ZYXEL
Your Networking Ally

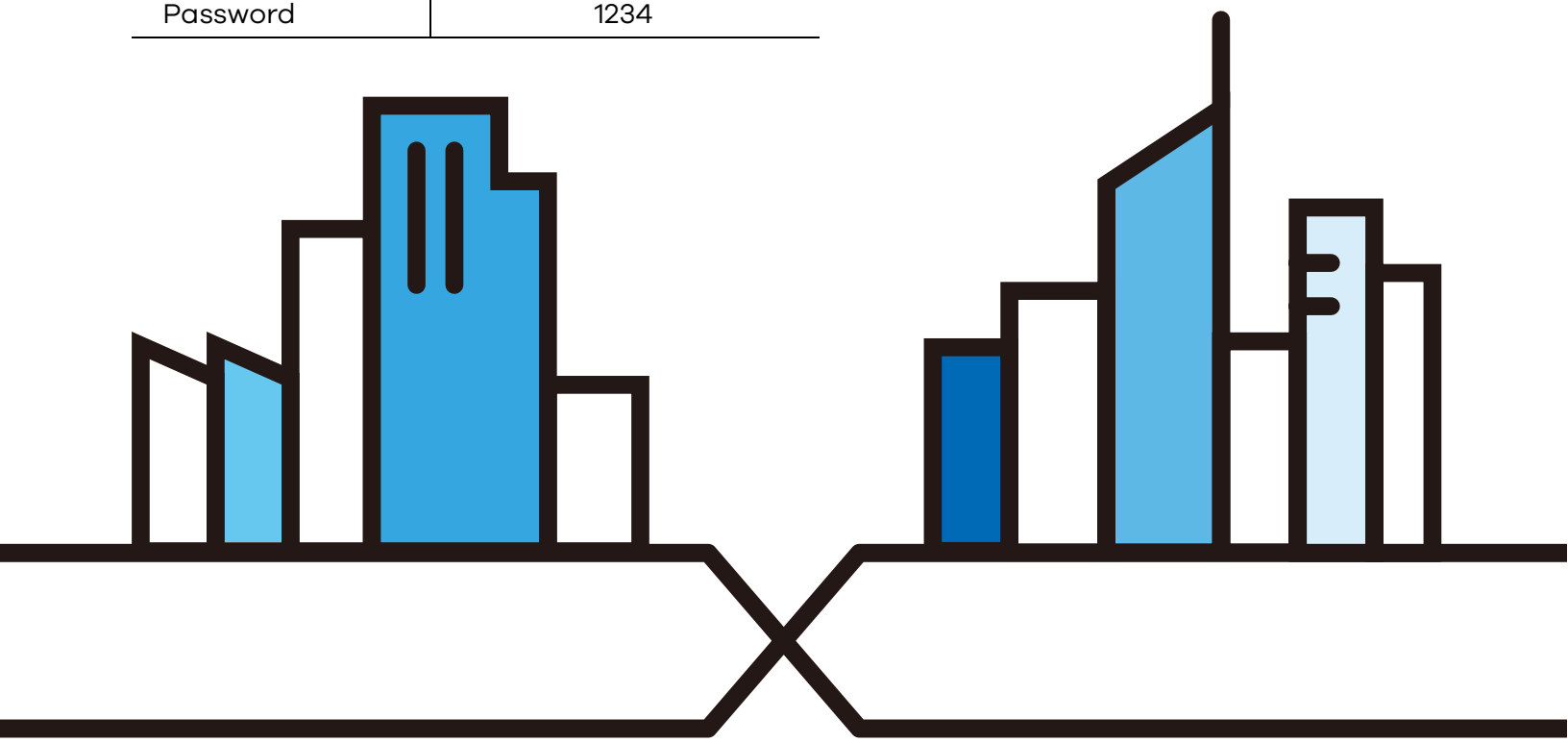
# User's Guide

# XS3800-28

28-port 10GbE L3 Managed Switch

| Default Login Details | |
|---|---|
| Out-of-Band MGMT Port | http://192.168.0.1 |
| In-Band Ports | http://DHCP-assigned IP or http://192.168.1.1 |
| User Name | admin |
| Password | 1234 |

Version 4.70 Edition 2, 03/2021



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**IMPORTANT!**

**READ CAREFULLY BEFORE USE.**

**KEEP THIS GUIDE FOR FUTURE REFERENCE.**

Screenshots and graphics in this book may differ slightly from your product due to differences in your product firmware or your computer operating system. Every effort has been made to ensure that the information in this manual is accurate.

## Related Documentation

- CLI Reference Guide

  This guide explains how to use the Command-Line Interface (CLI) to configure the Switch.

Note: It is recommended you use the Web Configurator to configure the Switch.

- Web Configurator Online Help

  Click the **Help** icon in any screen for help in configuring that screen and supplementary information.
- Networked AV Mode Online Help

  Click the **Help** icon in Networked AV mode to scan the QR code or click the web link to display the online help. The online help provide descriptions for each configuration screen in Networked AV mode.
- More Information

  Go to **https://businessforum.zyxel.com** for product discussions.

  Go to **support.zyxel.com** to find other information on the Switch.

# Document Conventions

## Warnings and Notes

These are how warnings and notes are shown in this guide.

**Warnings tell you about things that could harm you or your device.**

Note: Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

## Syntax Conventions

- All models may be referred to as the "Switch" in this guide.
- Product labels, screen names, field labels and field choices are all in **bold** font.
- A right angle bracket ( > ) within a screen name denotes a mouse click. For example, **Basic Setting** > **IP Setup** > **IP Configuration** > **Network Proxy Configuration** means you first click **Basic Setting** in the navigation panel, then the **IP Setup** sub menu, then **IP Configuration** and finally **Network Proxy Configuration** to get to that screen.

## Icons Used in Figures

Figures in this user guide may use the following generic icons. The Switch icon is not an exact representation of your device.

| | | |
|---|---|---|
| Switch | Generic Router | Wireless Router / Access Point |
| Generic Switch | Smart TV | Desktop |
| Laptop | IP Camera | Printer |
| Server | | |

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# PART I
# User's Guide

# CHAPTER 1
# Getting to Know Your Switch

## 1.1 Introduction

This chapter introduces the main features and applications of the Switch.

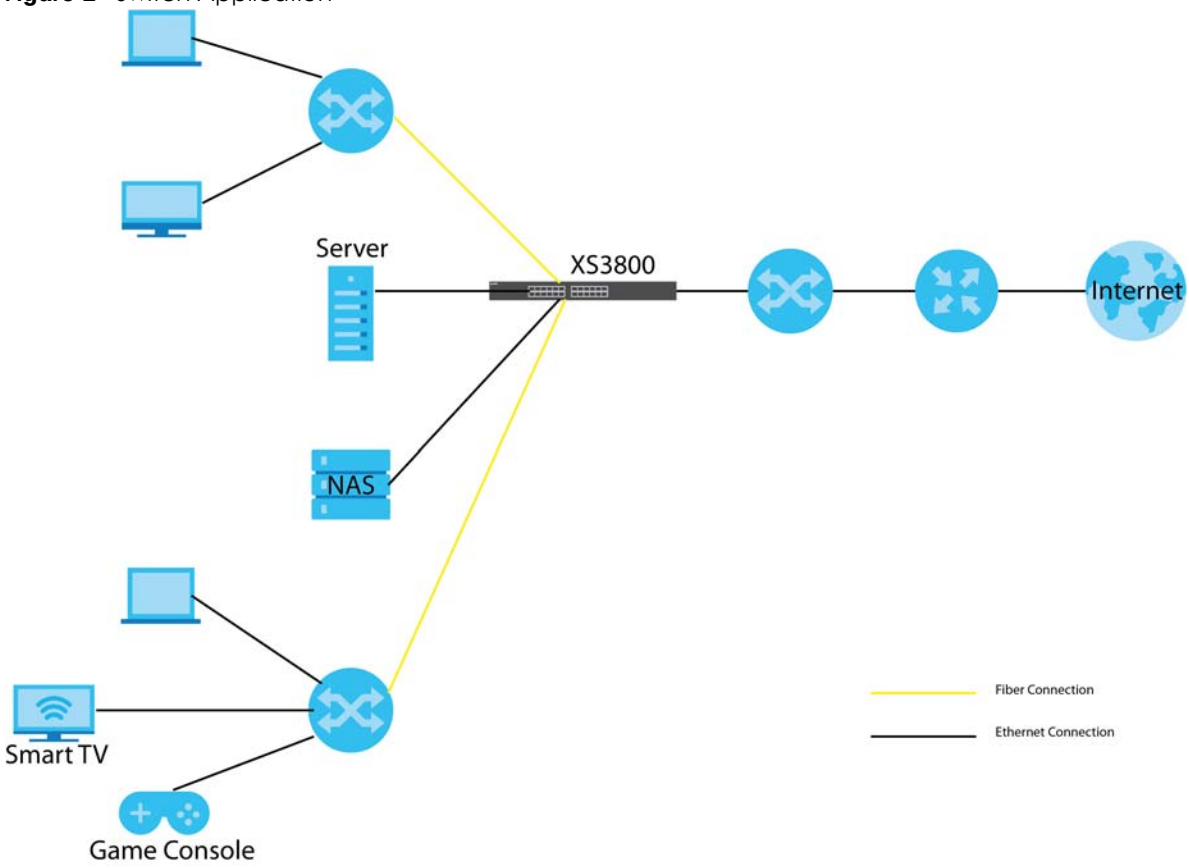
Your Switch is a stackable, layer-3, 10 Gigabit Ethernet (GbE) switch supporting Multi-Gigabit. See Section 1.1.2 on page 29 for more information about Multi-Gigabit. The Switch comes with two power slots for dual AC power supply modules.

You could use 10 Gigabit SFP+ slots for fiber connections to the backbone switches, and you could use the 10 Gbps Ethernet ports for connections to other Ethernet devices requiring high-bandwidth, such as network-attached storage (NAS), game consoles, servers, and so on.

The last four combo ports can also be used for stacking. When working in stacking mode, the Switch can operate together with other Switches of the same model and firmware version and allows you to remotely manage them from one switch using one single IP address.

The Switch performs full layer-2 switching features and basic layer-3 routing features, such as static route, and IGMP.

**Figure 1** Switch Application




## 1.1.1 License Option

At the time of writing, the following Switch license is available for purchase. The following table shows the features supported for the new license.

Table 1 License Comparison

| LICENSE NAME | UNLOCKED SERVICES | STACKING MODE SUPPORT |
|---|---|---|
| Basic Routing License | • RIPv1, v2<br>• OSPF v2<br>• DVMRP<br>• IGMP<br>• L3 Loopback Interface | No |

## 1.1.2 Multi-Gigabit

A 10 Gigabit port supports speeds of 10 Gbps if the connected device supports 10 Gbps and a Cat 6a (up to 100 m) or Cat 6 cable (up to 50 m) is used. The speed drops to 1G if these criteria are not met; it drops to 100 Mbps if a Cat 5 cable is used (up to 100 m).

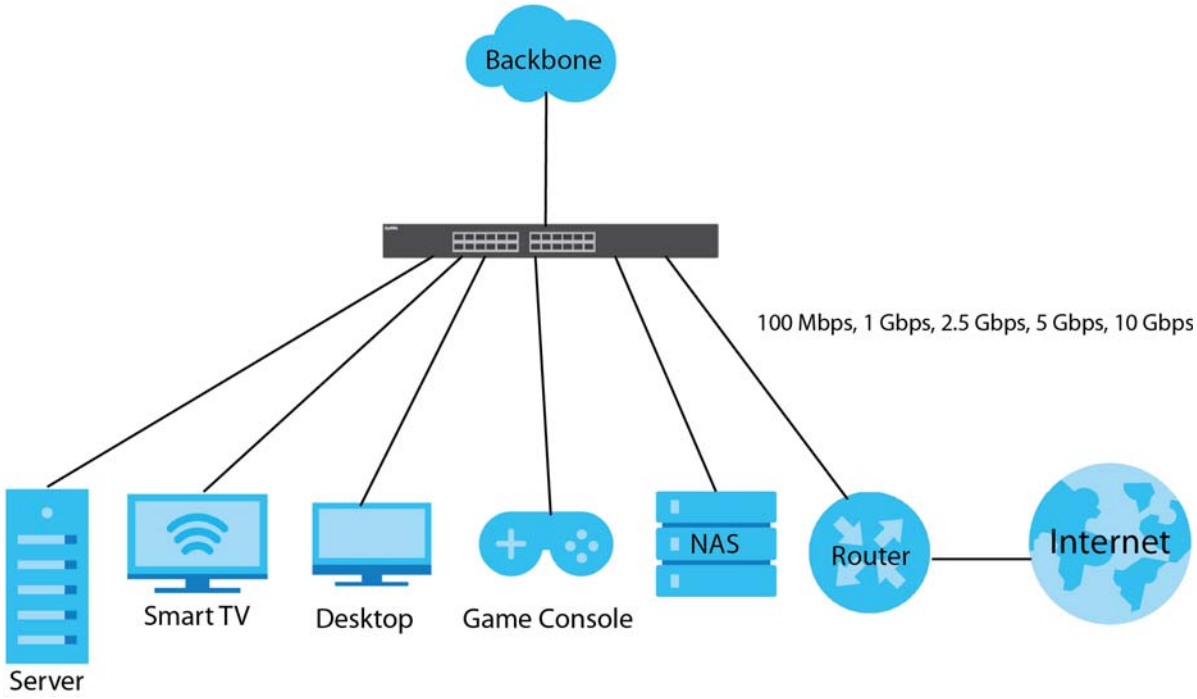
If a network device such as a 5G network card, gaming computer, server, Network Attached Storage (NAS) or Access Point (AP) only supports 2.5 Gigabit or 5 Gigabit connectivity, then the maximum speed potential of these devices is never reached.

In addition, at the time of writing, most existing cabling is Cat 5e or Cat 6, further limiting maximum

speed or distance potential.

Multi-Gigabit (IEEE 802.3bz) solves these problems by additionally supporting 2.5 Gigabit and 5 Gigabit Ethernet connections over Cat 5e and higher Ethernet cables. Multi-Gigabit ports are also backward compatible with 100 Mbps and 1 Gigabit ports.

**Figure 2** Multi-Gigabit Application




See the following table for the cables required and distance limitation to attain the corresponding speed.

Table 2 Cable Types

| CABLE | TRANSMISSION SPEED | MAXIMUM DISTANCE | BANDWIDTH CAPACITY |
|---|---|---|---|
| Category 5 | 100 Mbps | 100 m | 100 MHz |
| Category 5e | 1 Gbps/2.5 Gbps/5Gbps | 100 m | 100 MHz |
| Category 6 | 5 Gbps/10 Gbps | 50 m | 250 MHz |
| Category 6a | 10 Gbps | 100 m | 500 MHz |
| Category 7 | 10 Gbps | 100 m | 650 MHz |

Note: Make sure to select the correct speed for the port in **Basic Setting** > **Port Setup**.

## 1.1.3 Stacking Mode

The Switch can work in stacking mode and directly connect to other switches. The switches then operate together and act as a single switch or a virtual chassis. The stackable switches can be managed from a master switch in the stack.

Note: To set the Switch to stacking mode, go to the **Basic Setting** > **Stacking** > **Configuration** screen.

Note: When the Switch is in stacking mode, it uses the default static IP address 192.168.1.1.

**Figure 3** Stacking Example

## 1.1.4 Management Method

With its built-in Web Configurator, managing and configuring the Switch is easy. In addition, the Switch can also be managed through Telnet, any terminal emulator program using the Command Line Interface (CLI), or third-party SNMP management.

## 1.1.5 Management Modes

NebulaFlex for 'hybrid mode' means you can set the Switch to operate in only one of either direct standalone or cloud mode (not both at the same time). The Nebula Control Center (NCC) is an alternative cloud-based network management system that allows you to remotely manage and monitor the Switch in cloud mode.

Note: Hybrid mode and NCC registration are reserved for future use.

Use the Web Configurator to configure and manage the Switch directly in standalone mode or use Nebula Control Center (NCC) to configure and manage the Switch in cloud mode. You may also access a minimized version of the Web Configurator in cloud mode.

## 1.1.6 Mode Changing

This section describes how to change the Switch's management mode.

Note: Hybrid mode and NCC registration are reserved for future use.

Note: If you change the Switch's management mode from standalone mode to Nebula-managed mode, the configuration settings of the Switch will be overwritten with what you have configured in Nebula.

Note: If you change the Switch's management mode from Nebula-managed mode to standalone mode, the Switch will reset to its factory-default settings.

### From Standalone to Nebula Cloud Management

To manage your Switch through Nebula, connect the Switch to the Internet, and register it to a site and organization at the Nebula web portal (https://nebula.zyxel.com).

See the following steps or the Switch Quick Start Guide for how to do device registration.

**Go to the NCC to Register the Switch**

1 Go to the Nebula web portal in one of three ways.
- Type https://nebula.zyxel.com in a supported web browser. See the Nebula User's Guide for more information about supported browsers.
- Click **Visit Nebula** in the Switch's login page.
- Click the **Nebula** icon in the upper right of the Switch's Web Configurator.

2 Click **Login** in the Nebula web portal. Enter your myZyxel account information. You will be redirected to another screen where you can sign up for a myZyxel account if you do not have one.

3 Create an organization and a site or select an existing site using the Nebula setup wizard.

4 Register the Switch by entering its MAC address and serial number and assign it to the site. The serial number and MAC address can be found in the **Status** screen or the device back label on the Switch.

**Use the Zyxel Nebula Mobile App to Register the Switch**

1 Download and open the Zyxel Nebula Mobile app in your mobile device. Click **Sign Up** to create a myZyxel account or enter your existing account information to log in.

2 Create an organization and site, or select an existing site using the Zyxel Nebula Mobile app.

3 Select a site and scan the Switch's QR code to add it to the site. You can find the QR code:
- On a label on the Switch or
- On its box or
- In the Web Configurator at **Basic** > **Cloud Management** > **Nebula Switch Registration**.

See Section 3.3 on page 48 for more information about the **CLOUD** LED or Section 7.2 on page 98 for more information about the **Hybrid Mode** field in the **Status** screen to see if the Switch goes into Nebula cloud management mode successfully.

Note: The Switch goes into Nebula-managed mode automatically after it can access the Nebula web portal and is successfully registered there. Its login password and settings are then overwritten with what you have configured in the Nebula web portal.

### From Nebula-managed to Standalone

To return to direct management standalone mode, just remove (unregister) the Switch from the organization or site in the Nebula web portal. The Switch will reboot and restore the factory default settings.

## 1.1.7 ZON Utility

With its built-in Web Configurator, including the Neighbor Management feature (Section 7.2.1 on page 100), viewing, managing and configuring the Switch and its neighboring devices is simplified.

In addition, Zyxel offers a proprietary software program called Zyxel One Network (ZON) Utility, it is a utility tool that assists you to set up and maintain network devices in a more simple and efficient way. You can download the ZON Utility at www.zyxel.com and install it on a PC (Windows operation system). For more information on ZON Utility see Section 4.3 on page 55.

The following table shows which firmware version supports ZON and Neighbor Management (Smart Connect) for each Switch. The firmware on each Switch is identified by the firmware trunk version, followed by a unique model code and release number in brackets. For example, 4.70(ABML.0) is a firmware version for the Switch where 4.70 is the firmware trunk version, ABML identifies the Switch and .0 is the first release of trunk version 4.70.

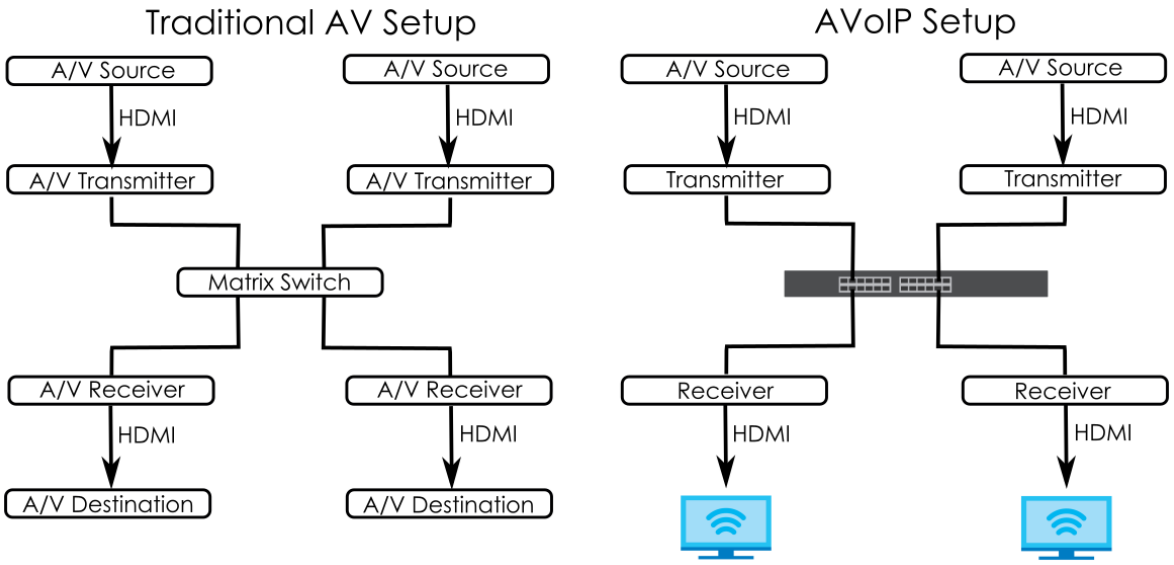
Table 3 Models and Firmware Version

| SWITCH MODEL | FIRMWARE VERSION |
|---|---|
| XS3800-28 | 4.70(ABML.0) and later |

### 1.1.8 Web Configurator Networked AV Mode

Aside from the Web Configurator in Standard mode, you can switch to Networked AV mode that is specifically designed to simplify configuration and management of the Switch for AVoIP (Audio-Video over Internet Protocol) application. In AV over IP, the AV transmitter is the transmitter, the AV receiver is the receiver, and the matrix switch is a standard IP Switch. See Section 4.4 on page 59 for details on using the Setup Wizard screen for configuring the Switch's Networked AV mode's basic and advanced settings.

**Figure 4** Comparison Between Traditional AV and AVoIP Setups




## 1.2 Example Applications

This section shows a few examples of using the Switch in various network environments. Note that the Switch in the figure is just an example Switch and not your actual Switch.

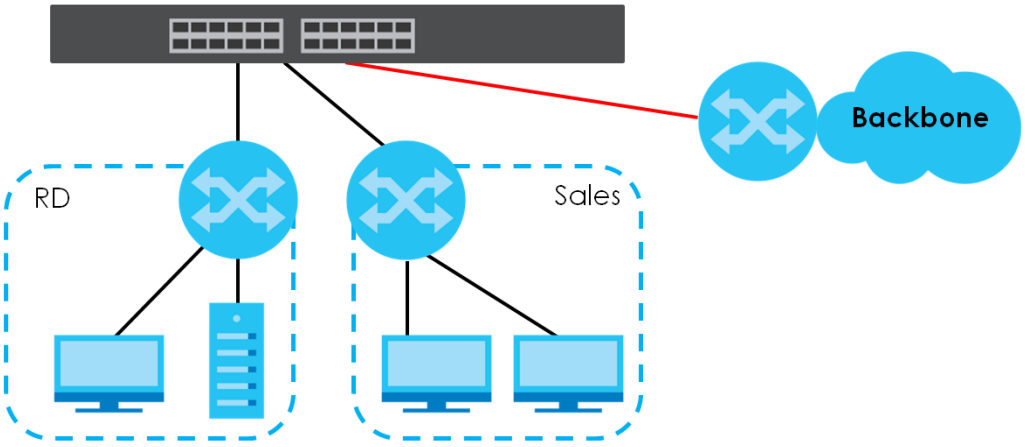
### 1.2.1 Bridging Example

In this example, the Switch connects different company departments (**RD** and **Sales**) to the corporate backbone. It can alleviate bandwidth contention and eliminate server and network bottlenecks. All users that need high bandwidth can connect to high-speed department servers through the Switch.

You can provide a super-fast uplink connection by using a Gigabit Ethernet or SFP port on the Switch.

Moreover, the Switch eases supervision and maintenance by allowing network managers to centralize multiple servers at a single location.

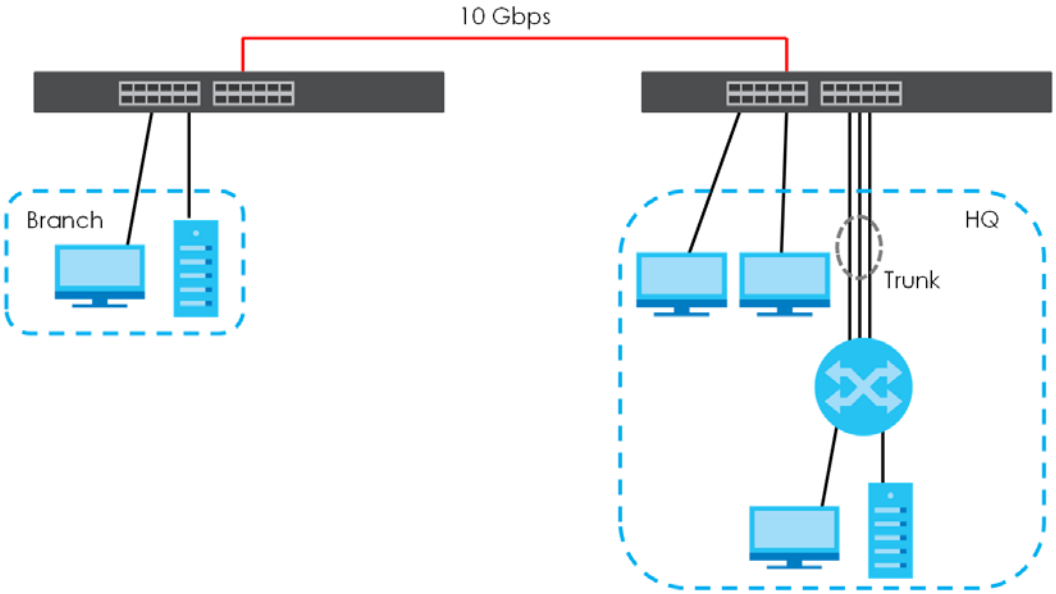
**Figure 5** Bridging Application




## 1.2.2 High Performance Switching Example

The Switch is ideal for connecting two geographically dispersed networks that need high bandwidth. In the following example, a company uses the 10 Gigabit uplink ports to connect the headquarters to a branch office network. Within the headquarters network, a company can use trunking to group several physical ports into one logical higher-capacity link. Trunking can be used if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link.

**Figure 6** High Performance Switching




## 1.2.3 IEEE 802.1Q VLAN Application Examples

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical

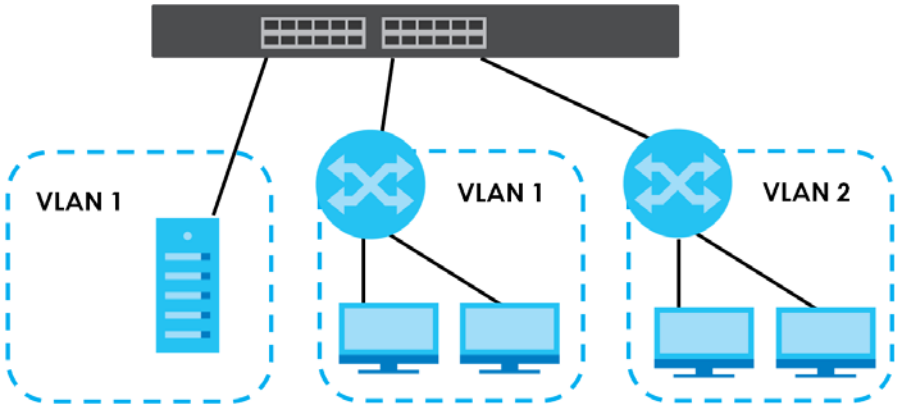
networks. Stations on a logical network belong to one or more groups. With VLAN, a station cannot directly talk to or hear from stations that are not in the same groups unless such traffic first goes through a router.

#### 1.2.3.1 Tag-based VLAN Example

Ports in the same VLAN group share the same frame broadcast domain thereby increase network performance through reduced broadcast traffic. VLAN groups can be modified at any time by adding, moving or changing ports without any re-cabling.

Shared resources such as a server can be used by all ports in the same VLAN as the server. In the following figure only ports that need access to the server need to be part of VLAN 1. Ports can belong to other VLAN groups too.

**Figure 7** Shared Server Using VLAN Example




### 1.2.4 IPv6 Support

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to 3.4 x $10^{38}$ IP addresses. At the time of writing, the Switch supports the following features.

- Static address assignment
- Neighbor Discovery Protocol (a protocol used to discover other IPv6 devices in a network)
- Remote Management using ping, SNMP, SSH, telnet, HTTP and FTP services
- ICMPv6 to report errors encountered in packet processing and perform diagnostic functions, such as "ping"
- IPv4/IPv6 dual stack; the Switch can run IPv4 and IPv6 at the same time
- DHCPv6 client and relay
- Multicast Listener Discovery (MLD) snooping and proxy

For more information on IPv6, refer to Appendix C on page 691 and the CLI Reference Guide.

## 1.3 Ways to Manage the Switch

Use any of the following methods to manage the Switch.

- NCC (Zyxel Nebula Control Center). With the NCC, you can remotely manage and monitor the Switch through a cloud-based network management system. See Section 8.12 on page 142 or the NCC User's Guide for detailed information about how to access the NCC and manage your Switch through the NCC. See the NCC User's Guide for how to configure Nebula managed devices.
- Web Configurator. This is recommended for everyday management of the Switch using a (supported) web browser. See Chapter 4 on page 51.
- Command Line Interface. Line commands offer an alternative to the Web Configurator and in some cases are necessary to configure advanced features. See the CLI Reference Guide.
- FTP. Use File Transfer Protocol for firmware upgrades and configuration backup or restore. See Section 58.9.1 on page 548.
- SNMP. The Switch can be monitored and/or managed by an SNMP manager. See Section 59.8.1 on page 563.
- Cluster Management. Cluster Management allows you to manage multiple switches through one switch, called the cluster manager. See Chapter 63 on page 587.
- ZON Utility. ZON Utility is a program designed to help you deploy and perform initial setup on a network more efficiently. See Section 4.3 on page 55.

## 1.4 Good Habits for Managing the Switch

Do the following regularly to make the Switch more secure and to manage the Switch more effectively.

- Change the password. Use a password that is not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.
- Back up the configuration (and make sure you know how to restore it). Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the Switch to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the Switch. You could simply restore your last configuration.

# CHAPTER 2
# Hardware Installation and Connection

This chapter shows you how to install and connect the Switch.

## 2.1 Safety Precautions

Please observe the following before using the Switch:

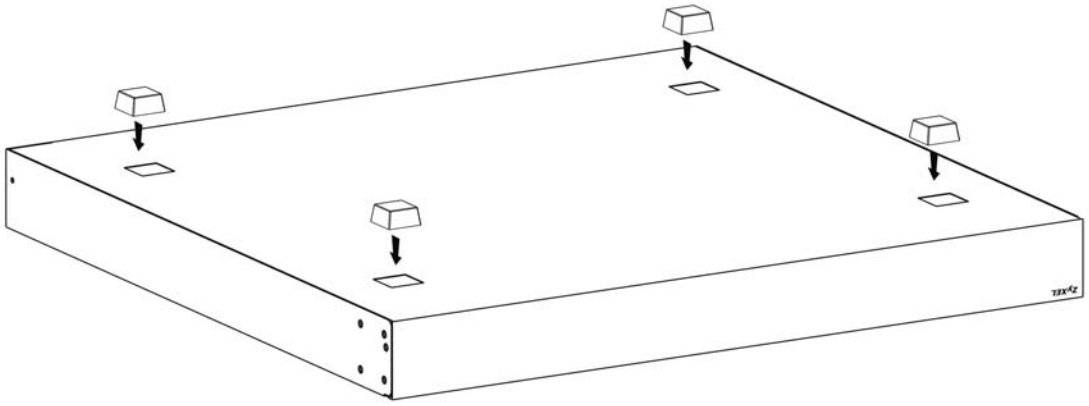
- It is recommended to ask an authorized technician to attach the Switch on a desk or to the rack or wall. Use the proper screws to prevent damage to the Switch. See the **Installation Requirements** sections in this chapter to know the types of screws and screwdrivers for each mounting method.
- Make sure there is at least 2 cm of clearance on the top and bottom of the Switch, and at least 5 cm of clearance on all four sides of the Switch. This allows air circulation for cooling.
- Do NOT block the ventilation holes nor store cables or power cords on the Switch. Allow clearance for the ventilation holes to prevent your Switch from overheating. This is especially crucial when your Switch does not have fans. Overheating could affect the performance of your Switch, or even damage it.
- The surface of the Switch could be hot when it is functioning. Do NOT put your hands on it. You may get burned. This could happen especially when you are using a fanless Switch.
- The Switches with fans are not suitable for use in locations where children are likely to be present.

To start using the Switch, simply connect the power cables to turn it on.

## 2.2 Freestanding Installation Procedure

1. Make sure the Switch is clean and dry.
2. Remove the adhesive backing from the rubber feet.
3. Attach the rubber feet to each corner on the bottom of the Switch. These rubber feet help protect the Switch from shock or vibration and ensure space between devices when stacking.

**Figure 8** Attaching Rubber Feet



4 Set the Switch on a smooth, level surface strong enough to support the weight of the Switch and the connected cables. Make sure there is a power outlet nearby.

### Cautions:

- Avoid stacking fanless Switches to prevent overheating.
- Ensure enough clearance around the Switch to allow air circulation for cooling.
- Do NOT remove the rubber feet as it provides space for air circulation.

# 2.3 Mounting the Switch on a Rack

The Switch can be mounted on an EIA standard size, 19-inch rack or in a wiring closet with other equipment. Follow the steps below to mount your Switch on a standard EIA rack using a rack-mounting kit.

Note: Make sure there is enough clearance between each equipment on the rack for air circulation.

## 2.3.1 Installation Requirements

- Two mounting brackets.
- Eight M3 flat head screws and a #2 Philips screwdriver.
- Four M5 flat head screws and a #2 Philips screwdriver.

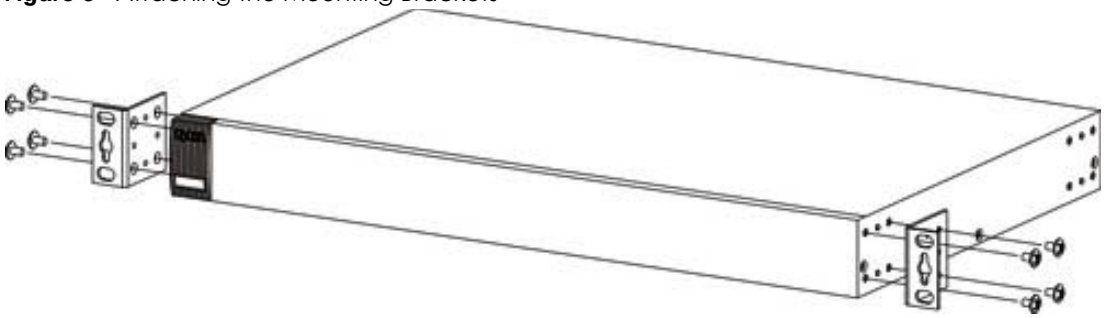
## 2.3.2 Precautions

- Make sure the rack will safely support the combined weight of all the equipment it contains. The maximum weight a bracket can hold is 21.5 kg.
- Make sure the position of the Switch does not make the rack unstable or top-heavy. Take all necessary precautions to anchor the rack securely before installing the unit.

## 2.3.3 Attaching the Mounting Brackets to the Switch

1 Position a mounting bracket on one side of the Switch, lining up the four screw holes on the bracket with the screw holes on the side of the Switch.

**Figure 9** Attaching the Mounting Brackets



2 Using a #2 Philips screwdriver, install the M3 flat head screws through the mounting bracket holes into the Switch.

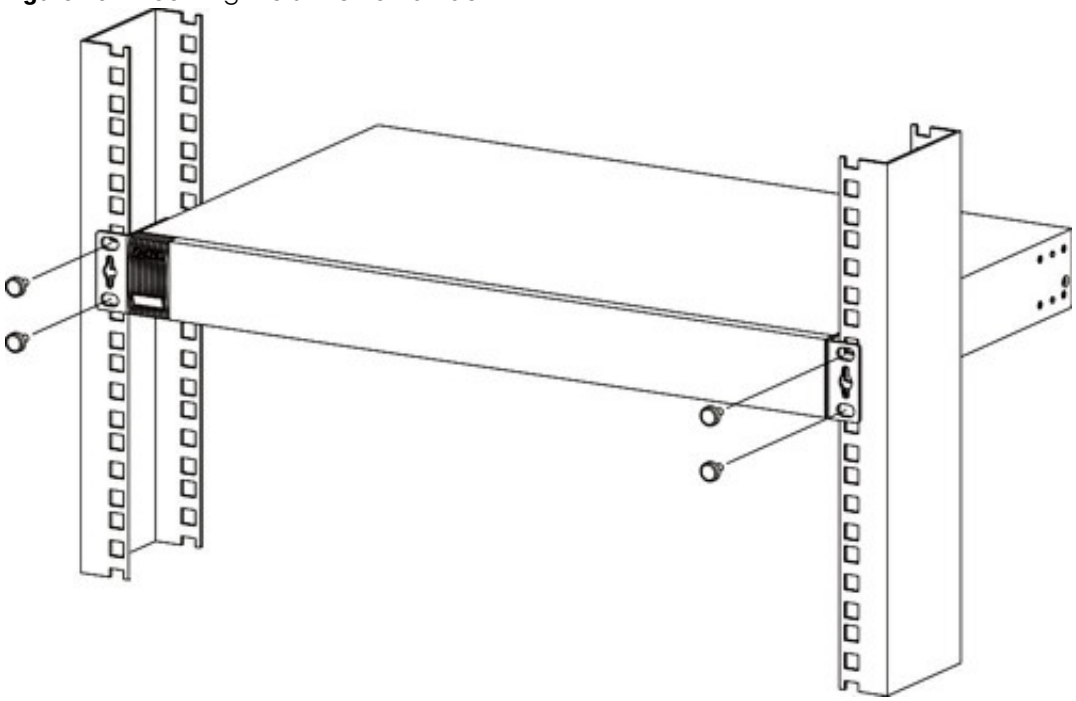
3 Repeat steps 1 and 2 to install the second mounting bracket on the other side of the Switch.

4 You may now mount the Switch on a rack. Proceed to the next section.

## 2.3.4 Mounting the Switch on a Rack

1 Position a mounting bracket (that is already attached to the Switch) on one side of the rack, lining up the two screw holes on the bracket with the screw holes on the side of the rack.

**Figure 10** Mounting the Switch on a Rack



2 Using a #2 Philips screwdriver, install the M5 flat head screws through the mounting bracket holes into

the rack.

Note: Make sure you tighten all the four screws to prevent the Switch from getting slanted.

3 Repeat steps 1 and 2 to attach the second mounting bracket on the other side of the rack.

# CHAPTER 3
# Hardware Panels

This chapter describes the front panel and rear panel of the Switch and shows you how to make the hardware connections.

## 3.1 Front Panel Connections

The Switch supports 16 SFP+ slots and four 10 Gigabit Ethernet ports. The Switch also comes with eight dual personality interfaces of 10 Gigabit. A dual personality interface includes one Gigabit port and one slot for a SFP+ module with one port active at a time.

Ethernet ports support Multi-Gigabit (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps).

The figure below shows the front panel of the Switch.

**Figure 11** Front Panel: XS3800-28

The following table describes the ports.

Table 4 Panel Connections

| CONNECTOR | DESCRIPTION |
|---|---|
| 16 10 GbE SFP+ Slots | Use SFP+ transceivers in these ports for high-bandwidth backbone connections. You can also insert an SFP+ Direct Attach Copper (DAC) in the SFP+ slot. |
| 4 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps RJ-45 Ethernet Ports | These are 10GBase-T auto-negotiating and auto-crossover Ethernet ports.<br>Connect these ports to a computer, a hub, a router, or an Ethernet switch. |
| 8 10 GbE Combo Ports (Dual Personality Interfaces) | Each interface has one 10GBase-T copper RJ-45 port and one SFP slot, with one port active at a time. |
| | • 8 10GBase-T Ports:<br>Connect these ports to a computer, an Ethernet switch or router. |
| | • 8 SFP+ Slots:<br>Use Small Form-Factor Pluggable (SFP) transceivers in these ports for fiber connections to an Ethernet switch or router. |
| RJ-45 out-of-band Management Port | Connect to a computer using an RJ-45 Ethernet cable for local configuration of the Switch. |
| Console Port | Only connect this port to your computer (using an RS-232 cable) if you want to configure the Switch using the command line interface (CLI) through the console port. |

Table 4 Panel Connections (continued)

| CONNECTOR | DESCRIPTION |
|---|---|
| RESET | Press the **RESET** button to reboot the Switch without turning the power off. |
| RESTORE | Press the **RESTORE** button for 3 to 6 seconds to have the Switch automatically reboot and restore the last-saved custom default file.<br>Press the **RESTORE** button for more than 7 seconds to have the Switch automatically reboot and restore the factory default file. |

## 3.1.1 Ethernet Ports

The Switch has 10GBase-T auto-negotiating, auto-crossover Ethernet ports. In 10/100 Mbps / 1/10 Gbps Gigabit Ethernet, the speed can be 10 Mbps, 100 Mbps, 1 Gbps or 10 Gbps. The duplex mode can be full duplex at 100 Mbps and full duplex only at 1000 Mbps.

An auto-negotiating port can detect and adjust to the optimum Ethernet speed (100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps) and full duplex mode of the connected device.

An auto-crossover (auto-MDI/MDI-X) port automatically works with a straight-through or crossover Ethernet cable.

When auto-negotiation is turned on, an Ethernet port negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer Ethernet port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, an Ethernet port uses the pre-configured speed and duplex mode when making a connection, thereby requiring you to make sure that the settings of the peer Ethernet port are the same in order to connect.

### 3.1.1.1 Default Ethernet Negotiation Settings

The factory default negotiation settings for the Ethernet ports on the Switch are:

- Speed: Auto
- Duplex: Auto
- Flow control: Off
- Dual Personality Interface: Fiber module first

## 3.1.2 SFP/SFP+ Slots

The transceiver slots are for Small Form-Factor Pluggable (SFP), SFP+ transceivers or DAC (Direct Attach Cables) cable. The SFP+ (SFP Plus) and the DAC cable are enhanced versions of the SFP and support data rates of up to 10 Gbps. A transceiver is a single unit that houses a transmitter and a receiver. Use a transceiver or a DAC cable to connect a fiber cable to the Switch. The Switch does not come with transceivers nor DAC cables. You must use transceivers or DAC cables that comply with the Small Form-factor Pluggable (SFP) Transceiver MultiSource Agreement (MSA). See the SFF committee's INF-8074i specification Rev 1.0 for details.

You can change transceivers or the DAC cables while the Switch is operating. You can use different transceivers to connect to Ethernet switches with different types of fiber connectors.

- Type: SFP connection interface
- Connection speed: 1 or 10 Gigabit per second (Gbps)

- Type: SFP+/DAC connection interface

**WARNING! To avoid possible eye injury, do not look into an operating fiber module's connectors.**
**HANDLING! All transceivers are static sensitive. To prevent damage from electrostatic discharge (ESD), it is recommended you attach an ESD preventive wrist strap to your wrist and to a bare metal surface when you install or remove a transceiver.**
**STORAGE! All modules are dust sensitive. When not in use, always keep the dust plug on. Avoid getting dust and other contaminant into the optical bores, as the optics do not work correctly when obstructed with dust.**

### 3.1.2.1 Transceiver Installation

Use the following steps to install a transceiver.

1. Attach an ESD preventive wrist strap to your wrist and to a bare metal surface.
2. Align the transceiver in front of the slot opening.
3. Make sure the latch is in the lock position (latch styles vary), then insert the transceiver into the slot with the exposed section of PCB board facing down.
4. Press the transceiver firmly until it clicks into place.
5. The Switch automatically detects the installed transceiver. Check the LEDs to verify that it is functioning properly.
6. Remove the dust plugs from the transceiver and cables (dust plug styles vary).
7. Identify the signal transmission direction of the fiber cables and the transceiver. Insert the fiber cable into the transceiver.

**Figure 12** Latch in the Lock Position

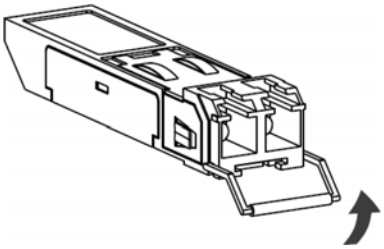


**Figure 13** Transceiver Installation Example

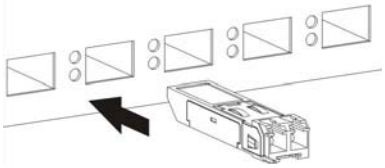
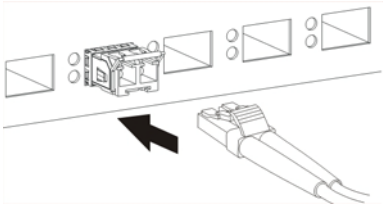


**Figure 14** Connecting the Fiber Cables



### 3.1.2.2 Transceiver Removal

Use the following steps to remove an SFP transceiver.

1. Attach an ESD preventive wrist strap to your wrist and to a bare metal surface on the chassis.
2. Remove the fiber cables from the transceiver.
3. Pull out the latch and down to unlock the transceiver (latch styles vary).

   Note: Make sure the transceiver's latch is pushed all the way down, so the transceiver can be pulled out successfully.

4. Pull the latch, or use your thumb and index finger to grasp the tabs on both sides of the transceiver, and carefully slide it out of the slot.

   Note: Do NOT pull the transceiver out by force. You could damage it. If the transceiver will not slide out, grasp the tabs on both sides of the transceiver with a slight up or down motion and carefully slide it out of the slot. If unsuccessful, contact Zyxel Support to prevent damage to your Switch and transceiver.

5. Insert the dust plug into the ports on the transceiver and the cables.

**Figure 15** Removing the Fiber Cables

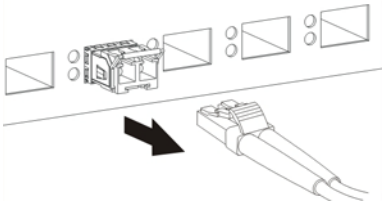


**Figure 16** Opening the Transceiver's Latch Example

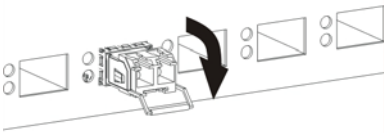
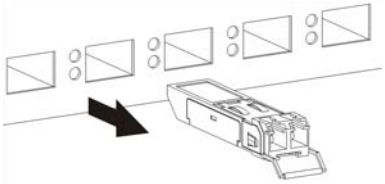


**Figure 17** Transceiver Removal Example



### 3.1.3 Dual Personality Interfaces

A combo port is for uplink connections. It consists of a 10 Gigabit Ethernet port for Ethernet connection, and a SFP+ transceiver slot for fiber connection. The fiber connection takes priority if the corresponding Gigabit port is also connected.

- 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps/10 Gbps – Connect these ports to high-bandwidth backbone network Ethernet switches using Category 5e/6/6a/7 copper cables.
- Transceiver Slots – Use SFP/SFP+ transceivers in these slots for connections to backbone Ethernet switches.

**Figure 18** Combo Port Example: 10 Gigabit Port and SFP+ Transceiver Slot

### 3.1.4 Management Port

The 1000Base-T Ethernet **MGMT** (management) port is used for local management. Connect directly to this port using an Ethernet cable. You can configure the Switch through Telnet or the Web Configurator.

The default IP address of the management port is 192.168.0.1 with a subnet mask of 255.255.255.0.

### 3.1.5 Console Port

This console port is for troubleshooting only. With instructions from customer support, connect the male 9-pin end of the RS-232 console cable to the console port of the Switch. Connect the female end to a serial port (COM1, COM2 or other COM port) of your computer. You can use a computer with terminal emulation software configured to the following parameters:

- VT100 terminal emulation
- 115200 bps
- No parity, 8 data bits, 1 stop bit
- No flow control

## 3.2 Rear Panel

The following figures show the rear panels of the Switch. The rear panels contain:

- Two AC power receptacles (**A** and **B**)

**Figure 19** Rear Panel: XS3800-28

## 3.2.1 Grounding

Grounding is a safety measure to direct excess electric charge to the ground. It prevents damage to the Switch, and protects you from electrocution. Use the grounding screw on the rear panel and the ground wire of the AC power supply to ground the Switch.

The grounding terminal and AC power ground where you install the Switch must follow your country's regulations. Qualified service personnel must ensure the building's protective earthing terminals are valid terminals.

Installation of Ethernet cables must be separate from AC power lines. To avoid electric surge and electromagnetic interference, use a different electrical conduit or raceway (tube/trough or enclosed conduit for protecting electric wiring) that is 15 cm apart, or as specified by your country's electrical regulations.

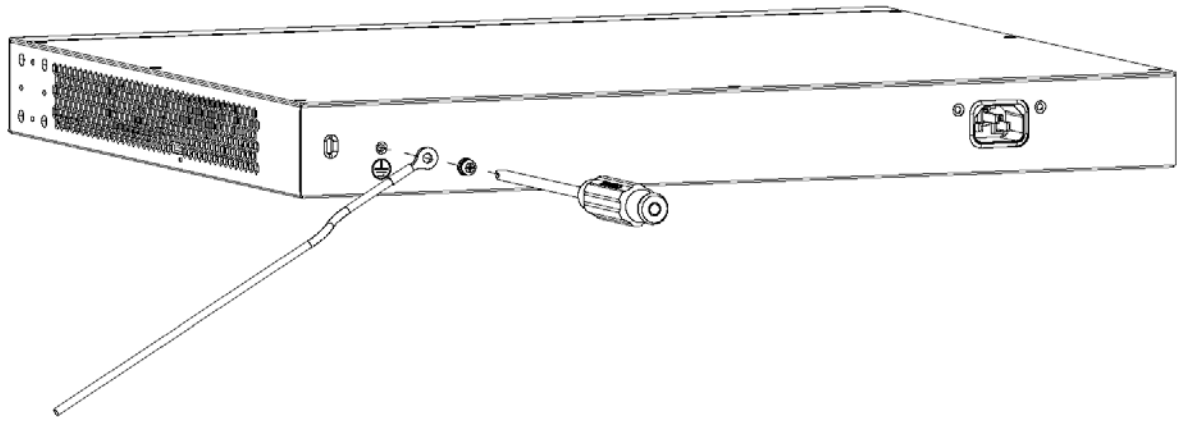
Any device that is located outdoors and connected to this product must be properly grounded and surge protected. To the extent permissible by your country's applicable law, failure to follow these guidelines could result in damage to your Switch which may not be covered by its warranty.

