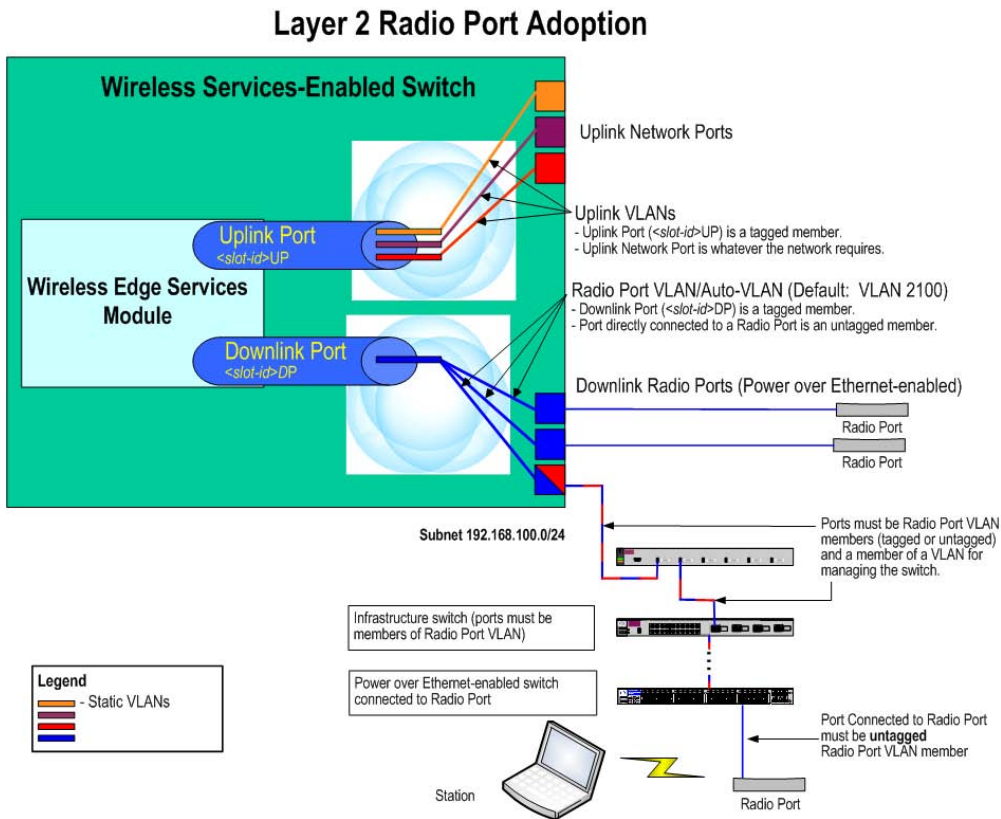
Note   Routing may not be used in the communications path between the Wireless Services-Enabled zl Switch and a radio port when a radio port is adopted at Layer 2. For Layer 3 adoption, see "Radio Ports as Layer 3 Devices" on page 9 for more information.

Radio Ports as Layer 3 Devices

You can configure the network to allow radio port adoption and communication over Layer 3.

N o t e   During radio port adoption, the Module automatically downloads a compatible bootloader code version into the radio port. However, to support Layer 3 adoption, a suitable bootloader code version must already be operating in the radio port. If a radio port fails Layer 3 adoption, it may be necessary to first adopt the radio port at Layer 2 so that it is updated with a suitable bootloader code version, and then re-installed for adoption at Layer 3.

A radio port initially attempts to establish communication with a Module using Layer 2. If that fails, a radio port sends a DHCP request to begin the process of establishing communication with a Module.

After acquiring an IP address and a default gateway, the radio port next needs a Module's IP address. Depending on your network configuration, a Module's IP address is acquired using either a special DHCP option (option 189) or through the Domain Name System (DNS).

Figure 2 shows the VLANs and network components needed for Layer 3 radio port adoption. For more information, see "Network Requirements for Layer 3 Adoption" in the *Management and Configuration Guide* for your zl Module.