Note: The specification for surge or ESD protection assumes that the Switch is properly grounded.

1 Remove the M4 ground screw from the Switch's rear panel.

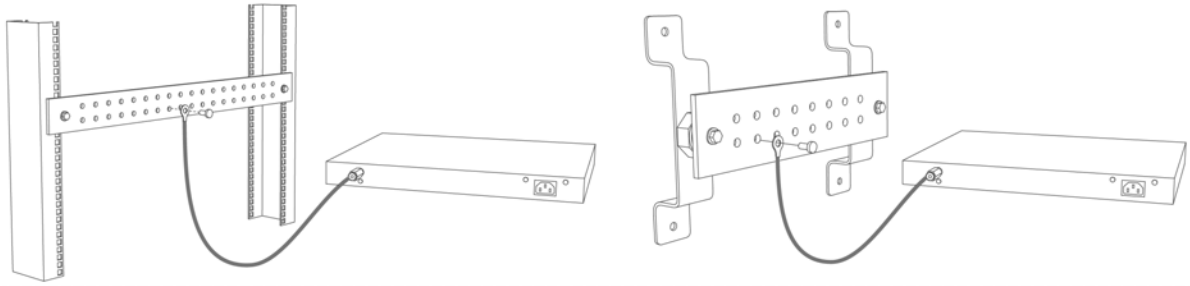
2 Secure a green or yellow ground cable (16 AWG or smaller) to the Switch's rear panel using the M4 ground screw.

**Figure 20** Grounding



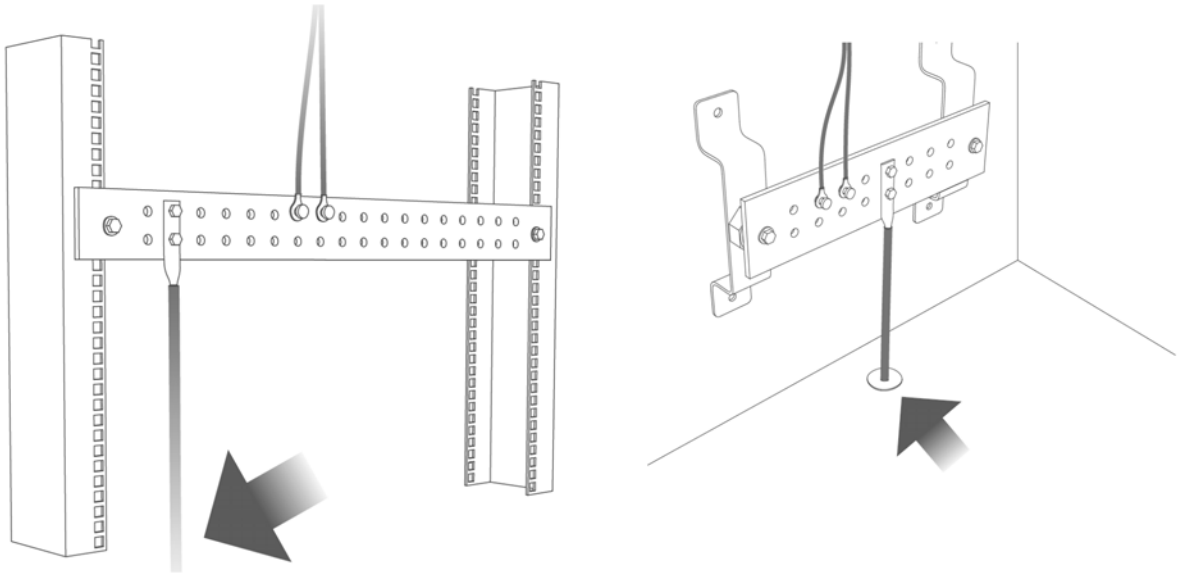
3 Attach the other end of the ground cable to a grounding bar located on the rack where you install the Switch or to an on-site grounding terminal.

**Figure 21** Attach Ground Cable to Grounding Bar or On-site Grounding Terminal



4 The grounding terminal of the server rack or on-site grounding terminal must also be grounded and connected to the building's main grounding electrode. Make sure the grounding terminal is connected to the buildings grounding electrode and has an earth resistance of less than 10 ohms, or according to your country's electrical regulations.

**Figure 22** Connecting to the Building's Main Grounding Electrode



If you are uncertain that suitable grounding is available, contact the appropriate electrical inspection authority or an electrician.

**This device must be grounded. Do this before you make other connections.**

## 3.2.2 AC Power Connection

Note: Make sure you are using the correct power source as shown on the panel and that no objects obstruct the airflow of the fans (located on the side of the unit).

The Switch uses two power supply modules, one of which is redundant, so if one power module fails the system can operate on the remaining module.

### Connecting the Power

Use the following procedures to connect the Switch to a power source after you have installed it in a rack.

Note: Use the included power cord for the AC power connection.

1 Connect the female end of the power cord to the AC power socket.

2 Connect the other end of the cord to a power outlet.

### Disconnecting the Power

The power input connectors can be disconnected from the power source individually.

1 Disconnect the power cord from the power outlet.

2 Disconnect the power cord from the AC power socket.

## 3.3 LEDs

The following table describes the LEDs.

Table 5 LEDs

| LED | COLOR | STATUS | DESCRIPTION |
|---|---|---|---|
| PWR1 | Green | On | The Switch is receiving power from the power module in the first power slot. |
| | | Blinking | The Switch is returning to the last-saved custom default configuration settings. |
| | Amber | On | The Switch is returning to its factory default configuration settings. |
| | | Blinking | The **PWR1** LED will blink in amber in the following situations:<br>• The Switch detected a power supply failure with the power cable connected to the Switch and a power source.<br>• The fans are not functioning at a proper speed or malfunctioning. |
| | | Off | The Switch is not receiving power from the power module in the first power slot. |
| PWR2 | Green | On | The Switch is receiving power from the power module in the second power slot. |
| | | Blinking | The Switch is returning to the last-saved custom default configuration settings. |
| | Amber | On | The Switch is returning to its factory default configuration settings. |
| | | Blinking | The **PWR2** LED will blink in amber in the following situations:<br>• The Switch detected a power supply failure with the power cable connected to the Switch and a power source.<br>• The fans are not functioning at a proper speed or malfunctioning. |
| | | Off | The Switch is not receiving power from the power module in the second power slot. |
| SYS (System) | Green | On | The Switch is on and functioning properly. |
| | | Blinking | The Switch is rebooting and performing self-diagnostic tests. |
| | Red | On | The Switch is functioning abnormally. |
| | | Off | The power is off or the system is not ready or malfunctioning. |

Table 5 LEDs (continued)

| LED | COLOR | STATUS | DESCRIPTION |
|---|---|---|---|
| CLOUD | Green | On | Switch has successfully connected to the NCC (Nebula Control Center). |
| | | Blinking | The Switch cannot connect to the NCC because it is not registered. |
| | Amber | On | The Switch is registered at the NCC but cannot connect to the NCC. Please check the Internet connection of the Switch. |
| | | Blinking | The Switch is not registered at the NCC and cannot connect to the NCC. Please check the Internet connection of the Switch and register the Switch at NCC. |
| | | Off | The Switch is operating in standalone mode. Nebula Control Center Discovery is disabled in **Basic** > **Cloud Management** > **Nebula Control Center Discovery** in the Switch Web Configurator. |
| | Note: Hybrid mode and NCC registration are reserved for future use. | | |
| LOCATOR | Blue | On | The Switch is uploading firmware. While the Switch is doing this, do not turn off the power. |
| | | Blinking | Shows the actual location of the Switch between several devices in a rack. The default timer is 30 minutes when you are configuring the Switch. |
| | | Off | The locator is not functioning or malfunctioning. |
| MAST (Master) | Green | On | The Switch is acting as a standalone switch or the master in stacking. |
| | | Off | The Switch is acting as a non-master member in a stack or it is in standalone mode. |
| | Amber | On | There is an error occurred when the Switch is selected as the master member in a stack. |
| Ethernet Ports | | | |
| 17 – 28 | Green | On | The port has a successful 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps connection. |
| | | Blinking | The port is receiving or transmitting data at 100 Mbps/1 Gbps/2.5 Gbps/5 Gbps. |
| | Blue | On | The port has a successful 10 Gbps connection. |
| | | Blinking | The port is receiving or transmitting data at 10 Gbps. |
| | | Off | This link is disconnected or the port is disabled. |
| SFP+ Slots | | | |
| 1 – 16; 21 – 28 | Green | On | The port has a successful 1000 Mbps connection. |
| | | Blinking | The port is receiving or transmitting data at 1000 Mbps. |
| | Blue | On | The port has a successful 10 Gbps connection. |
| | | Blinking | The port is receiving or transmitting data 10 Gbps. |
| | | Off | This link is disconnected. |
| MGMT (Management) | Green (Right) | On | The **MGMT** port is connected at 10/1000 Mbps. |
| | | Blinking | The system is transmitting or receiving to or from an Ethernet device at 10/1000 Mbps through the **MGMT** port. |
| | Amber (Left) | On | The **MGMT** port is connected at 100 Mbps. |
| | | Blinking | The system is transmitting or receiving to or from an Ethernet device at 100 Mbps through the **MGMT** port. |
| | | Off | The **MGMT** port is not connected to an Ethernet device, or the port is disabled. |
| STACK ID | | | The LED is showing the Stack ID number of the Switch.<br>ID 0 means it is a standalone Switch. |

# PART II
# Technical Reference

# CHAPTER 4
# Web Configurator

## 4.1 Overview

This section introduces the configuration and functions of the Web Configurator.

The Web Configurator is an HTML-based management interface that allows easy system setup and management through Internet browser. Use a browser that supports HTML5, such as Microsoft Edge, Internet Explorer 11, Mozilla Firefox, or Google Chrome. The recommended minimum screen resolution is 1024 by 768 pixels.

In order to use the Web Configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

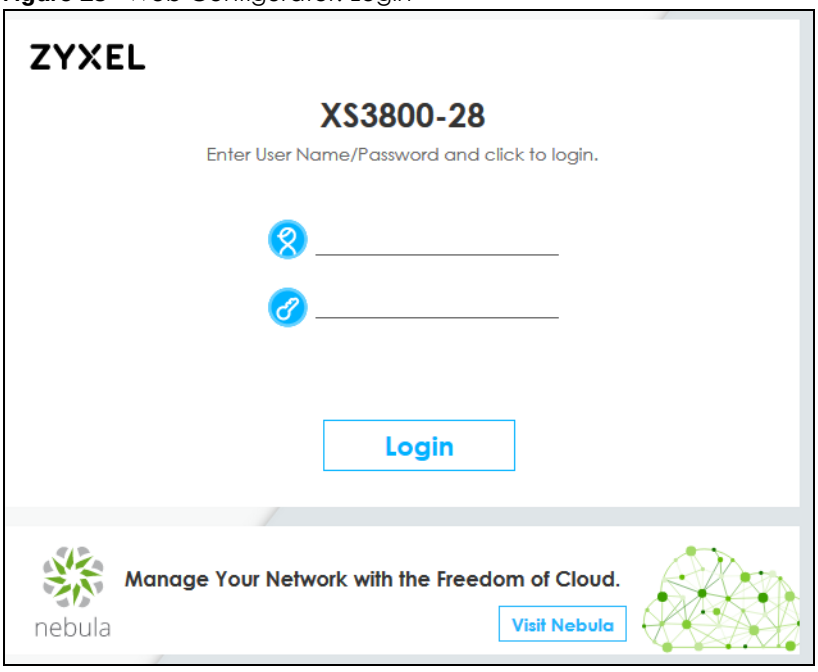
## 4.2 System Login

1. Start your web browser.
2. The Switch is a DHCP client by default. Type "http://DHCP-assigned IP" in the **Location** or **Address** field. Press [ENTER].

   If the Switch is not connected to a DHCP server, type "http://" and the static IP address of the Switch (for example, the default management IP address is 192.168.1.1 through an in-band (non-**MGMT**) port and 192.168.0.1 through the **MGMT** port) in the **Location** or **Address** field. Press [ENTER]. Your computer must be in the same subnet in order to access this website address.

   Also, you can use the ZON Utility to check your Switch's IP address. See Section 4.3 on page 55 for more information on the ZON utility.
3. The following screen appears.

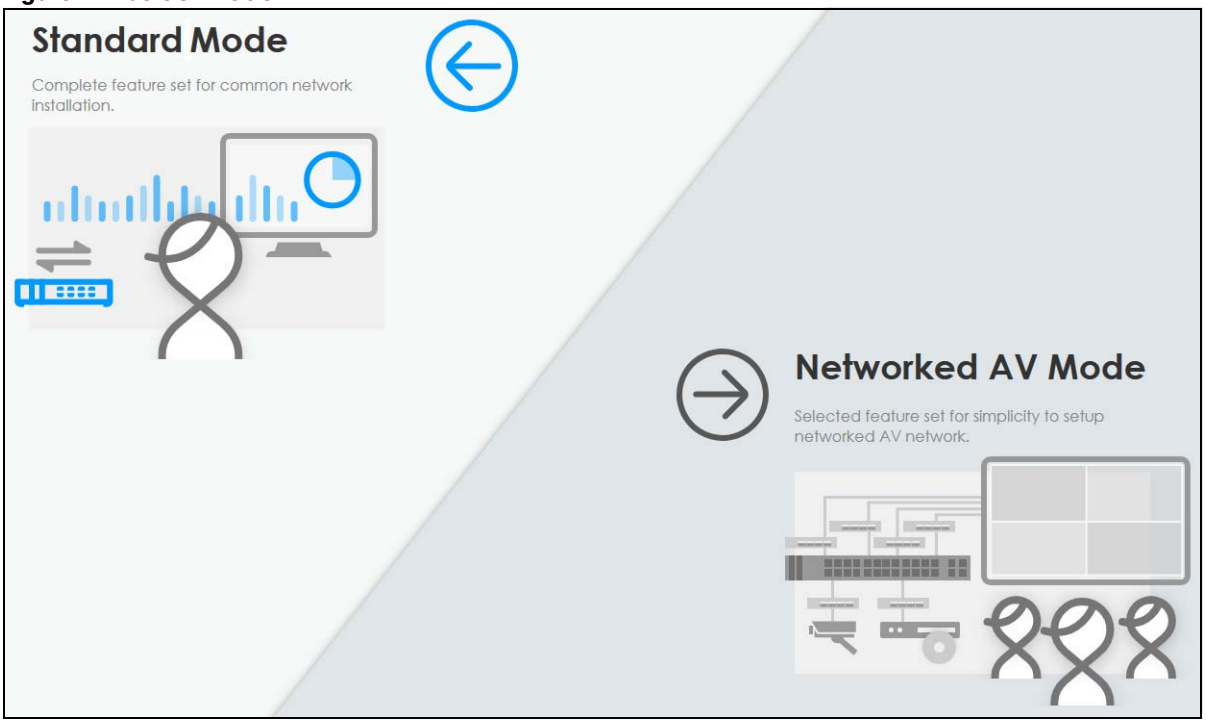
**Figure 23** Web Configurator: Login




4 Click **Login** to log into the Web Configurator to manage the Switch directly. The default user name is **admin** and associated default password is **1234**.

5 The following screen appears.

**Figure 24** Select Mode




6 Select the Web Configurator in **Standard Mode** that has a complete set of configuration for network installation. Or select the Web Configurator in **Networked AV Mode** that has a set of menus specifically designed to simplify configuration and management of the Switch for AVoIP (Audio-Video over Internet

Protocol) application.

7 If you select **Standard Mode**, go directly to step 9.

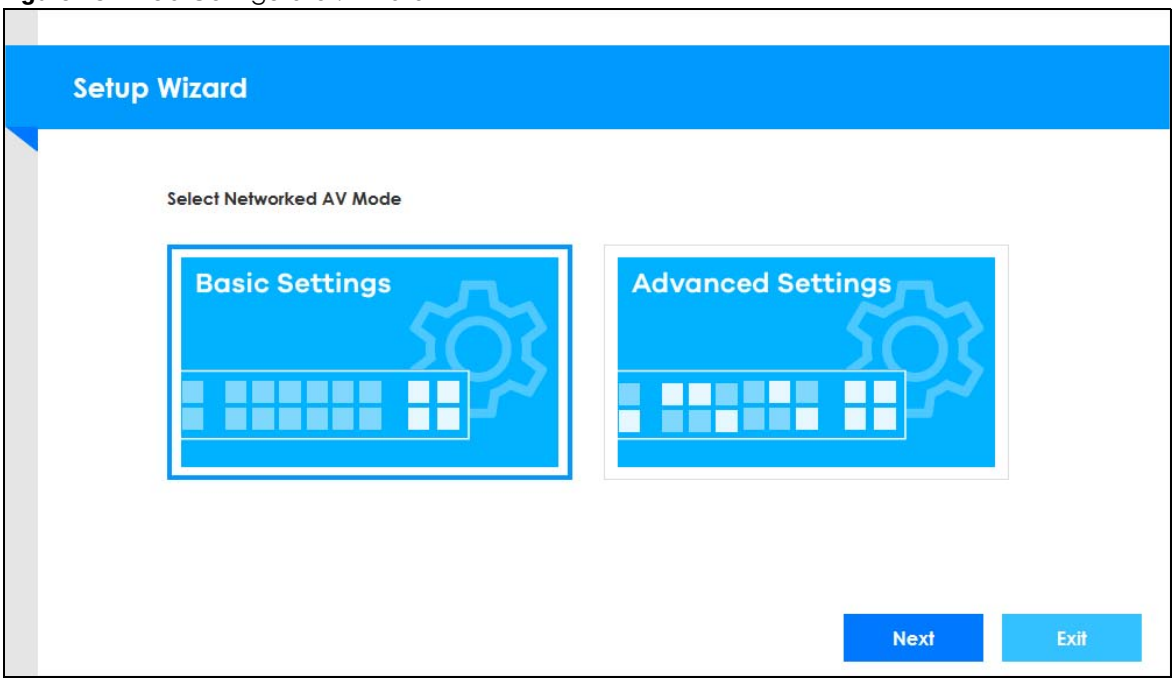
8 The **Setup Wizard** screen will appear after selecting the **Networked AV Mode**. You can use the **Setup Wizard** screen to configure the Switch's Networked AV mode's basic or advanced settings (see Section 4.4 on page 59 for details).

- Use the **Basic Settings** to configure networked AV operation on management VLAN. Such as the Switches' IP address, DNS server, system password, SNMP community, accept or skip the default Networked AV mode settings, and view a summary of the basic settings.
- Use the **Advanced Settings** for networks that wants to separate networked AV VLAN from management VLAN, specify which ports connect to AVoIP application, and for setting link aggregation across switches.

Once you click the **Finish** button, the settings configured in the **Setup Wizard** screen will overwrite the existing settings.

Otherwise, click the **Exit** button. If you want to open the **Setup Wizard** screen later, click the **Wizard** icon in the upper right hand corner of the Web Configurator in Networked AV mode.

**Figure 25** Web Configurator: Wizard




9 If you did not change the default administrator password and/or SNMP community values, a warning screen displays each time you log into the Web Configurator and select **Standard Mode**. Click **Password / SNMP** to open a screen where you can change the administrator password and SNMP community string simultaneously. Otherwise, click **Ignore** to close it.
If you log into the Web Configurator and select **Networked AV Mode**, open the screen in the **Wizard** > **Step 2 Password** to change the administrator password and SNMP community string. Click **Finish** on the last step of the **Wizard** to save your settings.

## Password/SNMP Setting

**Figure 26** Web Configurator: Warning

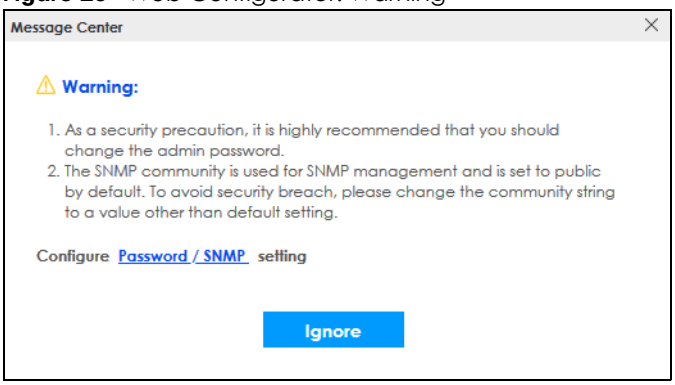
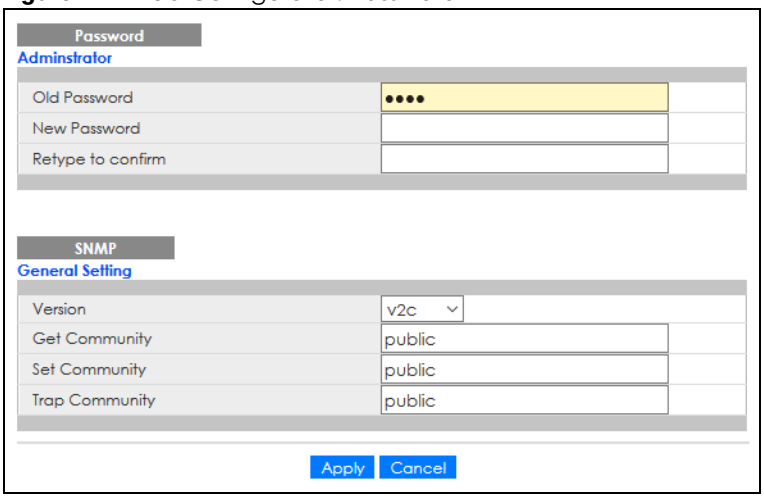



**Figure 27** Web Configurator: Password




Change the default administrator and/or SNMP passwords, and then click **Apply** to save your changes.

Table 6 Web Configurator: Password/SNMP

| LABEL | DESCRIPTION |
|---|---|
| Administrator<br><br>This is the default administrator account with the "admin" user name. You cannot change the default administrator user name. | |
| Old Password | Enter the existing system password (**1234** is the default password when shipped). |
| New Password | Enter your new system password. Up to 32 characters are allowed for the new password except [ ? ], [ \| ], [ ' ], [ " ], [ space ], or [ , ]. |
| Retype to confirm | Re-enter your new system password for confirmation. |
| General Setting<br><br>Use this section to specify the SNMP version and community (password) values. | |
| Version | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (**v2c**), SNMP version 3 (**v3**) or both (**v3v2c**).<br><br>Note: SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community | Enter the **Get Community** string, which is the password for the incoming Get- and GetNext-requests from the management station.<br><br>The **Get Community** string is only used by SNMP managers using SNMP version 2c or lower. |

Table 6 Web Configurator: Password/SNMP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Set Community | Enter the **Set Community** string, which is the password for the incoming Set- requests from the management station.<br>The **Set Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Community | Enter the **Trap Community** string, which is the password sent with each trap to the SNMP manager.<br>The **Trap Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 4.3 Zyxel One Network (ZON) Utility

ZON Utility is a program designed to help you deploy and manage a network more efficiently. It detects devices automatically and allows you to do basic settings on devices in the network without having to be near it.

The ZON Utility issues requests through Zyxel Discovery Protocol (ZDP) and in response to the query, the device responds back with basic information including IP address, firmware version, location, system and model name in the same broadcast domain. The information is then displayed in the ZON Utility screen and you can perform tasks like basic configuration of the devices and batch firmware upgrade in it. You can download the ZON Utility at www.zyxel.com and install it in a computer (Windows operating system).

## 4.3.1 Requirements

Before installing the ZON Utility in your computer, please make sure it meets the requirements listed below.

### Operating System

At the time of writing, the ZON Utility is compatible with:

- Windows 7 (both 32-bit / 64-bit versions)
- Windows 8 (both 32-bit / 64-bit versions)
- Windows 8.1 (both 32-bit / 64-bit versions)
- Windows 10 (both 32-bit / 64-bit versions)

Note: To check for your Windows operating system version, right-click on **My Computer** > **Properties**. You should see this information in the **General** tab.

### Hardware

Here are the minimum hardware requirements to use the ZON Utility on your computer.

- Core i3 processor

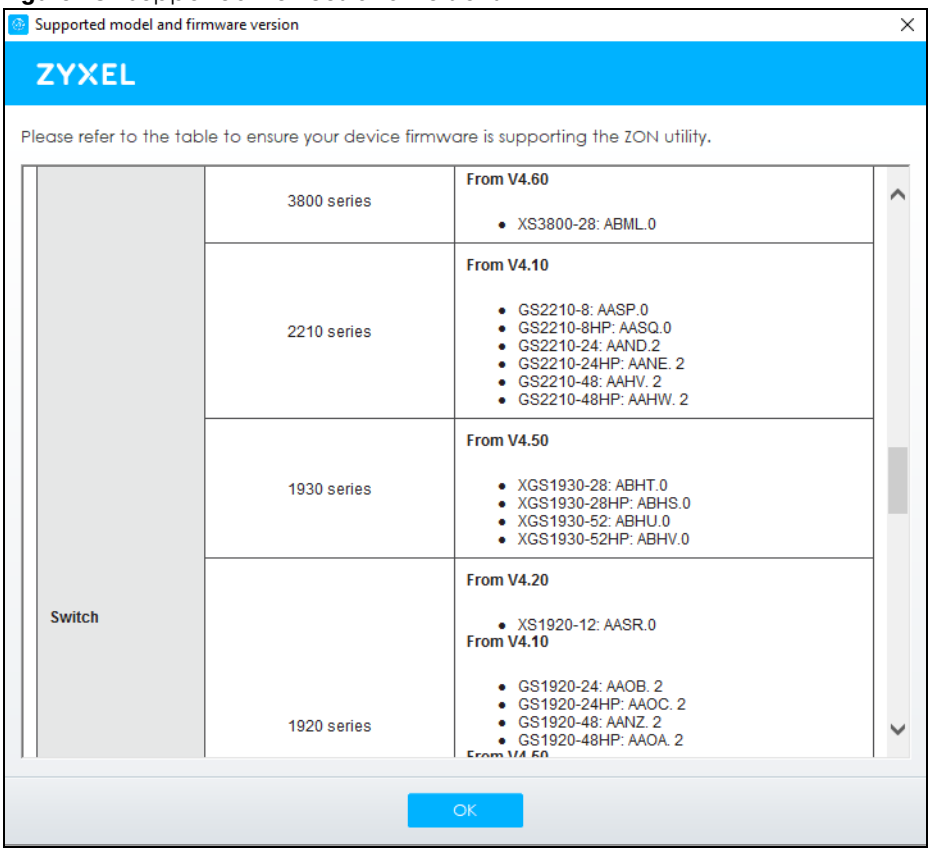
- 2 GB RAM
- 100 MB free hard disk
- WXGA (Wide XGA 1280 by 800)

## 4.3.2 Run the ZON Utility

1 Double-click the ZON Utility to run it.

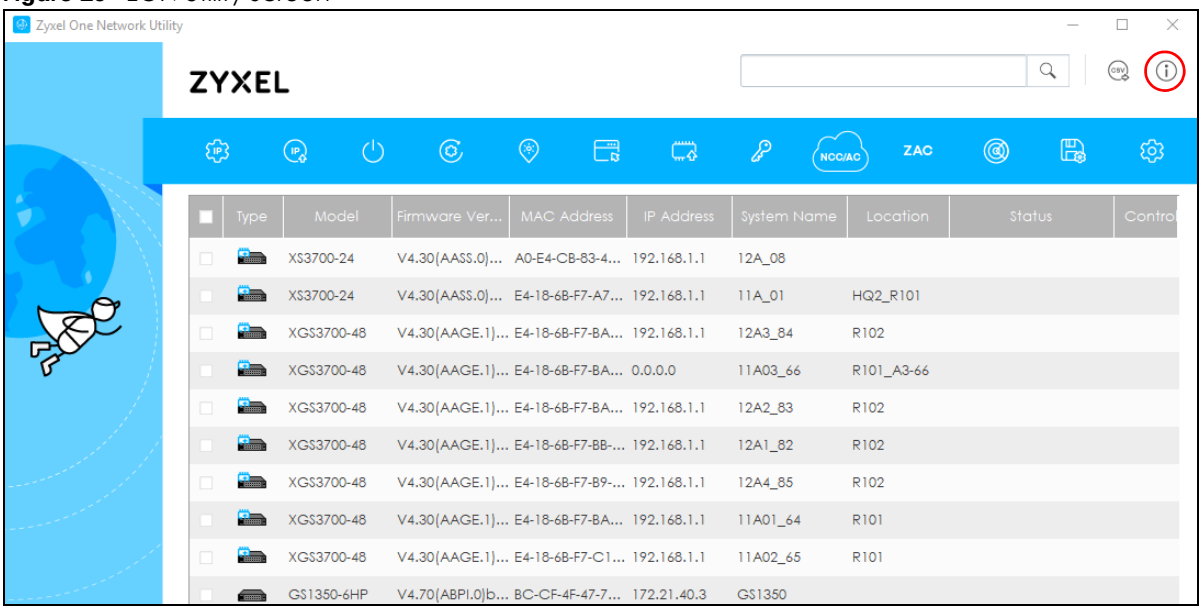
2 The first time you run the ZON Utility, you will see if your device and firmware version support the ZON Utility. Click the **OK** button to close this screen.

**Figure 28** Supported Devices and Versions



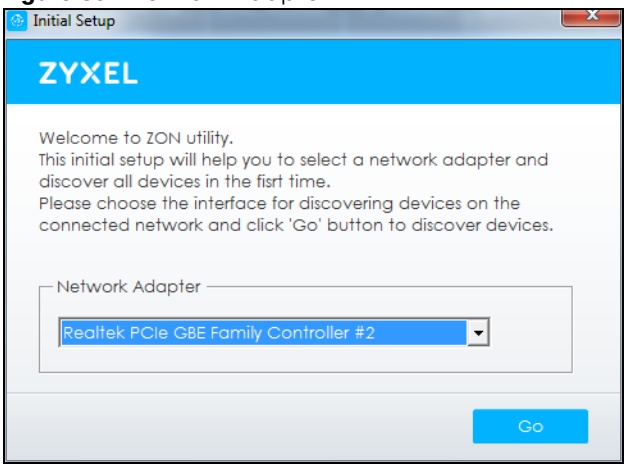

If you want to check the supported models and firmware versions later, you can click the **Show information about ZON** icon in the upper right of the screen. Then select the **Supported model and firmware version** link. If your device is not listed here, see the device release notes for ZON Utility support. The release notes are in the firmware zip file on the Zyxel web site.

**Figure 29** ZON Utility Screen



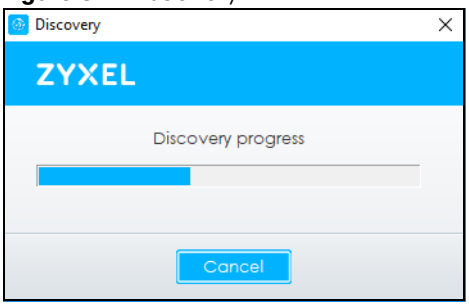

3 Select a network adapter to which your supported devices are connected.

**Figure 30** Network Adapter



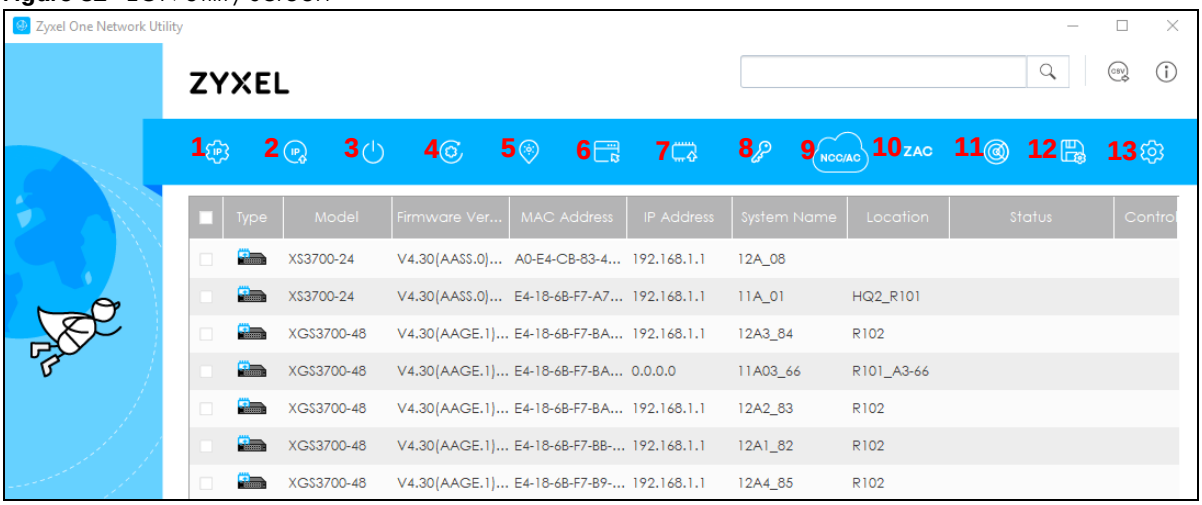

4 Click the **Go** button for the ZON Utility to discover all supported devices in your network.

**Figure 31** Discovery




5 The ZON Utility screen shows the devices discovered.

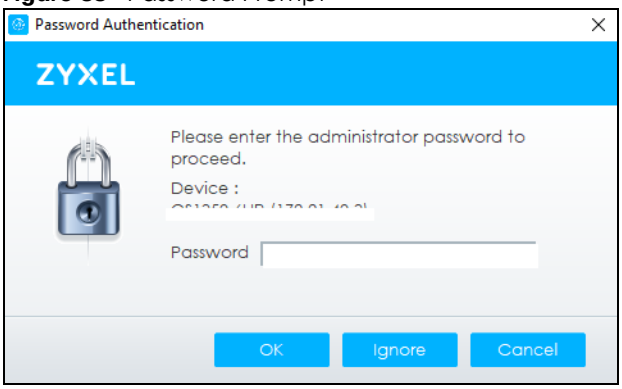
**Figure 32** ZON Utility Screen




6 Select a device and then use the icons to perform actions. Some functions may not be available for your devices.

Note: You must know the selected device admin password before taking actions on the device using the ZON Utility icons.

**Figure 33** Password Prompt




The following table describes the icons numbered from left to right in the ZON Utility screen.

Table 7 ZON Utility Icons

| ICON | DESCRIPTION |
|---|---|
| 1 IP Configuration | Change the selected device's IP address. |
| 2 Renew IP Address | Update a DHCP-assigned dynamic IP address. |
| 3 Reboot Device | Use this icon to restart the selected devices. This may be useful when troubleshooting or upgrading new firmware. |
| 4 Reset Configuration to Default | Use this icon to reload the factory-default configuration file. This means that you will lose all previous configurations. |
| 5 Locator LED | Use this icon to locate the selected device by causing its **Locator** LED to blink. |
| 6 Web GUI | Use this to access the selected device Web Configurator from your browser. You will need a user name and password to log in. |
| 7 Firmware Upgrade | Use this icon to upgrade new firmware to selected devices of the same model. Make sure you have downloaded the firmware from the Zyxel website to your computer and unzipped it in advance. |

Table 7 ZON Utility Icons (continued)

| ICON | DESCRIPTION |
|---|---|
| 8 Change Password | Use this icon to change the admin password of the selected device. You must know the current admin password before changing to a new one. |
| 9 Configure NCC Discovery | You must have Internet access to use this feature. Use this icon to enable or disable the Nebula Control Center (NCC) discovery feature on the selected device. If it is enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it will go into the Nebula cloud management mode. |
| 10 ZAC | Use this icon to run the Zyxel AP Configurator of the selected AP. |
| 11 Clear and Rescan | Use this icon to clear the list and discover all devices on the connected network again. |
| 12 Save Configuration | Use this icon to save configuration changes to permanent memory on a selected device. |
| 13 Settings | Use this icon to select a network adapter for the computer on which the ZON utility is installed, and the utility language. |

The following table describes the fields in the ZON Utility main screen.

Table 8 ZON Utility Fields

| LABEL | DESCRIPTION |
|---|---|
| Type | This field displays an icon of the kind of device discovered. |
| Model | This field displays the model name of the discovered device. |
| Firmware Version | This field displays the firmware version of the discovered device. |
| MAC Address | This field displays the MAC address of the discovered device. |
| IP Address | This field displays the IP address of an internal interface on the discovered device that first received a ZDP discovery request from the ZON Utility. |
| System Name | This field displays the system name of the discovered device. |
| Location | This field displays where the discovered device is. |
| Status | This field displays whether changes to the discovered device have been done successfully. As the Switch does not support **IP Configuration**, **Renew IP address** and **Flash Locator LED**, this field displays "Update failed", "Not support Renew IP address" and "Not support Flash Locator LED" respectively. |
| Controller Discovery | This field displays if the discovered device supports the Nebula Control Center (NCC) discovery feature. If it is enabled, the selected device will try to connect to the NCC. Once the selected device is connected to and has registered in the NCC, it will go into the Nebula cloud management mode. |
| Serial Number | Enter the admin password of the discovered device to display its serial number. |
| Hardware Version | This field displays the hardware version of the discovered device. |

# 4.4 Networked AV Mode Wizard

The **Setup Wizard** can be accessed using the following methods:

- When the Switch is in its factory-default state, selecting Networked AV mode will automatically access the **Setup Wizard**.
- When in Networked AV mode, click the **Wizard** link to access the **Setup Wizard**.

**Figure 34** Wizard Link in Networked AV Mode

The **Setup Wizard** contains the following parts:

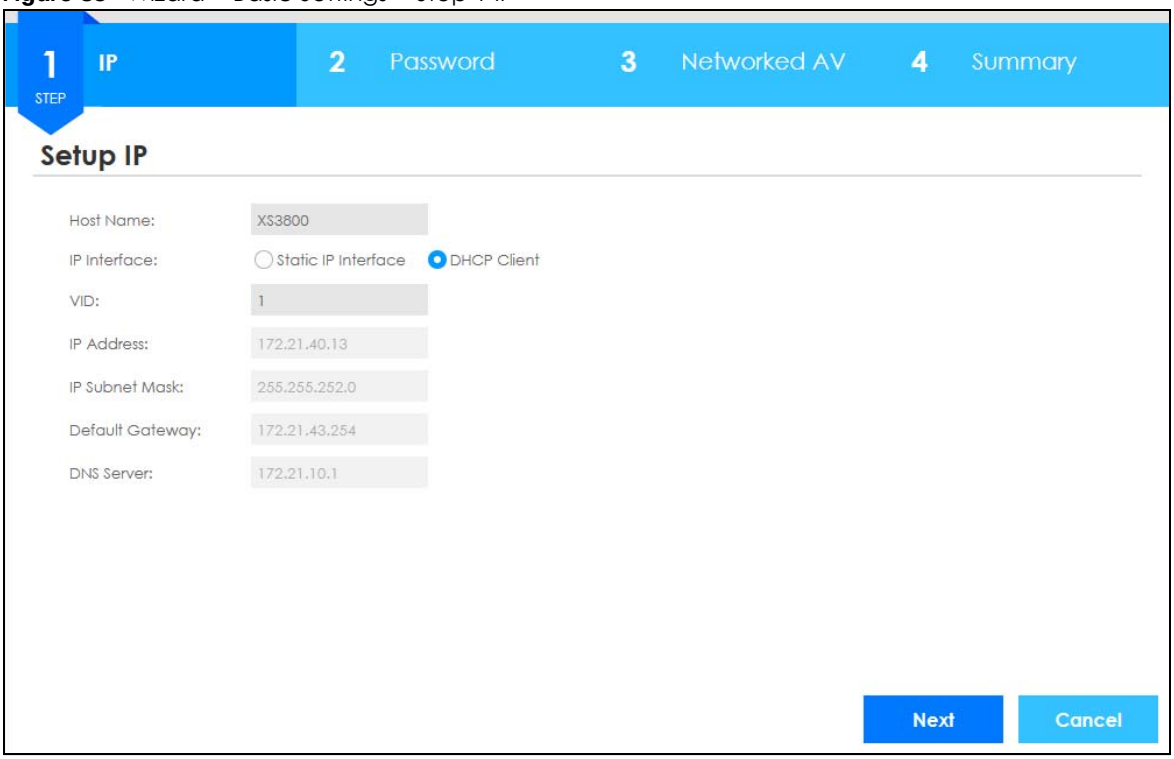
- Use the **Basic Settings** when networked AV service runs on management VLAN, using the combo/ fiber port for inter-switch connection.
- Use the **Advanced Settings** when you need to specify the VLAN for networked AV service and configure the port's role manually.

## 4.4.1 Basic Settings

In **Basic Settings**, you can set up IP or DNS, set up your password, SNMP community, accept or skip the default Networked AV mode settings, and view finished results.

In order to set up your IP or DNS, please do the following. Click **Wizard** > **Basic Settings** > **Step 1 IP** to access this screen.

**Figure 35** Wizard > Basic Settings > Step 1 IP



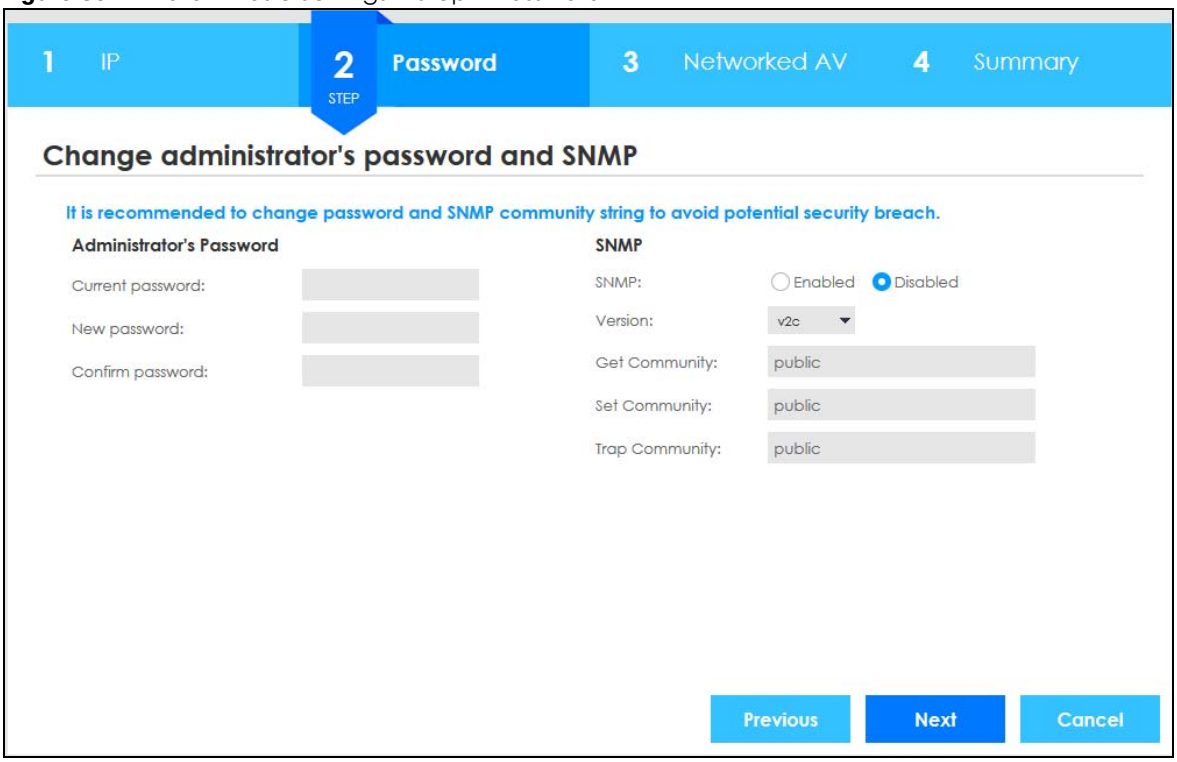
Each field is described in the following table.

Table 9 Wizard > Basic Settings > Step 1 IP

| LABEL | DESCRIPTION |
|---|---|
| Host Name | This field displays a host name. |
| IP Interface | Select **DHCP Client** if the Switch is connected to a router with the DHCP server enabled. You then need to check the router for the IP address assigned to the Switch in order to access the Switch's Web Configurator again.<br>Select **Static IP Interface** when the Switch is NOT connected to a router or you want to assign it a fixed IP address. |
| VID | This field displays the VLAN ID. |
| IP Address | The Switch needs an IP address for it to be managed over the network. |
| IP Subnet Mask | The subnet mask specifies the network number portion of an IP address. |
| Default Gateway | Type the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254. |
| DNS Server | DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. Enter a domain name server IP address in order to be able to use a domain name instead of an IP address. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next,** the **Password** screen appears.

**Figure 36** Wizard > Basic Settings > Step 2 Password



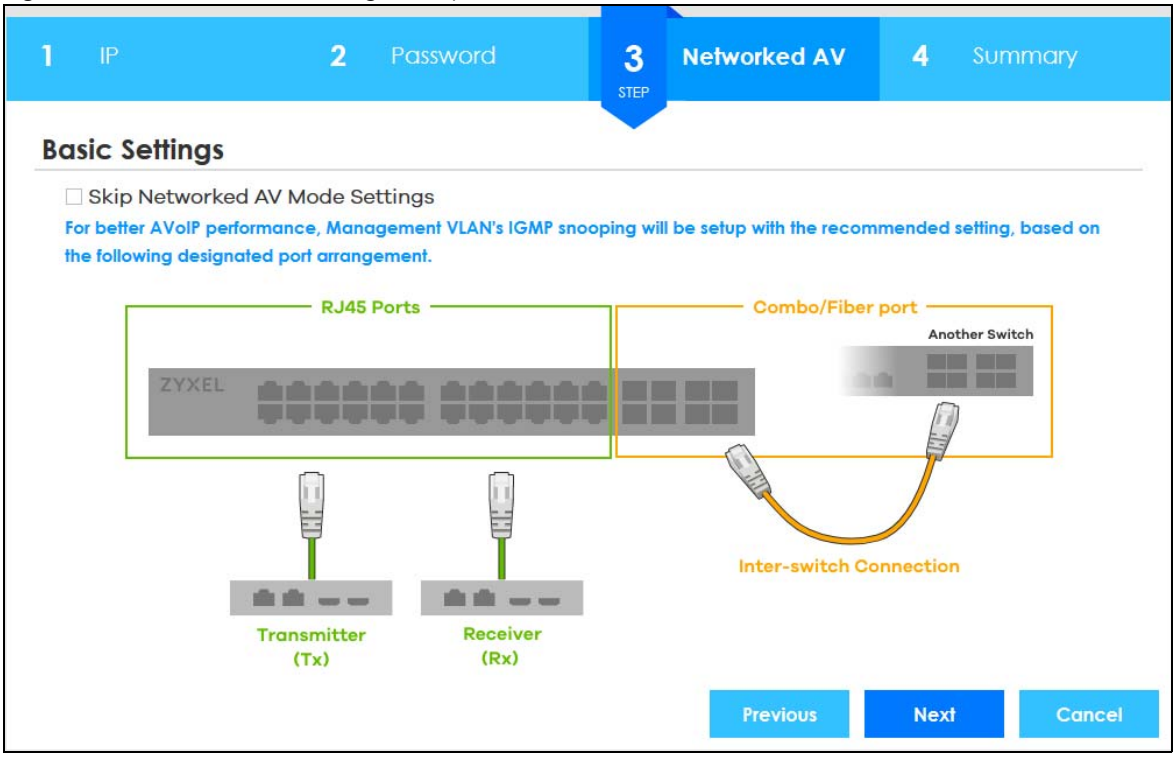
Each field is described in the following table.

Table 10 Wizard > Basic Settings > Step 2 Password

| LABEL | DESCRIPTION |
|---|---|
| Administrator's Password | |
| Current password | Type the existing system password (1234 is the default password when shipped). |
| New password | Enter your new system password. Up to 32 characters are allowed for the new password except [ ? ], [ \| ], [ ' ], [ " ], [ space ], or [ , ]. |
| Confirm password | Retype your new system password for confirmation. |
| SNMP | |
| SNMP | Select **Enabled** to let the Switch act as an SNMP agent, which allows a manager station to manage and monitor the Switch through the network. Select **Disabled** to turn this feature off. |
| Version | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (**v2c**), SNMP version 3 (**v3**) or both (**v3v2c**).<br>Note: SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community | Enter the **Get Community** string, which is the password for the incoming Get- and GetNextrequests from the management station.<br>The **Get Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Set Community | Enter the **Set Community** string, which is the password for the incoming Set- requests from the management station.<br>The **Set Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Community | Enter the **Trap Community** string, which is the password sent with each trap to the SNMP manager.<br>The **Trap Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Previous | Click **Previous** to show the previous screen. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next**, the **Networked AV** screen appears.