Figure 2. **VLAN Support for Layer 3 Radio Port Adoption**
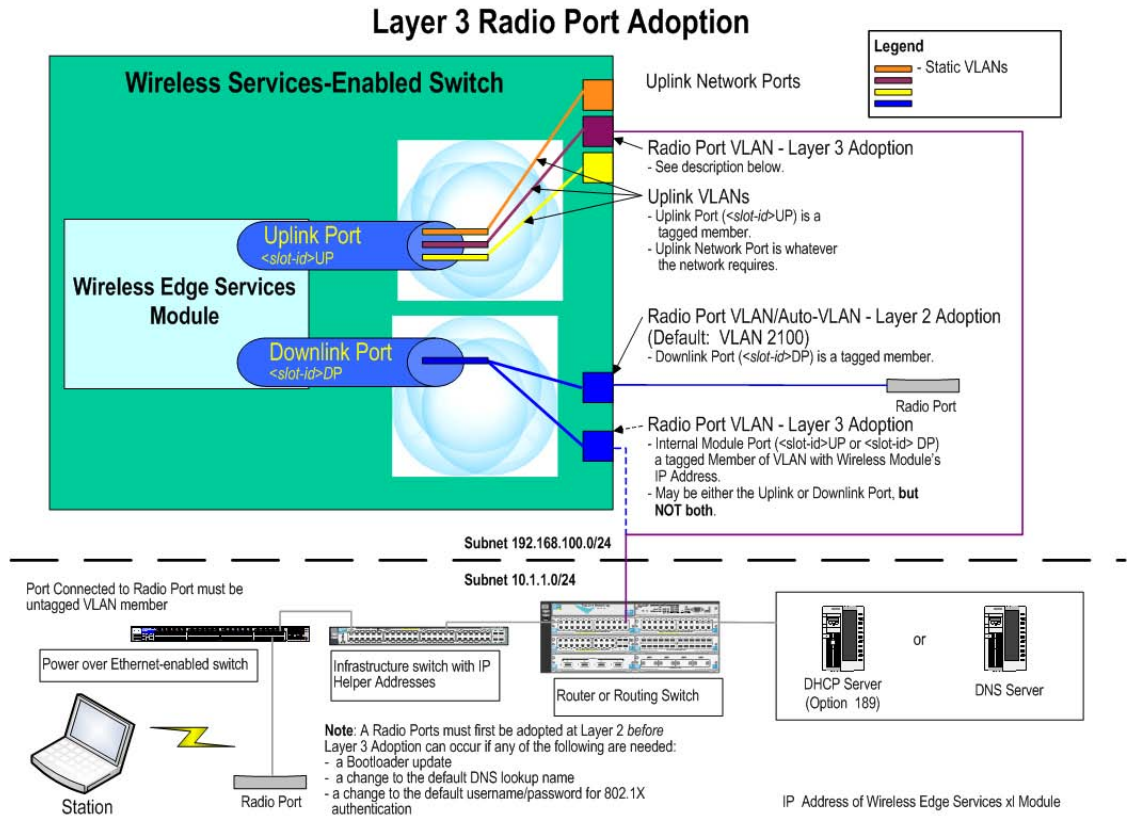
Using zl Switch Features for the Module

A zl switch provides support for the Wireless Edge Services zl Module in three major areas:

- providing VLANs for network communication, critical for radio-port adoption and control;
- initial Module set up; and
- Module management interfaces

These topics are covered in the following sections.

Configuring zl VLANs for Radio Port Adoption

The set up and configuration of VLANs used for communication between a radio port and the downlink port of the Wireless Edge Services zl Module is an essential element in providing wireless services in a network. This connectivity enables radio port adoption, the foundation for supplying wireless services. The zl switch software automates much of this VLAN set up and configuration.

If infrastructure switches are used to connect radio ports to a wireless services-enabled switch, some manual VLAN configuration is required. You also may choose to do VLAN set up and configuration manually on the zl switch as well.

On a zl switch, two methods for automating radio port VLAN set up and configuration are available:

- LLDP auto-provisioning (enabled by default), and
- 802.1X RADIUS-assigned VLANs (disabled by default).

LLDP auto-provisioning and 802.1X RADIUS-assigned VLANs both temporarily override a port's static configuration while the radio port connection is active. A port's static configuration is saved in the switch's configuration, but is not applied to the port until override control is relinquished. Both of these methods can be used simultaneously in a zl switch.

The following switch authentication applications take precedence over LLDP:

■ 8021.X

■ Web Authentication

■ MAC Authentication

This means that if LLDP is currently overriding a port's static configuration, and 802.1X authentication is enabled on the port, LLDP's override can be superseded by an 802.1X override.

All three of the above authentication schemes take precedence over LLDP. The **show vlan** *<vid>* CLI command list the ports being temporarily overridden for a given VLAN, along with the application that is forcing the override.

Note When using Layer 3 adoption, any VLAN which has the IP address of the Module may be used. Either the Module's internal uplink port (*<slot-id>*UP) or the internal downlink port (*<slot-id>*DP), **but not both**, must be a member of this VLAN.

Automatic RP VLAN Operation Using LLDP

LLDP CLI commands available in the zl switch software provide automatic VLAN creation (the Auto-VLAN) and memberships for both Module and switch ports to enable radio port communications. These commands are enabled by default and allow radio ports connected directly to PoE-enabled zl switch ports to communicate with the Module without any manual configuration,

Use the **show lldp auto-provision radio-ports** command to display the settings and status of auto-provisioning by the switch.

```
ProCurve(config)# show lldp auto-provision radio-ports

LLDP auto-provision Radio-Ports Support:

  LLDP Radio Port Enable [Yes] : Yes
  LLDP Radio Port suggested auto-vlan [2100] : 2100
  LLDP Radio Port auto-vlan  : 2100
  LLDP Radio Port assigned ports : C1,C23

  LLDP Global Enable [Yes] : Yes

ProCurve(config)#
```

Radio ports connected to infrastructure switches also can use the Auto-VLAN, but the infrastructure switches require manual configuration of the Auto-VLAN and port membership assignments. This includes the downlink radio ports (unless 802.1X RADIUS-assigned VLANs do so) and network uplink ports to the wireless services-enabled switch.

To simplify manual configuration, it is recommended that any infrastructure switches be members of a management VLAN that includes the wireless services-enabled zl switch.

The **lldp auto-provision radio-ports** command enables or disables auto-provisioning by the switch (enabled by default). The action taken by the switch when a Module or radio port is detected or removed depends on the state of auto-provisioning (enabled or disabled) and the existence and port membership of the Auto-VLAN. This behavior is described in Table 1.

Note   In the table, the state **Auto-Provision** means auto-provisioning is enabled; **No Auto-Provision** means auto-provisioning is disabled.

Auto-VLAN means an Auto-VLAN is configured on the switch; **No Auto-VLAN** means that there is no Auto-VLAN configured.