**Figure 37** Wizard > Basic Settings > Step 3 Networked AV



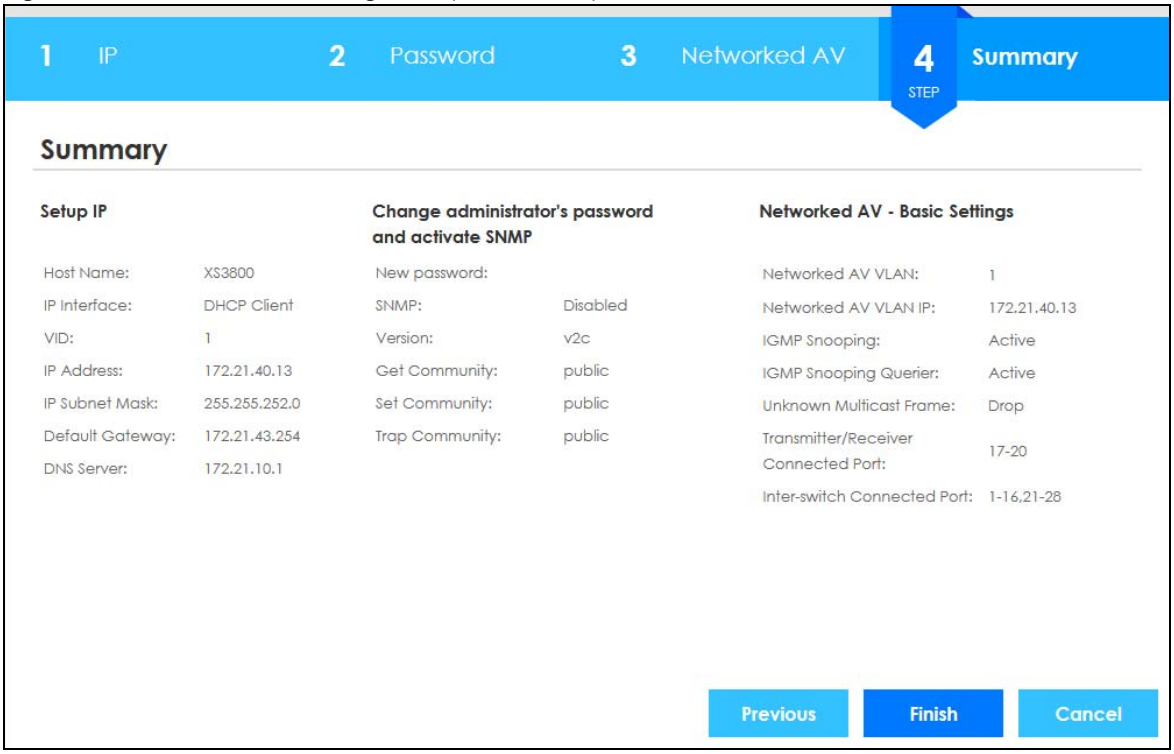

Each field is described in the following table.

Table 11 Wizard > Basic Settings > Step 3 Networked AV

| LABEL | DESCRIPTION |
|---|---|
| Skip Networked AV Mode Settings | Click this option to avoid using the basic default AVoIP settings. The default AVoIP settings can be seen in Step 4 Summary under **Networked AV – Basic Settings**.<br>Otherwise, clear the check box and follow the diagram for connecting RJ45 ports to audio and video equipment. The **Inter-switch Connection** is for connecting to another switch.<br>Note: Use the **Wizard** > **Advanced Settings** > **Step 3 Networked AV** to configure connections for non-Audio-Video equipment (for example computer, NAS) to the RJ45 ports. |
| Previous | Click **Previous** to show the previous screen. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next,** the **Summary** screen appears.

**Figure 38** Wizard > Basic Settings > Step 4 Summary




Each field is described in the following table.

Table 12 Wizard > Basic Settings > Step 4 Summary

| LABEL | DESCRIPTION |
|---|---|
| Setup IP | |
| Host Name | This field displays a host name. |
| IP Interface | This field displays whether the WAN interface is using a DHCP IP address or a static IP address. |
| VID | This field displays the VLAN ID. |
| IP Address | This field displays the Switches' IP address for it to be managed over the network. |
| IP Subnet Mask | This field displays the subnet mask that specifies the network number portion of an IP address. |
| Default Gateway | This field displays the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254. |
| DNS Server | This field displays the DNS (Domain Name System) for mapping a domain name to its corresponding IP address and vice versa. |
| Change administrator's password and activate SNMP | |
| New Password | This field displays asterisks when a new password has been created. |
| SNMP | This field displays whether the Switch acts as an SNMP agent. |
| Version | This field displays the SNMP version for the Switch. |
| Get Community | This field displays the **Get Community** string. |
| Set Community | This field displays the **Set Community** string. |
| Trap Community | This field displays the **Trap Community** string. |
| Networked AV – Basic Settings | |
| Networked AV VLAN | This field displays the VLAN ID for the AVoIP network. |

Table 12 Wizard > Basic Settings > Step 4 Summary (continued)

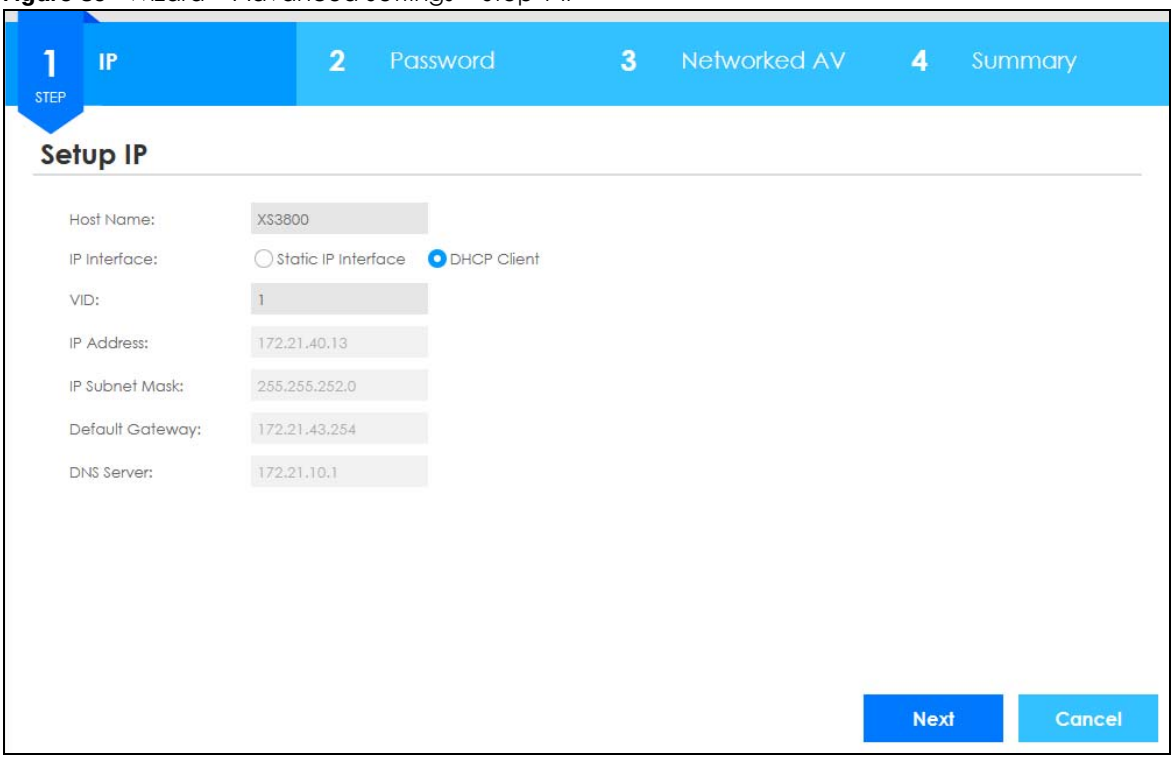
| LABEL | DESCRIPTION |
|---|---|
| Networked AV VLAN IP | This field displays the Switches' IP address for it to be managed over the AVoIP network. |
| IGMP Snooping | This field displays **Active** when IGMP Snooping is enabled to forward group multicast traffic only to ports that are members of that group.<br>Otherwise, it displays **Inactive**. |
| IGMP Snooping Querier | This field displays **Active** when the Switch is allowed to send IGMP General Query messages to the VLANs with the multicast hosts attached.<br>Otherwise, it displays **Inactive**. |
| Unknown Multicast Frame | This field displays the action to perform when the Switch receives an unknown multicast frame. It displays **Drop** when the frames are discarded. It displays **Flooding** when the frames are sent to all ports. |
| Transmitter/Receiver Connected Port | This field shows the Switches' port numbers for connection to networked audio and video equipment. |
| Inter-switch Connected Port | This field shows the Switches' port numbers for connection to another switch. |
| Previous | Click **Previous** to show the previous screen. |
| Finish | Review the information and click **Finish** to create the task. |
| Cancel | Click **Cancel** to exit this screen without saving. |

## 4.4.2 Advanced Settings

In **Advanced Settings**, you can set up IP or DNS, set up your password, SNMP community, configure Networked AV service to a VLAN, select and assign port role, link aggregation (trunking), and view finished results.

In order to set up your IP or DNS, please do the following. Click **Wizard** > **Advanced Settings** > **Step 1 IP** to access this screen.

**Figure 39** Wizard > Advanced Settings > Step 1 IP



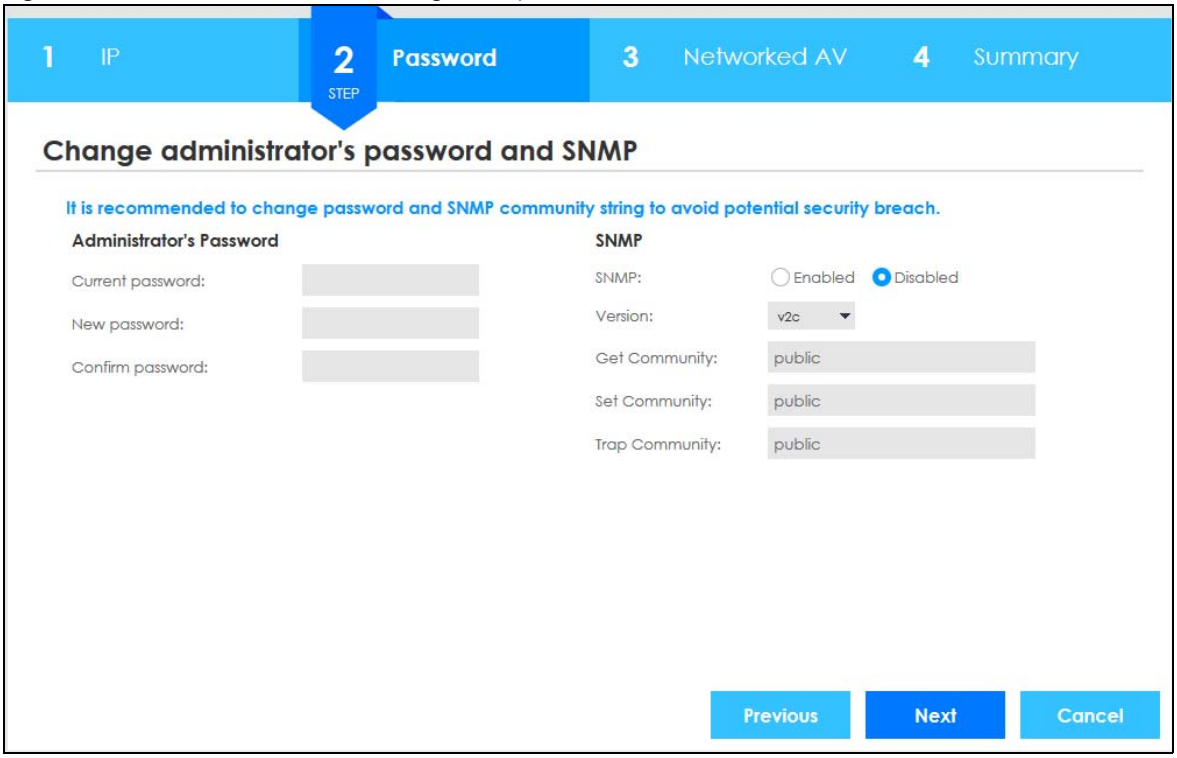

Each field is described in the following table.

Table 13 Wizard > Advanced Settings > Step 1 IP

| LABEL | DESCRIPTION |
|---|---|
| Host Name | This field displays a host name. |
| IP Interface | Select **DHCP Client** if the Switch is connected to a router with the DHCP server enabled. You then need to check the router for the IP address assigned to the Switch in order to access the Switch's Web Configurator again.<br>Select **Static IP Interface** when the Switch is NOT connected to a router or you want to assign it a fixed IP address. |
| VID | This field displays the VLAN ID. |
| IP Address | The Switch needs an IP address for it to be managed over the network. |
| IP Subnet Mask | The subnet mask specifies the network number portion of an IP address. |
| Default Gateway | Type the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254. |
| DNS Server | DNS (Domain Name System) is for mapping a domain name to its corresponding IP address and vice versa. Enter a domain name server IP address in order to be able to use a domain name instead of an IP address. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next,** the **Password** screen appears.

**Figure 40** Wizard > Advanced Settings > Step 2 Password




Each field is described in the following table.

Table 14 Wizard > Advanced Settings > Step 2 Password

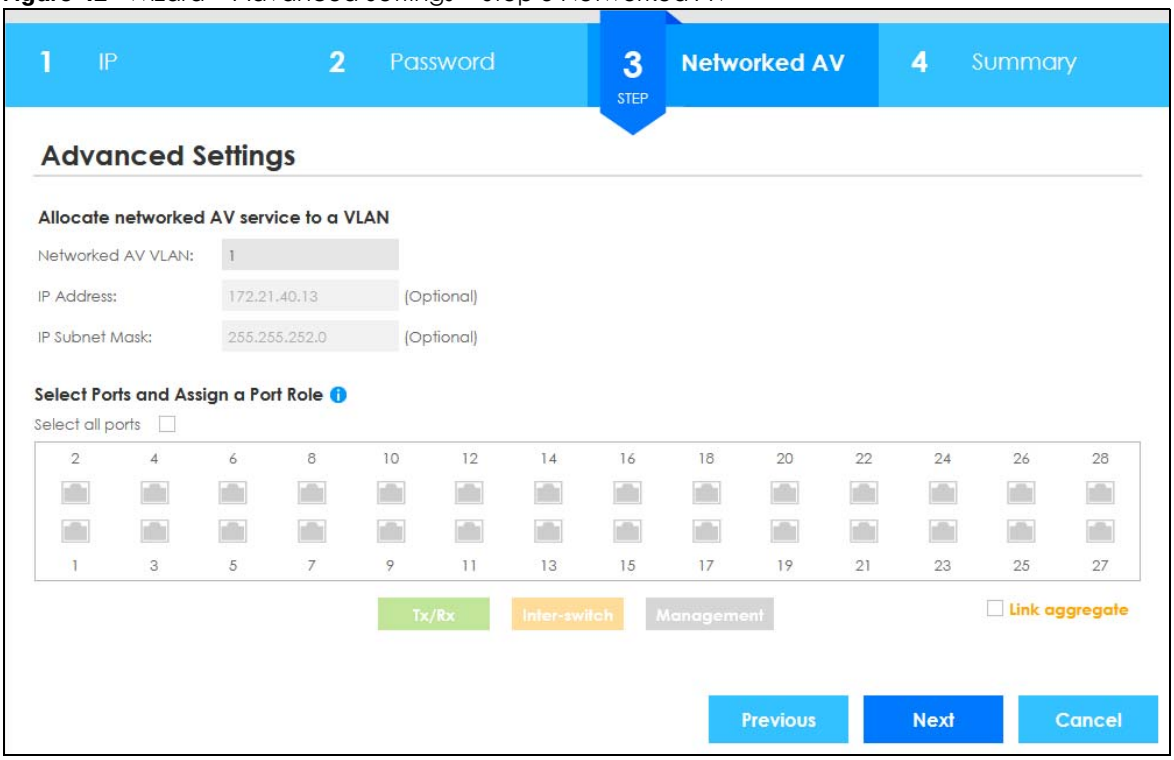
| LABEL | DESCRIPTION |
|---|---|
| Administrator's Password | |
| Current password | Type the existing system password (1234 is the default password when shipped). |
| New password | Enter your new system password. Up to 32 characters are allowed for the new password except [ ? ], [ \| ], [ ' ], [ " ], [ space ], or [ , ]. |
| Confirm password | Retype your new system password for confirmation. |
| SNMP | |
| SNMP | Select **Enabled** to let the Switch act as an SNMP agent, which allows a manager station to manage and monitor the Switch through the network. Select **Disabled** to turn this feature off. |
| Version | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (**v2c**), SNMP version 3 (**v3**) or both (**v3v2c**).<br><br>Note: SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community | Enter the **Get Community** string, which is the password for the incoming Get- and GetNextrequests from the management station.<br><br>The **Get Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Set Community | Enter the **Set Community** string, which is the password for the incoming Set- requests from the management station.<br><br>The **Set Community** string is only used by SNMP managers using SNMP version 2c or lower. |

Table 14 Wizard > Advanced Settings > Step 2 Password (continued)

| LABEL | DESCRIPTION |
|---|---|
| Trap Community | Enter the **Trap Community** string, which is the password sent with each trap to the SNMP manager.<br>The **Trap Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Previous | Click **Previous** to show the previous screen. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next**, the **Networked AV** screen appears.

**Figure 41** Wizard > Advanced Settings > Step 3 Networked AV




Each field is described in the following table.

Table 15 Wizard > Advanced Settings > Step 3 Networked AV

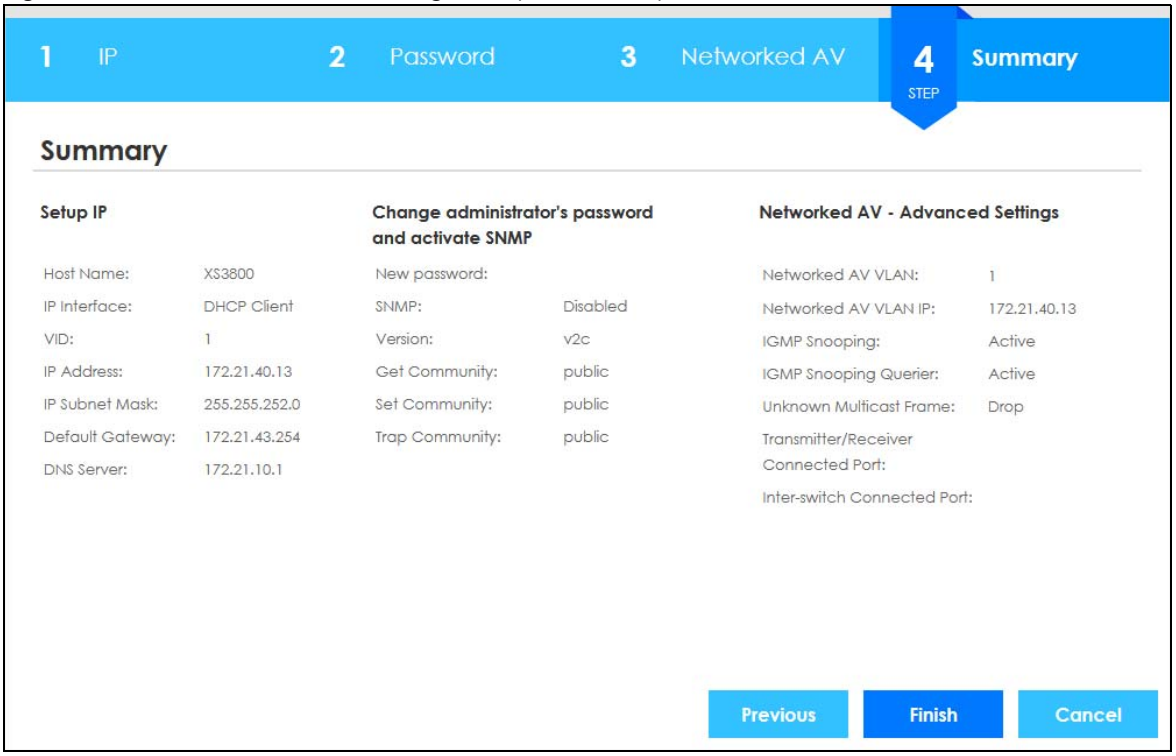
| LABEL | DESCRIPTION |
|---|---|
| Allocate networked AV service to a VLAN | |
| Networked AV VLAN | Enter a number between 1 and 4094 to create a VLAN for the AVoIP network (see Figure 4 on page 33 for details on an AVoIP network). |
| IP Address<br>(Optional) | You must enter a different VLAN ID in the previous field (**Networked AV VLAN**) to be able to assign another IP address for the Switch to be managed over the AVoIP network. |
| IP Subnet Mask<br>(Optional) | You must enter a different VLAN ID in the **Networked AV VLAN** field to be able to assign another subnet mask that specifies the network number portion of an IP address. |
| Select Ports and Assign a Port Role | |

Table 15 Wizard > Advanced Settings > Step 3 Networked AV (continued)

| LABEL | DESCRIPTION |
|---|---|
| Select all ports | After you create a VLAN, select the ports to be assigned to the Networked AV VLAN.<br>**Select all ports** to assign the same role to all ports.<br>You can select a port by clicking it. Then click any of the following:<br>Click **Tx/Rx** to assign the ports for connecting to audio and video equipment.<br>Click **Inter-switch** to assign the ports for connecting to other switches.<br>Click **Management** to assign the ports for connecting to non-Audio-Video equipment (for example, computer and NAS). |
| Link aggregate | Select this option to aggregate multiple port bandwidth if you are connecting to another switch. Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. |
| Previous | Click **Previous** to show the previous screen. |
| Next | Click **Next** to show the next screen. |
| Cancel | Click **Cancel** to exit this screen without saving. |

After clicking **Next,** the **Summary** screen appears.

**Figure 42** Wizard > Advanced Settings > Step 4 Summary




Each field is described in the following table.

Table 16 Wizard > Advanced Settings > Step 4 Summary

| LABEL | DESCRIPTION |
|---|---|
| Setup IP | |
| Host Name | This field displays a host name. |

Table 16 Wizard > Advanced Settings > Step 4 Summary (continued)

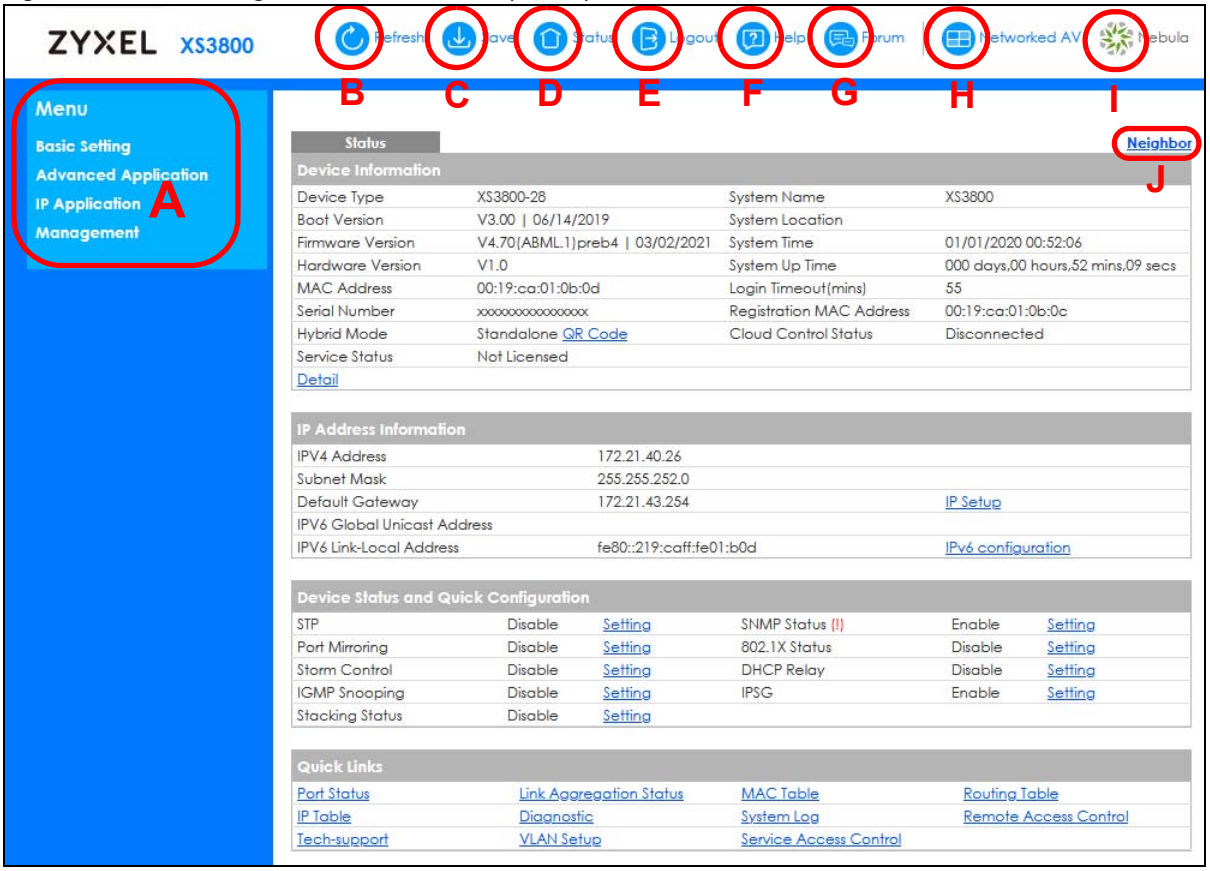
| LABEL | DESCRIPTION |
|---|---|
| IP Interface | This field displays whether the WAN interface is using a DHCP IP address or a static IP address. |
| VID | This field displays the VLAN ID. |
| IP Address | This field displays the Switches' IP address for it to be managed over the network. |
| IP Subnet Mask | This field displays the subnet mask that specifies the network number portion of an IP address. |
| Default Gateway | This field displays the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254. |
| DNS Server | This field displays the DNS (Domain Name System) for mapping a domain name to its corresponding IP address and vice versa. |
| Change administrator's password and activate SNMP | |
| New Password | This field displays asterisks when a new password has been created. |
| SNMP | This field displays whether the Switch acts as an SNMP agent. |
| Version | This field displays the SNMP version for the Switch. |
| Get Community | This field displays the **Get Community** string. |
| Set Community | This field displays the **Set Community** string. |
| Trap Community | This field displays the **Trap Community** string. |
| Networked AV – Advanced Settings | |
| Networked AV VLAN | This field displays the VLAN ID for the AVoIP network. |
| Networked AV VLAN IP | This field displays the corresponding VLAN ID's IP address for the AVoIP network. |
| IGMP Snooping | This field displays **Active** when IGMP Snooping is enabled to forward group multicast traffic only to ports that are members of that group.<br>Otherwise, it displays **Inactive**. |
| IGMP Snooping Querier | This field displays **Active** when the Switch is allowed to send IGMP General Query messages to the VLANs with the multicast hosts attached.<br>Otherwise, it displays **Inactive**. |
| Unknown Multicast Frame | This field displays the action to perform when the Switch receives an unknown multicast frame. It displays **Drop** when the frames are discarded. It displays **Flooding** when the frames are sent to all ports. |
| Transmitter/Receiver Connected Port | This field shows the Switches' port numbers for connection to networked audio and video equipment. |
| Inter-switch Connected Port (Link Aggregation) | This field shows the Switches' port numbers for connection to another switch. |
| Previous | Click **Previous** to show the previous screen. |
| Finish | Review the information and click **Finish** to create the task. |
| Cancel | Click **Cancel** to exit this screen without saving. |

# 4.5 Web Configurator Layout

The **Status** screen is the first screen that displays when you access the Web Configurator.

The following figure shows the navigating components of a Web Configurator screen.

**Figure 43** Web Configurator Home Screen (Status)




**A** – Click the menu items to open sub-menu links, and then click on a sub-menu link to open the screen in the main window.

**B**, **C**, **D**, **E**, **F** – These are quick links which allow you to perform certain tasks no matter which screen you are currently working in.

**B** – Click this link to update the information in the screen you are viewing currently.

**C** – Click this link to save your configuration into the Switch's non-volatile memory. Non-volatile memory is the configuration of your Switch that stays the same even if the Switch's power is turned off.

**D** – Click this link to go to the status page of the Switch.

**E** – Click this link to log out of the Web Configurator.

**F** – Click this link to display web help pages. The help pages provide descriptions for all of the configuration screens.

**G** – Click this link to go to the Zyxel Community Biz Forum.

**H** – Click this icon to switch between the Web Configurator's **Standard** or **Networked AV** mode.

**I** – Click this link to go to the NCC (Nebula Control Center) portal website.

**J** – Click this link to go to the **Neighbor** screen where you can see and manage neighbor devices learned by the Switch.

In the navigation panel, click a main link to reveal a list of sub-menu links.

Table 17 Navigation Panel Sub-links Overview

| BASIC SETTING | ADVANCED APPLICATION | IP APPLICATION | MANAGEMENT |
|---|---|---|---|
| Menu<br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br>System Info<br>General Setup<br>Switch Setup<br>IP Setup<br>Port Setup<br>Interface Setup<br>IPv6<br>Loopback Interface<br>Stacking<br>Cloud Management | Menu<br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br>VLAN<br>Static MAC Forwarding<br>Static Multicast Forwarding<br>Filtering<br>Spanning Tree Protocol<br>Bandwidth Control<br>Broadcast Storm Control<br>Mirroring<br>Link Aggregation<br>Port Authentication<br>Port Security<br>Time Range<br>Classifier<br>Policy Rule<br>Queuing Method<br>VLAN Stacking<br>Multicast<br>AAA<br>IP Source Guard<br>Loop Guard<br>VLAN Mapping<br>Layer 2 Protocol Tunneling<br>sFlow<br>PPPoE<br>Errdisable<br>Vlan Isolation<br>MAC Pinning<br>Private VLAN<br>Green Ethernet<br>LLDP<br>Anti-Arpscan<br>BPDU Guard<br>OAM<br>ZULD<br>NLB<br>Wol Relay | Menu<br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br>Static Routing<br>Policy Routing<br>RIP<br>OSPF<br>IGMP<br>DVMRP<br>DiffServ<br>DHCP<br>VRRP<br>Router Setup<br>ARP Setup | Menu<br>Basic Setting<br>Advanced Application<br>IP Application<br>Management<br>Maintenance<br>Access Control<br>Diagnostic<br>System Log<br>Syslog Setup<br>Cluster Management<br>MAC Table<br>IP Table<br>ARP Table<br>Routing Table<br>Path MTU Table<br>Configure Clone<br>IPv6 Neighbor Table<br>Port Status<br>Service Register |

The following table describes the links in the navigation panel.

Table 18 Navigation Panel Links

| LINK | DESCRIPTION |
|---|---|
| Basic Settings | |
| System Info | This link takes you to a screen that displays general system and hardware monitoring information. |
| General Setup | This link takes you to a screen where you can configure general identification information and time settings for the Switch. |
| Switch Setup | This link takes you to a screen where you can set up global Switch parameters such as VLAN type, MAC address learning, GARP and priority queues. |
| IP Setup | This link takes you to a screen where you can configure the IP address, subnet mask (necessary for Switch management) and set up to 128 IP routing domains. |

Table 18 Navigation Panel Links (continued)

| LINK | DESCRIPTION |
|---|---|
| Port Setup | This link takes you to screens where you can configure speed, flow control and priority settings for individual Switch ports. |
| Interface Setup | This link takes you to a screen where you can create virtual interfaces on the Switch. |
| IPv6 | This link takes you to a screen where you can enable an IPv6 interface and configure the IPv6 settings on the Switch. |
| Loopback Interface | This link takes you to a screen where you can configure the IPv4 loopback interface settings on the Switch. |
| Stacking | This link takes you to a screen where you can view and configure stacking system for the Switch. |
| DNS | This link takes you to a screen where you can configure DNS (domain name server) IP addresses. |
| Cloud Management | This screen displays a link to a screen where you can enable or disable the **Nebula Control Center Discovery** feature. If it's enabled, you can have the Switch search for the NCC (Nebula Control Center). Another link takes you to the **Nebula Switch Registration** screen which has a QR code containing the Switch's serial number and MAC address for handy registration of the Switch at NCC. |
| Advanced Application | |
| VLAN | This link takes you to screens where you can configure port-based or 802.1Q VLAN (depending on what you configured in the Switch Setup menu). You can also configure a protocol based VLAN or a subnet based VLAN in these screens. |
| Static MAC Forwarding | This link takes you to screens where you can configure static MAC addresses for a port. These static MAC addresses do not age out. |
| Static Multicast Forwarding | This link takes you to a screen where you can configure static multicast MAC addresses for port(s). These static multicast MAC addresses do not age out. |
| Filtering | This link takes you to a screen to set up filtering rules. |
| Spanning Tree Protocol | This link takes you to screens where you can configure the RSTP/MRSTP/MSTP to prevent network loops. |
| Bandwidth Control | This link takes you to screens where you can cap the maximum bandwidth allowed on a port. |
| Broadcast Storm Control | This link takes you to a screen to set up broadcast filters. |
| Mirroring | This link takes you to screens where you can copy traffic from one port or ports to another port in order that you can examine the traffic from the first port without interference. |
| Link Aggregation | This link takes you to screen where you can logically aggregate physical links to form one logical, higher-bandwidth link. |
| Port Authentication | This link takes you to a screen where you can configure IEEE 802.1x port authentication as well as MAC authentication for clients communicating through the Switch. |
| Port Security | This link takes you to a screen where you can activate MAC address learning and set the maximum number of MAC addresses to learn on a port. |
| Time Range | This link takes you to a screen where you can configure time range for time-oriented features like Classifier. |
| Classifier | This link takes you to screens where you can configure the Switch to group packets based on the specified criteria. |
| Policy Rule | This link takes you to a screen where you can configure the Switch to perform special treatment on the grouped packets. |
| Queuing Method | This link takes you to a screen where you can configure queuing with associated queue weights for each port. |
| VLAN Stacking | This link takes you to screens where you can activate and configure VLAN stacking. |
| Multicast | This link takes you to screen where you can configure various multicast features, IGMP snooping, MLD snooping-proxy and create multicast VLANs. |

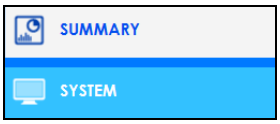
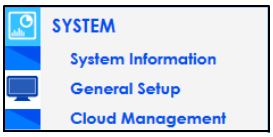
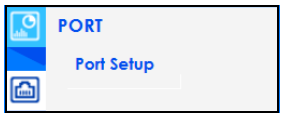
Table 18 Navigation Panel Links (continued)

| LINK | DESCRIPTION |
|---|---|
| AAA | This link takes you to a screen where you can configure authentication, authorization and accounting services through external servers. The external servers can be either RADIUS (Remote Authentication Dial-In User Service) or TACACS+ (Terminal Access Controller Access-Control System Plus). |
| IP Source Guard | This link takes you to screens where you can configure filtering of unauthorized DHCP and ARP packets in your network. |
| Loop Guard | This link takes you to a screen where you can configure protection against network loops that occur on the edge of your network. |
| VLAN Mapping | This link takes you to screens where you can configure VLAN mapping settings on the Switch. |
| Layer 2 Protocol Tunneling | This link takes you to a screen where you can configure L2PT (Layer 2 Protocol Tunneling) settings on the Switch. |
| sFlow | This link takes you to screens where you can configure sFlow settings on the Switch. |
| PPPoE | This link takes you to screens where you can configure how the Switch gives a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client. |
| Errdisable | This link takes you to a screens where you can view errdisable status and configure errdisable settings in CPU protection, errdisable detect, and errdisable recovery. |
| VLAN Isolation | This link takes you to a screen where you can block traffic between ports in a VLAN on the Switch. |
| MAC Pinning | This link takes you to a screen where you can set specific ports to have priority over other ports in MAC address learning. |
| Private VLAN | This link takes you to a screen where you can block traffic between ports in a VLAN on the Switch. |
| Green Ethernet | This link takes you to a screen where you can configure the Switch to reduce port power consumption. |
| LLDP | This link takes you to a screen where you can configure LLDP settings. |
| Anti-Arpscan | This link takes you to screens where you can enable anti-arpscan on the Switch and ports, and view the port state. You can also create trusted hosts, view blocked hosts and unblock them. |
| BPDU Guard | This link takes you to screens where you can enable BPDU guard on the Switch and ports, and view the port state. |
| OAM | This link takes you to screens where you can enable Ethernet OAM on the Switch, view the configuration of ports on which Ethernet OAM is enabled and perform remote-loopback tests. |
| ZULD | This link takes you to screens where you can enable ZULD on a port and configure related settings. |
| NLB | This link takes you to screens where you can configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic, and map the IP address to the MAC address of a cluster for layer-3 forwarding. |
| Wol Relay | This link takes you to a screen where you can configure settings on Wake On LAN relay. |
| IP Application | |
| Static Routing | This link takes you to a screen where you can configure static routes. A static route defines how the Switch should forward traffic by configuring the TCP/IP parameters manually. |
| Policy Routing | This link takes you to screens where you can configure policy routing rules. |
| RIP | This link takes you to a screen where you can configure the RIP (Routing Information Protocol) direction and version for IPv4 RIP timer, and the method of preventing routing loops. |
| OSPF | This link takes you to a screen where you can view the OSPF status and configure OSPF settings for IPv4. |
| IGMP | This link takes you to a screen where you can configure the IGMP settings. |

Table 18 Navigation Panel Links (continued)

| LINK | DESCRIPTION |
|---|---|
| DVMRP | This link takes you to a screen where you can configure the DVMRP (Distance Vector Multicast Routing Protocol) settings. |
| DiffServ | This link takes you to screens where you can enable DiffServ, configure marking rules and set DSCP-to-IEEE802.1p mappings. |
| DHCP | This link takes you to screens where you can configure the DHCP settings. |
| VRRP | This link takes you to screens where you can configure redundant virtual router for your network. |
| Router Setup | This link takes you to a screen where you can enable Equal-Cost MultiPath (ECMP) routing and set the criteria the Switch uses to determine the routing path for a packet. |
| ARP Setup | This link takes you to a screen where you can configure ARP learning mode on a per-port basis and create static ARP entries which do not age out. |
| Management | |
| Maintenance | This link takes you to screens where you can perform firmware and configuration file maintenance as well as reboot the system. |
| Access Control | This link takes you to screens where you can change the system login password and configure SNMP, remote management, and account security. |
| Diagnostic | This link takes you to screens where you can ping IP addresses, run traceroute, test ports. |
| System Log | This link takes you to a screen where you can view system logs. |
| Syslog Setup | This link takes you to a screen where you can setup system logs and a system log server. |
| Cluster Management | This link takes you to a screen where you can configure clustering management and view its status. |
| MAC Table | This link takes you to a screen where you can view the MAC address and VLAN ID of a device attach to a port. You can also view what kind of MAC address it is. |
| IP Table | This link takes you to a screen where you can view the IP addresses and VLAN ID of a device attached to a port.You can also view what kind of device it is. |
| ARP Table | This link takes you to a screen where you can view the MAC address – IP address resolution table. |
| Routing Table | This link takes you to a screen where you can view the routing table. |
| Path MTU Table | This link takes you to a screen where you can view the IPv6 path MTU table. |
| Configure Clone | This link takes you to a screen where you can copy attributes of one port to other ports. |
| IPv6 Neighbor Table | This link takes you to a screen where you can view the Switch's IPv6 neighbor table. |
| Port Status | This link takes you to a screen where you can view the port statistics. |
| Service Register | This link takes you to a screen where you can view the status of your service registrations and upgrade licenses. |

Table 19 Navigation Panel Sub-links Overview (Networked AV Mode)

| SUMMARY | SYSTEM | PORT | SWITCHING |
|---|---|---|---|
|  |  |  | |

| NETWORKING | SECURITY | MAINTENANCE |
|---|---|---|
| | | |







Table 20 Navigation Panel Links (Networked AV Mode)

| LINK | DESCRIPTION |
|---|---|
| Summary | This screen displays the Switch's front panel port status, connected ports, used power, Nebula Cloud Control status, and Networked AV status. |
| SYSTEM | |
| System Information | This link takes you to a screen that displays general system information. |
| General Setup | This link takes you to a screen where you can configure general identification information about the Switch. |
| PORT | |
| Port Setup | This screen allows you to configure settings for individual Switch ports. |
| SWITCHING | |
| Broadcast Storm Control | This link takes you to a screen to set up broadcast filters. |
| Link Aggregation | This link takes you to screens where you can logically aggregate physical links to form one logical, higher-bandwidth link. |
| VLAN | This link takes you to screens where you can view and search all static VLAN groups, view detailed port settings and status of the static VLAN group, configure a static VLAN for the Switch, and configure the static VLAN (IEEE 802.1Q) settings on a port. |
| Multicast | This link takes you to screens where you can view multicast group information, configure various multicast features like IGMP snooping and filtering profile, and create multicast VLANs. |
| NETWORKING | |
| IP Setup | This screen allows you to configure the IP address and subnet mask (necessary for Switch management) and set up to 64 IP routing domains. |
| SECURITY | |
| Access Control | |
| Logins | This link takes you to a screen where you can change the system login password, as well as configure up to four login details. |
| Remote Management | This link takes you to a screen where you can specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. |
| SNMP | This link takes you to screens where you can specify the SNMP version and community (password) values, configure where to send SNMP traps from the Switch, enable loopguard/ errdisable/poe/linkup/linkdown/lldp/transceiver-ddm/storm-control on the Switch, specify the types of SNMP traps that should be sent to each SNMP manager, and add/edit user information. |
| Service Access Control | This link takes you to a screen where you can decide what services you may use to access the Switch. |

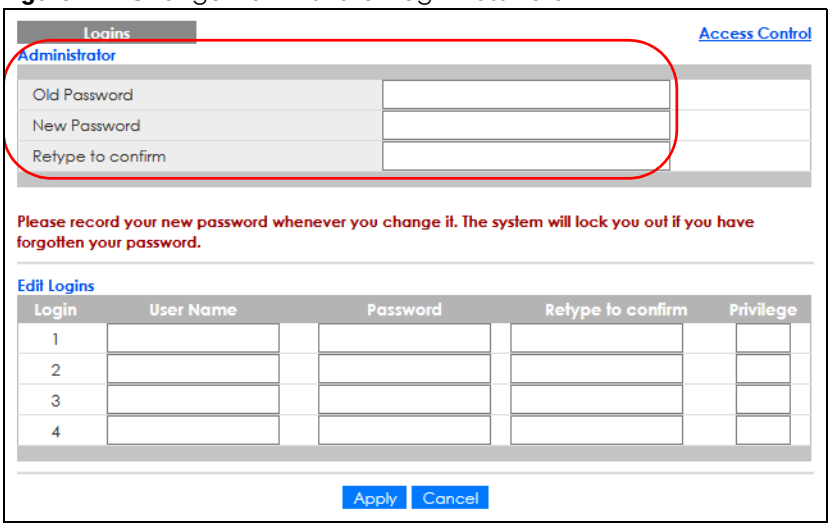
Table 20 Navigation Panel Links (Networked AV Mode) (continued)

| LINK | DESCRIPTION |
|---|---|
| Maintenance | |
| Backup Configuration | This link takes you to a screen where you can save your Switch's configurations (settings) for later use. |
| Firmware Upgrade | This link takes you to a screen to upload firmware to your Switch. |
| Reboot System | This link takes you to a screen to reboot the Switch without turning the power off. |
| Restore Configuration | This link takes you to a screen where you can upload a stored device configuration file. |
| Save Configuration | This link takes you to a screen where you can save the current configuration (settings) to a specific configuration file on the Switch. |
| Tech-Support | This link takes you to a screen where you can download related log reports for issue analysis. Log reports include CPU history and utilization, crash and memory. |
| Port Mirror | This link takes you to screens where you can copy traffic from one port or ports to another port in order that you can examine the traffic from the first port without interference. |

### 4.5.1 Change Your Password

After you log in for the first time, it is recommended you change the default administrator password. Click **Management** > **Access Control** > **Logins** to display the next screen.

**Figure 44** Change Administrator Login Password




## 4.6 Save Your Configuration

When you are done modifying the settings in a screen, click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

Click the **Save** link in the upper right of the Web Configurator to save your configuration to non-volatile memory. Non-volatile memory refers to the Switch's storage that remains even if the Switch's power is turned off.

Note: Use the **Save** link when you are done with a configuration session.

# 4.7 Switch Lockout

You could block yourself (and all others) from using in-band-management (managing through the data ports) if you do one of the following:

1. Delete the management VLAN (default is VLAN 1).
2. Delete all port-based VLANs with the CPU port as a member. The "CPU port" is the management port of the Switch.
3. Filter all traffic to the CPU port.
4. Disable all ports.
5. Misconfigure the text configuration file.
6. Forget the password and/or IP address.
7. Prevent all services from accessing the Switch.
8. Change a service port number but forget it.
9. You forgot to log out of the Switch from a computer before logging in again on another computer.

Note: Be careful not to lock yourself and others out of the Switch.

# 4.8 Reset the Switch

If you lock yourself (and others) from the Switch or forget the administrator password, you will need to reload the factory-default configuration file or reset the Switch back to the factory defaults.

## 4.8.1 Using the RESTORE Button

See Table 4 on page 41 to see how to use the **RESTORE** button to restore the factory default file.

## 4.8.2 Reload the Configuration File

Uploading the factory-default configuration file replaces the current configuration file with the factory-default configuration file. This means that you will lose all previous configurations and the speed of the console port will be reset to the default of 115200 bps with 8 data bit, no parity, one stop bit and flow control set to none. The password will also be reset to "1234" and the IP address to 192.168.1.1 or DHCP-assigned IP.

To upload the configuration file, do the following:

1 Connect to the console port using a computer with terminal emulation software.

2 Disconnect and reconnect the Switch's power to begin a session. When you reconnect the Switch's power, you will see the initial screen.

3 When you see the message "`Press any key to enter Debug Mode within 3 seconds ...`" press any key to enter debug mode.

4 Type `atlc` after the "`Enter Debug Mode`" message.

5 Wait for the "`Starting XMODEM upload`" message before activating XMODEM upload on your terminal.

6 After a configuration file upload, type `atgo` to restart the Switch.

**Figure 45** Resetting the Switch: through the Console Port

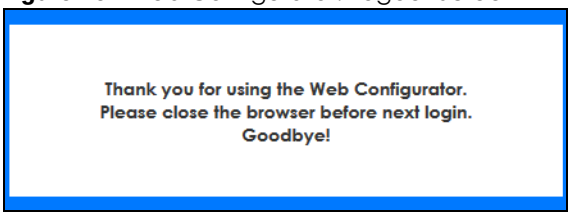
```
Bootbase Version: V1.00 | 02/21/2016 15:43:29
RAM: Size = 1048576 Kbytes
FLASH: 64M

ZyNOS Version: V4.60(ABML.0) | 04/18/2017 11:41:8

Press any key to enter debug mode within 1 second.
.................................
Enter Debug Mode
ras> atlc
Starting XMODEM upload (CRC mode)....
CCCCCCCCCCCCCCC
Total  393216 bytes received.
Erasing..
.............................................................
OK
ras> atgo
```

The Switch is now reinitialized with a default configuration file including the default password of "1234".

# 4.9 Log Out of the Web Configurator

Click **Logout** in a screen to exit the Web Configurator. You have to log in with your password again after you log out. This is recommended after you finish a management session for security reasons.

**Figure 46** Web Configurator: Logout Screen



# 4.10 Help

The Web Configurator's online help has descriptions of individual screens and some supplementary information.

Click the **Help** link from a Web Configurator screen to view an online help description of that screen.

# CHAPTER 5
# Initial Setup Example

## 5.1 Overview

This chapter shows how to set up the Switch for an example network.

The following lists the configuration steps for the initial setup:

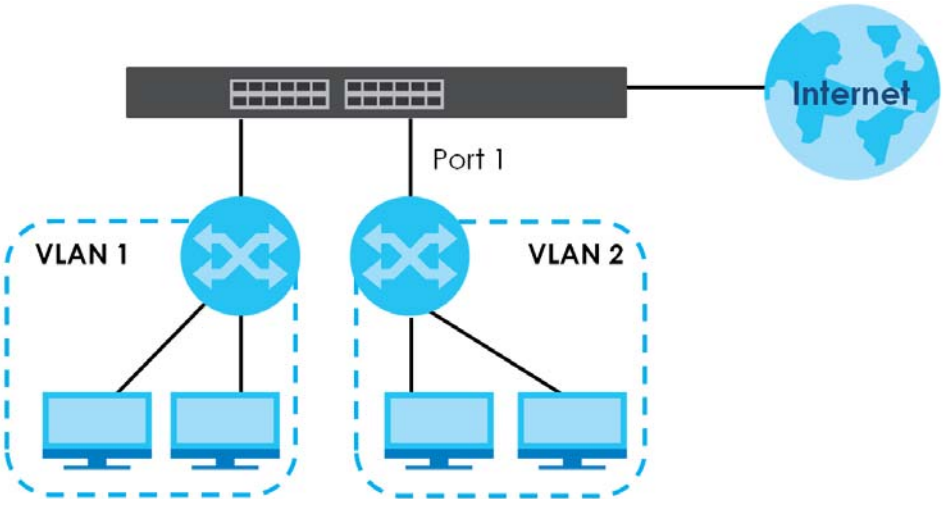
- Create a VLAN
- Set Port VID
- Configure Switch Management IP Address

### 5.1.1 Create a VLAN

VLANs confine broadcast frames to the VLAN group in which the ports belongs. You can do this with port-based VLAN or tagged static VLAN with fixed port members.

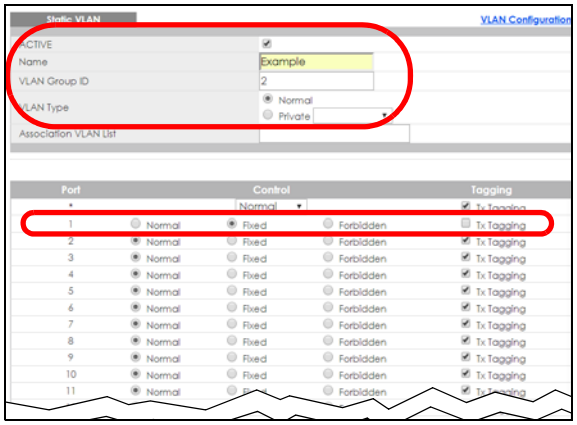
In this example, you want to configure port 1 as a member of VLAN 2.

**Figure 47** Initial Setup Network Example: VLAN




1 Click **Advanced Application** > **VLAN** > **VLAN Configuration** in the navigation panel and click the **Static VLAN Setup** link.

2 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name in the **Name** field and enter 2 in the **VLAN Group ID** field for the **VLAN2** network.




Note: The **VLAN Group ID** field in this screen and the **VID** field in the **IP Setup** screen refer to the same VLAN ID.

3 Since the **VLAN2** network is connected to port 1 on the Switch, select **Fixed** to configure port 1 to be a permanent member of the VLAN only.

4 To ensure that VLAN-unaware devices (such as computers and hubs) can receive frames properly, clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.

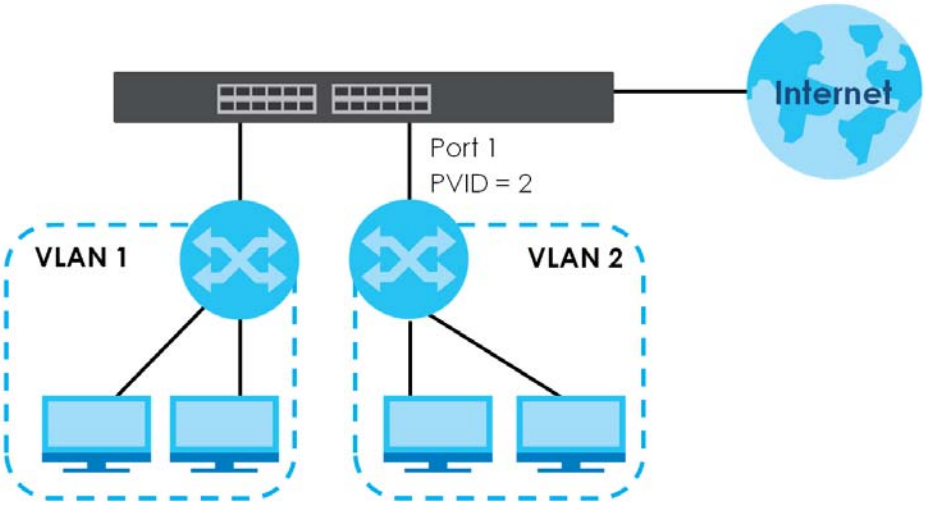
5 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

## 5.1.2 Set Port VID

Use PVID to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.

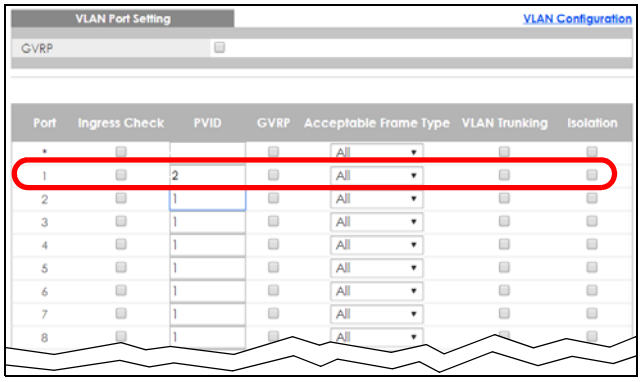
In the example network, configure 2 as the port VID on port 1 so that any untagged frames received on that port get sent to VLAN 2.

**Figure 48** Initial Setup Network Example: Port VID




1 Click **Advanced Applications** > **VLAN** > **VLAN Configuration** in the navigation panel. Then click the **VLAN Port Setup** link.

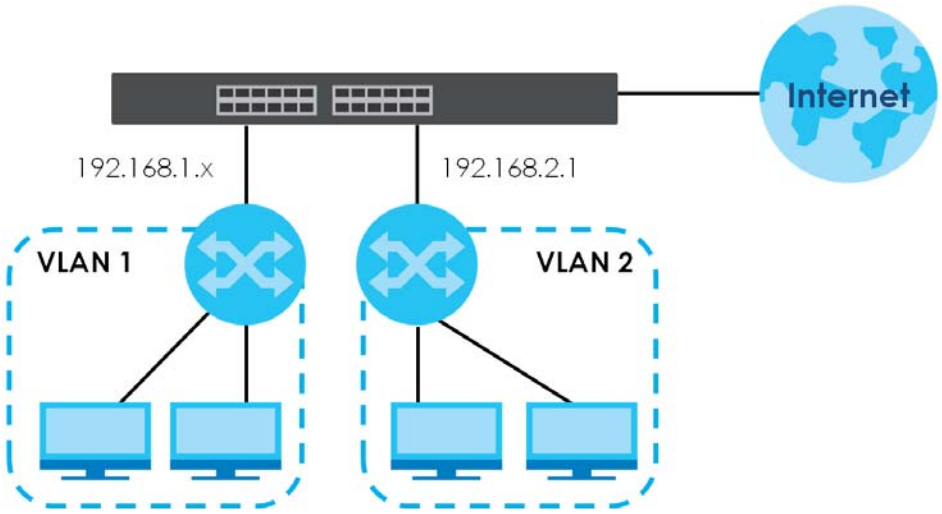
2 Enter 2 in the **PVID** field for port 1 and click **Apply** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.




## 5.1.3 Configure Switch Management IP Address

If the Switch fails to obtain an IP address from a DHCP server, the Switch will use 192.168.1.1 as the management IP address. You can configure another IP address in a different subnet for management purposes. The following figure shows an example.

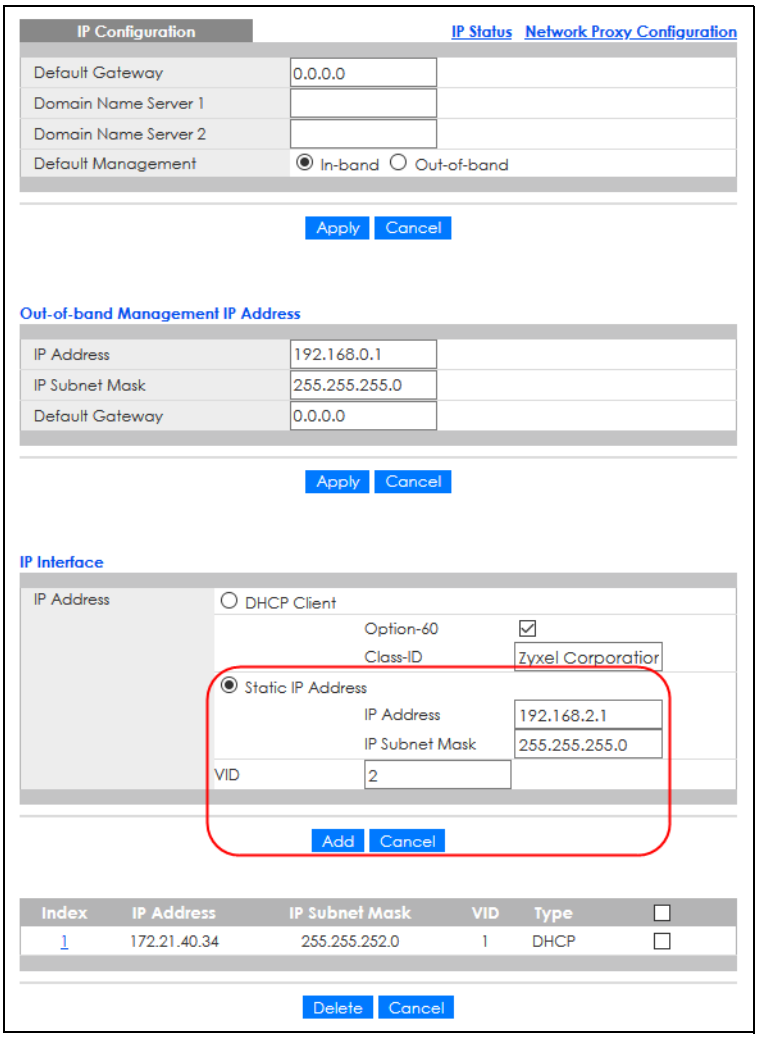
**Figure 49** Initial Setup Example: Management IP Address




1 Connect your computer to any Ethernet port on the Switch. Make sure your computer is in the same subnet as the Switch.

2 Open your web browser and enter 192.168.1.1 (the default IP address) in the address bar to access the Web Configurator. See Section 4.2 on page 51 for more information.

3 Click **Basic Setting** > **IP Setup** > **IP Configuration** in the navigation panel.




4 Configure the related fields in the **IP Configuration** screen.

5 For the **VLAN2** network, enter 192.168.2.1 as the IP address and 255.255.255.0 as the subnet mask.

6 In the **VID** field, enter the ID of the VLAN group to which you want this management IP address to belong. This is the same as the VLAN ID you configure in the **Static VLAN** screen.

7 Click **Add** to save your changes back to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

# CHAPTER 6
# Tutorials

## 6.1 Overview

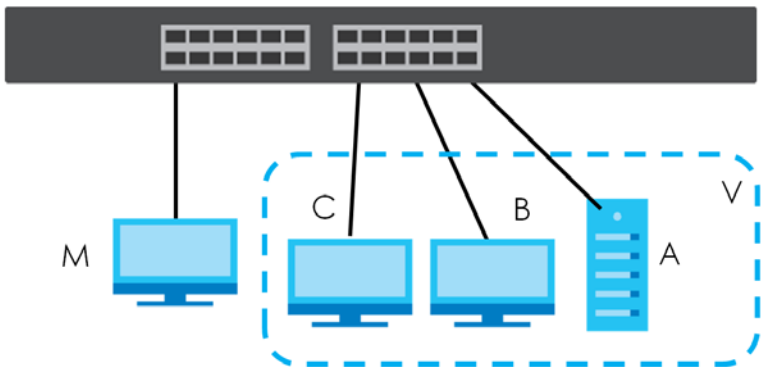
This chapter provides some examples of using the Web Configurator to set up and use the Switch. The tutorials include:

- How to Use DHCPv4 Snooping on the Switch
- How to Use DHCPv4 Relay on the Switch
- How to Use Auto Configuration through a DHCP Server on the Switch

## 6.2 How to Use DHCPv4 Snooping on the Switch

You only want DHCP server **A** connected to port 5 to assign IP addresses to all devices in VLAN network (**V**). Create a VLAN containing ports 5, 6 and 7. Connect a computer **M** to the Switch for management.

**Figure 50** Tutorial: DHCP Snooping Tutorial Overview




The settings in this tutorial are as the following.

Table 21 Tutorial: Settings in this Tutorial

| HOST | PORT CONNECTED | VLAN | PVID | DHCP SNOOPING PORT TRUSTED |
|---|---|---|---|---|
| DHCP Server (**A**) | 5 | 1 and 100 | 100 | Yes |
| DHCP Client (**B**) | 6 | 1 and 100 | 100 | No |
| DHCP Client (**C**) | 7 | 1 and 100 | 100 | No |

1 Access the Switch through **http://192.168.1.1** by default. Log into the Switch by entering the user name (default: **admin**) and password (default: **1234**).

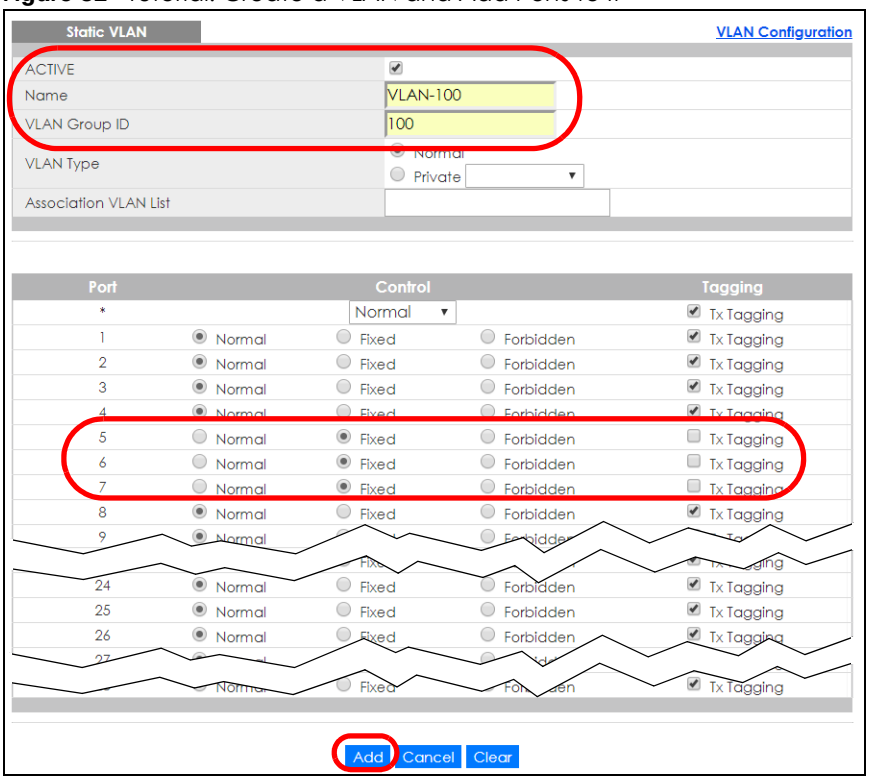
2 Go to **Advanced Application** > **VLAN** > **VLAN Configuration** > **Static VLAN Setup**, and create a VLAN with

ID of 100. Add ports 5, 6 and 7 in the VLAN by selecting **Fixed** in the **Control** field as shown.

De-select **Tx Tagging** because you do not want outgoing traffic to contain this VLAN tag.

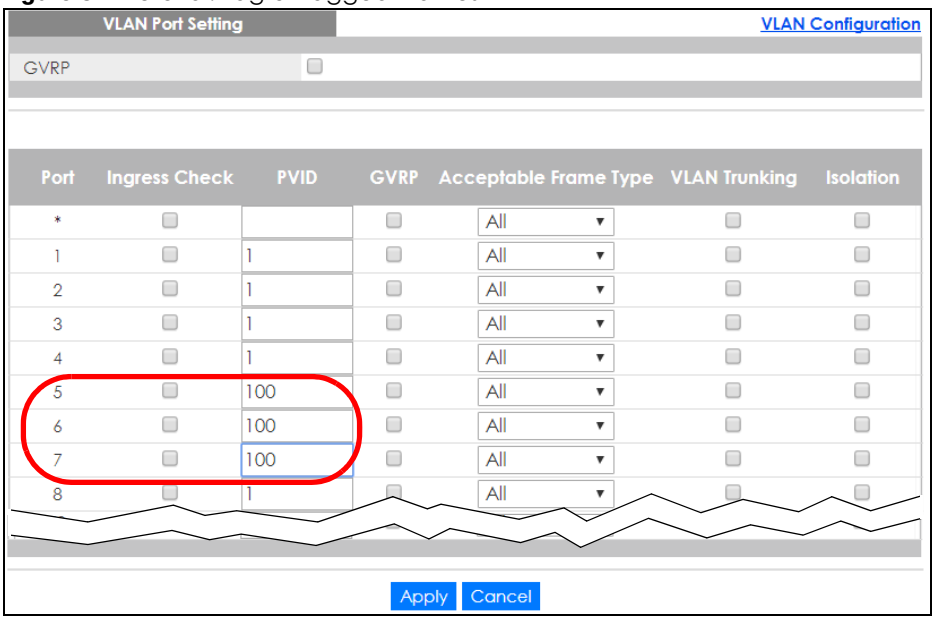
Click **Add**.

**Figure 51** Tutorial: Create a VLAN and Add Ports to It



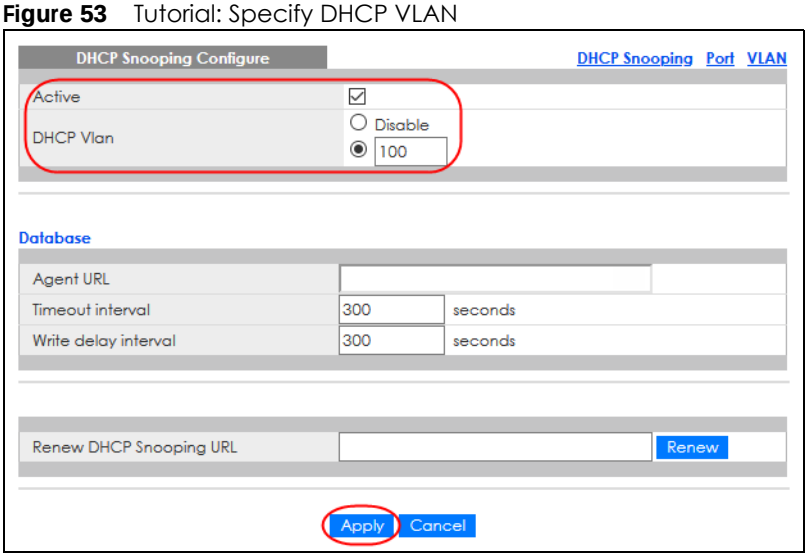

3 Go to **Advanced Application** > **VLAN** > **VLAN Configuration** > **VLAN Port Setup**, and set the PVID of the ports 5, 6 and 7 to 100. This tags untagged incoming frames on ports 5, 6 and 7 with the tag 100. Click **Apply**.

**Figure 52** Tutorial: Tag Untagged Frames



4 Go to **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure**, activate and specify VLAN 100 as the DHCP VLAN as shown. Click **Apply**.

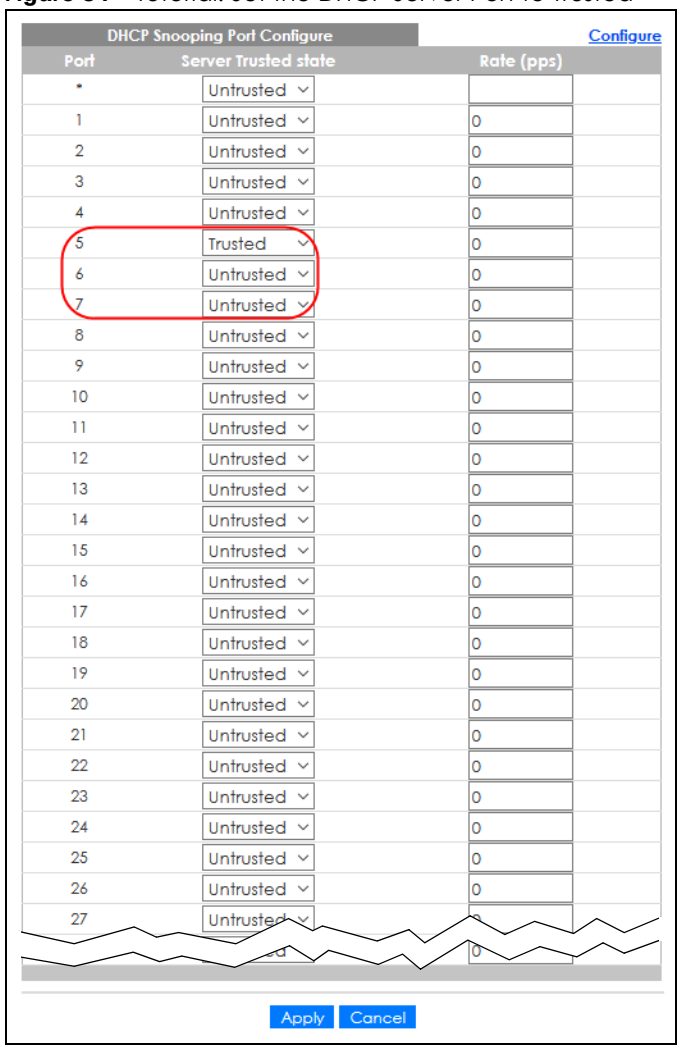
**Figure 53** Tutorial: Specify DHCP VLAN




5 Click the **Port** link at the top right.

6 The **DHCP Snooping Port Configure** screen appears. Select **Trusted** in the **Server Trusted state** field for port 5 because the DHCP server is connected to port 5. Keep ports 6 and 7 **Untrusted** because they are connected to DHCP clients. Click **Apply**.

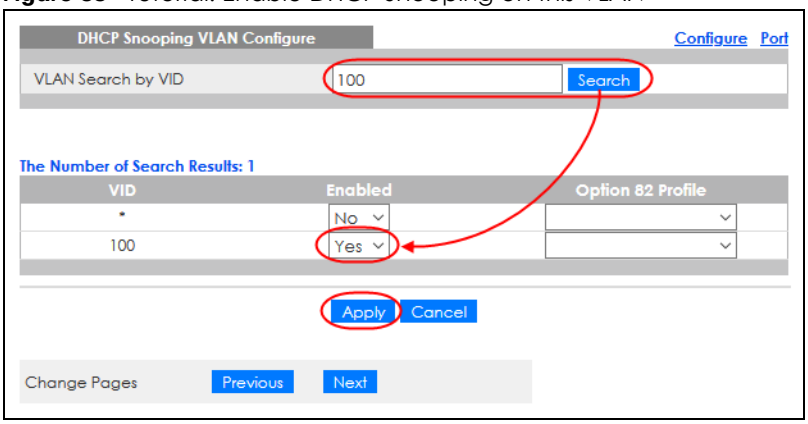
**Figure 54** Tutorial: Set the DHCP Server Port to Trusted




7 Go to **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure** > **VLAN**, show VLAN 100 by entering 100 in the **VLAN Search by VID** field and click **Search**. Then select **Yes** in the **Enabled** field of the VLAN 100 entry shown at the bottom section of the screen. Click **Apply**.

If you want to add more information in the DHCP request packets such as source VLAN ID or system name, you can also select an **Option82 Profile** in the entry.

**Figure 55** Tutorial: Enable DHCP Snooping on this VLAN

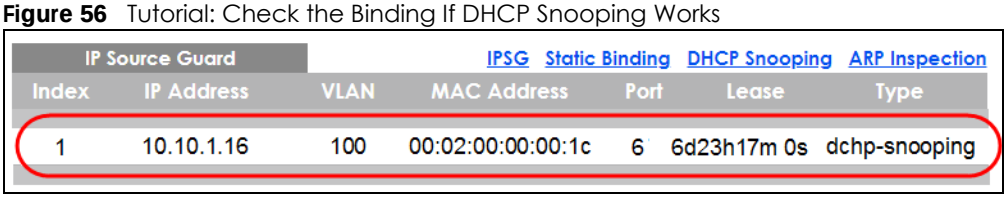



8 Click **Save** at the top right of the Web Configurator to save the configuration permanently.

9 Connect your DHCP server to port 5 and a computer (as DHCP client) to either port 6 or 7. The computer should be able to get an IP address from the DHCP server. If you put the DHCP server on port 6 or 7, the computer will NOT be able to get an IP address.

10 To check if DHCP snooping works, go to **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup**, you should see an IP assignment with the type **DHCP-Snooping** as shown.

**Figure 56** Tutorial: Check the Binding If DHCP Snooping Works




You can also telnet. Use the command "`show dhcp snooping binding`" to see the DHCP snooping binding table as shown next.

```
sysname# show dhcp snooping binding
         MacAddress        IpAddress         Lease           Type  VLAN   Port
  -----------------  ---------------  ------------  -------------  ----  -----
  00:02:00:00:00:1c       10.10.1.16   6d23h59m20s  dhcp-snooping   100      6
  Total number of bindings: 1
```

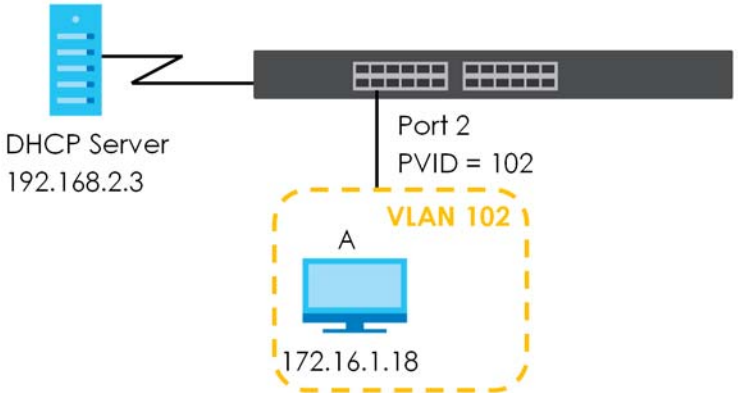
# 6.3 How to Use DHCPv4 Relay on the Switch

This tutorial describes how to configure your Switch to forward DHCP client requests to a specific DHCP server. The DHCP server can then assign a specific IP address based on the information in the DHCP requests.

## 6.3.1 DHCP Relay Tutorial Introduction

In this example, you have configured your DHCP server (192.168.2.3) and want to have it assign a specific IP address (say 172.16.1.18) to DHCP client **A** based on the system name, VLAN ID and port number in the DHCP request. Client **A** connects to the Switch's port 2 in VLAN 102.

**Figure 57** Tutorial: DHCP Relay Scenario



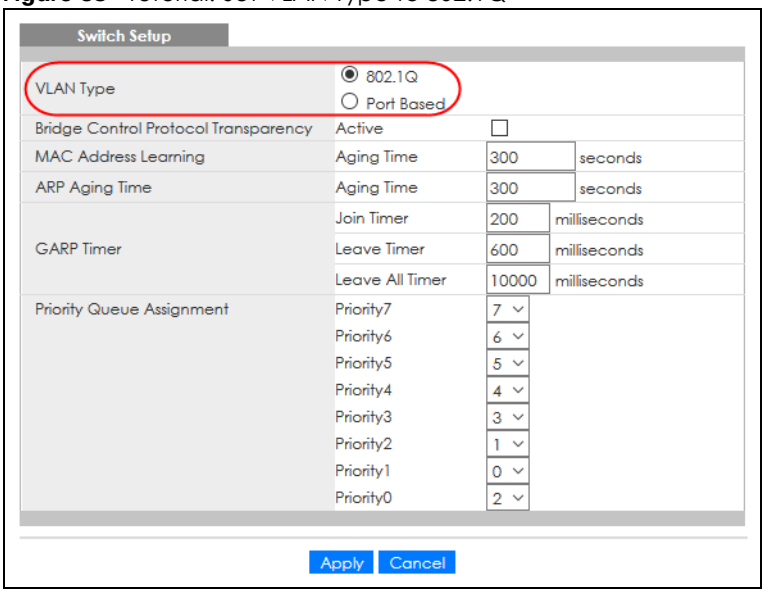

## 6.3.2 Create a VLAN

Follow the steps below to configure port 2 as a member of VLAN 102.

1 Access the Web Configurator through the Switch's management port.

2 Go to **Basic Setting** > **Switch Setup** and set the VLAN type to **802.1Q**. Click **Apply** to save the settings to the run-time memory.

**Figure 58** Tutorial: Set VLAN Type to 802.1Q




3 Click **Advanced Application** > **VLAN** > **VLAN Configuration** > **Static VLAN Setup**.

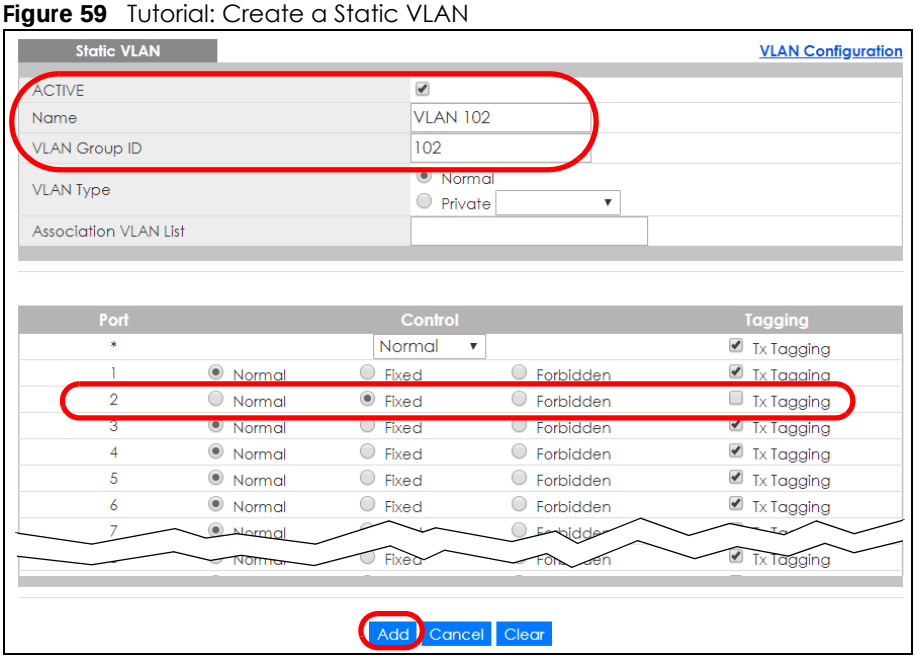
4 In the **Static VLAN** screen, select **ACTIVE**, enter a descriptive name (VLAN 102 for example) in the **Name** field and enter 102 in the **VLAN Group ID** field.

5 Select **Fixed** to configure port 2 to be a permanent member of this VLAN.

6 Clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending.

7 Click **Add** to save the settings to the run-time memory. Settings in the run-time memory are lost when the Switch's power is turned off.

**Figure 59** Tutorial: Create a Static VLAN



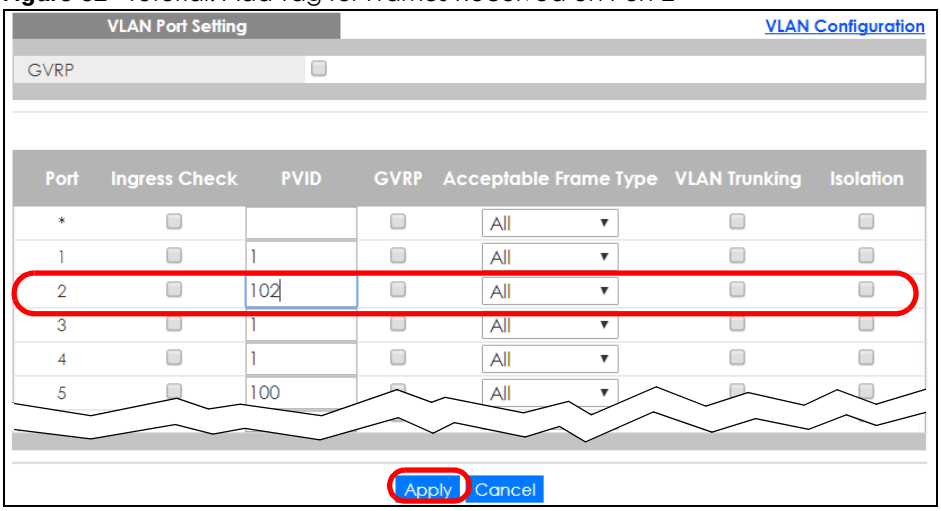

8 Click the **VLAN Configuration** link in the **Static VLAN Setup** screen and then the **VLAN Port Setup** link in the **VLAN Configuration** screen.

**Figure 60** Tutorial: Click the VLAN Port Setting Link

9 Enter 102 in the **PVID** field for port 2 to add a tag to incoming untagged frames received on that port so that the frames are forwarded to the VLAN group that the tag defines.

10 Click **Apply** to save your changes back to the run-time memory.

**Figure 61** Tutorial: Add Tag for Frames Received on Port 2




11 Click the **Save** link in the upper right of the Web Configurator to save your configuration permanently.

## 6.3.3 Configure DHCPv4 Relay

Follow the steps below to enable DHCP relay on the Switch and allow the Switch to add relay agent information (such as the VLAN ID) to DHCP requests.

1 Click **IP Application** > **DHCP** > **DHCPv4** and then the **Global** link to open the **DHCP Relay** screen.

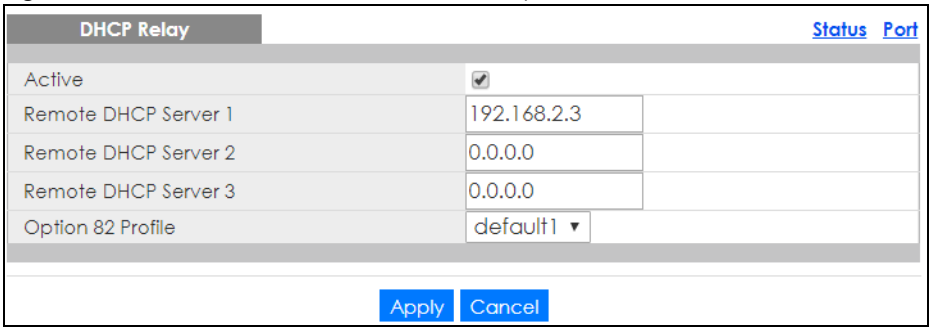
2 Select the **Active** check box.

3 Enter the DHCP server's IP address (192.168.2.3 in this example) in the **Remote DHCP Server 1** field.

4 Select **default1** or **default2** in the **Option 82 Profile** field.

5 Click **Apply** to save your changes back to the run-time memory.

**Figure 62** Tutorial: Set DHCP Server and Relay Information




6 Click the **Save** link in the upper right of the Web Configurator to save your configuration permanently.

7 The DHCP server can then assign a specific IP address based on the DHCP request.

### 6.3.4 Troubleshooting

Check client **A**'s IP address. If it did not receive the IP address 172.16.1.18, make sure:

1. Client **A** is connected to the Switch's port 2 in VLAN 102.
2. You configured the correct VLAN ID, port number and system name for DHCP relay on both the DHCP server and the Switch.
3. You clicked the **Save** link on the Switch to have your settings take effect.

## 6.4 How to Use Auto Configuration through a DHCP Server on the Switch

Follow the steps below to set up configurations on a DHCP server, TFTP server, and the Switch, so you can load an auto configuration file automatically from a TFTP server when you reboot the Switch.

Note that you can set up a DHCP server and TFTP server either on the same device or different devices. Also, make sure the Switch can communicate with the TFTP server.

Note: Steps order could vary according to different programs you use.

Note: You need to set up configurations on a DHCP server and TFTP server first to use auto configuration.

#### Setting up a DHCP Server

1. Set up a dynamic IP addresses pool so the DHCP server will assign an IP address to the Switch in that range.
2. Set up a TFTP server IP address, so the Switch will know where to load the auto configuration file.
3. Set up the filename of the auto configuration file, so the Switch will know which file to load when you reboot the Switch.
    - Enter the filename of an auto configuration file. The Switch will load this auto configuration file when rebooting with DHCP option 60 disabled.
    - If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step.
      Enter the filename of an auto configuration file. Set up a Vendor Class Identifier. To have the Switch load this auto configuration file, two conditions listed above must be met. Please refer to the following steps to see how to set up a Vendor Class Identifier on the Switch.

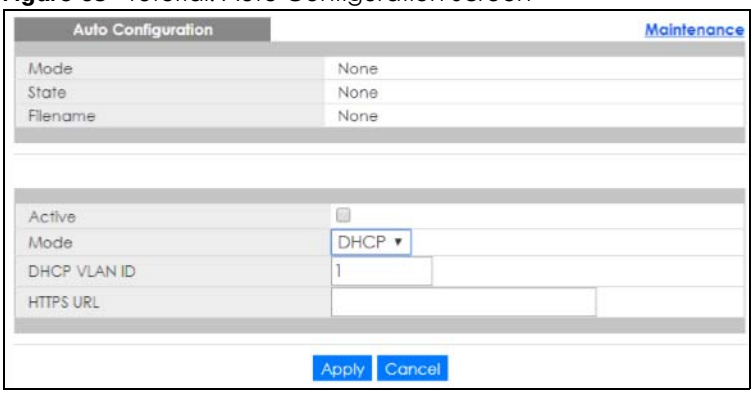
#### Setting up a TFTP Server

1. Select a directory on the TFTP server.
2. Put the configuration files in that directory.

## Setting up the Switch

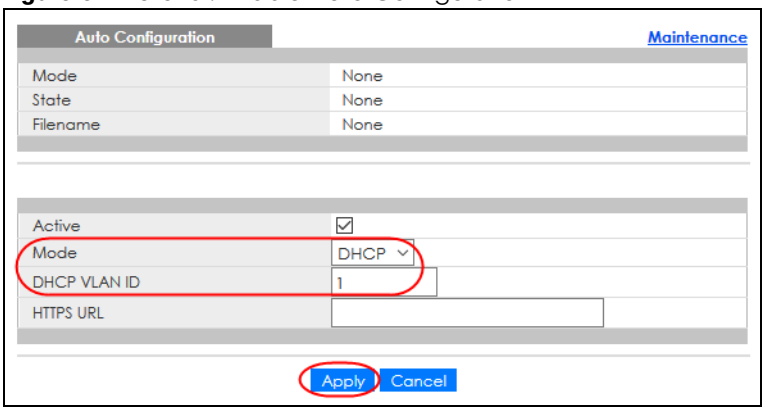
1 Open the Web Configurator. Go to the **Management** > **Maintenance** screen, and click the **Click Here** button next to the **Auto Configuration** field.

**Figure 63** Tutorial: Auto Configuration Screen




2 Select the check box in the **Active** field to enable auto configuration. Select **DHCP** in the **Mode** field, and enter the VLAN ID where the DHCP server belongs to in the **DHCP VLAN ID** field. Click **Apply** to save your changes.

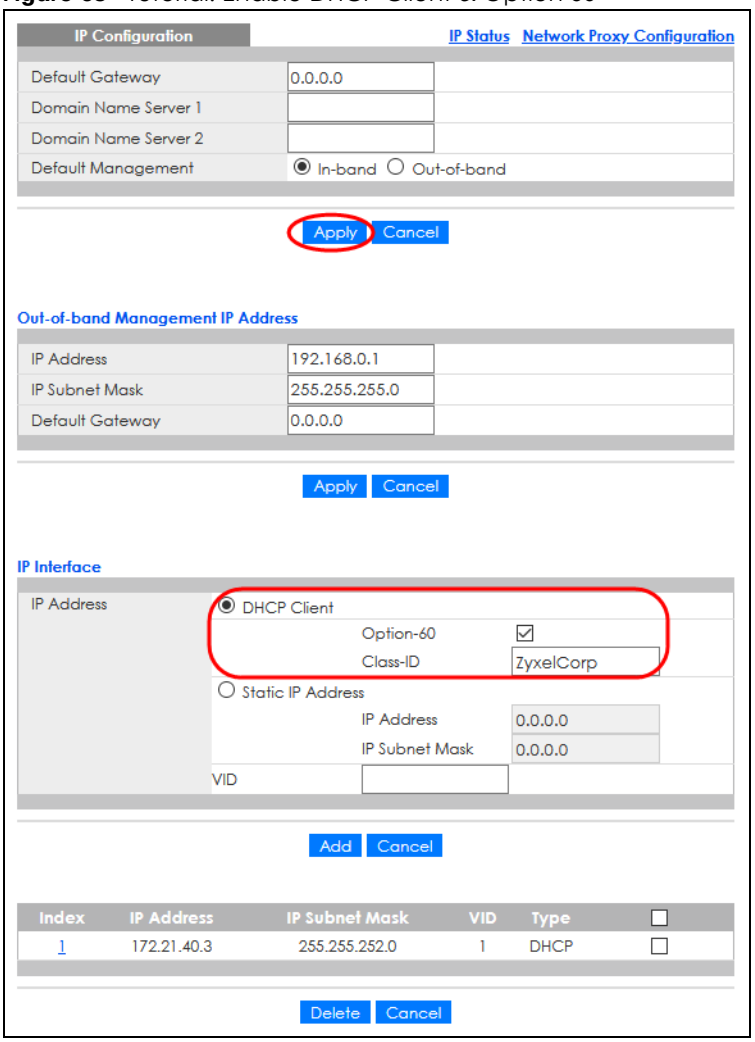
**Figure 64** Tutorial: Enable Auto Configuration




3 Go to the **Basic Setting** > **IP Setup** > **IP Configuration** screen. Select the check box in the **DHCP Client** field.

4 If you want to load the auto configuration file with DHCP option 60 enabled and a Vendor Class Identifier assigned when you reboot the Switch, follow the instruction below. Otherwise, skip this step. In the **Basic Setting** > **IP Setup** > **IP Configuration** screen, select the check box in the **Option-60** field, and enter a Vendor Class Identifier in the **Class-ID** field. In this example, we use "ZyxelCorp". Click **Add**.

**Figure 65** Tutorial: Enable DHCP Client & Option 60



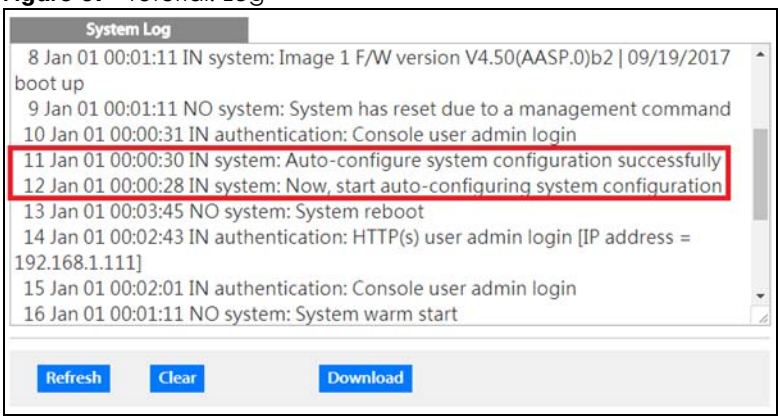

5 You need to save the current configuration in a configuration file, so the Switch will load the auto configuration file from the TFTP server automatically when rebooting. Go to the **Management** > **Maintenance** screen. Click the **Config 1**, **Config 2**, or **Custom Default** button next to the **Save Configuration** field.

6 Click the same button next to **Reboot System** field to reboot the Switch, and load the auto configuration setting as configured before. For example, if you save the auto configuration setting to **Config 1**, you need to click the **Config 1** button next to the **Reboot System** field.

**Figure 66** Tutorial: Save Configuration and Reboot System

7 Go to the **Management** > **System Log** screen to see if auto configuration was performed successfully.

**Figure 67** Tutorial: Log




8 Check the screens to see if it is the configuration file you want to load. If it is not, go through the steps above to check your configurations. If it is, click **Save** at the top right corner of the Web Configurator to save the configuration permanently.

**Figure 68** Tutorial: Save

# CHAPTER 7
# Status

## 7.1 Overview

This chapter describes the screens for System Status and Neighbor Details.

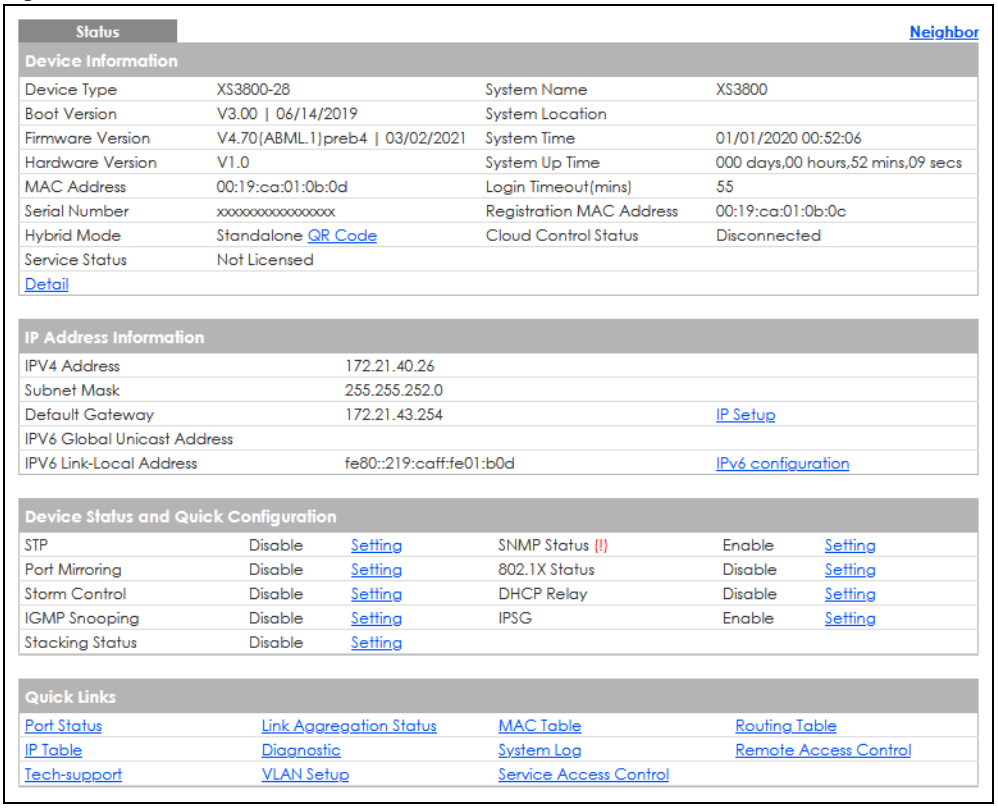
### 7.1.1 What You Can Do

- Use the **Status** screen (Section 7.2 on page 98) to see the Switch's general device information, system status, and IP addresses. You can also display other status screens for more information.
- Use the **Neighbor** screen (Section 7.2.1 on page 100) to view a summary and manage Switch's neighbor devices.
- Use the **Neighbor Detail** screen (Section 7.2.2 on page 101) to view more detailed information on the Switch's neighbor devices.

## 7.2 Status

The **Status** screen displays when you log into the Switch or click **Status** at the top right of the Web Configurator. The **Status** screen displays general device information, system status, and its IP addresses.

**Figure 69** Status




The following table describes the labels in this screen.

Table 22 Status

| LABEL | DESCRIPTION |
|---|---|
| Device Information | |
| Device Type | This field displays the model name of this Switch. |
| System Name | This field displays the name used to identify the Switch on any network. |
| Boot Version | This field displays the version number and date of the boot module that is currently on the Switch. |
| System Location | This field displays the geographic location of your Switch. You can change the setting in the **Basic Setting** > **General Setup** screen. |
| Firmware Version | This field displays the version number and date of the firmware the Switch is currently running. |
| System Time | This field displays the current date and time in the UAG. The format is mm-dd-yyyy hh:mm:ss. |
| Hardware Version | This field displays the hardware version number of the Switch. The integer is the generation number of the Switch series, and the decimal is the version of the hardware change. For example, V1.0 is a hardware version for the Switch where 1 identifies the first generation of the Switch series, and .0 is the first hardware change. |
| System Up Time | This field displays how long the Switch has been running since it last restarted or was turned on. |
| MAC Address | This field displays the MAC addresses of the Switch. |
| Login Timeout(mins) | This field displays how many minutes a management session can be left idle before the session times out. After it times out you have to log in with your password again. |
| Serial Number | This field displays the serial number of this Switch. The serial number is used for device tracking and control. |

Table 22 Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Registration MAC Address | This field displays the MAC address of the Switch that you must use to register at myZyxel.com or the NCC (Nebula Control Center). |
| Hybrid Mode | This field displays whether the Switch is in **Standalone** mode or **Cloud** mode. In **Standalone** mode you can see a link to a QR code to register the Switch to use NCC (Nebula Control Center). |
| Cloud Control Status | This field displays the registration and connection status between the Switch and the NCC (Nebula Control Center).<br>In Standalone mode, the status will display **Disconnected** or **Unregistered**. In cloud mode the status will display **Connected** or **Disconnected**.<br>**Connected** – The Switch is registered with and connected to the NCC.<br>**Disconnected** – The Switch is not connected to the NCC.<br>**Unregistered** – The Switch is not registered with the NCC. |
| Service Status | This field displays the service name (**Basic Routing** for example) if a service license is enabled at myZyxel or **Not Licensed** if the service license is not enabled. It also shows the amount of time that remains if you enabled a trial license (**Basic Routing \| Trial 30 day(s) 0 hour(s)** for example). |
| Detail | Click this link to go to the **Basic Setting** > **System Info** screen to check other detailed information, such as system resource usage and the Switch temperature, fan speeds or voltage. |
| IP Address Information | |
| IPv4 Address | This field displays the Switch's current IPv4 address. |
| Subnet Mask | This field displays the Switch's subnet mask. |
| Default Gateway | This field displays the IP address of the Switch's default gateway. |
| IP Setup | Click the link to go to the **Basic Setting** > **IP Setup** screen. |
| IPV6 Global Unicast Address | This field displays the Switch's IPv6 global unicast address |
| IPV6 Link-Local Address | This field displays the Switch's IPv6 link-local address. |
| IPv6 configuration | Click the link to go to the **Basic Setting** > **IPv6** screen. |
| Device Status and Quick Configuration | This section shows whether a feature is enabled or not on the Switch. You can click a feature's **Setting** link to go to the configuration screen for the feature.<br>Hover your cursor over a red exclamation mark to display information about the feature. |
| Quick Links | This section provides the shortcut link to a specific configuration screen. |

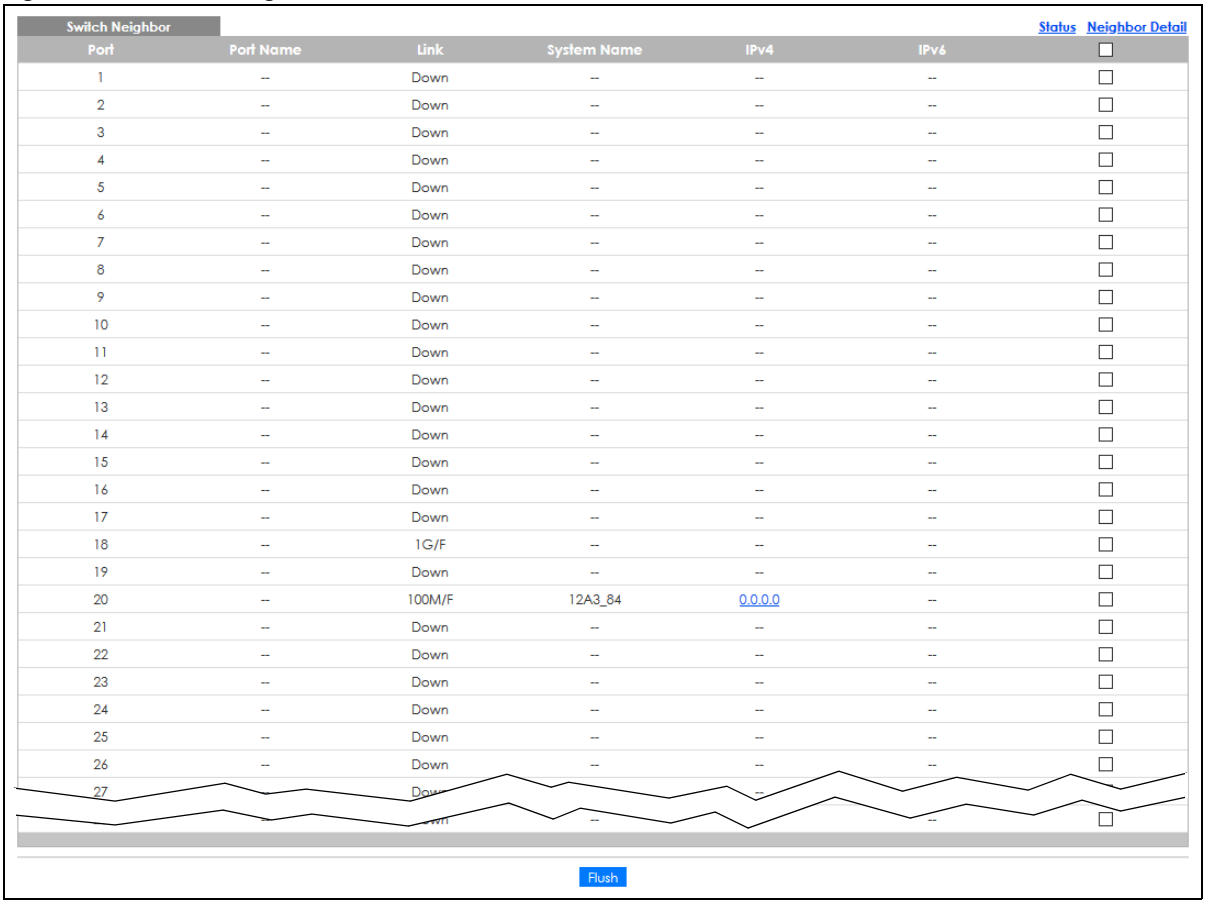
## 7.2.1 Neighbor Screen

The **Neighbor** screen allows you to view a summary and manage the Switch's neighboring devices. It uses Layer Link Discovery Protocol (LLDP) to discover all neighbor devices connected to the Switch including non-Zyxel devices. You can use this screen to perform tasks on the neighboring devices like login.