Table 1.   Automatic VLAN Provisioning with LLDP

Event	Switch State			
	Auto-Provision No Auto-VLAN (initial default state)	**Auto-Provision Auto-VLAN**	**No Auto-Provision Auto-VLAN**	**No Auto-Provision No Auto-VLAN**
Wireless Edge Services zl Module Detected	• Create Auto-VLAN from **vlan-base** • Add <*slot-id*>DP tagged to Auto-VLAN • Remove <*slot-id*>DP tagged from VLAN 1 • Add <*slot-id*>UP tagged to VLAN 1 *New State:* Auto-Provision Auto-VLAN	• Add <*slot-id*>DP tagged to Auto-VLAN • Remove <*slot-id*>DP tagged from VLAN 1 • Add <*slot-id*>UP tagged to VLAN 1	• Add <*slot-id*>DP tagged to Auto-VLAN • Remove <*slot-id*>DP tagged from VLAN 1 • Add <*slot-id*>UP tagged to VLAN 1	• Add <*slot-id*>DP tagged to VLAN 1 *only if* it belongs to no other VLAN. If the downlink port is a static member of a VLAN, it is unchanged. • Add <*slot-id*>UP tagged to VLAN 1 *RPs will not be adopted at Layer 2 on a VLAN that includes both the Uplink and Downlink ports.*
[1] DRP is a Downlink Radio Port				(Part 1 of 3)

Event	Switch State			
	Auto-Provision No Auto-VLAN (initial default state)	**Auto-Provision Auto-VLAN**	**No Auto-Provision Auto-VLAN**	**No Auto-Provision No Auto-VLAN**
Wireless Edge Services zl Module Removed	• No action taken	• No action taken	• No action taken	• No action taken
Radio Port Detected (LLDP enabled on switch and port)	• Create Auto-VLAN from **vlan-base** • Adds DRP[1] to Auto-VLAN (temporary VLAN override) *New State:* Auto-Provision Auto-VLAN	• Adds DRP[1] to Auto-VLAN (temporary override)	• No action taken	• No action taken
Radio Port Removed	• No action taken (Only possible if no Modules are installed and LLDP is disabled on the switch or the port)	• Removes DRP[1] from Auto-VLAN	• No action taken	• No action taken

User Creates or Changes Auto-VLAN	• Create empty Auto-VLAN with specified VID
	New State:
	  Auto-Provision Auto-VLAN
		• Create Auto-VLAN with specified VID
		• Add all *<slot-id>*DP to new Auto-VLAN
		• Moves all DRPs to new Auto-VLAN
		• If old Auto-VLAN contains only *<slot-id>*DP or is empty, delete old Auto-VLAN
			• Create Auto-VLAN with specified VID
			• Add all *<slot-id>*DP to new Auto-VLAN
			• If old Auto-VLAN contains only *<slot-id>*DP or is empty, delete old Auto-VLAN
			• DRP temporary VLAN override unchanged
				• Create Auto-VLAN with specified VID
				• Add all *<slot-id>*DP to Auto-VLAN
				• Remove all *<slot-id>*DP tagged from VLAN 1
				New State:
				  No Auto-Provision Auto-VLAN

User Deletes Auto-VLAN	• Operation denied - VLAN does not exist	• Operation denied - must first disable Auto-Provision	• Delete the VLAN • If *<slot-id>*DP is orphaned, move to VLAN 1 (tagged) *New State:* No Auto-Provision No Auto-VLAN	• Operation denied - VLAN does not exist
[1] DRP is a Downlink Radio Port				(Part 2 of 3)

Event	Switch State			
	Auto-Provision No Auto-VLAN (initial default state)	**Auto-Provision Auto-VLAN**	**No Auto-Provision Auto-VLAN**	**No Auto-Provision No Auto-VLAN**

User Enables Auto-Provision	• No action taken	• No action taken	• Confirm that all *<slot-id>*DPs are tagged members of Auto-VLAN
			
			New State:
			  Auto-Provision Auto-VLAN
				• Enable Auto-Provision
				• If Module installed:
				  – Create Auto-VLAN from vlan-base
				  – Add *<slot-id>*DP tagged to Auto-VLAN
				  – Remove *<slot-id>*DP tagged from VLAN 1
				  – Add *<slot-id>*UP tagged to VLAN 1
				
				New State (No Module or DRP[1]):
				  Auto-Provision No Auto-VLAN
				
				New State (Module or DRP[1]):
				  Auto-Provision Auto-VLAN

User Disables Auto-Provision	• Disable Auto-Provision
	
	New State:
	  No Auto-Provision No Auto-VLAN
		• Disable Auto-Provision
		• If Auto-VLAN exists and is empty, delete Auto-VLAN
		
		New State (Auto-VLAN not empty):
		  No Auto-Provision Auto-VLAN
		
		New State (Auto-VLAN exists and is empty):
		  No Auto-Provision No Auto-VLAN
			• No action taken	• No action taken

[1] DRP is a Downlink Radio Port				(Part 3 of 3)

An Auto-VLAN is created when:

- a Wireless Edge Services zl Module or Redundant Module is first inserted into a zl switch, or
- a radio port that is directly connected to a PoE-enabled port on the zl switch is detected.

The Auto-VLAN is created with the first available VLAN ID, starting from the **vlan-base** (the default is 2100). There can be only one Auto-VLAN in a switch. If one exists already, a new one is not created.