This screen shows the neighboring device first recognized on an Ethernet port of the Switch. Device information is displayed in gray when the neighboring device is offline.

Click **Status** > **Neighbor** to see the following screen.

**Figure 70** Status > Neighbor




The following table describes the fields in the above screen.

Table 23 Status > Neighbor

| LABEL | DESCRIPTION |
|---|---|
| Port | This shows the port of the Switch, on which the neighboring device is discovered. |
| Port Name | This shows the port description of the Switch. |
| Link | This shows the speed (either **10M** for 10 Mbps, **100M** for 100 Mbps, **1G** for 1 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). This field displays **Down** if the port is not connected to any device. |
| System Name | This shows the system name of the neighbor device. |
| IPv4 | This shows the IPv4 address of the neighbor device. The IPv4 address is a **hyper link** that you can click to log into and manage the neighbor device through its Web Configurator. |
| IPv6 | This shows the IPv6 address of the neighbor device. The IPv6 address is a **hyper link** that you can click to log into and manage the neighbor device through its Web Configurator. |
| | Select an entry's check box to select a specific port. Otherwise, select the check box in the table heading row to select all ports. |
| Flush | Click the **Flush** button to remove information about neighbors learned on the selected ports. |

## 7.2.2 Neighbor Detail

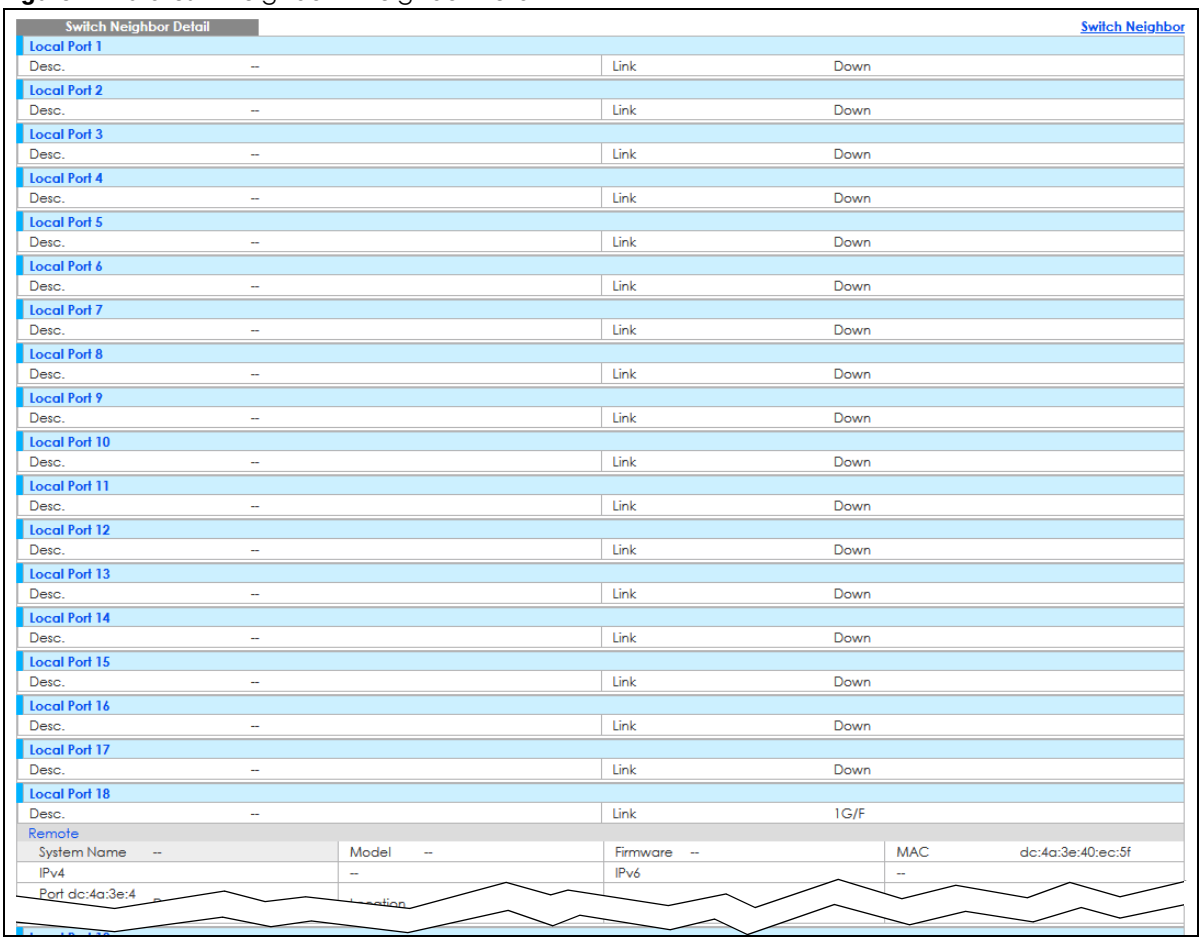
Use this screen to view detailed information about the neighboring devices. Device information is

displayed in gray when the neighboring device is currently offline.

Up to 10 neighboring device records per Ethernet port can be retained in this screen even when the devices are offline. When the maximum number of neighboring device records per Ethernet port is reached, new device records automatically overwrite existing offline device records, starting with the oldest existing offline device record first.

Click the **Neighbor Detail** link in the **Status** > **Neighbor** screen to see the following screen.

**Figure 71** Status > Neighbor > Neighbor Detail




The following table describes the fields in the above screen.

Table 24 Status > Neighbor > Neighbor Detail

| LABEL | DESCRIPTION |
|---|---|
| Local Port | This shows the port of the Switch, on which the neighboring device is discovered. |
| Desc. | This shows the port description of the Switch. |
| Link | This shows the speed (either **10M** for 10 Mbps, **100M** for 100 Mbps, **1G** for 1 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). This field displays **Down** if the port is not connected to any device. |
| Remote | |
| System Name | This shows the system name of the neighbor device. |
| Model | This shows the model name of the neighbor device. This field will show "**–**" for devices that do not support the ZON utility. |

Table 24 Status > Neighbor > Neighbor Detail (continued)

| LABEL | DESCRIPTION |
|---|---|
| Firmware | This shows the firmware version of the neighbor device. This field will show "**–**" for devices that do not support the ZON utility. |
| MAC | This shows the MAC address of the neighbor device. |
| IPv4 | This shows the IPv4 address of the neighbor device. The IPv4 address is a **hyper link** that you can click to log into and manage the neighbor device through its Web Configurator. |
| IPv6 | This shows the IPv6 address of the neighbor device. The IPv6 address is a **hyper link** that you can click to log into and manage the neighbor device through its Web Configurator. |
| Port | This show the number of the neighbor device's port which is connected to the Switch. |
| Desc. | This shows the description of the neighbor device's port which is connected to the Switch. |
| Location | This shows the geographic location of the neighbor device. This field will show "**–**" for devices that do not support the ZON utility. |

# CHAPTER 8
# Basic Setting

## 8.1 Overview

This chapter describes how to configure the **System Info**, **General Setup**, **Switch Setup**, **IP Setup**, **Port Setup**, **Interface Setup**, **IPv6**, **Loopback Interface**, **Stacking**, and **Cloud Management** screens.

### 8.1.1 What You Can Do

- Use the **System Info** screen (Section 8.2 on page 104) to check the firmware version number and monitor the Switch temperature.
- Use the **General Setup** screen (Section 8.3 on page 109) to configure general settings such as the system name and time.
- Use the **Switch Setup** screen (Section 8.5 on page 111) to choose your VLAN type and assign priorities to queues.
- Use the **IP Setup** screen (Section 8.6 on page 113) to configure the Switch IP address, default gateway device, management VLAN ID, and proxy server.
- Use the **Port Setup** screen (Section 8.7 on page 119) to configure Switch port settings.
- Use the **Interface Setup** screens (Section 8.8 on page 121) to configure Switch interface type and interface ID settings.
- Use the **IPv6** screens (Section 8.9 on page 122) to view IPv6 status and IPv6 configuration.
- Use the **Loopback Interface** screen (Section 8.10 on page 136) to configure the IPv4 loopback interface settings on the Switch.
- Use the **Stacking** screen (Section 8.11 on page 137) to view and configure stacking system for the Switch.
- Use the **Cloud Management** screen (Section 8.12 on page 142) to display links to **Nebula Control Center Discovery** and **Nebula Switch Registration** screens.

## 8.2 System Information

In the navigation panel, click **Basic Setting** > **System Info** to display the screen as shown. Use this screen to view general system information.

**Figure 72** Basic Setting > System Info (Standalone Mode)

**System Info**

| | |
|---|---|
| System Name | XS3800 |
| Product Model | XS3800-28 |
| ZyNOS F/W Version | V4.70(ABML.0)20210115 \| 01/15/2021 |
| Ethernet Address | bc:99:11:d8:3a:a5 |

**CPU Utilization**

| | |
|---|---|
| Current (%) | 4.53 |

**Memory Utilization**

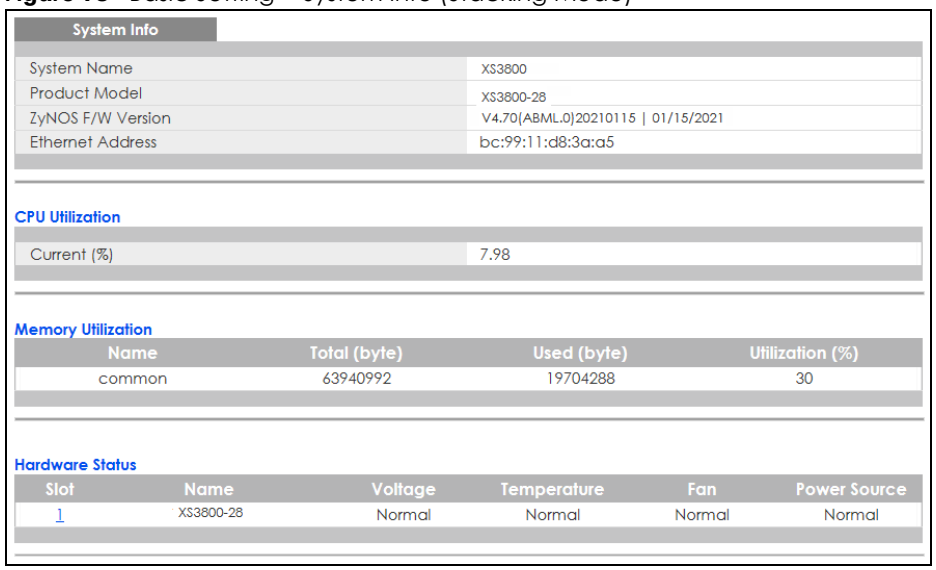
| Name | Total (byte) | Used (byte) | Utilization (%) |
|---|---|---|---|
| common | 63940992 | 12624272 | 19 |

**Hardware Monitor**

Temperature Unit C

| Temperature (C) | Current | MAX | MIN | Threshold | Status |
|---|---|---|---|---|---|
| CPU/MAC | 41.0 | 42.0 | 39.0 | 76.0 | Normal |
| BOARD | 42.0 | 43.0 | 41.0 | 113.0 | Normal |
| PHY | 42.0 | 42.0 | 40.0 | 99.0 | Normal |
| **FAN Speed (RPM)** | **Current** | **MAX** | **MIN** | **Threshold** | **Status** |
| FAN1 | 6498 | 6529 | 6467 | 500 | Normal |
| FAN2 | 6345 | 6375 | 6315 | 500 | Normal |
| FAN3 | 6286 | 6286 | 6228 | 500 | Normal |
| **Voltage (V)** | **Current** | **MAX** | **MIN** | **Threshold** | **Status** |
| 1.88V_84887 | 1.920 | 1.920 | 1.920 | +4%/-4% | Normal |
| 1V_84888 | 1.013 | 1.013 | 1.013 | +5%/-5% | Normal |
| 1.88V | 1.907 | 1.920 | 1.907 | +4%/-4% | Normal |
| 1.0V | 1.025 | 1.025 | 1.025 | +5%/-5% | Normal |
| 1.8V | 1.803 | 1.803 | 1.803 | +6%/-6% | Normal |
| 1.0V_H3 | 1.025 | 1.025 | 1.025 | +5%/-5% | Normal |
| 1V5_DDR | 1.490 | 1.490 | 1.490 | +6%/-6% | Normal |
| VTT_DDR | 0.744 | 0.744 | 0.744 | +5%/-5% | Normal |
| 3.3V | 3.274 | 3.274 | 3.274 | +6%/-6% | Normal |
| 2.5V | 2.539 | 2.565 | 2.539 | +6%/-6% | Normal |
| 12V | 11.656 | 11.656 | 11.656 | +10%/-20% | Normal |
| **Power Source** | | | | | **Status** |
| PSU_1 | | | | | Active |
| PSU_2 | | | | | N/A |

**Figure 73** Basic Setting > System Info (Stacking Mode)




The following table describes the labels in this screen.

Table 25 Basic Setting > System Info

| LABEL | DESCRIPTION |
|---|---|
| System Name | This field displays the descriptive name of the Switch for identification purposes. |
| Product Model | This field displays the product model of the Switch. Use this information when searching for firmware upgrade or looking for other support information in the website. |
| ZyNOS F/W Version | This field displays the version number of the Switch 's current firmware including the date created. |
| Ethernet Address | This field refers to the Ethernet MAC (Media Access Control) address of the Switch. |
| CPU Utilization | CPU utilization quantifies how busy the system is. **Current (%)** displays the current percentage of CPU utilization. |
| Memory Utilization | Memory utilization shows how much DRAM memory is available and in use. It also displays the current percentage of memory utilization. |
| Name | This field displays the name of the memory pool. |
| Total (byte) | This field displays the total number of bytes in this memory pool. |
| Used (byte) | This field displays the number of bytes being used in this memory pool. |
| Utilization (%) | This field displays the percentage (%) of memory being used in this memory pool. |
| Hardware Monitor | |
| Temperature Unit | The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field. |
| Temperature (C/F) | **BOARD** / **MAC** and **PHY/POWER** refers to the location of the temperature sensor on the Switch printed circuit board. |
| Current | This shows the current temperature at this sensor. |
| MAX | This field displays the maximum temperature measured at this sensor. |
| MIN | This field displays the minimum temperature measured at this sensor. |
| Threshold | This field displays the upper temperature limit at this sensor. |
| Status | This field displays **Normal** for temperatures below the threshold and **Error** for those above. |

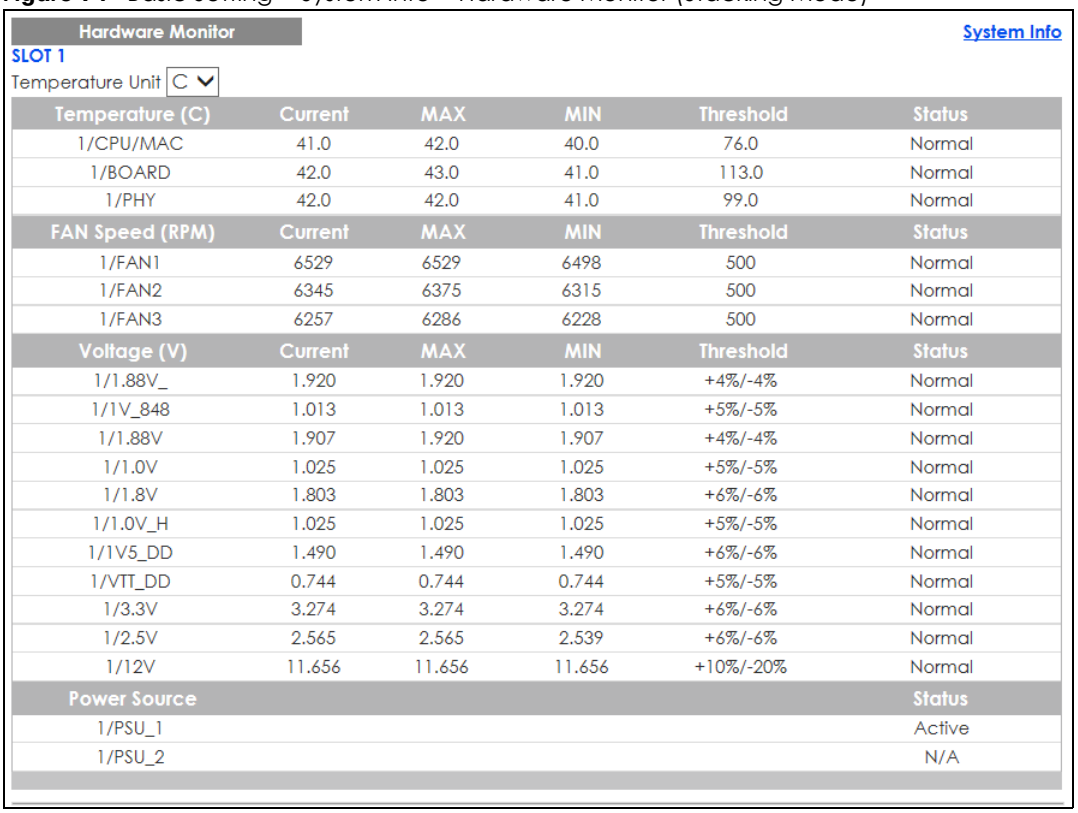
Table 25 Basic Setting > System Info (continued)

| LABEL | DESCRIPTION |
|---|---|
| FAN Speed (RPM) | A properly functioning fan is an essential component (along with a sufficiently ventilated, cool operating environment) in order for the device to stay within the temperature threshold. Each fan has a sensor that is capable of detecting and reporting if the fan speed falls below the threshold shown. |
| Current | This field displays this fan's current speed in Revolutions Per Minute (RPM). |
| MAX | This field displays this fan's maximum speed measured in Revolutions Per Minute (RPM). |
| MIN | This field displays this fan's minimum speed measured in Revolutions Per Minute (RPM). "<41" is displayed for speeds too small to measure (under 2000 RPM). |
| Threshold | This field displays the minimum speed at which a normal fan should work. |
| Status | **Normal** indicates that this fan is functioning above the minimum speed. **Error** indicates that this fan is functioning below the minimum speed. |
| Voltage(V) | The power supply for each voltage has a sensor that is capable of detecting and reporting if the voltage falls out of the tolerance range. |
| Current | This is the current voltage reading. |
| MAX | This field displays the maximum voltage measured at this point. |
| MIN | This field displays the minimum voltage measured at this point. |
| Threshold | This field displays the percentage tolerance of the voltage with which the Switch still works. |
| Status | **Normal** indicates that the voltage is within an acceptable operating range at this point; otherwise **Error** is displayed. |
| Power Source | This field lists the power supply modules installed in the Switch. **PSU_1** is **PWR1**, and **PSU_2** is **PWR2**. |
| Status | **Active** indicates the Switch is currently operating from the power source to which the power module is connected.<br>**Standby** indicates the power module is connected to a power source but the Switch is NOT operating from it.<br>**N/A** is displayed when the power module is not connected to a power source and there is no available power. |
| Hardware Status (Stacking Mode) | |
| Slot | This number identifies the Switch in the stack. Click the number to see more detailed information on the Switch. |
| Name | This is the system name of the Switch in the stack. |
| Voltage | This shows if the power supply voltage sensor is within normal tolerance range. |
| Temperature | This shows if the temperature sensors on the Switch printed circuit board are within normal tolerance range. |
| Fan | This shows if the fan sensors are within normal tolerance range. |
| Power Source | This shows if the Switch is properly operating from the connected power source. |

## 8.2.1 System Information Stacking Hardware Monitor

Click a slot number in the **System Info**rmation screen to display more detailed hardware information on a Switch.

**Figure 74** Basic Setting > System Info > Hardware Monitor (Stacking Mode)



Hardware Monitor — System Info

SLOT 1

Temperature Unit C

| Temperature (C) | Current | MAX | MIN | Threshold | Status |
|---|---|---|---|---|---|
| 1/CPU/MAC | 41.0 | 42.0 | 40.0 | 76.0 | Normal |
| 1/BOARD | 42.0 | 43.0 | 41.0 | 113.0 | Normal |
| 1/PHY | 42.0 | 42.0 | 41.0 | 99.0 | Normal |
| **FAN Speed (RPM)** | **Current** | **MAX** | **MIN** | **Threshold** | **Status** |
| 1/FAN1 | 6529 | 6529 | 6498 | 500 | Normal |
| 1/FAN2 | 6345 | 6375 | 6315 | 500 | Normal |
| 1/FAN3 | 6257 | 6286 | 6228 | 500 | Normal |
| **Voltage (V)** | **Current** | **MAX** | **MIN** | **Threshold** | **Status** |
| 1/1.88V_ | 1.920 | 1.920 | 1.920 | +4%/-4% | Normal |
| 1/1V_848 | 1.013 | 1.013 | 1.013 | +5%/-5% | Normal |
| 1/1.88V | 1.907 | 1.920 | 1.907 | +4%/-4% | Normal |
| 1/1.0V | 1.025 | 1.025 | 1.025 | +5%/-5% | Normal |
| 1/1.8V | 1.803 | 1.803 | 1.803 | +6%/-6% | Normal |
| 1/1.0V_H | 1.025 | 1.025 | 1.025 | +5%/-5% | Normal |
| 1/1V5_DD | 1.490 | 1.490 | 1.490 | +6%/-6% | Normal |
| 1/VTT_DD | 0.744 | 0.744 | 0.744 | +5%/-5% | Normal |
| 1/3.3V | 3.274 | 3.274 | 3.274 | +6%/-6% | Normal |
| 1/2.5V | 2.565 | 2.565 | 2.539 | +6%/-6% | Normal |
| 1/12V | 11.656 | 11.656 | 11.656 | +10%/-20% | Normal |
| **Power Source** | | | | | **Status** |
| 1/PSU_1 | | | | | Active |
| 1/PSU_2 | | | | | N/A |

The following table describes the labels in this screen.

Table 26 Basic Setting > System Info > Hardware Monitor (Stacking Mode)

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This number identifies the Switch in the stack. |
| Temperature Unit | The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field. |
| Temperature | **BOARD**, **PHY**, **CPU** and **MAC** refer to the location of the temperature sensors on the Switch printed circuit board. |
| Current | This shows the current temperature at this sensor. |
| MAX | This field displays the maximum temperature measured at this sensor. |
| MIN | This field displays the minimum temperature measured at this sensor. |
| Threshold | This field displays the upper temperature limit at this sensor. |
| Status | This field displays **Normal** for temperatures below the threshold and **Error** for those above. |
| Fan Speed (RPM) | A properly functioning fan is an essential component (along with a sufficiently ventilated, cool operating environment) in order for the device to stay within the temperature threshold. Each fan has a sensor that is capable of detecting and reporting if the fan speed falls below the threshold shown. |
| Current | This field displays this fan's current speed in Revolutions Per Minute (RPM). |
| MAX | This field displays this fan's maximum speed measured in RPM. |
| MIN | This field displays this fan's minimum speed measured in RPM. "<41" is displayed for speeds too small to measure (under 2000 RPM). |
| Threshold | This field displays the minimum speed at which a normal fan should work. |

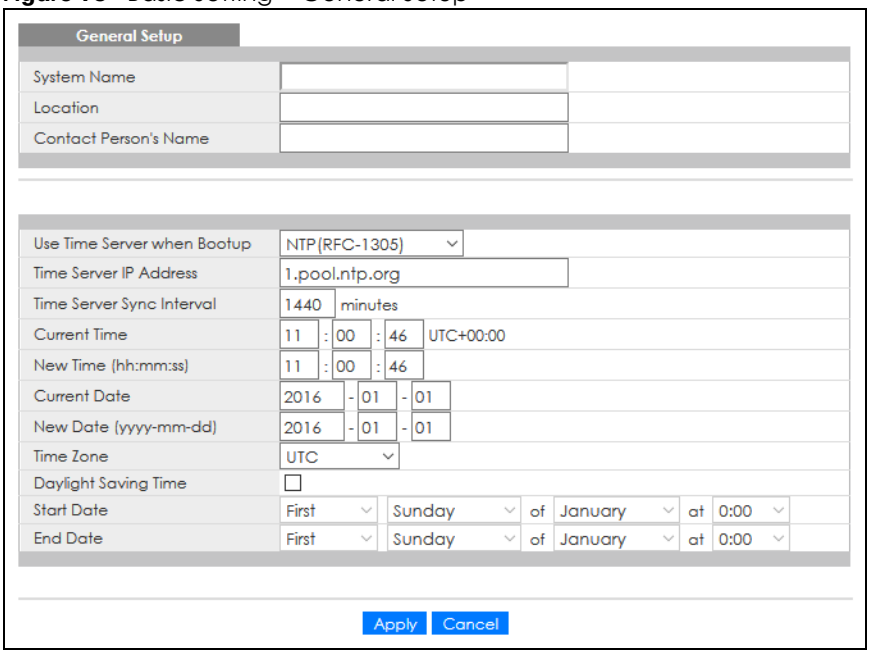
Table 26 Basic Setting > System Info > Hardware Monitor (Stacking Mode) (continued)

| LABEL | DESCRIPTION |
|---|---|
| Status | **Normal** indicates that this fan is functioning above the minimum speed. **Error** indicates that this fan is functioning below the minimum speed. |
| Voltage (V) | The power supply for each voltage has a sensor that is capable of detecting and reporting if the voltage falls out of the tolerance range. |
| Current | This is the current voltage reading. |
| MAX | This field displays the maximum voltage measured at this point. |
| MIN | This field displays the minimum voltage measured at this point. |
| Threshold | This field displays the percentage tolerance of the voltage with which the Switch still works. |
| Status | **Normal** indicates that the voltage is within an acceptable operating range at this point; otherwise **Error** is displayed. |
| Power Source | This field lists which power sources can be connected. |
| Status | **Active** indicates the Switch is currently operating from the power source. Otherwise, **N/A** is displayed. |

# 8.3 General Setup

Use this screen to configure general settings such as the system name and time. Click **Basic Setting** > **General Setup** in the navigation panel to display the screen as shown.

**Figure 75** Basic Setting > General Setup



The following table describes the labels in this screen.

Table 27 Basic Setting > General Setup

| LABEL | DESCRIPTION |
|---|---|
| System Name | Choose a descriptive name for identification purposes. This name consists of up to 64 printable characters; spaces are allowed. |
| Location | Enter the geographic location of your Switch. You can use up to 128 printable ASCII characters; spaces are allowed. |
| Contact Person's Name | Enter the name of the person in charge of this Switch. You can use up to 32 printable ASCII characters; spaces are allowed. |
| Use Time Server when Bootup | Enter the time service protocol that your time server uses. Not all time servers support all protocols, so you may have to use trial and error to find a protocol that works. The main differences between them are the time format.<br><br>When you select the **Daytime (RFC 867)** format, the Switch displays the day, month, year and time with no time zone adjustment. When you use this format it is recommended that you use a Daytime timeserver within your geographical time zone.<br><br>**Time (RFC-868)** format displays a 4-byte integer giving the total number of seconds since 1970/1/1 at 0:0:0.<br><br>**NTP (RFC-1305)** is similar to **Time (RFC-868)**.<br><br>**None** is the default value. Enter the time manually. Each time you turn on the Switch, the time and date will be reset to 1970-1-1 0:0:0. |
| Time Server IP Address | Enter the IP address or domain name of your timeserver. The Switch searches for the timeserver for up to 60 seconds. |
| Time Server Sync Interval | Enter the period in minutes between each time server synchronization. The Switch checks the time server after every synchronization interval. |
| Current Time | This field displays the time you open this menu (or refresh the menu). |
| New Time (hh:min:ss) | Enter the new time in hour, minute and second format. The new time then appears in the **Current Time** field after you click **Apply**. |
| Current Date | This field displays the date you open this menu. |
| New Date (yyyy-mm-dd) | Enter the new date in year, month and day format. The new date then appears in the **Current Date** field after you click **Apply**. |
| Time Zone | Select the time difference between UTC (Universal Time Coordinated, formerly known as GMT, Greenwich Mean Time) and your time zone from the drop-down list box. |
| Daylight Saving Time | Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening.<br><br>Select this option if you use Daylight Saving Time. |
| Start Date | Configure the day and time when Daylight Saving Time starts if you selected **Daylight Saving Time**. The time is displayed in the 24 hour format. Here are a couple of examples:<br><br>Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Second**, **Sunday**, **March** and **2:00**.<br><br>Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **March** and the last field depends on your time zone. In Germany for instance, you would select **2:00** because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). |

Table 27 Basic Setting > General Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| End Date | Configure the day and time when Daylight Saving Time ends if you selected **Daylight Saving Time**. The time field uses the 24 hour format. Here are a couple of examples:<br><br>Daylight Saving Time ends in the United States on the first Sunday of November. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **First**, **Sunday**, **November** and **2:00**.<br><br>Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **October** and the last field depends on your time zone. In Germany for instance, you would select **2:00** because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 8.4 Introduction to VLANs

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same groups; the traffic must first go through a router.

In MTU (Multi-Tenant Unit) applications, VLAN is vital in providing isolation and security among the subscribers. When properly configured, VLAN prevents one subscriber from accessing the network resources of another on the same LAN, thus a user will NOT see the printers and hard disks of another user in the same building.

VLAN also increases network performance by limiting broadcasts to a smaller and more manageable logical broadcast domain. In traditional switched environments, all broadcast packets go to each and every individual port. With VLAN, all broadcasts are confined to a specific broadcast domain.

Note: VLAN is unidirectional; it only governs outgoing traffic.

# 8.5 Switch Setup

Click **Basic Setting** > **Switch Setup** in the navigation panel to display the screen as shown. The VLAN setup screens change depending on whether you choose **802.1Q** or **Port Based** in the **VLAN Type** field in this screen (in Standalone mode).

**Figure 76** Basic Setting > Switch Setup (Standalone Mode)

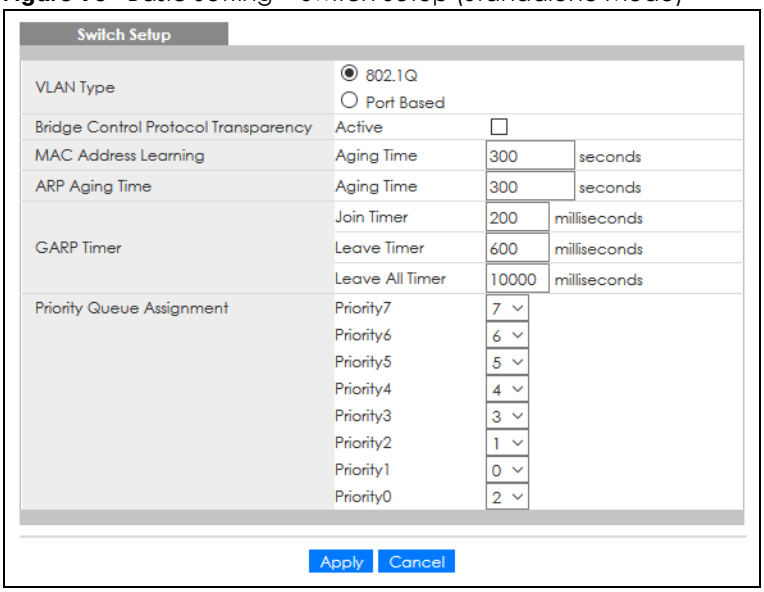
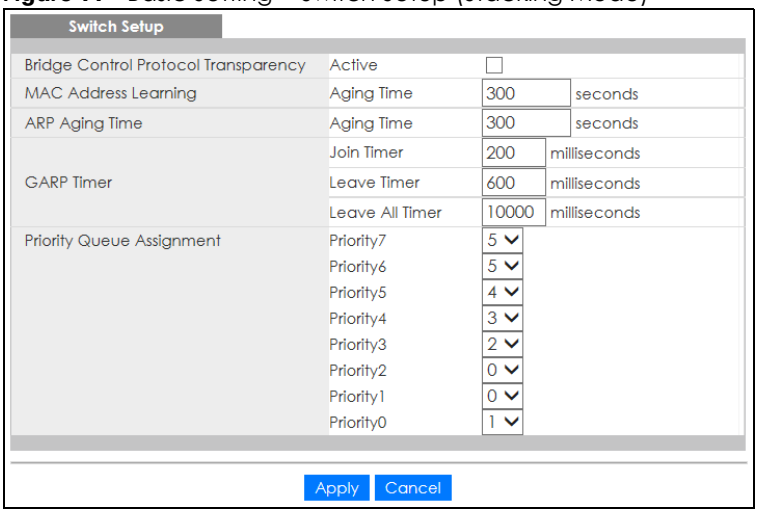



**Figure 77** Basic Setting > Switch Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 28 Basic Setting > Switch Setup

| LABEL | DESCRIPTION |
|---|---|
| VLAN Type<br><br>(Standalone mode only) | Choose **802.1Q** or **Port Based**. The **VLAN Setup** screen changes depending on whether you choose **802.1Q** VLAN type or **Port Based** VLAN type in this screen.<br><br>The Switch does not have port-based VLAN available in stacking mode (**Active** is enabled in **Basic Setting** > **Stacking** > **Configuration**), so this field does not display in stacking mode. |
| Bridge Control Protocol Transparency | Select **Active** to allow the Switch to handle bridging control protocols (STP, for example). You also need to define how to treat a BPDU in the **Port Setup** screen. |
| MAC Address Learning<br><br>MAC address learning reduces outgoing traffic broadcasts. For MAC address learning to occur on a port, the port must be active. | |
| Aging Time | Enter a time from 10 to 1000000 seconds. This is how long all dynamically learned MAC addresses remain in the MAC address table before they age out (and must be relearned). |

Table 28 Basic Setting > Switch Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| ARP Aging Time | |
| Aging Time | Enter a time from 60 to 1000000 seconds. This is how long dynamically learned ARP entries remain in the ARP table before they age out (and must be relearned). The setting here applies to ARP entries which are newly added in the ARP table after you click **Apply**. |
| GARP Timer: Switches join VLANs by making a declaration. A declaration is made by issuing a **Join** message using GARP. Declarations are withdrawn by issuing a **Leave** message. A **Leave All** message terminates all registrations. GARP timers set declaration timeout values. See the chapter on VLAN setup for more background information. | |
| Join Timer | Join Timer sets the duration of the Join Period timer for GVRP in milliseconds. Each port has a **Join Period** timer. The allowed **Join Time** range is between 100 and 65535 milliseconds; the default is 200 milliseconds. See the chapter on VLAN setup for more background information. |
| Leave Timer | Leave Time sets the duration of the **Leave Period** timer for GVRP in milliseconds. Each port has a single **Leave Period** timer. Leave Time must be two times larger than **Join Timer**; the default is 600 milliseconds. |
| Leave All Timer | Leave All Timer sets the duration of the Leave All Period timer for GVRP in milliseconds. Each port has a single Leave All Period timer. Leave All Timer must be larger than Leave Timer. |
| Priority Queue Assignment<br><br>IEEE 802.1p defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Frames without an explicit priority tag are given the default priority of the ingress port. Use the next fields to configure the priority level-to-physical queue mapping.<br><br>The Switch has eight physical queues that you can map to the eight priority levels. On the Switch, traffic assigned to higher index queues gets through faster while traffic in lower index queues is dropped if the network is congested. | |
| Priority Level (The following descriptions are based on the traffic types defined in the IEEE 802.1d standard (which incorporates the 802.1p).<br><br>To map a priority level to a physical queue, select a physical queue from the drop-down menu on the right. | |
| Priority 7 | Typically used for network control traffic such as router configuration messages. |
| Priority 6 | Typically used for voice traffic that is especially sensitive to jitter (jitter is the variations in delay). |
| Priority 5 | Typically used for video that consumes high bandwidth and is sensitive to jitter. |
| Priority 4 | Typically used for controlled load, latency-sensitive traffic such as SNA (Systems Network Architecture) transactions. |
| Priority 3 | Typically used for "excellent effort" or better than best effort and would include important business traffic that can tolerate some delay. |
| Priority 2 | This is for "spare bandwidth". |
| Priority 1 | This is typically used for non-critical "background" traffic such as bulk transfers that are allowed but that should not affect other applications and users. |
| Priority 0 | Typically used for best-effort traffic. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 8.6 IP Setup

Use the **IP Setup** screen to configure the default gateway device, the default domain name server and add IP domains.

## 8.6.1 IP Interfaces

The Switch needs an IP address for it to be managed over the network. When the Switch (in Standalone mode) fails to obtain an IP address from a DHCP server, the static IP address 192.168.1.1 will be automatically added and used as the Switch's management IP address.

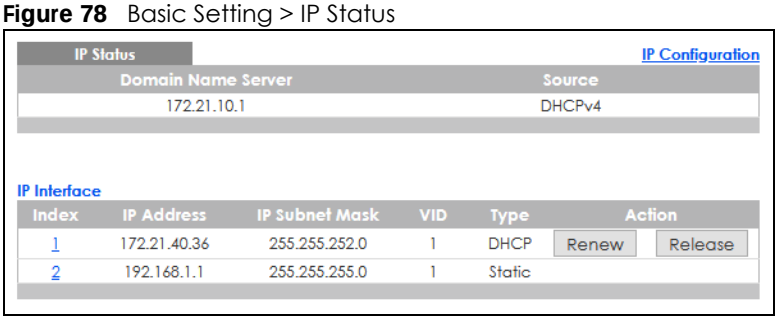
On the Switch, an IP address is not bound to any physical ports. Since each IP address on the Switch must be in a separate subnet, the configured IP address is also known as IP interface (or routing domain). In addition, this allows routing between subnets based on the IP address without additional routers.

You can configure multiple routing domains on the same VLAN as long as the IP address ranges for the domains do not overlap. To change the IP address of the Switch in a routing domain, simply add a new routing domain entry with a different IP address in the same subnet.

Note: You must configure a VLAN first. Each VLAN can have multiple management IP addresses, and you can log into the Switch through different management IP addresses simultaneously.

## 8.6.2 IP Status

**Figure 78** Basic Setting > IP Status




The following table describes the labels in this screen.

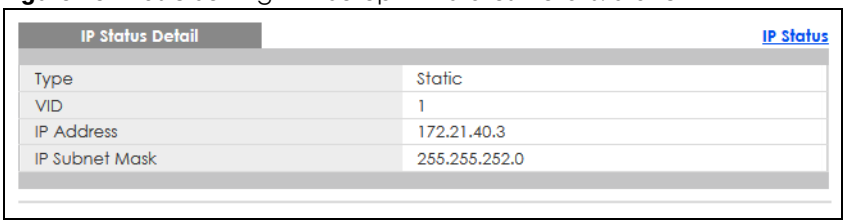
Table 29 Basic Setting > IP Status

| LABEL | DESCRIPTION |
|---|---|
| IP Status | |
| Domain Name Server | This field displays the IP address of the DNS server. |
| Source | This field displays whether the DNS server address is configured manually (**Static**) or obtained automatically using **DHCPv4**. |
| IP Interface | |
| Index | This field displays the index number of an entry. |
| IP Address | This field displays the IP address of the Switch in the IP domain. |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain. |
| VID | This field displays the VLAN identification number of the IP domain on the Switch. |
| Type | This shows whether this IP address is dynamically assigned from a DHCP server or manually assigned (**Static**). |
| Renew | Click this to renew the dynamic IP address. |
| Release | Click this to release the dynamic IP address. |

## 8.6.3 IP Status Details

Use this screen to view IP status details. Click a number in the **Index** column in the **IP Status** screen to display the screen as shown next.

**Figure 79** Basic Setting > IP Setup > IP Status Details: Static

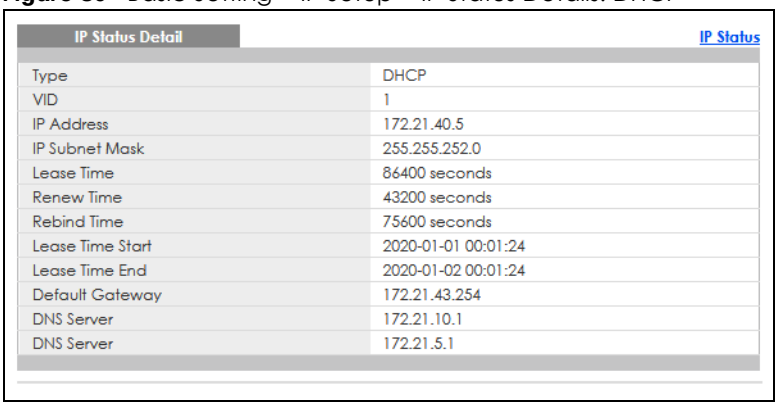



The following table describes the labels in this screen.

Table 30 Basic Setting > IP Setup > IP Status Details: Static

| LABEL | DESCRIPTION |
|---|---|
| Type | This shows the IP address is manually assigned (**Static**). |
| VID | This is the VLAN identification number to which an IP routing domain belongs. |
| IP Address | This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1. |
| IP Subnet Mask | This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0. |

**Figure 80** Basic Setting > IP Setup > IP Status Details: DHCP




The following table describes the labels in this screen.

Table 31 Basic Setting > IP Setup > IP Status Details: DHCP

| LABEL | DESCRIPTION |
|---|---|
| Type | This shows the IP address is dynamically assigned from a DHCP server (**DHCP**). |
| VID | This is the VLAN identification number to which an IP routing domain belongs. |
| IP Address | This is the IP address of your Switch in dotted decimal notation for example 192.168.1.1. |
| IP Subnet Mask | This is the IP subnet mask of your Switch in dotted decimal notation for example 255.255.255.0. |
| Lease Time | This displays the length of time in seconds that this interface can use the current dynamic IP address from the DHCP server. |
| Renew Time | This displays the length of time from the lease start that the Switch will request to renew its current dynamic IP address from the DHCP server. |
| Rebind Time | This displays the length of time from the lease start that the Switch will request to get any dynamic IP address from the DHCP server. |

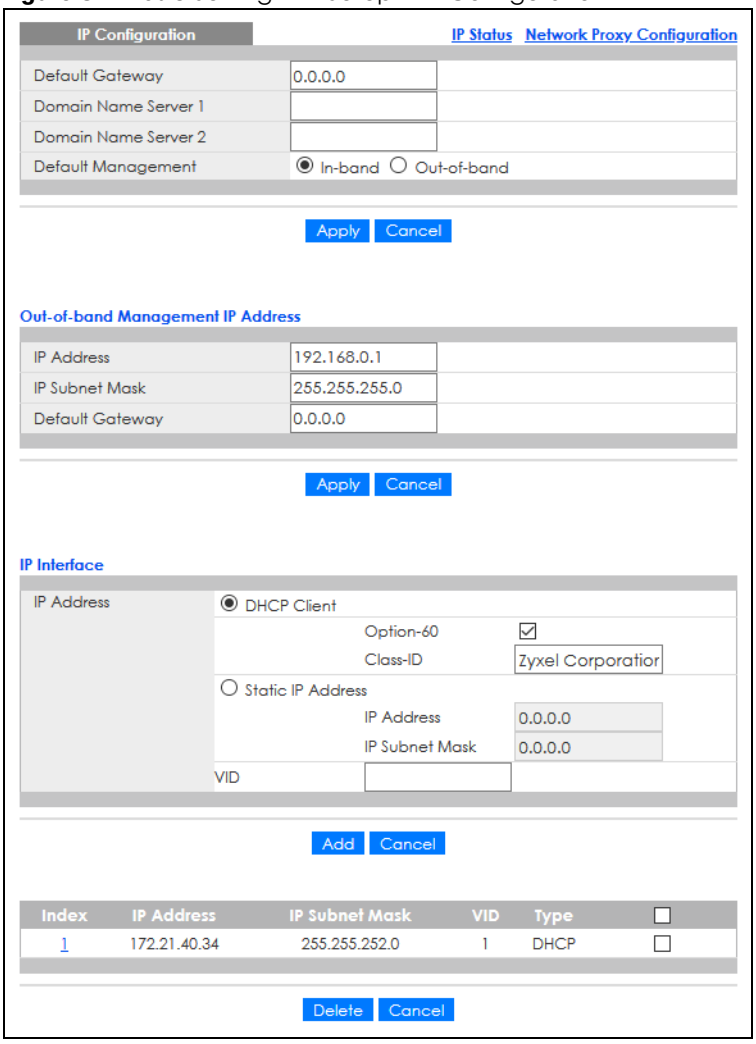
Table 31 Basic Setting > IP Setup > IP Status Details: DHCP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Lease Time Start | This displays the date and time that the current dynamic IP address assignment from the DHCP server began. You should configure date and time in **Basic Setting** > **General Setup**. |
| Lease Time End | This displays the date and time that the current dynamic IP address assignment from the DHCP server will end. You should configure date and time in **Basic Setting** > **General Setup**. |
| Default Gateway | This displays the IP address of the default gateway assigned by the DHCP server. 0.0.0.0 means no gateway is assigned. |
| DNS Server | This displays the IP address of the primary and secondary DNS servers assigned by the DHCP server. 0.0.0.0 means no DNS server is assigned. |

## 8.6.4 IP Configuration

Use this screen to configure the default gateway device, the default domain name server and add IP domains.

**Figure 81** Basic Setting > IP Setup > IP Configuration



The following table describes the labels in this screen.

Table 32 Basic Setting > IP Setup > IP Configuration

| LABEL | DESCRIPTION |
|---|---|
| Default Gateway | Type the IP address of the default outgoing gateway in dotted decimal notation, for example 192.168.1.254. |
| Domain Name Server 1/2 | Enter a domain name server IPv4 address in order to be able to use a domain name instead of an IP address. |
| Default Management | Specify which traffic flow (**In-Band** or **Out-of-band**) the Switch is to send packets originating from itself (such as SNMP traps) or packets with unknown source.<br><br>Select **Out-of-band** to have the Switch send the packets to the management port labeled **MGMT**. This means that devices connected to the other ports do not receive these packets.<br><br>Select **In-Band** to have the Switch send the packets to all ports except the management port (labeled **MGMT**) to which connected devices do not receive these packets. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Out-of-band Management IP Address<br><br>Use these fields to set the settings for the out-of-band management port. | |
| IP Address | Enter the out-of-band management IP address of your Switch in dotted decimal notation. For example, 192.168.0.1. |
| IP Subnet Mask | Enter the IP subnet mask of your Switch in dotted decimal notation, for example, 255.255.255.0. |
| Default Gateway | Enter the IP address of the default outgoing gateway in dotted decimal notation, for example, 192.168.0.254. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| IP Interface<br><br>Use these fields to create or edit IP routing domains on the Switch. | |
| DHCP Client | Select this option if you have a DHCP server that can assign the Switch an IP address, subnet mask, a default gateway IP address and a domain name server IP address automatically. |
| Option-60 | DHCP Option 60 is used by the Switch for identification to the DHCP server using the VCI (Vendor Class Identifier) on the DHCP server. The Switch adds it in the initial DHCP discovery message that a DHCP client broadcasts in search of an IP address. The DHCP server can assign different IP addresses or options to clients with the specific VCI or reject the request from clients without the specific VCI.<br><br>Select this and enter the device identity you want the Switch to add in the DHCP discovery frames that go to the DHCP server. This allows the Switch to identify itself to the DHCP server. |
| Class-ID | Type a string of up to 32 characters to identify this Switch to the DHCP server. For example, Zyxel-TW. |
| Static IP Address | Select this option if you do not have a DHCP server or if you wish to assign static IP address information to the Switch. You need to fill in the following fields when you select this option. |
| IP Address | Enter the IP address of your Switch in dotted decimal notation, for example, 192.168.1.1. This is the IP address of the Switch in an IP routing domain. |
| IP Subnet Mask | Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.255.0. |
| VID | Enter the VLAN identification number to which an IP routing domain belongs. |

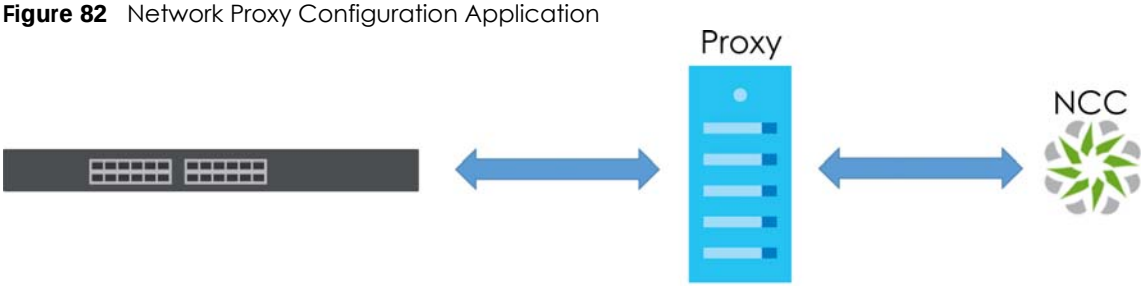
Table 32 Basic Setting > IP Setup > IP Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Index | This field displays the index number of an entry. |
| IP Address | This field displays the IP address of the Switch in the IP domain. |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain. |
| VID | This field displays the VLAN identification number of the IP domain on the Switch. |
| Type | This field displays the type of IP address status. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table.<br>Note: Deleting all IP subnets locks you out of the Switch. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 8.6.5 Network Proxy Configuration

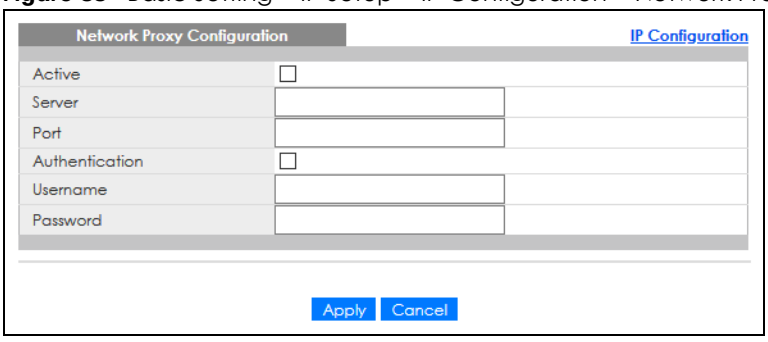
The proxy server of an organization may prohibit communication between the Switch and NCC (Nebula Control Center) (Section 8.12 on page 142). Use this screen to enable communication between the Switch and NCC through the proxy server.

**Figure 82** Network Proxy Configuration Application




As of this writing, this setting only allows communication between the Switch and the NCC.

**Figure 83** Basic Setting > IP Setup > IP Configuration > Network Proxy Configuration



The following table describes the labels in this screen.

Table 33 Basic Setting > IP Setup > IP Configuration > Network Proxy Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable communication between the Switch and NCC through a proxy server. |
| Server | Enter the IP address (dotted decimal notation) or host name of the proxy server. When entering the host name, up to 128 alphanumeric characters are allowed for the **Server** except [ ? ], [ \| ], [ ' ], or [ " ]. |
| Port | Enter the port number of the proxy server (1 – 65535). |
| Authentication | Select this option to enable proxy server authentication using a **Username** and **Password**. |
| Username | Enter a login user name from the proxy server administrator. Up to 32 alphanumeric characters are allowed for the **Username** except [ ? ], [ \| ], [ ' ], or [ " ]. |
| Password | Enter a login password from the proxy server administrator. Up to 32 alphanumeric characters are allowed for the **Password** except [ ? ], [ \| ], [ ' ], or [ " ]. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |

# 8.7 Port Setup

Use this screen to configure Switch port settings. Click **Basic Setting** > **Port Setup** in the navigation panel to display the configuration screen.

**Figure 84** Basic Setting > Port Setup (Standalone Mode)

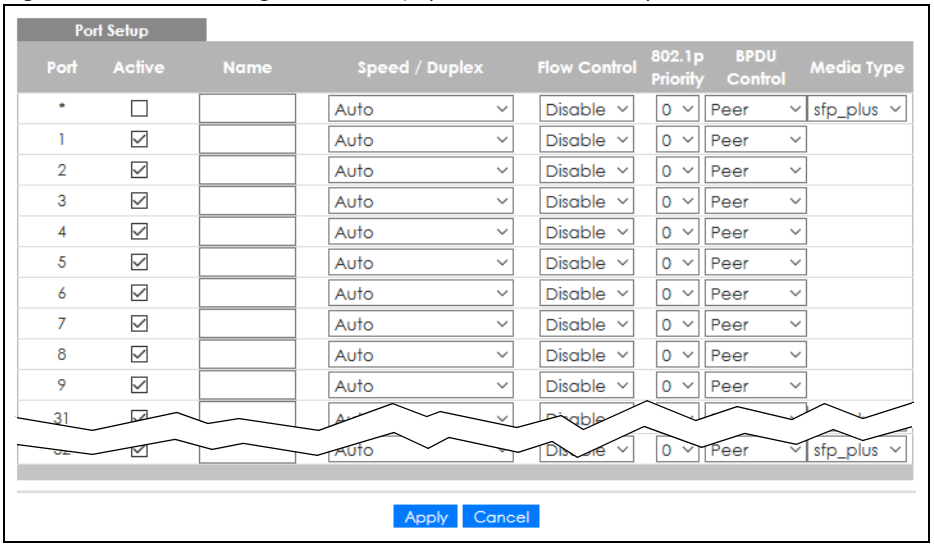
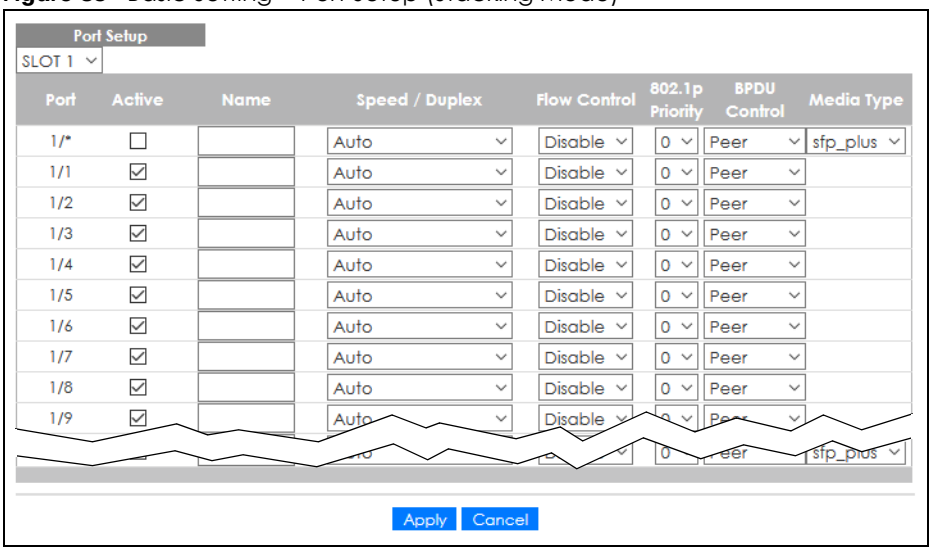


**Figure 85** Basic Setting > Port Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 34 Basic Setting > Port Setup

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This is the port index number. In stacking mode, the first number represents the slot ID and the second one is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable a port. The factory default for all ports is enabled. A port must be enabled for data transmission to occur. |
| Name | Type a descriptive name that identifies this port. You can enter up to 128 ASCII characters except [ ? ], [ \| ], [ ' ] or [ " ].<br><br>Note: Due to space limitations, the port name may be truncated in some Web Configurator screens. |
| Speed/Duplex | Select the speed and the duplex mode of the Ethernet connection on this port. The choices are **Auto**, **Auto-1G**, **2.5G / Full Duplex**, **5G / Full Duplex**, and **100M / Full Duplex** for a 100Base-T connection. **1G / Full Duplex** is supported by both 1000Base-T and 1000Base-X connections. **10G / Full Duplex** is supported by the 10 Gigabit Ethernet connections on the Switch that has a 10 Gigabit interface.<br><br>Selecting **Auto-1G** or **Auto** (auto-negotiation) allows one port to negotiate with a peer port automatically to obtain the connection speed and duplex mode that both ends support. When auto-negotiation is turned on, a port on the Switch negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, a port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer port are the same in order to connect. |

Table 34 Basic Setting > Port Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Flow Control | A concentration of traffic on a port decreases port bandwidth and overflows buffer memory causing packet discards and frame losses. **Flow Control** is used to regulate transmission of signals to match the bandwidth of the receiving port.<br>The Switch uses IEEE 802.3x flow control in full duplex mode and backpressure flow control in half duplex mode.<br>IEEE 802.3x flow control is used in full duplex mode to send a pause signal to the sending port, causing it to temporarily stop sending signals when the receiving port memory buffers fill.<br>Back Pressure flow control is typically used in half duplex mode to send a "collision" signal to the sending port (mimicking a state of packet collision) causing the sending port to temporarily stop sending signals and resend later.<br>Select **Tx Rx** to allow the Switch port to send pause signal to the connected device, and for the connected device to send a pause signal to the Switch. The Switch will temporarily stop sending signals after receiving pause signal.<br>Select **Tx** to allow the Switch port to send pause signal to the connected device.<br>Select **Rx** to allow the connected device to send a pause signal to the Switch. The Switch will temporarily stop sending signals.<br>Otherwise, select **Disable**. |
| 802.1p Priority | This priority value is added to incoming frames without a (802.1p) priority queue tag. |
| BPDU Control | Configure the way to treat BPDUs received on this port. You must activate bridging control protocol transparency in the Switch **Setup** screen first.<br>Select **Peer** to process any BPDU (Bridge Protocol Data Units) received on this port.<br>Select **Tunnel** to forward BPDUs received on this port.<br>Select **Discard** to drop any BPDU received on this port.<br>Select **Network** to process a BPDU with no VLAN tag and forward a tagged BPDU. |
| Media Type | You can insert either an SFP+ transceiver or an SFP+ Direct Attach Copper (DAC) cable into the 10 Gigabit interface of the Switch.<br>Select the media type (**sfp_plus** or **dac10g**) of the SFP+ module that is attached to the 10 Gigabit interface. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

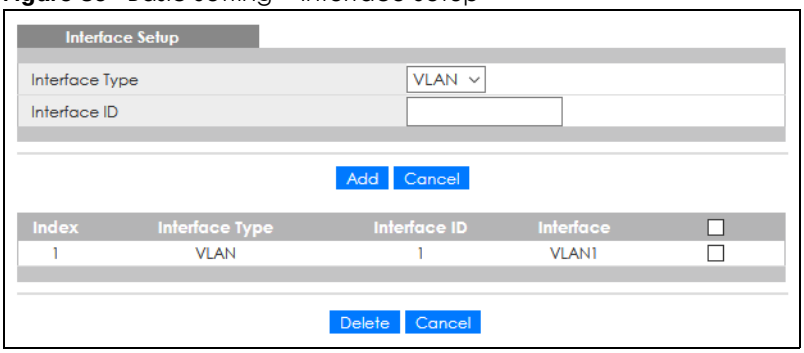
# 8.8 Interface Setup

An IPv6 address is configured on a per-interface basis. The interface can be a physical interface (for example, an Ethernet port) or a virtual interface (for example, a VLAN). The Switch supports the VLAN interface type for IPv6 at the time of writing.

Use this screen to set IPv4 loopback interfaces for routing protocols or IPv6 interfaces on which you can configure an IPv6 address to access and manage the Switch.

Click **Basic Setting** > **Interface Setup** in the navigation panel to display the configuration screen.

**Figure 86** Basic Setting > Interface Setup




The following table describes the labels in this screen.

Table 35 Basic Setting > Interface Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface Type | Select the type of IPv6 interface for which you want to configure. The Switch supports the VLAN interface type for IPv6 at the time of writing. |
| Interface ID | Specify a unique identification number (from 1 to 4094) for the VLAN interface or a unique identification number (from 0 to 2) for the loopback interface.<br><br>To have IPv6 function properly, you should configure a static VLAN with the same ID number in the **Advanced Application** > **VLAN** screens. |
| Add | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Index | This field displays the index number of an entry. |
| Interface Type | This field displays the type of interface. |
| Interface ID | This field displays the identification number of the interface. |
| Interface | This field displays the interface's descriptive name which is generated automatically by the Switch. The name is from a combination of the interface type and ID number. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

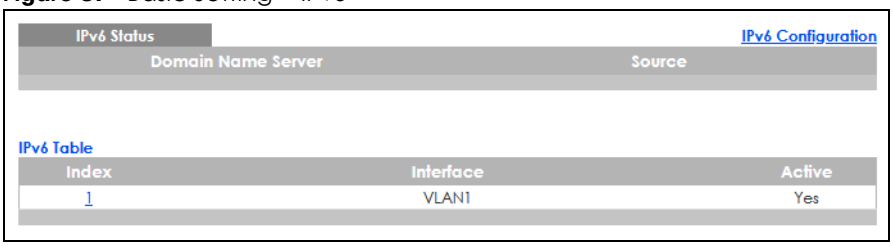
# 8.9 IPv6

Use this screen to view the IPv6 interface status and configure the Switch's management IPv6 addresses.

## 8.9.1 IPv6 Status

Click **Basic Setting** > **IPv6** in the navigation panel to display the IPv6 status screen as shown next.

**Figure 87** Basic Setting > IPv6




The following table describes the labels in this screen.

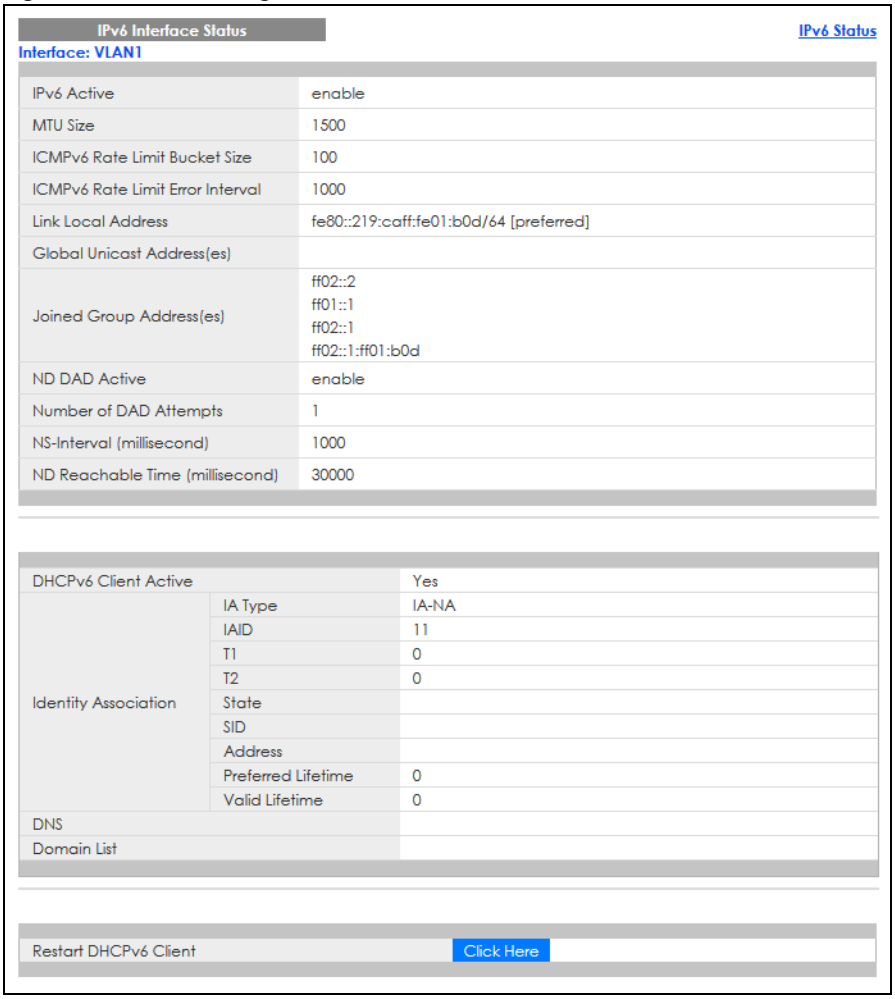
Table 36 Basic Setting > IPv6

| LABEL | DESCRIPTION |
|---|---|
| IPv6 Status | |
| Domain Name Server | This field displays the IP address of the DNS server. |
| Source | This field displays whether the DNS server address is configured manually (**Static**) or obtained automatically using **DHCPv6**. |
| IPv6 Table | |
| Index | This field displays the index number of an IPv6 interface. Click on an index number to view more interface details. |
| Interface | This is the name of the IPv6 interface you created. |
| Active | This field displays whether the IPv6 interface is activated or not. |

## 8.9.2 IPv6 Interface Status

Use this screen to view a specific IPv6 interface status and detailed information. Click an interface index number in the **Basic Setting** > **IPv6** screen. The following screen opens.

**Figure 88** Basic Setting > IPv6 > IPv6 Interface Status




The following table describes the labels in this screen.

Table 37 Basic Setting > IPv6 > IPv6 Interface Status

| LABEL | DESCRIPTION |
|---|---|
| IPv6 Active | This field displays whether the IPv6 interface is activated or not. |
| MTU Size | This field displays the Maximum Transmission Unit (MTU) size for IPv6 packets on this interface. |
| ICMPv6 Rate Limit Bucket Size | This field displays the maximum number of ICMPv6 error messages which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed. |
| ICMPv6 Rate Limit Error Interval | This field displays the time period (in milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit. |
| Link Local Address | This field displays the Switch's link-local IP address and prefix generated by the interface. It also shows whether the IP address is preferred, which means it is a valid address and can be used as a sender or receiver address. |
| Global Unicast Address(es) | This field displays the Switch's global unicast address to identify this interface. |
| Joined Group Address(es) | This field displays the IPv6 multicast addresses of groups the Switch's interface joins. |

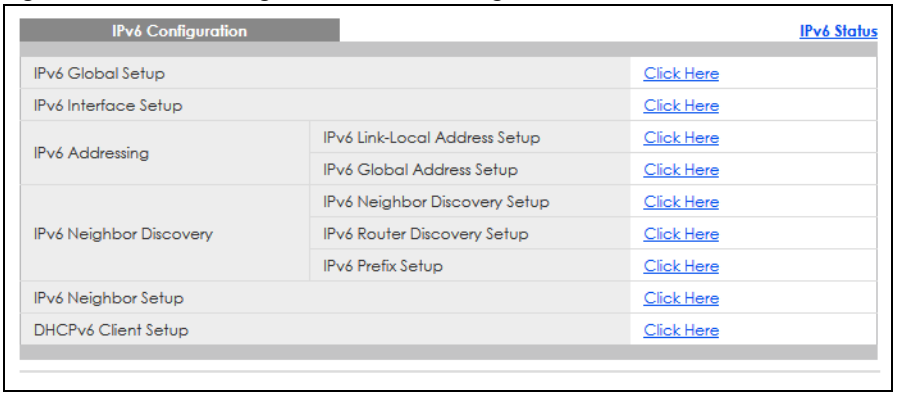
Table 37 Basic Setting > IPv6 > IPv6 Interface Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| ND DAD Active | This field displays whether Neighbor Discovery (ND) Duplicate Address Detection (DAD) is enabled on the interface. |
| Number of DAD Attempts | This field displays the number of consecutive neighbor solicitations the Switch sends for this interface. |
| NS-Interval (millisecond) | This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface. |
| ND Reachable Time (millisecond) | This field displays how long (in milliseconds) a neighbor is considered reachable for this interface. |
| DHCPv6 Client Active | This field displays whether the Switch acts as a DHCPv6 client to get an IPv6 address from a DHCPv6 server. |
| Identity Association | An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. |
| IA Type | The IA type is the type of address in the IA. Each IA holds one type of address. **IA_NA** means an identity association for non-temporary addresses and **IA_TA** is an identity association for temporary addresses. |
| IAID | Each IA consists of a unique IAID and associated IP information. |
| T1 | This field displays the DHCPv6 T1 timer. After T1, the Switch sends the DHCPv6 server a Renew message.<br>An IA_NA option contains the T1 and T2 fields, but an IA_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA_NA before the lifetimes expire. |
| T2 | This field displays the DHCPv6 T2 timer. If the time T2 is reached and the server does not respond, the Switch sends a Rebind message to any available server. |
| State | This field displays the state of the TA. It shows<br>**Active** when the Switch obtains addresses from a DHCpv6 server and the TA is created.<br>**Renew** when the TA's address lifetime expires and the Switch sends out a Renew message.<br>**Rebind** when the Switch does not receive a response from the original DHCPv6 server and sends out a Rebind message to another DHCPv6 server. |
| SID | This field displays the DHCPv6 server's unique ID. |
| Address | This field displays the Switch's global address which is assigned by the DHCPv6 server. |
| Preferred Lifetime | This field displays how long (in seconds) that the global address remains preferred. |
| Valid Lifetime | This field displays how long (in seconds) that the global address is valid. |
| DNS | This field displays the DNS server address assigned by the DHCPv6 server. |
| Domain List | This field displays the address record when the Switch queries the DNS server to resolve domain names. |
| Restart DHCPv6 Client | Click **Click Here** to send a new DHCP request to the DHCPv6 server and update the IPv6 address and DNS information for this interface. |

## 8.9.3 IPv6 Configuration

Use this screen to configure IPv6 settings on the Switch. Click the **IPv6 Configuration** link in the **Basic Setting** > **IPv6** screen. The following screen opens.

**Figure 89** Basic Setting > IPv6 > IPv6 Configuration




The following table describes the labels in this screen.

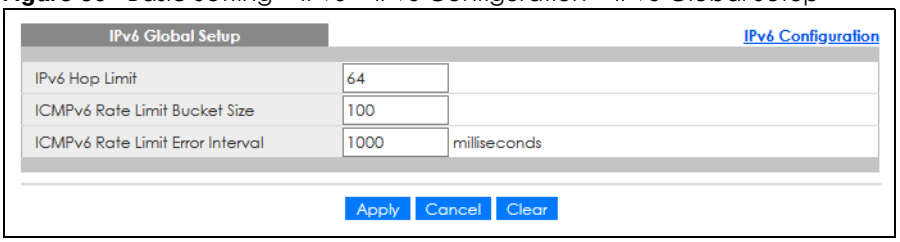
Table 38 Basic Setting > IPv6 > IPv6 Configuration

| LABEL | DESCRIPTION |
|---|---|
| IPv6 Global Setup | Click the link to go to a screen where you can configure the global IPv6 settings on the Switch. |
| IPv6 Interface Setup | Click the link to go to a screen where you can enable an IPv6 interface on the Switch. |
| IPv6 Addressing | |
| IPv6 Link-Local Address Setup | Click the link to go to a screen where you can configure the IPv6 link-local address for an interface. |
| IPv6 Global Address Setup | Click the link to go to a screen where you can configure the IPv6 global address for an interface. |
| IPv6 Neighbor Discovery | |
| IPv6 Neighbor Discovery Setup | Click the link to go to a screen where you can configure the IPv6 neighbor discovery settings. |
| IPv6 Router Discovery Setup | Click the link to go to a screen where you can configure the IPv6 router discovery settings. |
| IPv6 Prefix Setup | Click the link to go to a screen where you can configure the Switch's IPv6 prefix list. |
| IPv6 Neighbor Setup | Click the link to go to a screen where you can create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table. |
| DHCPv6 Client Setup | Click the link to go to a screen where you can configure the Switch DHCPv6 client settings. |

## 8.9.4 IPv6 Global Setup

Use this screen to configure the global IPv6 settings. Click the link next to **IPv6 Global Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 90** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Setup



The following table describes the labels in this screen.

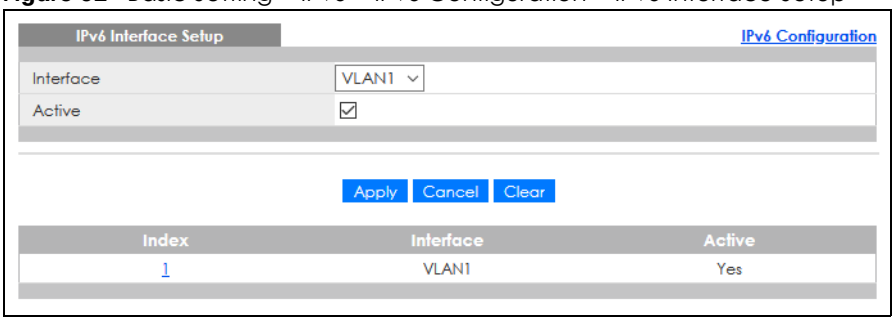
Table 39 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Setup

| LABEL | DESCRIPTION |
|---|---|
| IPv6 Hop Limit | Specify the maximum number of hops (from 1 to 255) in router advertisements. This is the maximum number of hops on which an IPv6 packet is allowed to transmit before it is discarded by an IPv6 router, which is similar to the TTL field in IPv4. |
| ICMPv6 Rate Limit Bucket Size | Specify the maximum number of ICMPv6 error messages (from 1 to 200) which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed. |
| ICMPv6 Rate Limit Error Interval | Specify the time period (from 0 to 2147483647 milliseconds) during which ICMPv6 error messages of up to the bucket size can be transmitted. 0 means no limit. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |

## 8.9.5 IPv6 Interface Setup

Use this screen to turn on or off an IPv6 interface. Click the link next to **IPv6 Interface Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 91** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup




The following table describes the labels in this screen.

Table 40 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Interface Setup

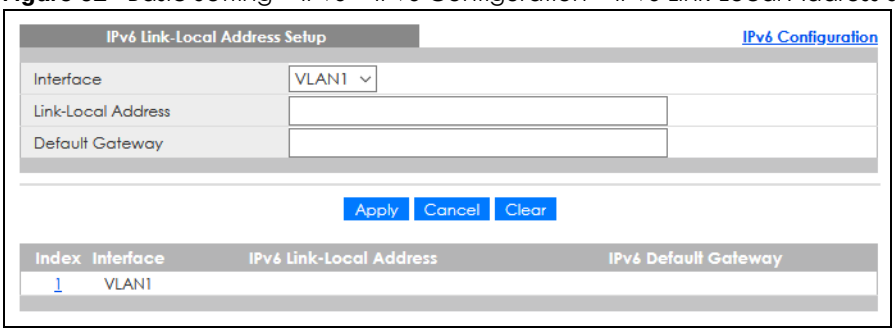
| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| Active | Select this option to enable the interface. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click on an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| Active | This field displays whether the IPv6 interface is activated or not. |

## 8.9.6 IPv6 Link-Local Address Setup

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10.

Use this screen to configure the interface's link-local address and default gateway. Click the link next to **IPv6 Link-Local Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 92** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup




The following table describes the labels in this screen.

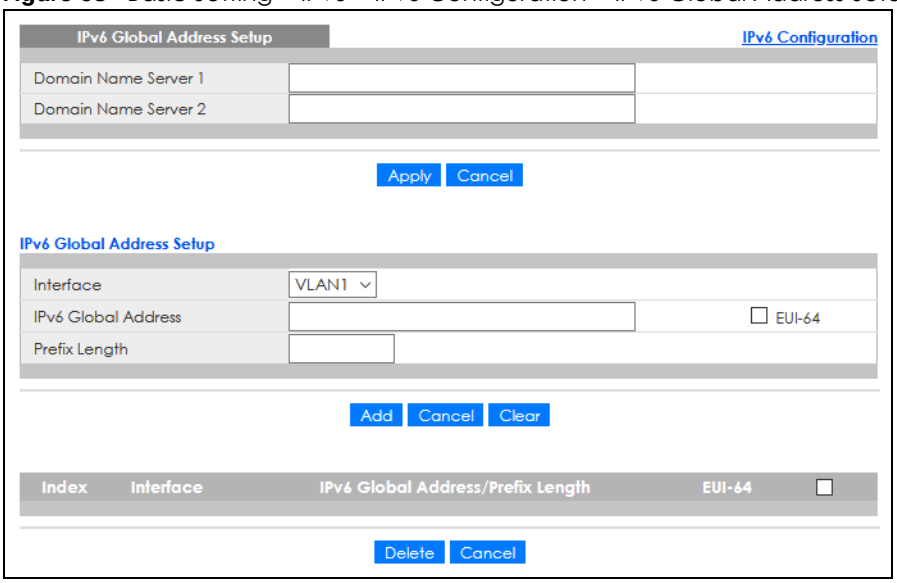
Table 41 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Link-Local Address Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| Link-Local Address | Manually configure a static IPv6 link-local address for the interface. |
| Default Gateway | Set the default gateway IPv6 address for the interface. When an interface cannot find a routing information for a frame's destination, it forwards the packet to the default gateway. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| IPv6 Link-Local Address | This is the static IPv6 link-local address for the interface. |
| IPv6 Default Gateway | This is the default gateway IPv6 address for the interface. |

## 8.9.7 IPv6 Global Address Setup

Use this screen to configure the interface's IPv6 global address. Click the link next to **IPv6 Global Address Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 93** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup




The following table describes the labels in this screen.

Table 42 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup

| LABEL | DESCRIPTION |
|---|---|
| Domain Name Server 1/2 | Enter a domain name server IPv6 address in order to be able to use a domain name instead of an IP address. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the **Domain Name Server** values in this screen to their last-saved values. |
| Interface | Select the IPv6 interface you want to configure. |
| IPv6 Global Address | Manually configure a static IPv6 global address for the interface. |
| Prefix Length | Specify an IPv6 prefix length that specifies how many most significant bits (start from the left) in the address compose the network address. |
| EUI-64 | Select this option to have the interface ID be generated automatically using the EUI-64 format. |
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| IPv6 Global Address/Prefix Length | This field displays the IPv6 global address and prefix length for the interface. |
| EUI-64 | This shows whether the interface ID of the global address is generated using the EUI-64 format. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |

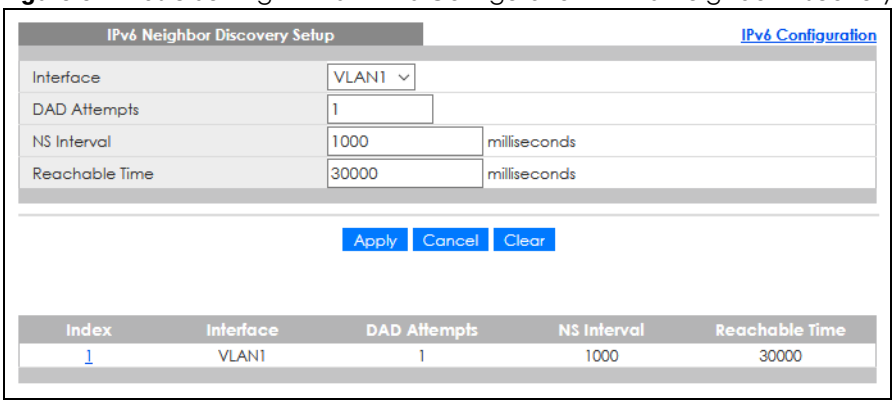
Table 42 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Global Address Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Delete | Check the entries that you want to remove and then click **Delete** to remove the selected entries from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 8.9.8 IPv6 Neighbor Discovery Setup

Use this screen to configure neighbor discovery settings for each interface. Click the link next to **IPv6 Neighbor Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 94** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup




The following table describes the labels in this screen.

Table 43 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| DAD Attempts | The Switch uses Duplicate Address Detection (DAD) with neighbor solicitation and advertisement messages to check whether an IPv6 address is already in use before assigning it to an interface.<br><br>Specify the number of consecutive neighbor solicitations (from 0 to 600) the Switch sends for this interface. Enter 0 to turn off DAD. |
| NS Interval | Specify the time interval (from 1000 to 3600000 milliseconds) at which neighbor solicitations are re-sent for this interface. |
| Reachable Time | Specify how long (from 1000 to 3600000 milliseconds) a neighbor is considered reachable for this interface. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click on an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| DAD Attempts | This field displays the number of consecutive neighbor solicitations the Switch sends for this interface. |

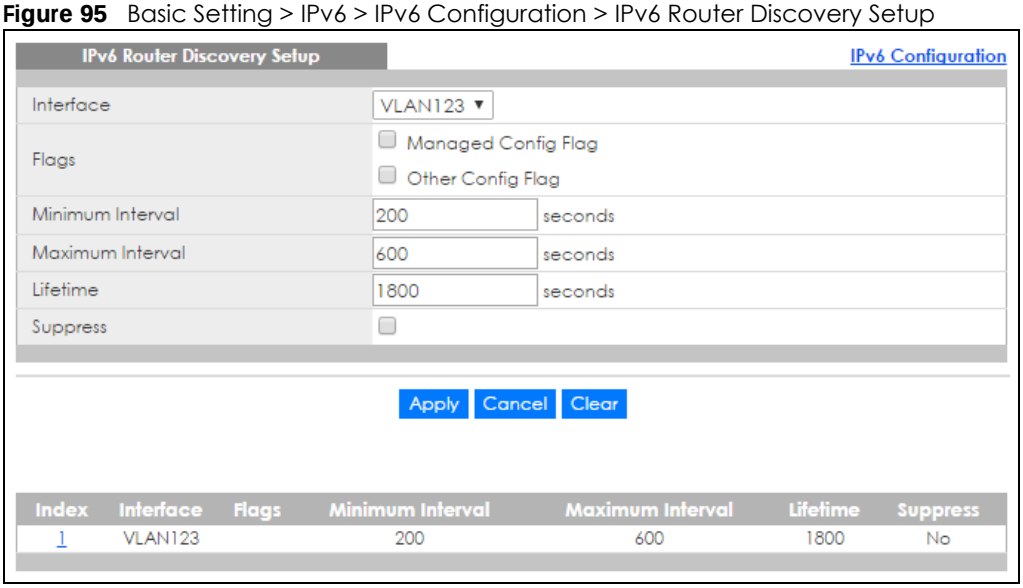
Table 43 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Discovery Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| NS Interval | This field displays the time interval (in milliseconds) at which neighbor solicitations are re-sent for this interface. |
| Reachable Time | This field displays how long (in milliseconds) a neighbor is considered reachable for this interface. |

## 8.9.9 IPv6 Router Discovery Setup

Use this screen to configure router discovery settings for each interface. Click the link next to **IPv6 Router Discovery Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 95** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup




The following table describes the labels in this screen.

Table 44 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| Flags | Select the **Managed Config Flag** option to have the Switch set the "managed address configuration" flag (the M flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses. De-select the option to set the flag to 0 and the host will not use DHCPv6 to obtain IPv6 stateful addresses.<br><br>Select the **Other Config Flag** option to have the Switch set the "Other stateful configuration" flag (the O flag) to 1 in IPv6 router advertisements, which means IPv6 hosts use DHCPv6 to obtain additional configuration settings, such as DNS information. De-select the option to set the flag to 0 and the host will not use DHCPv6 to obtain additional configuration settings. |
| Minimum Interval | Specify the minimum time interval (from 3 to 1350 seconds) at which the Switch sends router advertisements for this interface.<br><br>Note: The minimum time interval cannot be greater than three-quarters of the maximum time interval. |
| Maximum Interval | Specify the maximum time interval (from 4 to 1800 seconds) at which the Switch sends router advertisements for this interface. |

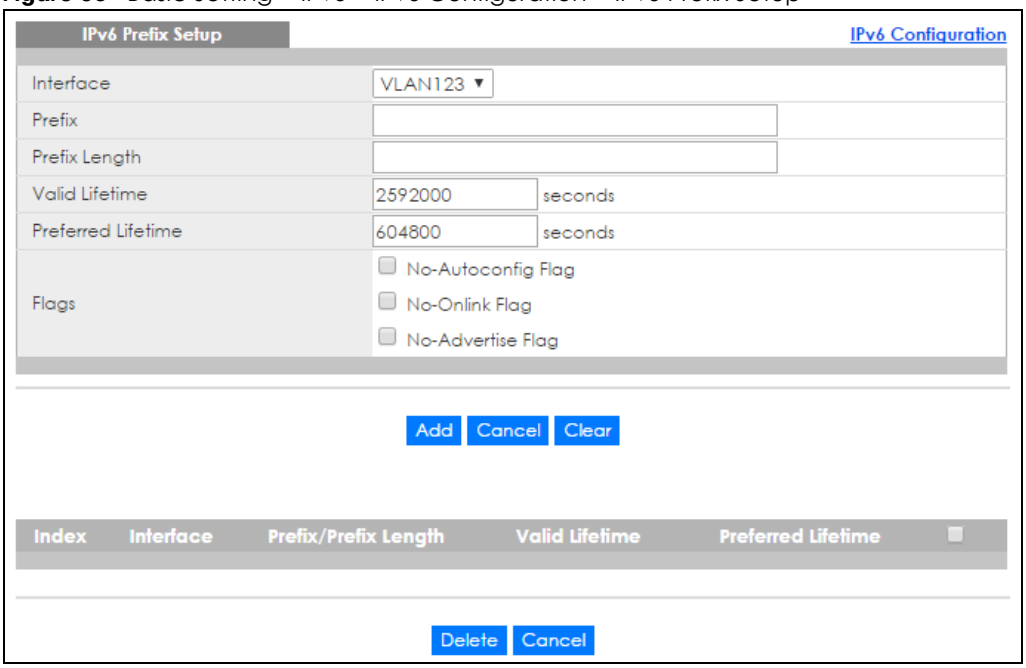
Table 44 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Router Discovery Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Lifetime | Specify how long (from 0 to 9000 seconds) the router in router advertisements can be used as a default router for this interface. |
| Suppress | Select this option to set the Switch to not send router advertisements and responses to router solicitations on this interface. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| Flags | This field displays whether IPv6 hosts use DHCPv6 to obtain IPv6 stateful addresses (**M**) and/or additional configuration settings (**O**). |
| Minimum Interval | This field displays the minimum time interval at which the Switch sends router advertisements for this interface. |
| Maximum Interval | This field displays the maximum time interval at which the Switch sends router advertisements for this interface. |
| Lifetime | This field displays how long the router in router advertisements can be used as a default router for this interface. |
| Suppress | This field displays whether the Switch sends router advertisements and responses to router solicitations on this interface (**No**) or not (**Yes**). |

## 8.9.10 IPv6 Prefix Setup

Use this screen to configure the Switch's IPv6 prefix list for each interface. Click the link next to **IPv6 Prefix Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 96** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup



The following table describes the labels in this screen.

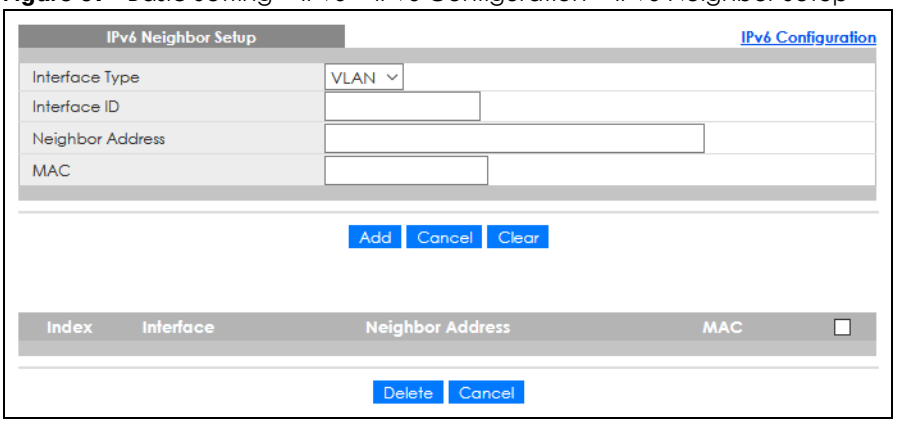
Table 45 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Prefix Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| Prefix | Set the IPv6 prefix that the Switch includes in router advertisements for this interface. |
| Prefix Length | Set the prefix length that the Switch includes in router advertisements for this interface. |
| Valid Lifetime | Specify how long (from 0 to 4294967295 seconds) the prefix is valid for on-link determination. |
| Preferred Lifetime | Specify how long (from 0 to 4294967295 seconds) that addresses generated from the prefix remain preferred.<br>The preferred lifetime cannot exceed the valid lifetime. |
| Flags | Select **No-Autoconfig Flag** to not allow IPv6 hosts to use this prefix.<br>Select **No-Onlink Flag** to not allow the specified prefix to be used for on-link determination.<br>Select **No-Advertise Flag** to set the Switch to not include the specified IPv6 prefix, prefix length in router advertisements for this interface. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| Prefix/Prefix Length | This field displays the IPv6 prefix and prefix length that the Switch includes in router advertisements for this interface. |
| Valid Lifetime | This field displays the IPv6 prefix valid lifetime. |
| Preferred Lifetime | This field displays the preferred lifetime of an IPv6 address generated from the prefix. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove in the **Delete** column and then click **Delete** to remove the selected entries from the summary table. |
| Cancel | Click **Cancel** to clear the **Delete** check boxes. |

## 8.9.11 IPv6 Neighbor Setup

Use this screen to create a static IPv6 neighbor entry in the Switch's IPv6 neighbor table to store the neighbor information permanently. Click the link next to **IPv6 Neighbor Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 97** Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup




The following table describes the labels in this screen.

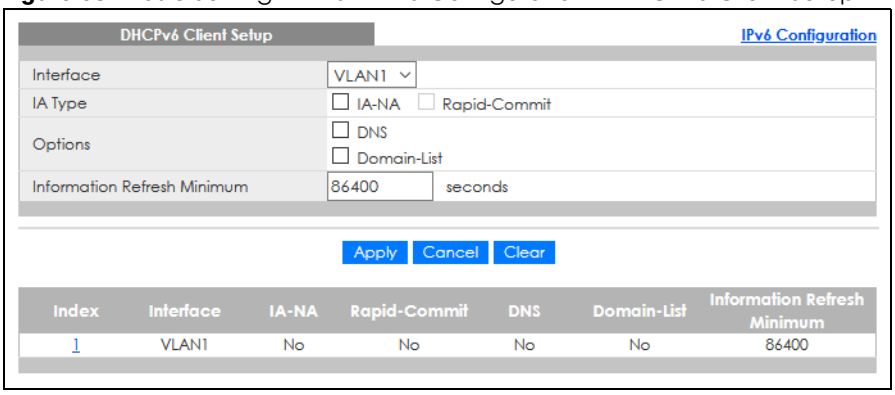
Table 46 Basic Setting > IPv6 > IPv6 Configuration > IPv6 Neighbor Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface Type | Select the type of IPv6 interface for which you want to configure. The Switch supports the VLAN interface type for IPv6 at the time of writing. |
| Interface ID | Specify a unique identification number (from 1 to 4094) for the interface.<br>A static IPv6 neighbor entry displays in the **Management** > **IPv6 Neighbor Table** screen only when the interface ID is also created in the **Basic Setup** > **Interface Setup** screen.<br>To have IPv6 function properly, you should configure a static VLAN with the same ID number in the **Advanced Application** > **VLAN** screens. |
| Neighbor Address | Specify the IPv6 address of the neighboring device which can be reached through the interface. |
| MAC | Specify the MAC address of the neighboring device which can be reached through the interface. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| Neighbor Address | This field displays the IPv6 address of the neighboring device which can be reached through the interface. |
| MAC | This field displays the MAC address of the neighboring device which can be reached through the interface. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove and then click **Delete** to remove the selected entries from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 8.9.12 DHCPv6 Client Setup

Use this screen to configure the Switch's DHCP settings when it is acting as a DHCPv6 client. Click the link next to **DHCPv6 Client Setup** in the **IPv6 Configuration** screen to display the screen as shown next.

**Figure 98** Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup




The following table describes the labels in this screen.

Table 47 Basic Setting > IPv6 > IPv6 Configuration > DHCPv6 Client Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the IPv6 interface you want to configure. |
| IA Type | Select **IA-NA** to set the Switch to get a non-temporary IP address from the DHCPv6 server for this interface.<br><br>Optionally, you can also select **Rapid-Commit** to have the Switch send its DHCPv6 Solicit message with a Rapid Commit option to obtain information from the DHCPv6 server by a rapid two-message exchange. The Switch discards any Reply messages that do not include a Rapid Commit option. The DHCPv6 server should also support the Rapid Commit option to have it work well. |
| Options | Select **DNS** to have the Switch obtain DNS server IPv6 addresses and/or select **Domain-List** to have the Switch obtain a list of domain names from the DHCP server. |
| Information Refresh Minimum | Specify the time interval (from 600 to 4294967295 seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the interface index number. Click an index number to change the settings. |
| Interface | This is the name of the IPv6 interface you created. |
| IA-NA | This field displays whether the Switch obtains a non-temporary IP address from the DHCPv6 server. |
| Rapid-Commit | This field displays whether the Switch obtains information from the DHCPv6 server by a rapid two-message exchange. |
| DNS | This field displays whether the Switch obtains DNS server IPv6 addresses from the DHCPv6 server. |
| Domain-List | This field displays whether the Switch obtains a list of domain names from the DHCP server. |
| Information Refresh Minimum | This field displays the time interval (in seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again. |

# 8.10 Loopback Interface

The loopback interface is a virtual interface which can be assigned an IP address and used by routing protocols. The loopback interface does not need to be connected to any devices and will always be available if the Switch is functioning normally and connected to a network. You can enable multiple loopback interfaces on the Switch, and each loopback interface must be uniquely identified.

The Switch can use a loopback interface address as the source address of all packets that originate from the Switch. Filters can then be applied to the loopback address to protect the system.

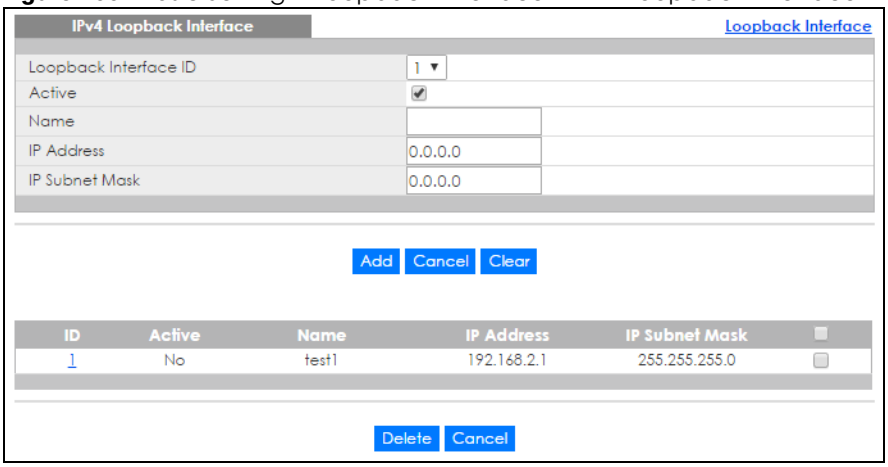
Click the link next to **IPv4 Loopback Interface** in the **Basic Setting** > **Loopback Interface** screen. The following screen opens.

**Figure 99** Basic Setting > Loopback Interface

## 8.10.1 IPv4 Loopback Interface

Use this screen to configure IPv4 loopback interfaces on the Switch.

**Figure 100** Basic Setting > Loopback Interface > IPv4 Loopback Interface




The following table describes the labels in this screen.

Table 48 Basic Setting > Loopback Interface > IPv4 Loopback Interface

| LABEL | DESCRIPTION |
|---|---|
| Loopback Interface ID | Select the ID of loopback interface you want to configure. |
| Active | Select this option to enable the interface. |
| Name | Enter a descriptive name for the IPv4 loopback interface for identification purposes. This name consists of up to 64 printable characters; spaces are allowed. |
| IP Address | Enter the IP address of your Switch in dotted decimal notation, for example, 192.168.1.1. This is the IP address of the Switch in an IP routing domain. |
| IP Subnet Mask | Enter the IP subnet mask of an IP routing domain in dotted decimal notation, for example, 255.255.255.0. |

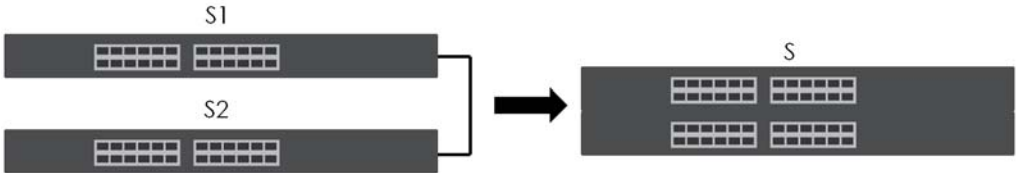
Table 48 Basic Setting > Loopback Interface > IPv4 Loopback Interface (continued)

| LABEL | DESCRIPTION |
|---|---|
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to the factory defaults. |
| Clear | Click **Clear** to begin configuring this screen afresh. |
| ID | This field displays the identification number of the interface. |
| Active | This field displays whether the IPv4 loopback interface is activated or not. |
| Name | This field displays the descriptive name for this IPv4 loopback interface. |
| IP Address | This field displays the IP address of the Switch in the IP domain. |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 8.11 Stacking

Stacking is directly connecting Switches to form a larger system that behaves as a single Switch or a virtual chassis with increased port density.

**Figure 101** Switch Stacking Concept




The last four combo ports of your Switch are dedicated for Switch stacking. At the time of writing, the Switch can only connect to another Switch of the same model and firmware version.

Note: Up to four Switches per stack are allowed.

Note: See Table 1 on page 29 for the services not supported in stacking mode.

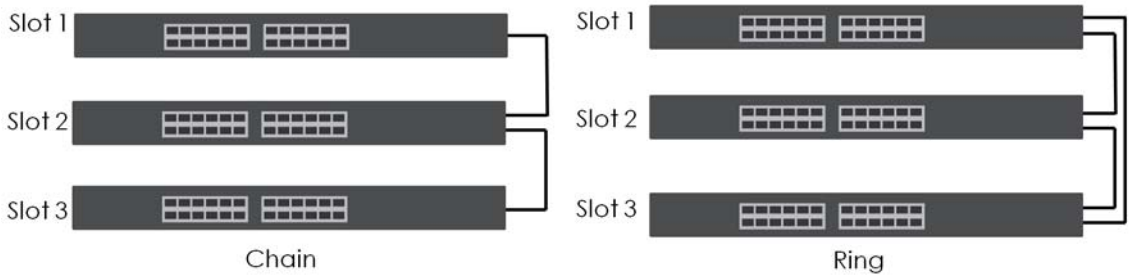
You can manage each Switch in the stack from a master Switch using its Web Configurator or console. Each Switch supports up to two stacking channels. The stacking ports used to form the same stacking channel must be connected to the ports of the same channel on a neighboring Switch. For example, ports 25 and 26 (channel 1) on Switch A can connect to ports 25 and 26 (channel 1) or ports 27 and 28 (channel 2) on Switch B.

Table 49 Stacking Channels and Ports

| STACKING CHANNEL | STACKING PORTS |
|---|---|
| 1 | 25, 26 |
| 2 | 27, 28 |

You can build a Switch stack using a ring or chain topology. In a ring topology, the last Switch is connected to the first.

**Figure 102** Stacking Topology




Use the master Switch to assign a 'slot ID' for each 'linecard' non-master Switch. 'Slot' refers to a Switch in the 'virtual chassis' stack.