Auto-provisioning configures and manages the Module and switch ports to automatically supply communication between radio ports and the Module. In the default configuration, when a Module is inserted, auto-provisioning:

- adds its internal downlink port (*<slot-id>*DP) to the Auto-VLAN as a tagged member
- removes the downlink port from VLAN 1, and
- places the Module's uplink port (*<slot-id>*UP) into VLAN 1 as a tagged member

In the default configuration, LLDP is globally-enabled and enabled on the zl switch ports, and auto-provisioning is enabled. When a radio port connection to the wireless services-enabled switch is discovered (through LLDP data it transmits), the connecting switch port is placed in the Auto-VLAN as an untagged member using a temporary override of the port's static VLAN. The override is temporary in that it terminates when the radio port is disconnected, or a higher-priority override is made to the port. A VLAN override is not saved in a configuration file and is lost when the switch reboots.

When a radio port is disconnected from the zl switch, the temporary VID is removed and the switch port returns to the VLAN(s) for which it was statically configured as a member.

N o t e   Auto-provisioning does not occur if the radio port connects to a switch port that already has a temporary override VLAN assigned.

LLDP Auto-Provisioning. By default, LLDP is enabled on the switch and all switch ports. The following command enables auto-provisioning. For auto-provisioning to operate, it must be in an enabled state.

 ProCurve (Config)# lldp auto-provision radio-ports

The **no** form of this command disables auto-provisioning.

Automatic RP VLAN Operation Using RADIUS-Assigned VLANs

Using 802.1X RADIUS-assigned VLANs, an authenticated radio port may be automatically assigned to a designated radio port VLAN. Any PoE-enabled switch port configured as an 802.1X authenticator may be used to connect an authenticated radio port. Using authentication, only authorized radio ports can provide wireless services to the network.

Radio ports use a supplicant-initiated, MD5-based 802.1X authentication scheme. A global username and password (default values are *admin* and *procurve* respectively) may be configured for all adopted radio ports. With a RADIUS server configured to assign authenticated radio ports to a radio port VLAN, radio ports may be connected to switch ports configured as 802.1X authenticators and begin communicating with the wireless services-enabled switch.

802.1X must be configure in port-based mode (the default mode) rather than client-based mode, if that option is available. Client-based mode allows multiple clients (1-32) on the same port, but only when they individually authenticate themselves. Radio ports will *not* be adopted if 802.1X is configured on a port in the client-based mode.

ProCurve Identity Driven Management can be used to configure and manage policies that allow a RADIUS server to assign VLANs, as well as ACLs and rate limits to authenticated clients. Alternately, VLAN assignment can be configured directly on the RADIUS server.

Manually Configuring RP VLAN Operation

You can manually configure static VLANs to provide communication between the wireless services-enabled switch and a radio port, as well as communication to the wired network (uplink network ports). You may configure as many uplink VLANs and radio port VLANs as your network requires, provided that these VLANs only include the Module's internal uplink or downlink port as *tagged* members.

If auto-provisioning is disabled when a Module is installed:

■ the switch adds the Module's uplink port to the **DEFAULT_VLAN** as a tagged member, and

■ the switch adds the Module's downlink port, if not a member of any existing VLAN, to the **DEFAULT_VLAN** as a tagged member.

This configuration will not support radio port adoption at Layer 2. Radio port adoption at Layer 2 uses the downlink port. However, to prevent loops, the Module will automatically ignore the downlink port's membership to a VLAN that also includes the uplink port.

When configuring radio port VLANs manually, you should:

■ first disable LLDP auto-provisioning (**no lldp auto-provision radio-ports**) to ensure that radio ports are not automatically assigned to an incorrect VLAN.

■ configure the Module's uplink and downlink ports as tagged members of separate VLANs.

Note   Any non-radio port traffic received on the Module's downlink port is dropped.

When manually configuring Module and radio port communication paths, you must:

■ Specify a radio port VLAN using standard CLI commands, and add the internal downlink port (as a tagged member) and downlink radio ports, including infrastructure switches, to it.

■ Add the internal uplink port as a tagged member to any VLAN needed for communication to the wired network.

■ Disable LLDP auto-provisioning and 802.1X RADIUS-assigned radio port VLANs.

If you wish to specify the Auto-VLAN and not use the first available VLAN starting from **vlan-base** (default VLAN 2100), but allow ports to be auto-provisioned, do the following:

■ Use the **lldp auto-provision radio-ports auto-vlan <*vid*>** command to enable and designate the desired Auto-VLAN.

■ Use LLDP auto-provisioning or 802.1X RADIUS-assigned radio port VLANs for automatic downlink radio ports and Module uplink and downlink port setup.

zl Switch Features Not Supported

As the Module uses internal ports and VLANs for wireless services to stations, not all of the features of the zl switch are applicable. For example, adding the internal downlink or uplink port to a trunk would not be compatible with the Module's operation, and is prohibited.

Some zl switch configurations are not allowed by the Command Line Interface (CLI). When a CLI command fails, a descriptive message is typically displayed. Warning messages are issued when an operation could potentially cause problems managing traffic through the Module. For example, if the Module's downlink and uplink ports are configured as tagged members of the same VLAN, a warning message is issued because this is not a recommended configuration. In some cases, Log messages are created stemming from an operation or event, and describe potential problems that may occur as a result.

Note   zl switch ports that are not used by the Wireless Edge Services Module continue to operate as regular zl switch ports. Their operation is not affected.

Table 2 presents the zl switch features that are not supported for use with a Wireless Edge Services Module.

Table 2.   zl Switch Features Not Supported on a Module

Feature	Uplink Port	Downlink Port	Downlink Radio Ports	Radio Port VLANs	Explanation
802.1X	x[a]	x			Not allowed.
GVRP	x	x			GVRP cannot be enabled on a Module's uplink or downlink port.
Interface Monitoring (Port Mirroring)	x	x			Cannot be used as a monitoring port.
Interface Provisioning: Speed Duplex Flow-Control Auto-MDIX mode	 x x x x	 x x x x			 Fixed at 1000Mbps. Fixed at Full-Duplex. Not allowed. Not allowed.
LLDP	x	x			Set to off.
MAC Auth	x	x			Not allowed.
Meshing	x	x			Not allowed.
Trunking[b]: LACP	 x	 x			 Not allowed.
Web Auth	x	x			Not allowed.

a. 'x' indicates that the feature is not supported.
b. A zl switch trunk group that is configured using the **trunk** option, can be added to a radio port VLAN.

Management Interfaces

To configure and manage the ProCurve Wireless Edge Services zl Module, you can use one of the following management interfaces:

■ Web browser interface — Accessed through a Web browser, this intuitive interface provides comprehensive information to help you manage and monitor your company's wireless services. The menus and online help guide you through configuration steps.

■ Command line interface (CLI) — Available through a serial, Telnet, or Secure Shell (SSH) session to the zl switch. The **wireless-services** context provides a complete set of commands to configure, manage, and troubleshoot your wireless services.

The CLI commands available in the **wireless-services** context of the zl switch CLI are documented in an appendix of the *Management and Configuration Guide* for your Wireless Edge Services Module.

Web Browser Interface

Because the Web browser interface simplifies both management and configuration tasks, this interface is recommended. See the *Management and Configuration Guide* for your Wireless Edge Services Module for information on using the Web browser interface to configure and manage a Module.

To run the Web browser interface for the ProCurve Wireless Edge Services zl Module, your workstation must be running Java Virtual Machine (JVM), which enables the Web browser to run Java applets. If your workstation is not running the JVM and you attempt to open the Module's Web browser interface, the workstation will automatically try to access the Internet and download the JVM.

In addition to ensuring that your workstation is running JVM, you must be able to access the Wireless Edge Services zl Module's IP address from the workstation that is running the Web browser. Either determine the IP Address dynamically assigned to the Module (through DHCP), or assign a static IP address and default gateway before attempting access to the Module's Web browser interface.

Once the Module's IP address is know, you can open the Module's Web browser interface by enter the IP address in your browser's address field.

Alternatively, you can access the zl switch's Web browser interface to access the Module Web browser interface. Open a browser window, using the switch's IP address. Go to the **Configuration** tab, then select the link displayed on the Module's image.

Figure 3.   Accessing the Module Web Browser Interface from the Switch Web Browser Interface
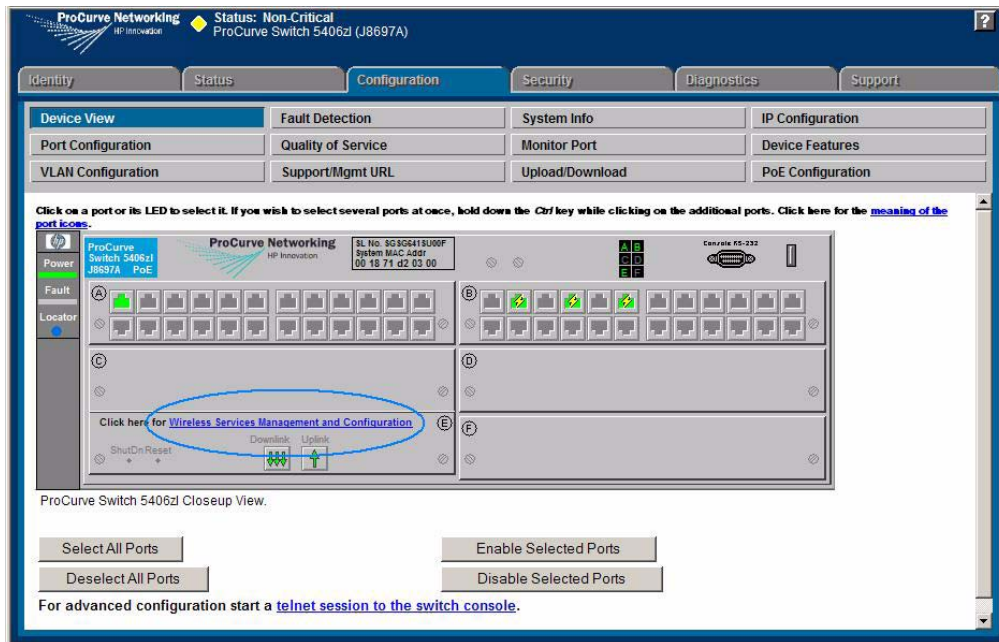
CLI (Command Line Interface)

You must first access the switch CLI, in accordance with your switch manuals. You cannot access the Module CLI commands directly.

Displaying the Module's Software Version

Use the **show wireless-services** *<slot-id>* command to display Module's software version. The following example shows a Module running software version WT.01.03 in slot C of the switch:

```
ProCurve> show wireless-services c

 Status and Counters - Wireless Services Module C Status

  HP Wireless Services ZL Module J9051A

  Versions          : A.01.05, B.01.01, WT.01.03
  Current status    : running
  Uplink MAC address  : 0001e6-f586fd

 For more information, use the show commands in wireless-services context

ProCurve>
```

Accessing the Module's CLI

Access to the Module's CLI is based on the user's access level: operator or manager. For example, manager-level CLI access uses the following CLI command:

ProCurve# wireless-services *<slot-id>*
ProCurve(wireless-services-*<slot-id>*)#

where *<slot-id>* is the switch slot in which the Module is installed.