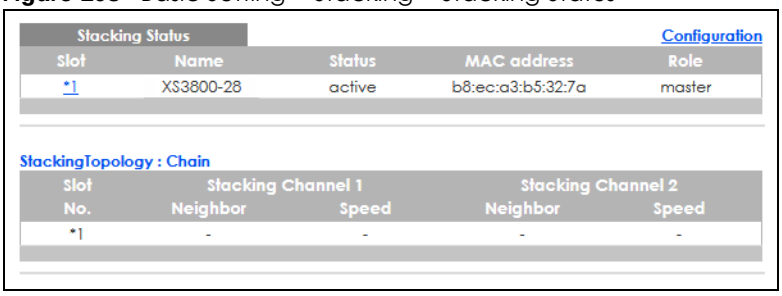
The advantages of stacking are:

- High port density – for example, two 24-port Switches can become one 48-port logical Switch
- Centralized management – log into a single IP address of the master switch to control all Switches in the stacking system using the web configurator, CLI, SNMP or FTP
- Redundancy – Data redundancy allows traffic to be forwarded even if one Switch in the stack fails. Management redundancy lets you still manage the stack even if one Switch in the stack fails
- Modularity and hot-swappable – you can add, remove, or replace Switches to increase or decrease the stack with minimum disruption to ongoing network traffic

## 8.11.1 Stacking Status

Click **Basic Setting** > **Stacking** in the navigation panel to display the **Stacking Status** screen as shown next.

**Figure 103** Basic Setting > Stacking > Stacking Status




The following table describes the labels in this screen.

Table 50 Basic Setting > Stacking > Stacking Status

| LABEL | DESCRIPTION |
|---|---|
| Slot | 'Slot' refers to a Switch in the 'virtual chassis' stack. This field displays the slot ID of the stacked Switch. You can click the ID number to go to the **Stacking Slot Status** screen. |
| Name | This field displays the model name of the stacked Switch. |

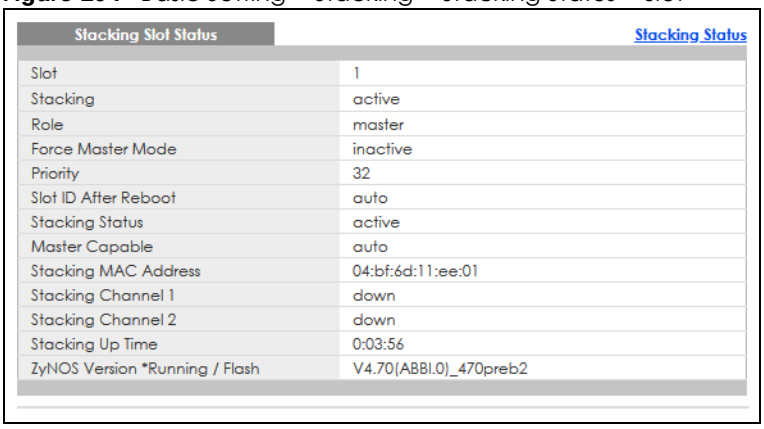
Table 50 Basic Setting > Stacking > Stacking Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Status | This field displays whether the stacked Switch is **active** or **inactive** in a stack system.<br>**Init** means the slot ID is being initialized by the master Switch.<br>**active*** means the Switch is in the stack, but some items failed to initiate. See the system logs for details. If the Switch is not a master, disconnect and reconnect the stacking port and wait. Restart the Switch if it still displays **active***. If the Switch is a master, restart it or choose another master. |
| MAC address | This field displays the MAC address of the stacked Switch. |
| Role | This field displays whether the Switch is a master, backup or linecard. There's only one master and one backup Switch in the stacking mode; all others are linecard Switches. |
| Stacking Topology: Ring/Chain | |
| Slot No. | This field displays the slot ID number of the stacked Switch. |
| Stacking Channel1 | |
| Neighbor | This field displays the neighbor Switch that is connected using slot channel 1 of the Switch. |
| Speed | This field displays the Ethernet speed of stacking channel 1 of the Switch. |
| Stacking Channel2 | |
| Neighbor | This field displays the neighbor Switch that is connected to slot channel 2 of the Switch. |
| Speed | This field displays the Ethernet speed of stacking channel 2 of the Switch. |

## 8.11.2 Stacking Slot

Click a stack number in **Basic Setting** > **Stacking** > **Stacking Status** to display the **Stacking Slot Status** screen as shown next.

**Figure 104** Basic Setting > Stacking > Stacking Status > Slot




The following table describes the labels in this screen.

Table 51 Basic Setting > Stacking > Stacking Status > Slot

| LABEL | DESCRIPTION |
|---|---|
| Slot | This field displays the slot ID of the Switch. |
| Stacking | This field displays whether the Switch is active in the stacking system. |
| Role | This field displays whether the stacked Switch is a master, backup or linecard Switch. |

Table 51 Basic Setting > Stacking > Stacking Status > Slot (continued)

| LABEL | DESCRIPTION |
|---|---|
| Force Master Mode | This field displays whether the Force Master Mode is enabled or disabled on this Switch. The **Active Force Master Mode** forces this Switch to become a master Switch. This Switch will have the highest priority over all other Switch in the stack. If two Switches are set as masters, they will have the same priority level, but the Switch that has the longest active run-time will be selected as the master Switch automatically. |
| Priority | This field displays the priority level of the Switch. A higher number represents higher priority. |
| Slot ID After Reboot | This field displays the slot ID of the Switch after a reboot. You can save the slot ID of the Switch after a reboot by clicking **Freeze** in the **Stacking Configuration** screen. |
| Stacking Status | This field displays whether the stacked Switch is **active** or **inactive** in a stack system.<br>**Init** means the slot ID is being initialized by the master Switch.<br>**active*** means the Switch is in the stack, but some items failed to initiate. See the system logs for details. If the Switch is not a master, disconnect and reconnect the stacking port and wait. Restart the Switch if it still displays **active***. If the Switch is a master, restart it or choose another master. |
| Master Capable | This field displays whether the Switch has capacity to become a master Switch. **Auto** means the stack system master election process will determine if the Switch can be assigned as a master Switch. |
| Stacking MAC Address | This field displays the stacking Switch MAC address. |
| Stacking Channel 1 | This field displays the status of the port stacking channel 1 of the Switch. It will display up for active or down for inactive. |
| Stacking Channel 2 | This field displays the status of the port stacking channel 2 of the Switch. It will display up for active or down for inactive. |
| Stacking Up Time | This field displays the time that the active Switch in a stack has been running. |
| ZyNOS version *Running/Flash | This field displays the ZyNOS firmware that is currently running on the Switch. |

## 8.11.3 Stacking Configuration

A supported Switch can change between stacking and standalone mode by selecting the **Active** check box in the **Basic Setting** > **Stacking** > **Configuration** screen.

Note: When you change modes, all configurations except user accounts, but including running configuration, config01, config02 and custom default configuration will be erased and the Switch will reboot with a new config01. Therefore, you should back up previous configurations if you want to reload them later.

Note: When the Switch is in stacking mode, it uses the default static IP address 192.168.1.1.

Stacking will automatically choose a master Switch in a stack but you can overwrite that by actively forcing a Switch to become a master Switch. In the **Stacking Configuration** screen, click **Force Master Mode** to choose the master Switch. This master Switch will have the highest priority over all other stacked Switches even when they have same priority value.

If two or more Switches have **Force Master Mode** enabled, they have the same **System Priority**. Then the Switch with the longest up-time is selected. Uptime is measured in increments of 10 minutes. The Switch with the higher number of increments is selected. If they have the same uptime, then the Switch with the lowest MAC address will be the master.

This is the master election priority in a stack system:

1 Active **Force Master Mode**

2 Highest **Stacking Priority**

3 Longest **System Up Time**

4 Lowest MAC Address

Note: Master election occurs when a stacking port link status changes (up or down). The link status changes when (for example):

– a stacking port cable is disconnected

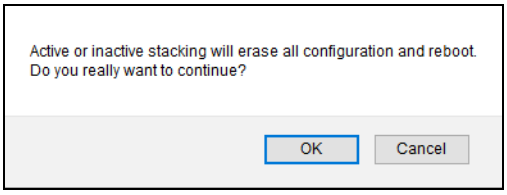
– a Switch in the stack reboots (as happens after you change stacking mode to standalone)

– you add a Switch to the stack or

– a Switch in the stack shuts down.

Use the following procedure to create a stack:

1 Select a Switch to be the master. Change its mode to stacking mode. You will see a message asking you to confirm the change. Click **OK** to confirm and the Switch will reboot automatically using a new config01 and the default static IP address 192.168.1.1.




2 After reboot completes, the master LED will turn on.

3 Configure the Switch stacking priority to a high value, such as 63.

4 Change a second Switch to stacking mode and wait for it to finish rebooting automatically. This master LED will also turn on.

5 Connect the two Switches using the stacking ports for the Switch defined.

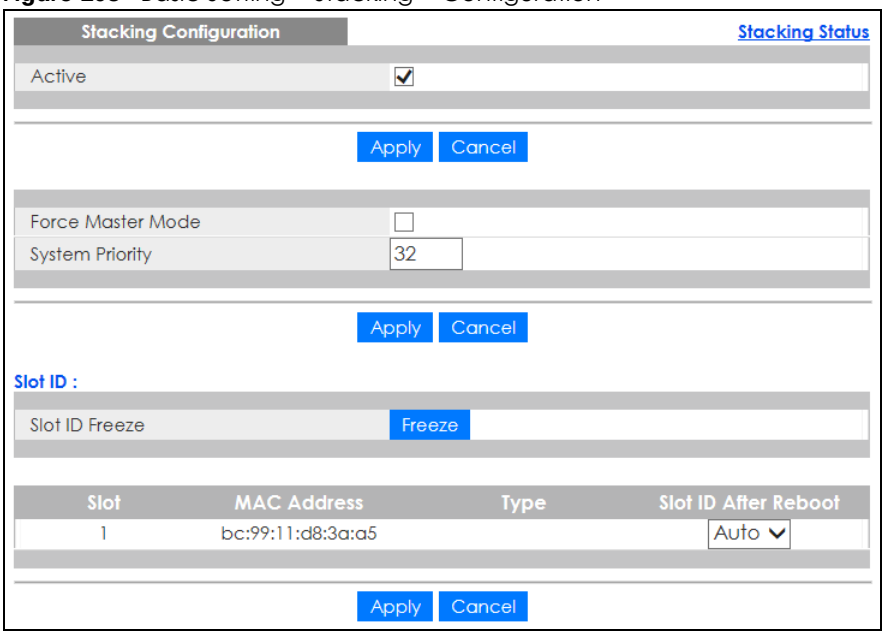
6 The second Switch master LED will then turn off, and its **Sys** LED will blink while it is initializing. Please wait until it stops blinking, indicating that it has joined the stack.

7 Repeat steps 4 to 6 to connect other Switches to the stack.

When the Switch is in Stacking mode, the Web Configurator will change port and VLAN port settings to support the stacking mode.

Click **Basic Setting** > **Stacking** > **Configuration** to see the following screen.

**Figure 105** Basic Setting > Stacking > Configuration




The following table describes the labels in this screen.

Table 52 Basic Setting > Stacking > Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select the **Active** check box to put the Switch in stacking mode. This will erase the running configuration, config01 and config02. The master Switch's login will remain unchanged. If you want to reload a previous configuration, please back one up first. |
| Apply | Click **Apply** to activate the stacking mode. |
| Cancel | Click **Cancel** to clear the Active check box. |
| Force Master Mode | Select the **Force Master Mode** check box to force this Switch to become a master Switch. |
| System Priority | Enter a number (from1 to 63) to assign a priority for the stacking Switch. The higher the number, the higher the priority. |
| Apply | Click **Apply** to save the **Active Force Master Mode** and **System Priority** fields. |
| Cancel | Click **Cancel** to clear the **Active Force Master Mode** and **System Priority** fields. |
| Slot ID Freeze | Click the **Freeze** button to have the Switch retain its slot ID after reboot. |
| Slot | This field displays the slot or port channel of the stacked Switch. |
| MAC Address | This field displays the MAC address of the stacked Switch. |
| Type | This field displays the model name of the Switch. |
| Slot ID After Reboot | Choose **Auto** to have a new slot ID assigned after reboot. If you want to keep the original slot ID after reboot, you can click **Freeze** or select an ID in the **Slot ID After Reboot** list box. |
| Apply | Click **Apply** to save the **Slot ID After Reboot** field. |
| Cancel | Click **Cancel** to clear the **Slot ID After Reboot** field. |

# 8.12 Cloud Management

The Zyxel Nebula Control Center (NCC) is a cloud-based network management system that allows you

to remotely manage and monitor Zyxel Nebula APs, Ethernet switches and security gateways.

The Switch is managed and provisioned automatically by the NCC (Nebula Control Center) when:

- It is connected to the Internet.
- The **Nebula Control Center Discovery** feature is enabled.
- It has been registered in the NCC.

This screen displays links to **Nebula Control Center Discovery** where you can have the Switch search for the NCC (Nebula Control Center) and to **Nebula Switch Registration** which has a QR code containing the Switch's serial number and MAC address for handy registration of the Switch at NCC.

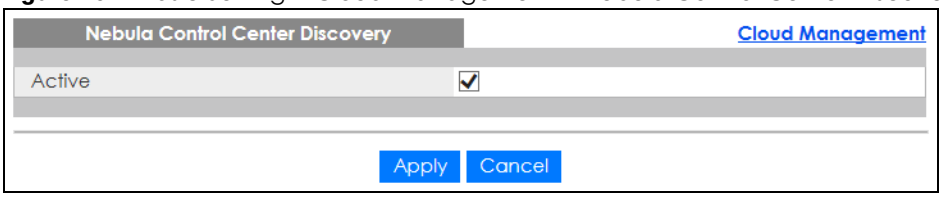
Click **Basic Setting** > **Cloud Management** in the navigation panel to display this screen.

**Figure 106** Basic Setting > Cloud Management

## 8.12.1 Nebula Center Control Discovery

Click **Basic Setting** > **Cloud Management** > **Nebula Control Center Discovery** to display this screen.

**Figure 107** Basic Setting > Cloud Management > Nebula Control Center Discovery




Select **Active** to turn on NCC discovery on the Switch. If the Switch has Internet access and has been registered in the NCC, it will go into cloud management mode.

In cloud management mode, NCC will first check if the firmware on the Switch needs to be upgraded. If it does, the Switch will upgrade the firmware immediately. If the firmware does not need to be upgraded, but there is newer firmware available for the Switch, then it will be upgraded according to the firmware upgrade schedule for the Switch on the NCC. Below is the process for upgrading firmware:

1 Download firmware through the NCC.

2 Upgrade the firmware and reboot.

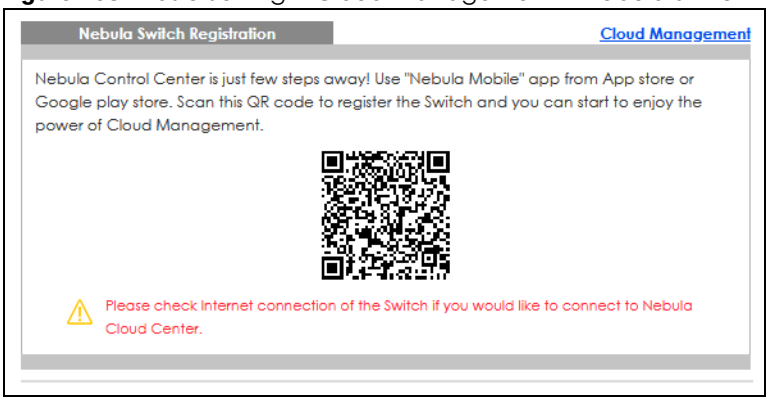
Note: While the Switch is rebooting, do NOT turn off the power.

Clear **Active** to turn off NCC discovery on the Switch. The Switch will NOT discover the NCC and remain in standalone mode.

## 8.12.2 Nebula Switch Registration

Click **Basic Setting** > **Cloud Management** > **Nebula Switch Registration** to display this screen.

**Figure 108** Basic Setting > Cloud Management > Nebula Switch Registration




This screen has a QR code containing the Switch's serial number and MAC address for handy NCC registration of the Switch using the Nebula Mobile app. First, download the app from the Google Play store for Android devices or the App Store for iOS devices and create an organization and site.

# CHAPTER 9
# VLAN

## 9.1 Overview

This chapter shows you how to configure 802.1Q tagged and port-based VLANs.

The type of screen you see here depends on the **VLAN Type** you selected in the **Switch Setup** screen which is only available in standalone mode. The Switch does not support port-based VLANs in stacking mode.

### 9.1.1 What You Can Do

- Use the **VLAN** screen (Section 9.3 on page 148) to view and search all static VLAN groups.
- Use the **VLAN Detail** screen (Section 9.3.1 on page 149) to view detailed port settings and status of the static VLAN group.
- Use the **Private VLAN Status** screen (Section 9.4 on page 151) to view all private VLANs created on the Switch.
- Use the **Static VLAN Setup** screen (Section 9.6 on page 152) to configure a static VLAN for the Switch.
- Use the **VLAN Port Setup** screen (Section 9.7 on page 155) to configure the static VLAN (IEEE 802.1Q) settings on a port.
- Use the **Subnet Based VLAN Setup** screen (Section 9.8 on page 157) to set up VLANs that allow you to group traffic into logical VLANs based on the source IP subnet you specify.
- Use the **Protocol Based VLAN Setup** screen (Section 9.9 on page 160) to set up VLANs that allow you to group traffic into logical VLANs based on the protocol you specify.
- Use the **Voice VLAN Setup** screen (Section 9.10 on page 163) to set up VLANs that allow you to group voice traffic with defined priority and enable the Switch port to carry the voice traffic separately from data traffic to ensure the sound quality does NOT deteriorate.
- Use the **MAC Based VLAN Setup** screen (Section 9.11 on page 165) to set up VLANs that allow you to group untagged packets into logical VLANs based on the source MAC address of the packet. This eliminates the need to reconfigure the Switch when you change ports. The Switch will forward the packets based on the source MAC address you set up previously.
- Use the **Vendor ID Based VLAN Setup** screen (Section 9.12 on page 166) to set up VLANs that allow you to group untagged packets into logical VLANs based on the source MAC address of the packet. You can specify a mask for the MAC address to create a MAC address filter and enter a weight to set the VLAN rule's priority.

### 9.1.2 What You Need to Know

Read this section to know more about VLAN and how to configure the screens.

# 9.2 Introduction to IEEE 802.1Q Tagged VLANs

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges – they are not confined to the switch on which they were created. The VLANs can be created statically by hand or dynamically through GVRP. The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is 4 bytes longer than an untagged frame and contains 2 bytes of TPID (Tag Protocol Identifier, residing within the type or length field of the Ethernet frame) and 2 bytes of TCI (Tag Control Information, starts after the source address field of the Ethernet frame).

The CFI (Canonical Format Indicator) is a single-bit flag, always set to zero for Ethernet switches. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port. The remaining twelve bits define the VLAN ID, giving a possible maximum number of 4096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a priority frame, meaning that only the priority level is significant and the default VID of the ingress port is given as the VID of the frame. Of the 4096 possible VIDs, a VID of 0 is used to identify priority frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4094.

| TPID | User Priority | CFI | VLAN ID |
|---|---|---|---|
| 2 Bytes | 3 Bits | 1 Bit | 12 bits |

### Forwarding Tagged and Untagged Frames

Each port on the Switch is capable of passing tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the Switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the Switch first decides where to forward the frame, and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are members of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

#### 9.2.0.1 Automatic VLAN Registration

GARP and GVRP are the protocols used to automatically register VLAN membership across switches.

### GARP

GARP (Generic Attribute Registration Protocol) allows network switches to register and de-register attribute values with other GARP participants within a bridged LAN. GARP is a protocol that provides a generic mechanism for protocols that serve a more specific application, for example, GVRP.

### GARP Timers

Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values.

### GVRP

GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network. Enable this function to permit VLAN groups beyond the local Switch.

Please refer to the following table for common IEEE 802.1Q VLAN terminology.

Table 53 IEEE 802.1Q VLAN Terminology

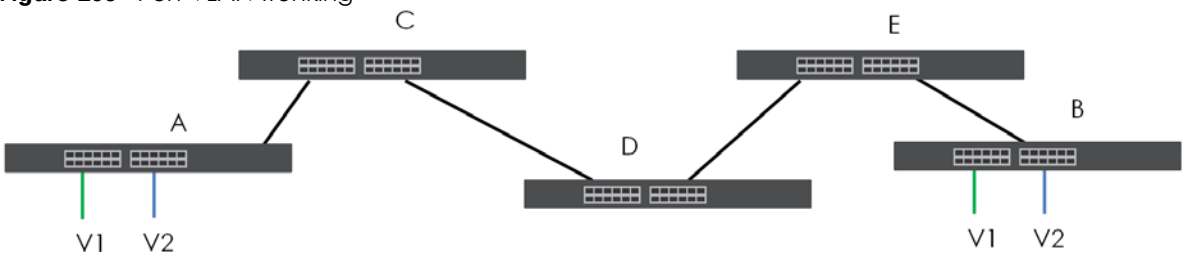
| VLAN PARAMETER | TERM | DESCRIPTION |
|---|---|---|
| VLAN Type | Permanent VLAN | This is a static VLAN created manually. |
| | Dynamic VLAN | This is a VLAN configured by a GVRP registration or de-registration process. |
| VLAN Administrative Control | Registration Fixed | Fixed registration ports are permanent VLAN members. |
| | Registration Forbidden | Ports with registration forbidden are forbidden to join the specified VLAN. |
| | Normal Registration | Ports dynamically join a VLAN using GVRP. |
| VLAN Tag Control | Tagged | Ports belonging to the specified VLAN tag all outgoing frames transmitted. |
| | Untagged | Ports belonging to the specified VLAN do not tag all outgoing frames transmitted. |
| VLAN Port | Port VID | This is the VLAN ID assigned to untagged frames that this port received. |
| | Acceptable Frame Type | You may choose to accept both tagged and untagged incoming frames, just tagged incoming frames or just untagged incoming frames on a port. |
| | Ingress filtering | If set, the Switch discards incoming frames for VLANs that do not have this port as a member. |

## 9.2.0.2 Port VLAN Trunking

Enable **VLAN Trunking** on a port to allow frames belonging to unknown VLAN groups to pass through that port. This is useful if you want to set up VLAN groups on end devices without having to configure the same VLAN groups on intermediary devices.

Refer to the following figure. Suppose you want to create VLAN groups 1 and 2 (V1 and V2) on devices A and B. Without **VLAN Trunking**, you must configure VLAN groups 1 and 2 on all intermediary switches C, D and E; otherwise they will drop frames with unknown VLAN group tags. However, with **VLAN Trunking** enabled on ports in each intermediary switch you only need to create VLAN groups in the end devices (A and B). C, D and E automatically allow frames with VLAN group tags 1 and 2 (VLAN groups that are unknown to those switches) to pass through their VLAN trunking ports.

**Figure 109** Port VLAN Trunking

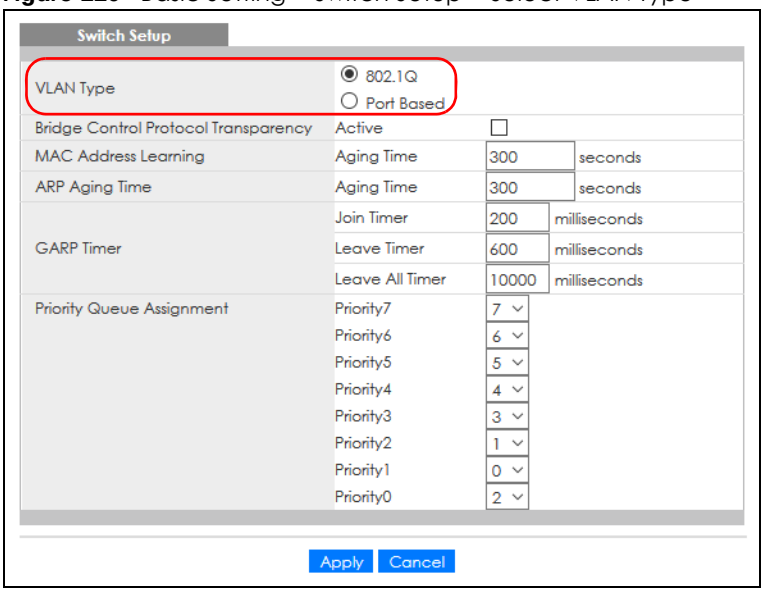


### 9.2.0.3 Select the VLAN Type

Select a VLAN type in the **Basic Setting** > **Switch Setup** screen.

**VLAN Type** is not applicable in stacking mode.

**Figure 110** Basic Setting > Switch Setup > Select VLAN Type




### 802.1Q Static VLAN

Make sure **802.1Q** is selected in the **Basic Setting** > **Switch Setup** screen.

Use a static VLAN to decide whether an incoming frame on a port should be

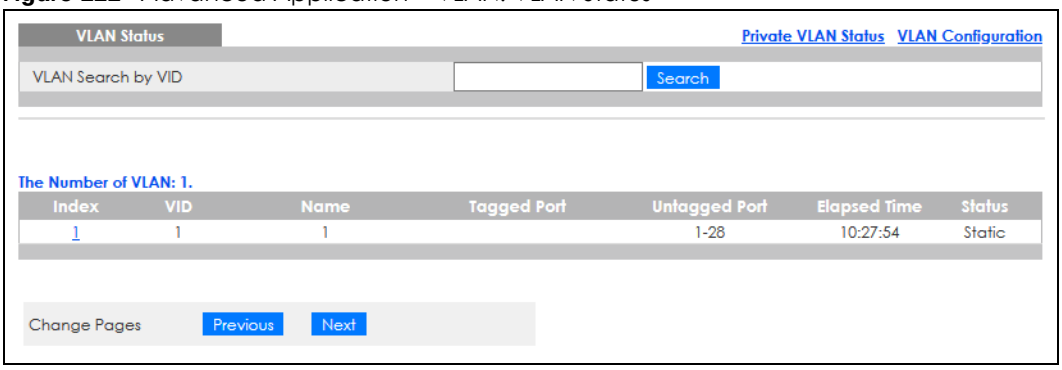
- sent to a VLAN group as normal depending on its VLAN tag.
- sent to a group whether it has a VLAN tag or not.
- blocked from a VLAN group regardless of its VLAN tag.

You can also tag all outgoing frames (that were previously untagged) from a port with the specified VID.

## 9.3 VLAN Status

Use this screen to view and search all static VLAN groups. Click **Advanced Application** > **VLAN** from the navigation panel to display the **VLAN Status** screen as shown next.

**Figure 111** Advanced Application > VLAN: VLAN Status




The following table describes the labels in this screen.

Table 54 Advanced Application > VLAN: VLAN Status

| LABEL | DESCRIPTION |
|---|---|
| VLAN Search by VID | Enter (an) existing VLAN ID numbers (use a comma (,) to separate individual VLANs or a dash (–) to indicate a range of VLANs. For example, "3,4" or "3–9") and click **Search** to display only the specified VLANs in the list below.<br>Leave this field blank and click **Search** to display all VLANs configured on the Switch. |
| The Number of VLAN | This is the number of VLANs configured on the Switch. |
| The Number of Search Results | This is the number of VLANs that match the searching criteria and display in the list below.<br>This field displays only when you use the **Search** button to look for certain VLANs. |
| Index | This is the VLAN index number. Click an index number to view more VLAN details. |
| VID | This is the VLAN identification number that was configured in the corresponding VLAN configuration screen. |
| Name | This fields shows the descriptive name of the VLAN. |
| Tagged Port | This field shows the tagged ports that are participating in the VLAN. |
| Untagged Port | This field shows the untagged ports that are participating in the VLAN. |
| Elapsed Time | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up. |
| Status | This field shows how this VLAN was added to the Switch.<br>• **Dynamic** – using GVRP<br>• **Static** – manually added as a normal VLAN<br>• **Private** – manually added as a private VLAN (primary, isolated or community)<br>• **RMirror** – manually added as a remote port mirroring VLAN<br>• **MVR** – added through Multicast VLAN Registration (MVR) |
| Change Pages | Click **Previous** or **Next** to show the previous or next screen if all status information cannot be seen in one screen. |

## 9.3.1 VLAN Details

Use this screen to view detailed port settings and status of the static VLAN group. Click an index number in the **VLAN Status** screen to display VLAN details.

**Figure 112** Advanced Application > VLAN > VLAN Detail (Standalone Mode)

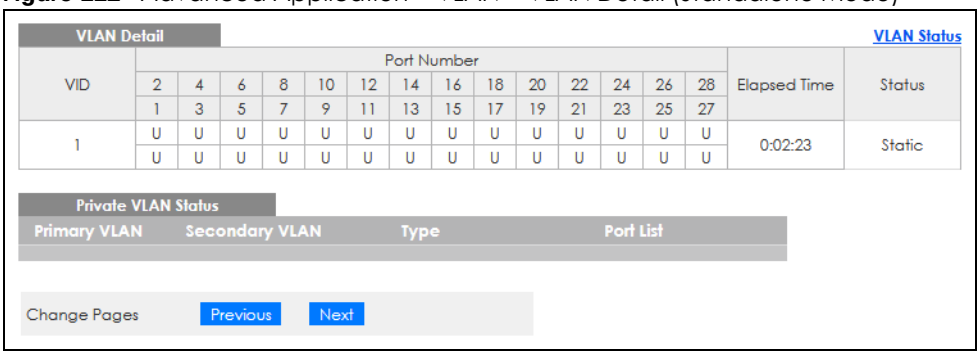
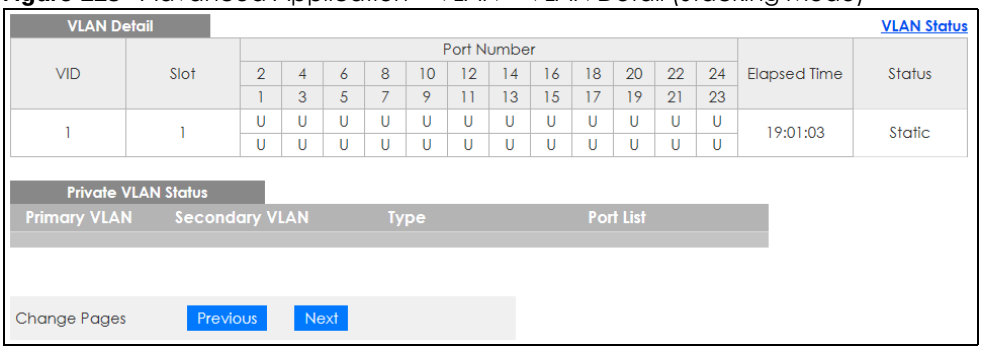



**Figure 113** Advanced Application > VLAN > VLAN Detail (Stacking Mode)




The following table describes the labels in this screen.

Table 55 Advanced Application > VLAN > VLAN Detail

| LABEL | DESCRIPTION |
|---|---|
| VLAN Status | Click this to go to the **VLAN Status** screen. |
| VID | This is the VLAN identification number that was configured in the corresponding VLAN configuration screen. |
| Slot | 'Slot' refers to a Switch in the 'virtual chassis' stack. This field displays the slot ID of the stacked Switch. |
| Port Number | This column displays the ports that are participating in a VLAN. A tagged port is marked as **T**, an untagged port is marked as **U** and ports not participating in a VLAN are marked as "**–**". |
| Elapsed Time | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up. |
| Status | This field shows how this VLAN was added to the Switch.<br>• **Dynamic** – using GVRP<br>• **Static** – manually added as a normal VLAN<br>• **Private** – manually added as a private VLAN (primary, isolated or community)<br>• **RMirror** – manually added as a remote port mirroring VLAN<br>• **MVR** – added through Multicast VLAN Registration (MVR) |
| Private VLAN Status | These fields show private VLAN information for the selected VLAN. |
| Primary VLAN | This field shows the primary VLAN ID in the selected VLAN. |
| Secondary VLAN | This field shows the secondary VLAN ID in the selected VLAN. |
| Type | This field shows the type of private VLAN: **Primary**, **Community** or **Isolated**. |

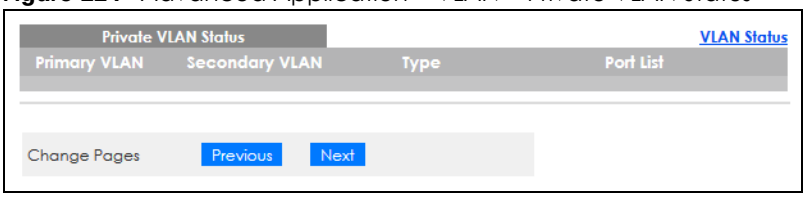
Table 55 Advanced Application > VLAN > VLAN Detail (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port List | This shows the ports mapped to the private VLAN using the **Advanced Application** > **Private VLAN** or **Advanced Application** > **VLAN** > **Static VLAN** screen. |
| Change Pages | Click **Previous** or **Next** to show the previous or next screen if all status information cannot be seen in one screen. |

# 9.4 Private VLAN Status

Use this screen to view all private VLANs created on the Switch. Click **Advanced Application** > **VLAN** > **Private VLAN Status** to see the following screen.

**Figure 114** Advanced Application > VLAN > Private VLAN Status




The following table describes the labels in this screen.

Table 56 Advanced Application > VLAN > Private VLAN Status

| LABEL | DESCRIPTION |
|---|---|
| Private VLAN Status | These fields show information for the all private VLANs. See also **Advanced Application** > **Private VLAN**. |
| Primary VLAN | This field shows the primary VLAN ID in a private VLAN. |
| Secondary VLAN | This field shows the secondary VLAN ID in a private VLAN. |
| Type | This field shows the type of private VLAN: **Primary**, **Community** or **Isolated**. |
| Port List | This shows the ports mapped to the private VLAN using the **Advanced Application** > **Private VLAN** or **Advanced Application** > **VLAN** > **Static VLAN** screen. |
| Change Pages | Use the **Previous** and **Next** buttons to display different pages. |

# 9.5 VLAN Configuration

Use this screen to view IEEE 802.1Q VLAN parameters for the Switch. Click **Advanced Application** > **VLAN** > **VLAN Configuration** to see the following screen.

**Figure 115** Advanced Application > VLAN > VLAN Configuration

The following table describes the labels in the above screen.

Table 57 Advanced Application > VLAN > VLAN Configuration

| LABEL | DESCRIPTION |
|---|---|
| Static VLAN Setup | Click **Click Here** to configure the Static VLAN for the Switch. |
| VLAN Port Setup | Click **Click Here** to configure the VLAN Port for the Switch. |
| Subnet Based VLAN Setup | Click **Click Here** to configure the Subnet Based VLAN for the Switch. |
| Protocol Based VLAN Setup | Click **Click Here** to configure the Protocol Based VLAN for the Switch. |
| Voice VLAN Setup | Click **Click Here** to configure the Voice VLAN for the Switch. |
| MAC Based VLAN Setup | Click **Click Here** to configure the MAC Based VLAN for the Switch. |
| Vendor ID Based VLAN Setup | Click **Click Here** to configure the Vendor ID Based VLAN for the Switch. |

# 9.6 Configure a Static VLAN

Use this screen to configure a static VLAN for the Switch. Click the **Static VLAN Setup** link in the **VLAN Configuration** screen to display the screen as shown next.

**Figure 116** Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (Standalone Mode)

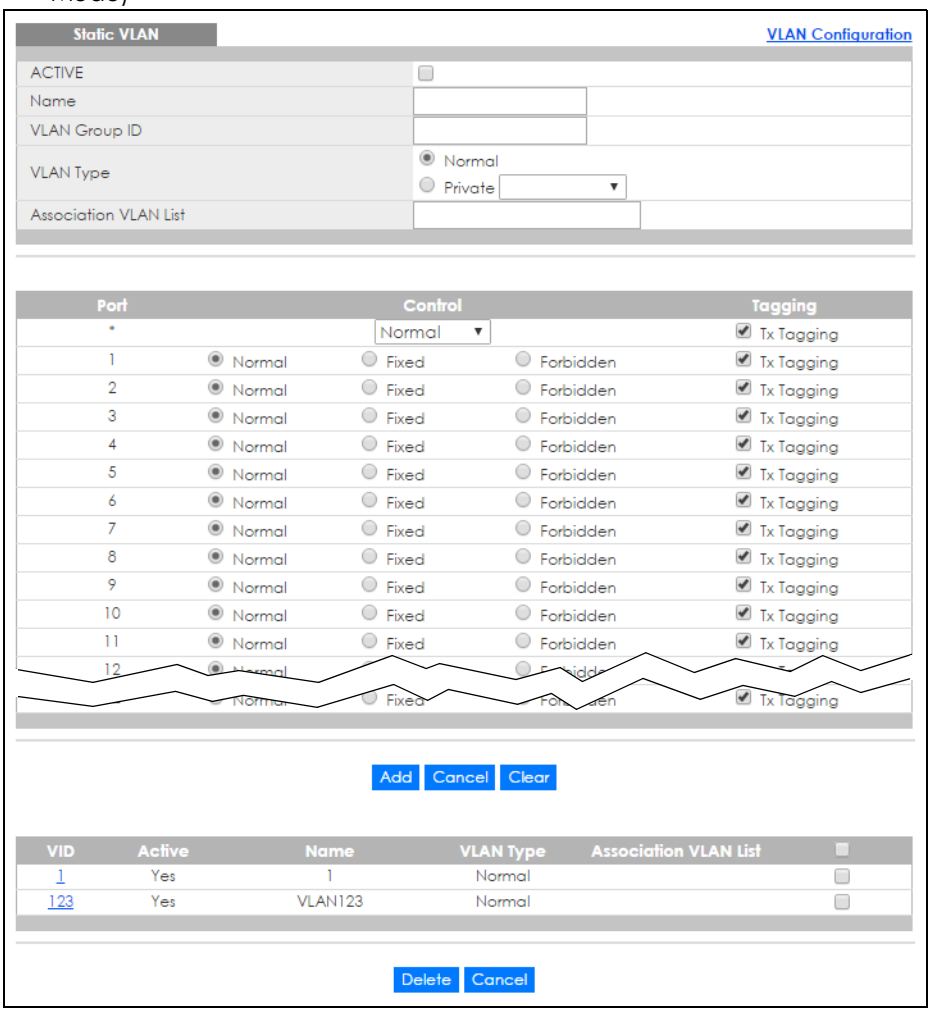
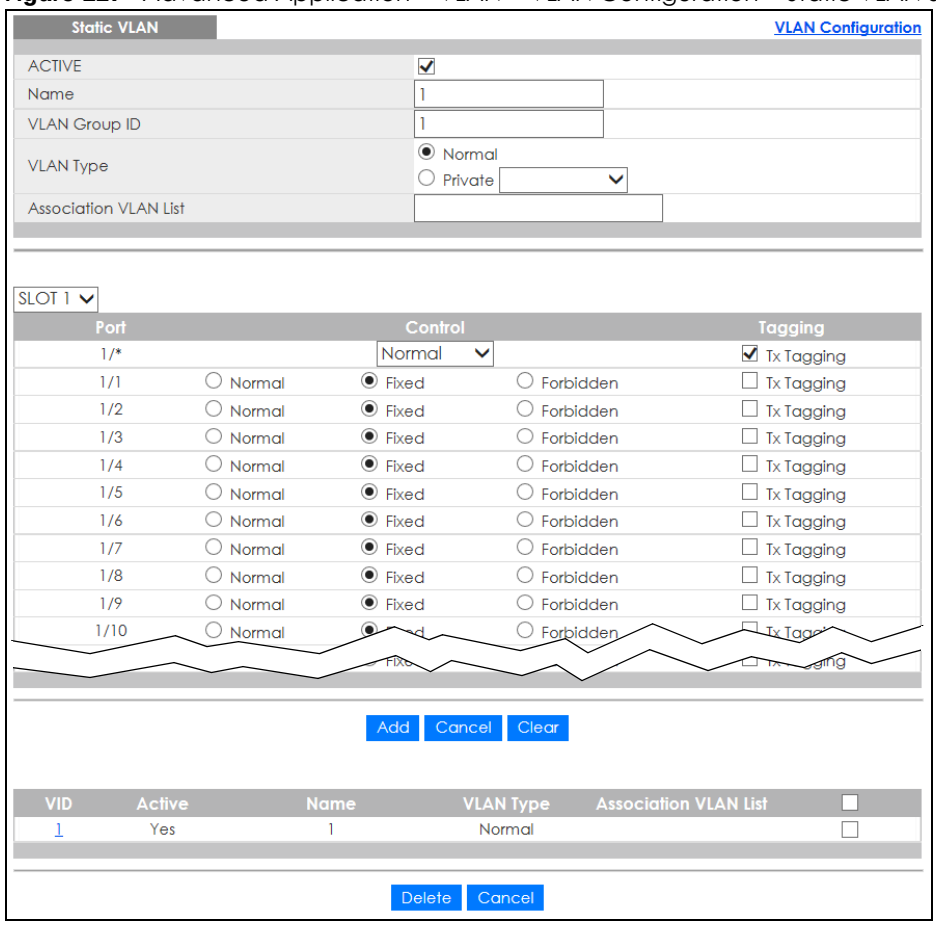


**Figure 117** Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (Stacking Mode)




The following table describes the related labels in this screen.

Table 58 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| ACTIVE | Select this check box to activate the VLAN settings. |
| Name | Enter a descriptive name for the VLAN group for identification purposes. This name consists of up to 64 printable characters. Spaces are allowed. |
| VLAN Group ID | Enter the VLAN ID for this static entry; the valid range is between 1 and 4094.<br><br>Note: Do NOT add a VLAN ID that has been used in the **Voice VLAN Setup**. |
| VLAN Type | Select **Normal** (static) or **Private**. For **Private** VLANs, select **Primary**, **Isolated** or **Community**. |
| Association VLAN List | **Primary** private VLANs can associate with several (secondary) **Community** private VLANs and up to one (secondary) **Isolated** private VLAN.<br><br>You only configure **VLAN Association List** for **Primary** private VLANs. Use a dash to associate consecutive VLANs and a comma (no spaces) to associate non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52.<br><br>Secondary private VLANs can only be associated with one primary private VLAN. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

Table 58 Advanced Application > VLAN > VLAN Configuration > Static VLAN Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | The port number identifies the port you are configuring. In stacking mode, the first number represents the slot ID and the second one is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Control | Select **Normal** for the port to dynamically join this VLAN group using GVRP. This is the default selection.<br>Select **Fixed** for the port to be a permanent member of this VLAN group.<br>Select **Forbidden** if you want to prohibit the port from joining this VLAN group. |
| Tagging | Select **TX Tagging** if you want the port to tag all outgoing frames transmitted with this VLAN Group ID. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to start configuring the screen again. |
| VID | This field displays the ID number of the VLAN group. Click the number to edit the VLAN settings. |
| Active | This field indicates whether the VLAN settings are enabled (**Yes**) or disabled (**No**). |
| Name | This field displays the descriptive name for this VLAN group. |
| VLAN Type | This field displays the **Normal** or **Private** (**Primary**, **Isolated** or **Community**) type VLAN configured in the top part of this screen. |
| Association VLAN List | This field displays which secondary private VLANs are associated with a primary private VLAN configured in the top part of this screen. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 9.7 Configure VLAN Port Settings

Use this screen to configure the static VLAN (IEEE 802.1Q) settings on a port. Click the **VLAN Port Setup** link in the **VLAN Configuration** screen.

**Figure 118** Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup (Standalone Mode)

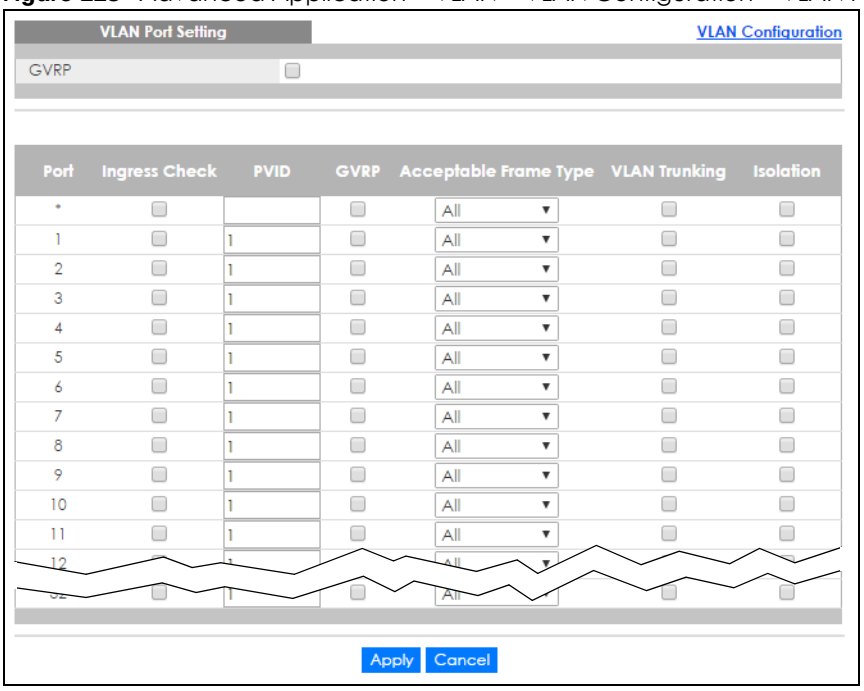
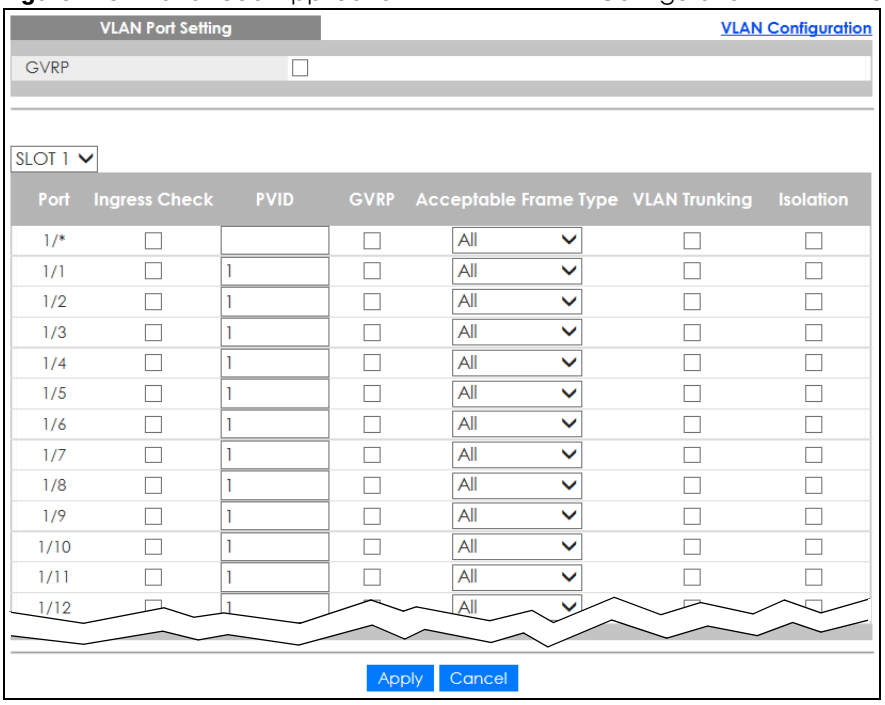



**Figure 119** Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup (Stacking Mode)



The following table describes the labels in this screen.

Table 59 Advanced Application > VLAN > VLAN Configuration > VLAN Port Setup

| LABEL | DESCRIPTION |
|---|---|
| GVRP | GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network.<br>Select this check box to permit VLAN groups beyond the local Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number of the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Ingress Check | If this check box is selected, the Switch discards incoming frames on a port for VLANs that do not include this port in its member set.<br>Clear this check box to disable ingress filtering. |
| PVID | A PVID (Port VLAN ID) is a tag that adds to incoming untagged frames received on a port so that the frames are forwarded to the VLAN group that the tag defines.<br>Enter a number between 1and 4094 as the port VLAN ID. |
| GVRP | Select this check box to allow GVRP on this port. |
| Acceptable Frame Type | Specify the type of frames allowed on a port. Choices are **All**, **Tag Only** and **Untag Only**.<br>Select **All** from the drop-down list box to accept all untagged or tagged frames on this port. This is the default setting.<br>Select **Tag Only** to accept only tagged frames on this port. All untagged frames will be dropped.<br>Select **Untag Only** to accept only untagged frames on this port. All tagged frames will be dropped.<br>Note: When the Switch is in stacking mode and the master Switch has VLAN1, all other ports will be configured to untagged port. |
| VLAN Trunking | Enable **VLAN Trunking** on ports connected to other switches or routers (but not ports directly connected to end users) to allow frames belonging to unknown VLAN groups to pass through the Switch. |
| Isolation | Select this to allows this port to communicate only with the CPU management port and the ports on which the isolation feature is NOT enabled. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 9.8 Subnet Based VLANs

Subnet based VLANs allow you to group traffic into logical VLANs based on the source IP subnet you specify. When a frame is received on a port, the Switch checks if a tag is added already and the IP

subnet it came from. The untagged packets from the same IP subnet are then placed in the same subnet based VLAN. One advantage of using subnet based VLANs is that priority can be assigned to traffic from the same IP subnet.

Note: Subnet based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, an ISP (Internet Services Provider) may divide different types of services it provides to customers into different IP subnets. Traffic for voice services is designated for IP subnet 172.16.1.0/24, video for 192.168.1.0/24 and data for 10.1.1.0/24. The Switch can then be configured to group incoming traffic based on the source IP subnet of incoming frames.

You configure a subnet based VLAN with priority 6 and VID of 100 for traffic received from IP subnet 172.16.1.0/24 (voice services). You also have a subnet based VLAN with priority 5 and VID of 200 for traffic received from IP subnet 192.168.1.0/24 (video services). Lastly, you configure VLAN with priority 3 and VID of 300 for traffic received from IP subnet 10.1.1.0/24 (data services). All untagged incoming frames will be classified based on their source IP subnet and prioritized accordingly. That is video services receive the highest priority and data the lowest.