Table 3 shows the commands available at the switch operator and manager levels.

Table 3.   Module CLI Commands by User Access Level

Operator (ProCurve>)	Manager (ProCurve#)	Description
–	acknowledge	Acknowledge alarms
–	archive	Manage archive files
cd	cd	Change current directory
–	clear	Reset functions
cls	cls	Clear the display screen
–	configure	Enter configuration mode
–	copy	Copy from one file to another
–	debug	Debugging functions
diff	diff	Display differences between two files
dir	dir	List files on a file system
–	edit	Edit a text file
–	erase	Delete specified file from the system
exit	exit	End current mode, return to previous mode
–	halt	Halt wireless Module
help	help	Describes the interactive help system
logout	logout	Exit from the CLI
–	mkdir	Create a directory
–	more	Display the contents of a file
–	no	Negate a command or set its defaults
page	page	Toggle paging
ping	ping	Send ICMP echo messages
pwd	pwd	Display current directory
redundancy-group-cli-config	redundancy-group-cli-config	Redundancy group config context
–	reload	Halt and perform a warm reboot
–	rename	Rename a file
–	rmdir	Delete a directory

Operator (ProCurve>)	Manager (ProCurve#)	Description
show	show	Show running system information
support	support	Support commands
–	telnet	Open a Telnet connection
–	terminal	Set terminal line parameters
–	upgrade	Upgrade software image
–	upgrade-abort	Abort an ongoing upgrade
write	write	Write running configuration to memory or terminal

Configuring the Module on the Network

By default, the Module uses DHCP to get an IP address. When the IP address is assigned manually, be sure to configure a Default Gateway as required.

Use the following commands to configure an IP address manually.

Note "**ProCurve**" is used here as a generic prompt for all zl switches.

ProCurve# wireless-services *<slot-id>*

ProCurve(wireless-services-<slot-id>)#configure

ProCurve(wireless-services-<slot-id>)(config)#interface vlan1

ProCurve(wireless-services-<slot-id>)(config-if)# ip address *<ip-addr>*

where *<slot-id>* is the slot in the zl switch where the Module is installed, *<ip-addr>* is either the IP address in CIDR notation (n.n.n.n/mask bit number) *or* **dhcp**, which uses a DHCP client to obtain an IP address.

If necessary, use the following command in the **Config** context to set or change the default gateway:

ProCurve(wireless-services-<slot-id>)(config)#ip default-gateway *<ip-addr>*

where *<ip-addr>* is the numeric IP address of the default gateway, for example 10.1.2.1.

To display the Module's IP address, you must first go to the **wireless-services** context in the zl switch CLI, using the following command:

ProCurve# wireless-services *<slot-id>*

To show the Module's IP address, enter

ProCurve(wireless-services-<slot-id>)# show ip interfaces

The following example shows the IP address assigned by DHCP to a Module installed in Slot C of a zl switch:

```
ProCurve(wireless-services-C)#show ip interface
Interface          IP-Address          Status          Protocol
vlan1              10.100.50.10(DHCP)  up              up
vlan21             10.10.10.10         up              up
ProCurve(wireless-services-C)#
```

Changing the Auto-Provision VLAN-Base

You may wish to use another VLAN as your suggested Auto-VLAN. This may be done using the following command.

ProCurve (config)# lldp auto-provision radio-ports vlan-base *<2-4094>*

> where *<2-4094>* is the suggested VLAN ID (VID) used when the Auto-VLAN is created by LLDP auto-provisioning.

The following command changes the **vlan-base** used when the Auto-VLAN is created to 120 instead of the default 2100.

ProCurve (Config)# lldp auto-provision radio-ports vlan-base 120

As illustrated below, the **show lldp auto-provision radio-ports** command displays the new configuration of the **vlan-base**.

```
ProCurve(config)# show lldp auto-provision radio-ports

LLDP auto-provision Radio-Ports Support:

  LLDP Radio Port Enable [Yes] : Yes
  LLDP Radio Port suggested auto-vlan [2100] : 120
  LLDP Radio Port auto-vlan  : 2100
  LLDP Radio Port assigned ports : C1,C23

  LLDP Global Enable [Yes] : Yes

ProCurve(config)#
```

Creating or Changing the Radio Port Auto-VLAN

You may wish to manually create or use another VLAN as the Auto-VLAN. This may be done using the following command.

ProCurve (Config)#lldp auto-provision radio-ports auto-vlan *<vid>*

> where **<vid>** is 2-4094. See Table 1, "Automatic VLAN Provisioning with LLDP," on page 13 for information on the changes that occur, depending on the current state of the switch.

The following command changes the **auto-vlan** to 3200 instead of the default 2100.

ProCurve (Config)# lldp auto-provision radio-ports auto-vlan 3200

The **show lldp auto-provision radio-ports** command displays the new **auto-vlan**.

```
ProCurve(config)# show lldp auto-provision radio-ports

LLDP auto-provision Radio-Ports Support:

  LLDP Radio Port Enable [Yes] : Yes
  LLDP Radio Port suggested auto-vlan [2100] : 120
  LLDP Radio Port auto-vlan  : 3200
  LLDP Radio Port assigned ports : C1,C23

  LLDP Global Enable [Yes] : Yes

ProCurve(config)#
```

The **no lldp auto-provision radio-ports auto-vlan <*vid*>** may be used to delete the radio port Auto-VLAN. See Table 1, "Automatic VLAN Provisioning with LLDP," on page 13 for information on the changes that occur, depending on the current state of the switch.

Managing Module Configuration Files

The configuration files for the Wireless Edge Services zl Module and the Redundant Wireless Services zl Module are stored on the Module, not on the zl switch, which may be unlike other zl module accessories. An external FTP or TFTP server must be used to back up and restore a Module's complete configuration. The switch does save a small subset of the Module's configuration that allows the switch:

- to locate the full configuration file on the external FTP or TFTP server, and,

- to validate the configuration file using a checksum

For more information on configuring and managing configuration files on an external FTP or TFTP server see the latest *Management and Configuration Guide* for your Wireless Edge Services Module.

The stored subset of a Module's configuration file appears in a **show running-config** or **show config** command as uneditable text.

CLI Configuration Commands Overview and Syntax

Command	Page
Switch Configuration Context	
[no] lldp auto-provision radio-ports	29
[no] lldp auto-provision radio-ports auto-vlan <vid>	29
lldp auto-provision radio-ports vlan-base <2-4094>	29
wireless-services <*slot-id*>	30
wireless-services <*slot-id*> reload	30
wireless-services <*slot-id*> shutdown	30
Wireless-Services Context	
For a complete listing of the commands, please refer to the *ProCurve Wireless Edge Services zl Modules Management and Configuration Guide*.	

Switch **Config** Context Commands and Syntax

Syntax: [no] lldp auto-provision radio-ports

> *Enables ports connecting to a radio port, discovered using LLDP, to be automatically placed into the Auto-VLAN. LLDP must be enabled on the switch and the port.*
>
> *When enabled (the default) the Auto-VLAN (default 2100) is created when a Module or radio port is detected. The Module downlink port, <slot-id>DP, is placed in the Auto-VLAN as a tagged member; the Module's uplink port, <slot-id>UP, is placed in the DEFAULT_VLAN (VLAN 1) as a tagged member.*
>
> *The* **no** *form can be used to disable this automatic port placement.*

Syntax: [no] lldp auto-provision radio-ports auto-vlan <vid>

> *Creates the Auto-VLAN with the specified VLAN ID (VID) if it does not already exist and if the specified VID does not already exist.*
>
> *If the radio port Auto-VLAN already exists, all ports in the current Auto-VLAN are moved to the new Auto-VLAN. If the previous Auto-VLAN then contains only downlink ports (<slot-id>DP) or is empty, it is deleted.*
>
> *The* **no lldp auto-provision radio-ports auto-vlan *<vid>*** *command may be used to delete the auto-vlan.*

Syntax: lldp auto-provision radio-ports vlan-base *<2-4094>*

> *Sets the suggested Auto-VLAN's ID (VID) for the Auto-VLAN created by the switch when a Wireless Edge Services zl Module or radio port is discovered and auto-provisioning is enabled (the default). If the VID is already in use, the next available VID following the suggested value is used.*
>
> *The default suggested VID is 2100.*

Syntax: wireless-services <*slot-id*>

Changes the CLI to the wireless-services context for the Wireless Edge Services zl Module in **slot-id** *(a - h). The* **exit** *command returns the CLI to the switch configuration context.*

Syntax: wireless-services <*slot-id*> reload]

Reboots the wireless services Module in **slot-id** *with the current software version. This command may be used to restart a Module that was previously shutdown*

Syntax: wireless-services <*slot-id*> shutdown]

Halts the wireless services Module in **slot-id.**

Displaying zl Module Status from the Switch CLI

Show commands are available in both the configuration context and the wireless server context of the zl switch CLI. The configuration context commands are shown below. For the wireless server context commands see the latest *Management and Configuration Guide* for your Wireless Edge Services Module.

Module Status Commands Overview and Syntax

Command	Page
Switch Configuration Context	
show lldp auto-provision radio-ports	32
show Modules	32
show wireless-services *<slot-id>*	32
[radio-ports]	33
[uplinks]	33
show wireless-services vlans	33

Switch **Config** Context Command Syntax

Syntax: show lldp auto-provision radio-ports

> *Displays the configuration and status of the following auto-provisioning elements. Items in [ ] are default values:*
>
> > **LLDP Radio Port Enable [Yes]**
> >
> > **LLDP Radio Port suggested auto-vlan [2100]**
> >
> > **LLDP Radio Port auto-vlan**
> >
> > **LLDP Radio Port assigned ports**
> >
> > **LLDP Global Enable [Yes]**

Syntax: show modules

> *Displays all Modules installed in the zl switch. The Module slot, a Module description, and the Module serial number are shown.*
>
> *This command is also valid in the global context.*

Syntax: show wireless-services <*slot-id*>

> *Displays the following for the wireless services Module in* **slot-id** *(a - h).*

Versions	*Module version information for support staff.*
| **Current status** | ```
BIOS error
booted
booting
booting timed out
configuration fault
failed to boot
halted
initializing
not responding
performing self-test
rebooting
running
self-test failed
shutting down
shut down (safe for removal)
``` |
| **Uplink MAC Address** | *MAC address for the Module's uplink port.* |

Syntax: show wireless-services <*slot-id*> radio-ports

> *Displays the radio port VLANs'* **802.1Q VID** *and* **Name** *and member downlink radio ports associated with the specified wireless services Module,* **slot-id** *(a - h).*
>
> *Note: the Module's downlink port does not display as a member. To explicitly see the VLANs containing a Module's downlink port, use the* **show vlans ports <*slot-id*>dp** *command.*

Syntax: show wireless-services <*slot-id*> uplinks

> *Displays the uplink network ports configured on the wireless services Module in* **slot-id** *(a - h).*
>
> *Note: the Module's uplink port does not display as a member. To explicitly see the VLANs containing a Module's uplink port, use the* **show vlans ports <*slot-id*>up** *command.*

Syntax: show wireless-services vlans

> *Displays the* **802.1Q VID** *and* **Name** *of all radio port VLANs configured on the switch.*

Downloading New Software to the Module

See the latest *Management and Configuration Guide* for your Wireless Edge Services Module.

Resetting the Module to Factory Defaults

See the latest *Management and Configuration Guide* for your Wireless Edge Services Module.

Module Messages in the Event Log

The Module sends messages to the zl switch Event Log. Each log message contains the following elements:

<severity code> <date stamp> <time stamp> <number> wsm *<slot-id>: message*

Messages reporting the module's status, sent by the zl switch, are included here. These log messages contain the following elements:

<severity code> <date stamp> <time stamp> <number> HPESP*: message*

Wireless Edge Services Module Event Log messages from the module and the switch are described below.

Table 4.   Event Log Messages

#	Message	Severity	Description
648	Wireless Services zl Module *<slot-id>*: Self-test failed (*reason*)	major	The module self-test failed. The reason appears in parentheses.
649	Wireless Services zl Module *<slot-id>*: base configuration transfer failed	major	A problem occurred when loading the module configuration
650	Wireless Services zl Module *<slot-id>*: incompatible BIOS version: (*version*)	major	The module BIOS is not compatible with the current switch software.
651	(Message is not applicable to this module.)		
652	(Message is not applicable to this module.)		
653	(Message is not applicable to this module.)		
654	(Message is not applicable to this module.)		
655	(Message is not applicable to this module.)		
656	(Message is not applicable to this module.)		
657	Wireless Services zl Module *<slot-id>*: application initialization failed	major	The application did not initialize due to a software incompatibility with the switch or the application could not create VLANs.
658	Wireless Services zl Module *<slot-id>*: Illegal event *<id>* at state *<id>*	major	This message is used for debugging purposes.

#	Message	Severity	Description
659	Wireless Services zl Module *<slot-id>*: excessive reboots detected	major	Communication has not been established with the switch. The module is not ready.
660	Wireless Services zl Module *<slot-id>* removed before shutdown completed	major	The module was removed before the shutdown process was completed.
661	Wireless Services zl Module *<slot-id>* is safe for removal	info	The module may be safely removed from the chassis.
662	Wireless Services zl Module *<slot-id>*: incompatible application version: (*version*)	major	The module software is not compatible with the switch software.
663	(Message is not applicable to this module.)		
664	Wireless Services zl Module *<slot-id>* is shutting down	info	The shutdown process has been initiated.
665	Wireless Services zl Module *<slot-id>* is rebooting	info	The module is being rebooted.
666	Wireless Services zl Module *<slot-id>* is booting	info	The module is loading its operating system.
667	Wireless Services zl Module *<slot-id>* is ready	info	The module has loaded its operating system and is ready.
668	Wireless Services zl Module *<slot-id>* HPLAP send TLV error condition *<id>* on connection ID *<id>*	info	A transmit error occurred between the application and the switch when sending a type, length, and value element.
669	(Message is not applicable to this module.)		
670	Wireless Services zl Module error processing license.	major	A license could not be read or updated.
671	Slot *<slot-id>* License updated successfully	info	A license update was successful.
672	Wireless Services zl Module error while processing.	warning	An unexpected event occurred when accessing module's application data.
673	Wireless Services zl Module *<slot-id>* flash write aborted; write already in progress	info	A write to the module's flash memory failed because another write was already in process.
1500	ESPd beginning main:*xx.xx.xx*.	info	The module is starting operation. The platform version, *xx.xx.xx*, is listed.
1501	Connection to switch status changed, status *xx*	major	A protocol error has occurred. A status code is provided for Support use.
1502	Received empty license record.	major	A default license is not installed. Contact ProCurve.

#	Message	Severity	Description
1503	Number of Radio Ports supported *xx*.	info	Indicates the number of radio port licenses present on a module when it begins or resumes operation. Redundant modules always report 0 licenses.
1504	This Version of Software xx.xx.xx cannot support *x* number of Radio Ports.	major	This message appears followed by message 1505. The number of licenses installed is not supported by the current software version.
1505	Revert back to your old version or contact support.	major	The current number of licenses are not supported by the software version in use.
1506	Received license buffer of zero length record.	info	An error occurred when processing a software license.
1507	License key Update complete.	info	A license key update has completed.
1508	License Write in Progress.	info	The module is writing a license.
1509	Switch terminated connection.	major	The switch no longer provides access to the module's CLI.
1510	Privilege level CLI session out of range: *x*.	info	The CLI session privilege level on the switch is not valid for the module's CLI.
1511	Unknown privilege level: (*level*), defaulting to lowest level.	info	An unknown privilege level was used to access the module CLI. The privilege level defaults to the lowest level.
1512	Unknown TLV received *x*.	debug	Unknown TLV value received by the switch from the module.
1513	SendTLV error status *x*.	major	A problem has occurred processing a TLV value sent from the module to the switch. The error status codes (*x*) are as follows: 0 - No errors 1 - No Connection 2 - Resource Allocation Error 3 - Flow Control Active 4 - Invalid Data 5 - Too Many Packets 6 - Max TLV Error
1515	Downlink traffic blocked due to invalid config on VLAN 1.	major	Both the internal Uplink and Downlink ports are members of the same VLAN. To prevent a broadcast storm, all traffic in the Downlink port on that VLAN will be blocked.