**Figure 120** Subnet Based VLAN Application Example

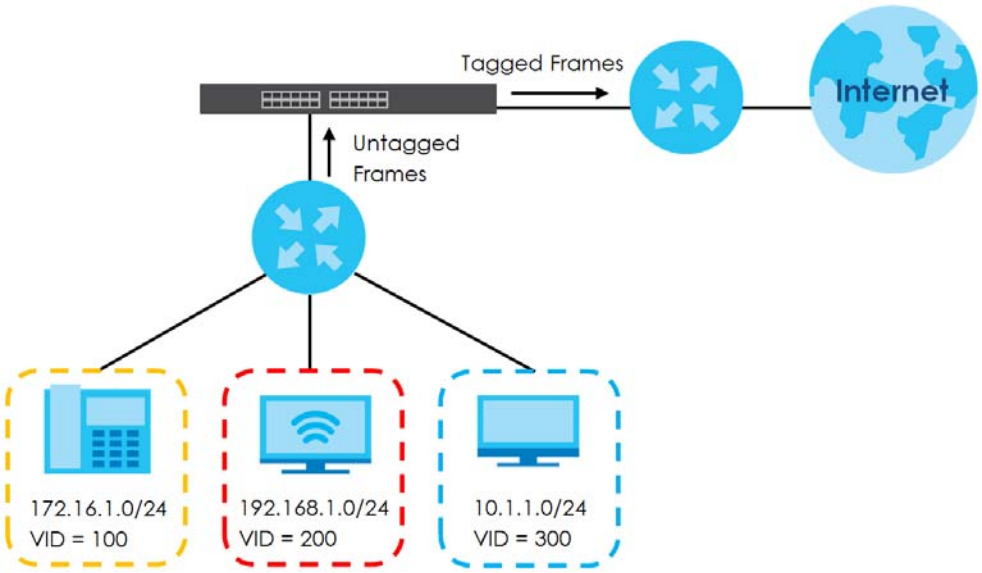
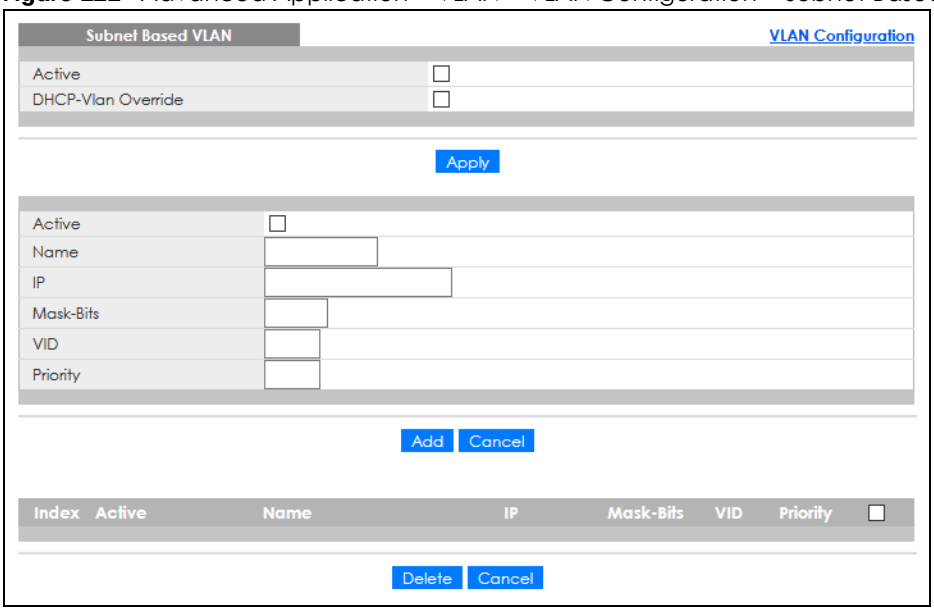


**Figure 121** Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup




The following table describes the labels in this screen.

Table 60 Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Active | Check this box to activate this subnet based VLANs on the Switch. |
| DHCP-Vlan Override | When DHCP snooping is enabled DHCP clients can renew their IP address through the DHCP VLAN or through another DHCP server on the subnet based VLAN.<br><br>Select this check box to force the DHCP clients in this IP subnet to obtain their IP addresses through the DHCP VLAN. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Active | Check this box to activate the IP subnet VLAN you are creating or editing. |
| Name | Enter up to 32 alpha numeric characters to identify this subnet based VLAN. |
| IP | Enter the IP address of the subnet for which you want to configure this subnet based VLAN. |
| Mask-Bits | Enter the bit number of the subnet mask. To find the bit number, convert the subnet mask to binary format and add all the 1's together. Take "255.255.255.0" for example. 255 converts to eight 1s in binary. There are three 255s, so add three eights together and you get the bit number (24). |
| VID | Enter the ID of a VLAN with which the untagged frames from the IP subnet specified in this subnet based VLAN are tagged. This must be an existing VLAN which you defined in the **Advanced Application** > **VLAN** > **Static VLAN** screen. |
| Priority | Select the priority level that the Switch assigns to frames belonging to this VLAN. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Index | This is the index number identifying this subnet based VLAN. Click on any of these numbers to edit an existing subnet based VLAN. |
| Active | This field shows whether the subnet based VLAN is active or not. |

Table 60 Advanced Application > VLAN > VLAN Configuration > Subnet Based VLAN Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Name | This field shows the name the subnet based VLAN. |
| IP | This field shows the IP address of the subnet for this subnet based VLAN. |
| Mask-Bits | This field shows the subnet mask in bit number format for this subnet based VLAN. |
| VID | This field shows the VLAN ID of the frames which belong to this subnet based VLAN. |
| Priority | This field shows the priority which is assigned to frames belonging to this subnet based VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click this to delete the subnet based VLANs which you marked for deletion. |
| Cancel | Click **Cancel** to clear the check boxes. |

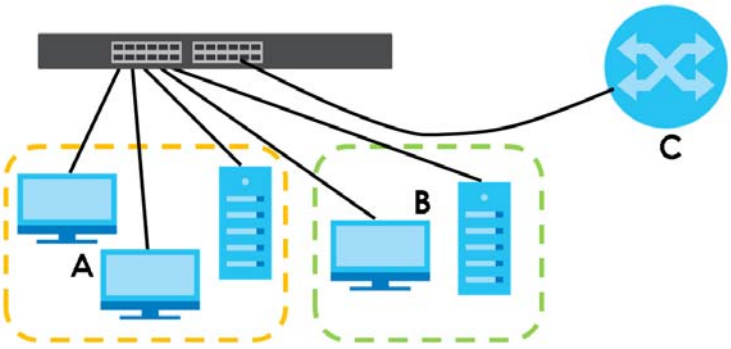
# 9.9 Protocol Based VLANs

Protocol based VLANs allow you to group traffic into logical VLANs based on the protocol you specify. When an upstream frame is received on a port (configured for a protocol based VLAN), the Switch checks if a tag is added already and its protocol. The untagged packets of the same protocol are then placed in the same protocol based VLAN. One advantage of using protocol based VLANs is that priority can be assigned to traffic of the same protocol.

Note: Protocol-based VLAN applies to un-tagged packets and is applicable only when you use IEEE 802.1Q tagged VLAN.

For example, port 1, 2, 3 and 4 belong to static VLAN 100, and port 4, 5, 6, 7 belong to static VLAN 120. You configure a protocol based VLAN A with priority 3 for ARP traffic received on port 1, 2 and 3. You also have a protocol based VLAN B with priority 2 for Apple Talk traffic received on port 6 and 7. All upstream ARP traffic from port 1, 2 and 3 will be grouped together, and all upstream Apple Talk traffic from port 6 and 7 will be in another group and have higher priority than ARP traffic, when they go through the uplink port to a backbone switch C.

**Figure 122** Protocol Based VLAN Application Example




## 9.9.1 Configuring Protocol Based VLAN

Click the **Protocol Based VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

**Figure 123** Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup (Standalone Mode)

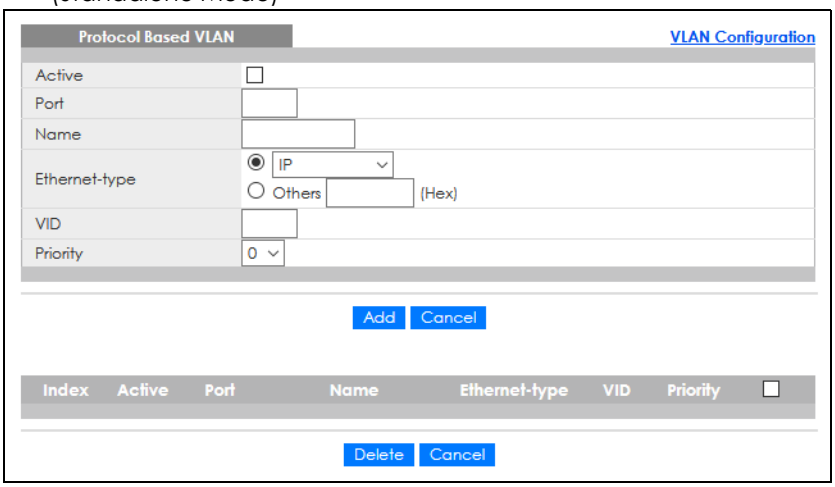
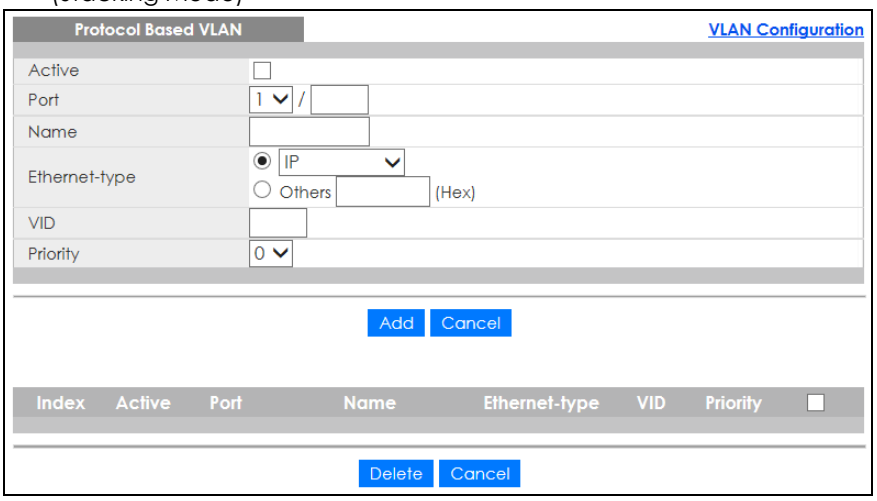



**Figure 124** Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 61 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Active | Check this box to activate this protocol based VLAN. |
| Port | Type a port number to be included in this protocol based VLAN. In stacking mode, the first box field is the slot ID and the second field is the port number.<br><br>This port must belong to a static VLAN in order to participate in a protocol based VLAN. |
| Name | Enter up to 32 alpha numeric characters to identify this protocol based VLAN. |
| Ethernet-type | Use the drop down list box to select a predefined protocol to be included in this protocol based VLAN or select **Others** and type the protocol number in hexadecimal notation. For example the IP protocol in hexadecimal notation is 0800, and Novell IPX protocol is 8137.<br><br>Note: Protocols in the hexadecimal number range of 0x0000 to 0x05ff are not allowed to be used for protocol based VLANs. |
| VID | Enter the ID of a VLAN to which the port belongs. This must be an existing VLAN which you defined in the **Advanced Application** > **VLAN** > **Static VLAN** screen. |
| Priority | Select the priority level that the Switch will assign to frames belonging to this VLAN. |

Table 61 Advanced Application > VLAN > VLAN Configuration > Protocol Based VLAN Setup

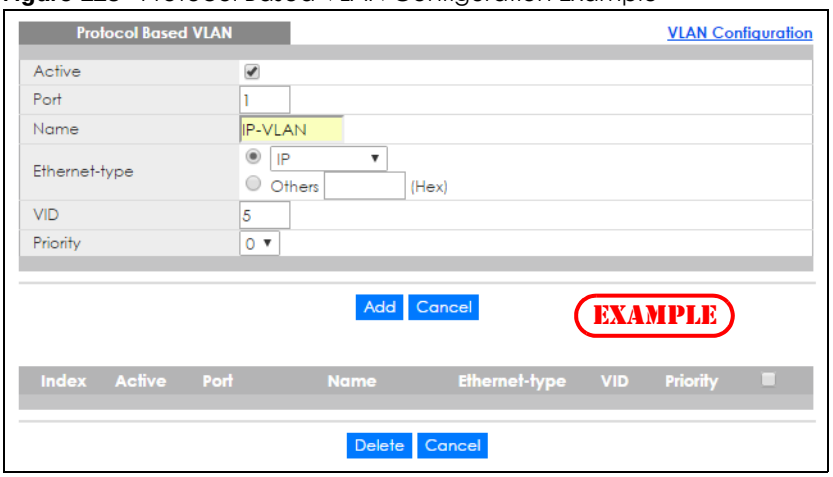
| LABEL | DESCRIPTION |
|---|---|
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Index | This is the index number identifying this protocol based VLAN. Click any of these numbers to edit an existing protocol based VLAN. |
| Active | This field shows whether the protocol based VLAN is active or not. |
| Port | This field shows which port belongs to this protocol based VLAN. In stacking mode, the first number represents the slot ID and the second is the port number. |
| Name | This field shows the name of the protocol based VLAN. |
| Ethernet-type | This field shows which Ethernet protocol is part of this protocol based VLAN. |
| VID | This field shows the VLAN ID of the port. |
| Priority | This field shows the priority which is assigned to frames belonging to this protocol based VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click this to delete the protocol based VLANs which you marked for deletion. |
| Cancel | Click **Cancel** to clear the check boxes. |

### 9.9.1.1 Create an IP-based VLAN Example

This example shows you how to create an IP VLAN which includes ports 1, 4 and 8. Follow these steps using the screen below:

1. Activate this protocol based VLAN.
2. Type the port number you want to include in this protocol based VLAN. Type **1**.
3. Give this protocol-based VLAN a descriptive name. Type **IP-VLAN**.
4. Select the protocol. Leave the default value **IP**.
5. Type the VLAN ID of an existing VLAN. In our example we already created a static VLAN with an ID of 5. Type **5**.
6. Leave the priority set to **0** and click **Add**.

**Figure 125** Protocol Based VLAN Configuration Example




To add more ports to this protocol based VLAN.

1 Click the index number of the protocol based VLAN entry. Click **1**.

2 Change the value in the **Port** field to the next port you want to add.

3 Click **Add**.

# 9.10 Voice VLAN

Voice VLAN is a VLAN that is specifically allocated for voice traffic. It ensures that the sound quality of an IP phone is preserved from deteriorating when the data traffic on the Switch ports is high. It groups the voice traffic with defined priority into an assigned VLAN which enables the separation of voice and data traffic coming onto the Switch port.

The Switch can determine whether a received packet is

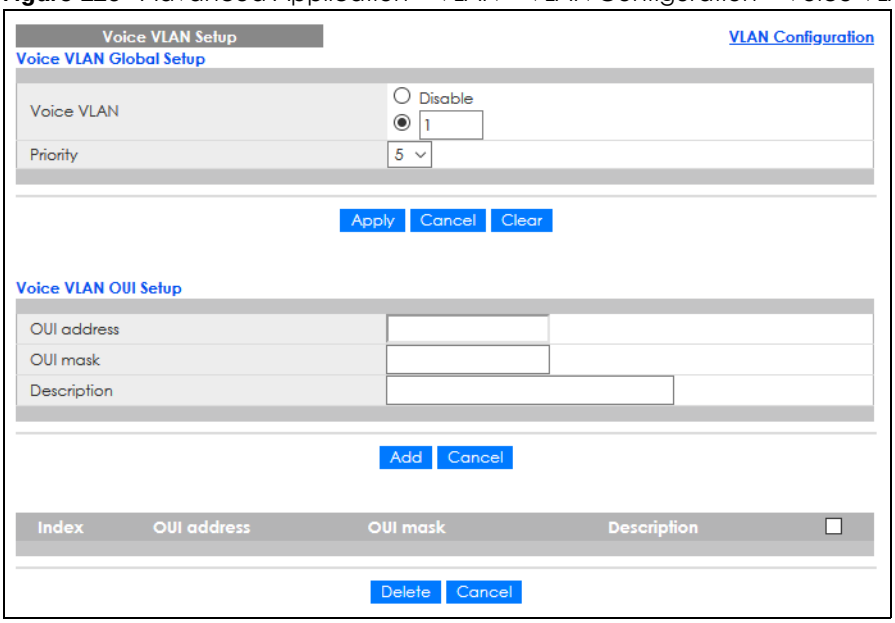
- an untagged voice packet when the incoming port is a fixed port for voice VLAN.
- a tagged voice packet when the incoming port and VLAN tag belongs to a voice VLAN.

It then checks the source packet's MAC address against an OUI list. If a match is found, the packet is considered as a voice packet.

You can set priority level to the Voice VLAN and add MAC address of IP phones from specific manufacturers by using its ID from the Organizationally Unique Identifiers (OUI).

Click the **Voice VLAN Setup** link in the **VLAN Configuration** screen to display the configuration screen as shown.

**Figure 126** Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup




The following table describes the fields in the above screen.

Table 62 Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Voice VLAN Global Setup | |
| Voice VLAN | Click the second radio button if you want to enable the Voice VLAN feature. Type a VLAN ID number in the box next to the radio button that is associated with the Voice VLAN. You also need to create a static VLAN with the same VID in the **Static VLAN Setup** screen, and then connect the IP phone with the specified OUI MAC address to a port that joins the static VLAN.<br><br>Click **Disable** radio button if you do not want to enable the Voice VLAN feature. |
| Priority | Select the priority level of the voice traffic from 0 to 7. Default setting is 5. The higher the numeric value you assign, the higher the priority for this voice traffic. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this section afresh. |
| Clear | Click **Clear** to reset the fields to default settings. |
| Voice VLAN OUI Setup | |
| OUI address | Enter the IP phone manufacturer's OUI MAC address. The first 3 bytes is the manufacturer identifier, the last 3 bytes is a unique station ID. |
| OUI mask | Enter the mask for the specified IP phone manufacturer's OUI MAC address to determine which bits a packet's MAC address should match.<br><br>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. |
| Description | Enter a description up to 32 characters for the Voice VLAN device. For example: Siemens. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |

Table 62 Advanced Application > VLAN > VLAN Configuration > Voice VLAN Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Cancel | Click **Cancel** to begin configuring this section afresh. |
| Index | This field displays the index number of the Voice VLAN. |
| OUI address | This field displays the OUI address of the Voice VLAN. |
| OUI mask | This field displays the OUI mask address of the Voice VLAN. |
| Description | This field displays the description of the Voice VLAN with OUI address. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

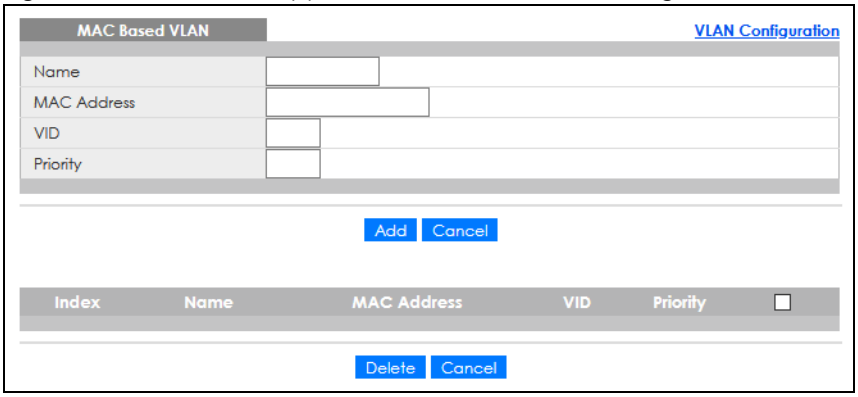
# 9.11 MAC Based VLAN

The MAC-based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the Switch, the source MAC address of the packet is looked up in a MAC to VLAN mapping table. If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN. You can assign priority to the MAC-based VLAN and define a MAC to VLAN mapping table by entering a specified source MAC address in the MAC-based VLAN setup screen. You can also delete a MAC-based VLAN entry in the same screen.

Click the **MAC Based VLAN Setup** link in the **VLAN Configuration** screen to see the following screen.

**Figure 127** Advanced Application > VLAN > VLAN Configuration > MAC Based VLAN Setup




The following table describes the fields in the above screen.

Table 63 Advanced Application > VLAN > VLAN Configuration > MAC Based VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Name | Type a name up to 32 alpha numeric characters for the MAC-based VLAN entry. |
| MAC Address | Type a MAC address that is bind to the MAC-based VLAN entry. This is the source MAC address of the data packet that is looked up when untagged packets arrive at the Switch. |

Table 63 Advanced Application > VLAN > VLAN Configuration > MAC Based VLAN Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| VID | Type an ID (from 1 to 4094) for the VLAN that is associated with the MAC-based VLAN entry. |
| Priority | Type a priority (0 to 7) that the Switch assigns to frames belonging to this VLAN. The higher the numeric value you assign, the higher the priority for this MAC-based VLAN entry. |
| Add | Click **Add** to save the new MAC-based VLAN entry. |
| Cancel | Click **Cancel** to clear the fields in the MAC-based VLAN entry. |
| Index | This field displays the index number of the MAC-based VLAN entry. |
| Name | This field displays the name of the MAC-based VLAN entry. |
| MAC Address | This field displays the source MAC address that is bind to the MAC-based VLAN entry. |
| VID | This field displays the VLAN ID of the MAC-based VLAN entry. |
| Priority | This field displays the priority level which is assigned to frames belonging to this MAC-based VLAN entity. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 9.12 Vendor ID Based VLAN

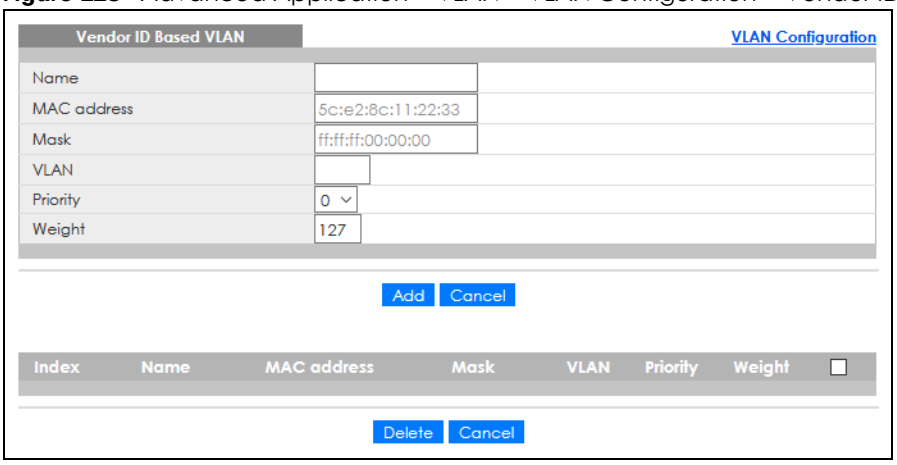
The Vendor ID based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the switch, the source MAC address of the packet is looked up in a Vendor ID to VLAN mapping table. If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN. You can assign a 802.1p priority to the vendor ID based VLAN and define a vendor ID to VLAN mapping table by entering a specified source MAC address and mask in the vendor ID based VLAN setup screen. You can also delete a vendor ID based VLAN entry in the same screen.

For every vendor ID based VLAN rule you set, you can specify a weight number to define the rule's priority level. As rules are processed one after the other, stating a priority order will let you choose which rule has to be applied first and which second.

Click the **Vendor ID Based VLAN Setup** link in the **VLAN Configuration** screen to see the following screen.

**Figure 128** Advanced Application > VLAN > VLAN Configuration > Vendor ID Based VLAN Setup




The following table describes the fields in the above screen.

Table 64 Advanced Application > VLAN > VLAN Configuration > Vendor ID Based VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Name | Type a name up to 32 alpha numeric characters for the vendor ID based VLAN entry. |
| MAC Address | Type a MAC address that is bind to the vendor ID-based VLAN entry. This is the source MAC address of the data packet that is looked up when untagged packets arrive at the Switch. |
| Mask | Type the mask for the specified source MAC address to determine which bits a packet's MAC address should match.<br>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. |
| VLAN | Type an ID (from 1 to 4094) for the VLAN that is associated with the vendor ID based VLAN entry. |
| Priority | Select the priority level that the Switch assigns to frames belonging to this VLAN. The higher the numeric value you assign, the higher the priority for this vendor ID based VLAN entry. |
| Weight | Enter a number between 0 and 255 to specify the rule's weight. This is to decide the priority in which the rule is applied. The higher the number, the higher the rule's priority. |
| Add | Click **Add** to save the new vendor ID based VLAN entry. |
| Cancel | Click **Cancel** to clear the fields in the vendor ID based VLAN entry. |
| Index | This field displays the index number of the vendor ID based VLAN entry. |
| Name | This field displays the name of the vendor ID based VLAN entry. |
| MAC Address | This field displays the source MAC address that is bind to the vendor ID based VLAN entry. |
| Mask | This field displays the mask for the source MAC address that is bind to the vendor ID based VLAN entry. |
| VLAN | This field displays the VLAN ID of the vendor ID based VLAN entry. |
| Priority | This field displays the priority level which is assigned to frames belonging to this vendor ID based VLAN. |
| Weight | This field displays the weight of the vendor ID based VLAN entry. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 9.13 Port-Based VLAN Setup

Port-based VLANs are VLANs where the packet forwarding decision is based on the destination MAC address and its associated port.

Port-based VLANs require allowed outgoing ports to be defined for each port. Therefore, if you wish to allow two subscriber ports to talk to each other, for example, between conference rooms in a hotel, you must define the egress (an egress port is an outgoing port, that is, a port through which a data packet leaves) for both ports.

Port-based VLANs are specific only to the Switch on which they were created.

Note: When you activate port-based VLAN, the Switch uses a default VLAN ID of 1. You cannot change it.

Note: In screens (such as **IP Setup** and **Filtering**) that require a VID, you must enter 1 as the VID.

The port-based VLAN setup screen is shown next. The **CPU** management port forms a VLAN with all Ethernet ports.

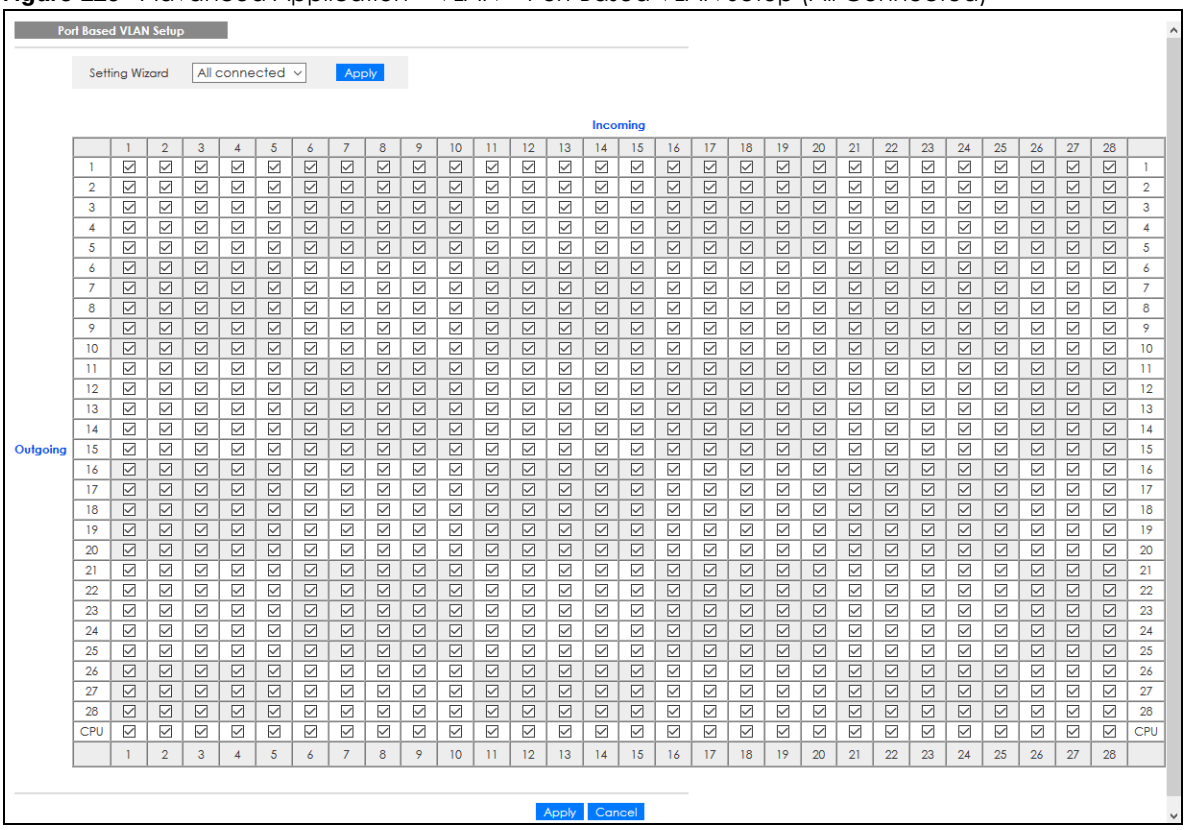
## 9.13.1 Configure a Port-Based VLAN

Select **Port Based** as the VLAN Type in the **Basic Setting** > **Switch Setup** screen and then click **Advanced Application** > **VLAN** from the navigation panel to display the next screen.

Select either **All Connected** or **Port Isolated** from the drop-down list depending on your VLAN and VLAN security requirements. If VLAN members need to communicate directly with each other, then select **All Connected**. Select **Port Isolated** if you want to restrict users from communicating directly. Click **Apply** to save your settings.

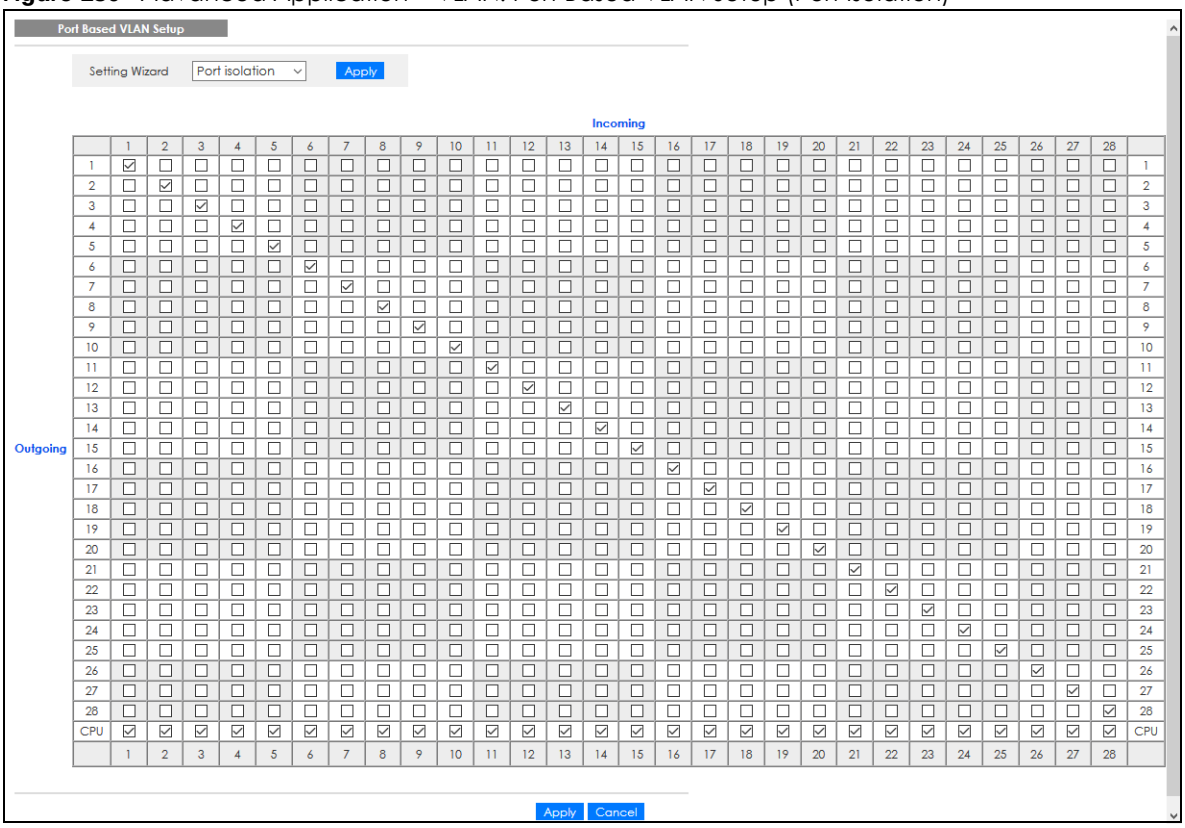
The following screen shows users on a port-based, all-connected VLAN configuration.

**Figure 129** Advanced Application > VLAN > Port Based VLAN Setup (All Connected)




The following screen shows users on a port-based, port-isolated VLAN configuration.

**Figure 130** Advanced Application > VLAN: Port Based VLAN Setup (Port Isolation)




The following table describes the labels in this screen.

Table 65 Advanced Application > VLAN: Port Based VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Setting Wizard | Choose **All connected** or **Port isolation**.<br><br>**All connected** means all ports can communicate with each other, that is, there are no virtual LANs. All incoming and outgoing ports are selected. This option is the most flexible but also the least secure.<br><br>**Port isolation** means that each port can only communicate with the CPU management port and cannot communicate with each other. All incoming ports are selected while only the CPU outgoing port is selected. This option is the most limiting but also the most secure.<br><br>After you make your selection, click **Apply** (top right of screen) to display the screens as mentioned above. You can still customize these settings by adding or deleting incoming or outgoing ports, but you must also click **Apply** at the bottom of the screen. |
| Incoming | These are the ingress ports; an ingress port is an incoming port, that is, a port through which a data packet enters. If you wish to allow two subscriber ports to talk to each other, you must define the ingress port for both ports. The numbers in the top row denote the incoming port for the corresponding port listed on the left (its outgoing port). **CPU** refers to the Switch management port. By default it forms a VLAN with all Ethernet ports. If it does not form a VLAN with a particular port then the Switch cannot be managed from that port. |
| Outgoing | These are the egress ports; an egress port is an outgoing port, that is, a port through which a data packet leaves. If you wish to allow two subscriber ports to talk to each other, you must define the egress port for both ports. **CPU** refers to the Switch management port. By default it forms a VLAN with all Ethernet ports. If it does not form a VLAN with a particular port then the Switch cannot be managed from that port. |

Table 65 Advanced Application > VLAN: Port Based VLAN Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 10
# Static MAC Forwarding

## 10.1 Overview

This chapter discusses how to configure forwarding rules based on MAC addresses of devices on your network.

Use these screens to configure static MAC address forwarding.

### 10.1.1 What You Can Do

Use the **Static MAC Forwarding** screen (Section 10.2 on page 172) to assign static MAC addresses for a port.

## 10.2 Configure Static MAC Forwarding

A static MAC address is an address that has been manually entered in the MAC address table. Static MAC addresses do not age out. When you set up static MAC address rules, you are setting static MAC addresses for a port. This may reduce the need for broadcasting.

Click **Advanced Application** > **Static MAC Forwarding** in the navigation panel to display the configuration screen as shown.

**Figure 131** Advanced Application > Static MAC Forwarding (Standalone Mode)

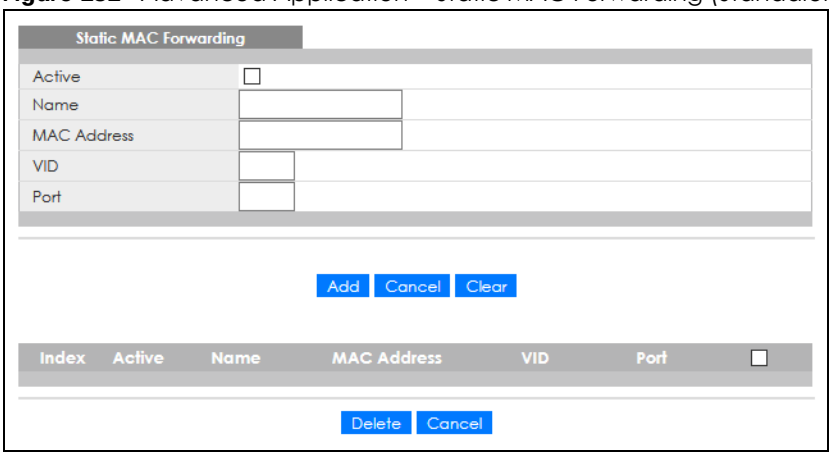
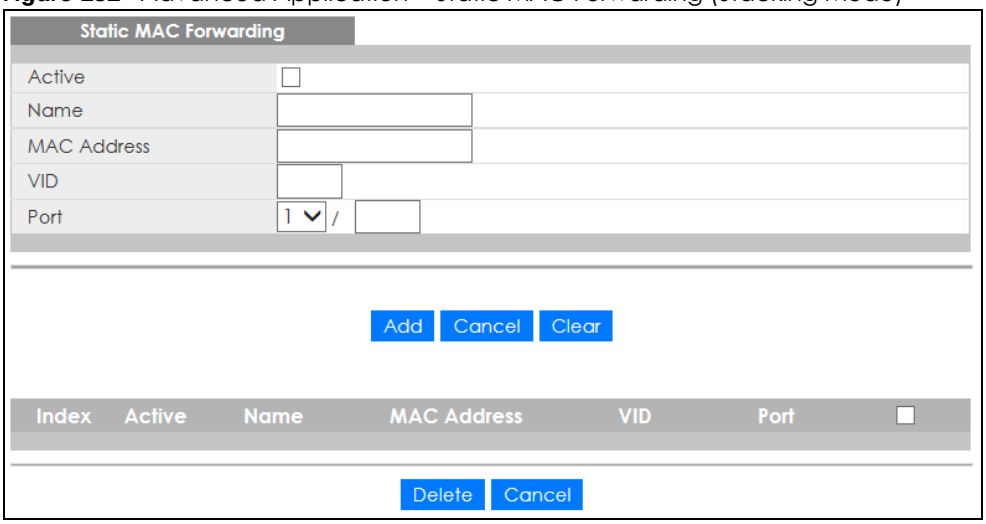


**Figure 132** Advanced Application > Static MAC Forwarding (Stacking Mode)




The following table describes the labels in this screen.

Table 66 Advanced Application > Static MAC Forwarding

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box. |
| Name | Enter a descriptive name for identification purposes for this static MAC address forwarding rule. |
| MAC Address | Enter the MAC address in valid MAC address format, that is, six hexadecimal character pairs.<br><br>Note: Static MAC addresses do NOT age out. |
| VID | Enter the VLAN identification number. |
| Port | Enter the port where the MAC address entered in the previous field will be automatically forwarded. In stacking mode, the first box field is the slot ID and the second field is the port number. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Clear | Click **Clear** to begin configuring this screen afresh. |
| Index | Click an index number to modify a static MAC address rule for a port. |
| Active | This field displays whether this static MAC address forwarding rule is active (**Yes**) or not (**No**). You may temporarily deactivate a rule without deleting it. |
| Name | This field displays the descriptive name for identification purposes for this static MAC address-forwarding rule. |
| MAC Address | This field displays the MAC address that will be forwarded and the VLAN identification number to which the MAC address belongs. |
| VID | This field displays the ID number of the VLAN group. |
| Port | This field displays the port where the MAC address shown in the next field will be forwarded.<br><br>In stacking mode, the first number represents the slot ID and the second is the port number. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |

Table 66 Advanced Application > Static MAC Forwarding (continued)

| LABEL | DESCRIPTION |
|---|---|
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 11
# Static Multicast Forwarding

## 11.1 Overview

This chapter discusses how to configure forwarding rules based on multicast MAC addresses of devices on your network.

Use these screens to configure static multicast address forwarding.

### 11.1.1 What You Can Do

Use the **Static Multicast Forwarding** screen (Section 11.2 on page 176) to configure rules to forward specific multicast frames, such as streaming or control frames, to specific ports.

### 11.1.2 What You Need To Know

A multicast MAC address is the MAC address of a member of a multicast group. A static multicast address is a multicast MAC address that has been manually entered in the multicast table. Static multicast addresses do not age out. Static multicast forwarding allows you (the administrator) to forward multicast frames to a member without the member having to join the group first.

If a multicast group has no members, then the switch will either flood the multicast frames to all ports or drop them. Figure 133 on page 175 shows such unknown multicast frames flooded to all ports. With static multicast forwarding, you can forward these multicasts to ports within a VLAN group. Figure 134 on page 176 shows frames being forwarded to devices connected to port 3. Figure 135 on page 176 shows frames being forwarded to ports 2 and 3 within VLAN group 4.

**Figure 133** No Static Multicast Forwarding

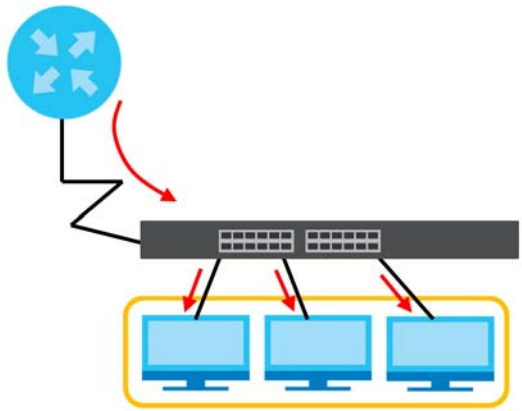


**Figure 134** Static Multicast Forwarding to a Single Port

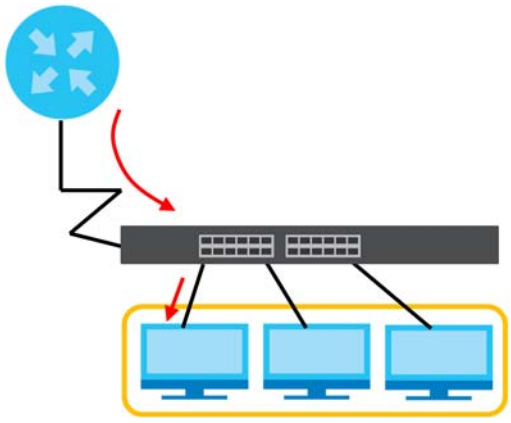
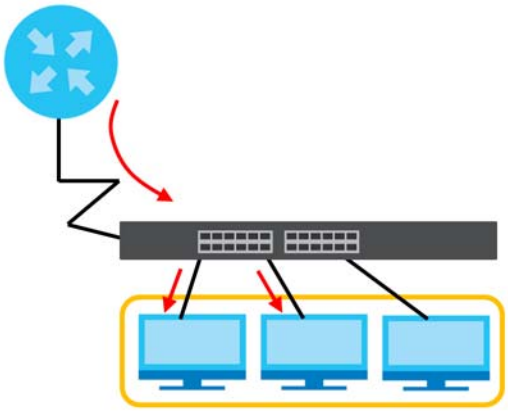


**Figure 135** Static Multicast Forwarding to Multiple Ports

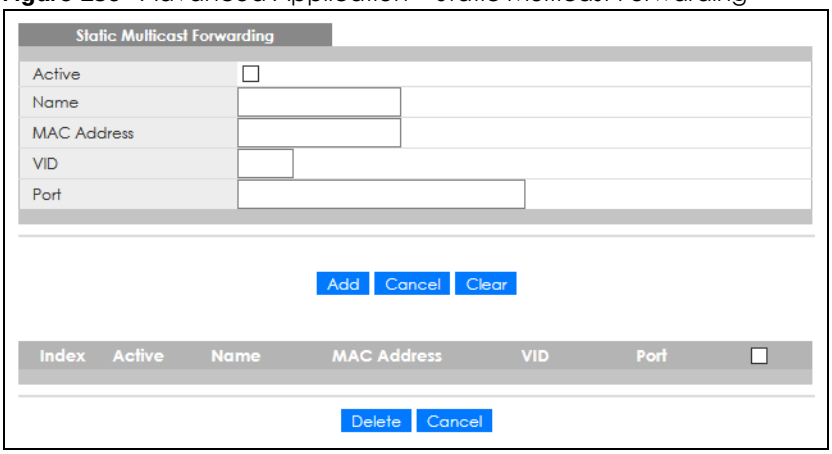


# 11.2 Configure Static Multicast Forwarding

Use this screen to configure rules to forward specific multicast frames, such as streaming or control frames, to specific ports.

Click **Advanced Application** > **Static Multicast Forwarding** to display the configuration screen as shown.

**Figure 136** Advanced Application > Static Multicast Forwarding



The following table describes the labels in this screen.

Table 67 Advanced Application > Static Multicast Forwarding

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box. |
| Name | Type a descriptive name (up to 32 printable ASCII characters) for this static multicast MAC address forwarding rule. This is for identification only. |
| MAC Address | Enter a multicast MAC address which identifies the multicast group. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses. |
| VID | You can forward frames with matching destination MAC address to ports within a VLAN group. Enter the ID that identifies the VLAN group here. If you do NOT have a specific target VLAN, enter 1. |
| Port | Enter the ports where frames with destination MAC address that matched the entry above are forwarded. You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br><br>In stacking mode, the first number represents the slot ID and the second is the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your rule to the Switch's run-time memory. The Switch loses this rule if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Clear | Click **Clear** to begin configuring this screen afresh. |
| Index | Click an index number to modify a static multicast MAC address rule for ports. |
| Active | This field displays whether a static multicast MAC address forwarding rule is active (**Yes**) or not (**No**). You may temporarily deactivate a rule without deleting it. |
| Name | This field displays the descriptive name for identification purposes for a static multicast MAC address-forwarding rule. |
| MAC Address | This field displays the multicast MAC address that identifies a multicast group. |
| VID | This field displays the ID number of a VLAN group to which frames containing the specified multicast MAC address will be forwarded. |
| Port | This field displays the ports within an identified VLAN group to which frames containing the specified multicast MAC address will be forwarded. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 12
# Filtering

## 12.1 Filtering Overview

This chapter discusses MAC address port filtering.

Filtering means sifting traffic going through the Switch based on the source and/or destination MAC addresses and VLAN group (ID).

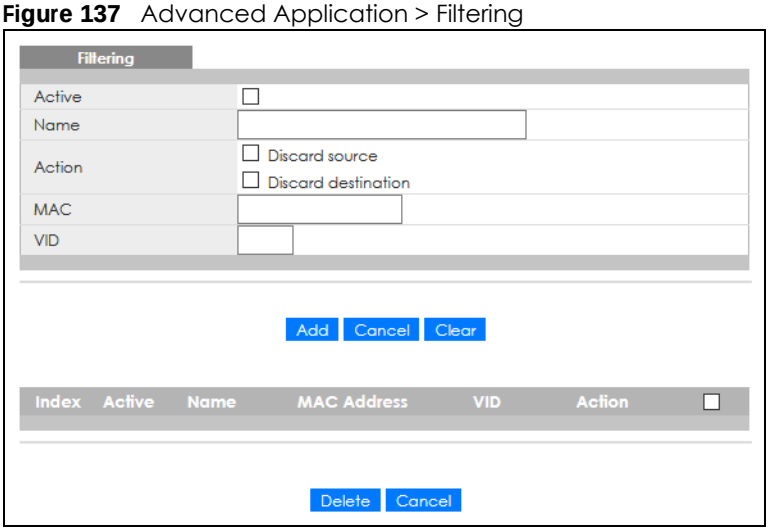
### 12.1.1 What You Can Do

Use the **Filtering** screen (Section 12.2 on page 178) to create rules for traffic going through the Switch.

## 12.2 Configure a Filtering Rule

Use this screen to create rules for traffic going through the Switch. Click **Advanced Application** > **Filtering** in the navigation panel to display the screen as shown next.

**Figure 137** Advanced Application > Filtering



The following table describes the related labels in this screen.

Table 68 Advanced Application > Filtering

| LABEL | DESCRIPTION |
|---|---|
| Active | Make sure to select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by de-selecting this check box. |
| Name | Type a descriptive name (up to 32 printable ASCII characters) for this rule. This is for identification only. |
| Action | Select **Discard source** to drop the frames from the source MAC address (specified in the **MAC** field). The Switch can still send frames to the MAC address.<br>Select **Discard destination** to drop the frames to the destination MAC address (specified in the **MAC** address). The Switch can still receive frames originating from the MAC address.<br>Select **Discard source** and **Discard destination** to block traffic to or from the MAC address specified in the **MAC** field. |
| MAC | Type a MAC address in valid MAC address format, that is, six hexadecimal character pairs. |
| VID | Type the VLAN group identification number. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to clear the fields to the factory defaults. |
| Index | This field displays the index number of the rule. Click an index number to change the settings. |
| Active | This field displays **Yes** when the rule is activated and **No** when is it deactivated. |
| Name | This field displays the descriptive name for this rule. This is for identification purpose only. |
| MAC Address | This field displays the source or destination MAC address with the VLAN identification number to which the MAC address belongs. |
| VID | This field displays the VLAN group identification number. |
| Action | This field displays **Discard source**, **Discard destination**, or **Discard both** depending on what you configured above. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# CHAPTER 13
# Spanning Tree Protocol

## 13.1 Spanning Tree Protocol Overview

The Switch supports Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) as defined in the following standards.

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Spanning Tree Protocol
- IEEE 802.1s Multiple Spanning Tree Protocol

The Switch also allows you to set up multiple STP configurations (or trees). Ports can then be assigned to the trees.

### 13.1.1 What You Can Do

- Use the **Spanning Tree Protocol Status** screen (Section 13.2 on page 183) to view the STP status in the different STP modes (RSTP, MRSTP or MSTP) you can configure on the Switch.
- Use the **Spanning Tree Configuration** screen (Section 13.3 on page 183) to activate one of the STP modes on the Switch.
- Use the **Rapid Spanning Tree Protocol Status** screen (Section 13.4 on page 184) to view the RSTP status.
- Use the **Rapid Spanning Tree Protocol** screen (Section 13.5 on page 186) to configure RSTP settings.
- Use the **Multiple Spanning Tree Protocol** screen (Section 13.6 on page 188) to configure MSTP.
- Use the **Multiple Spanning Tree Protocol Status** screen (Section 13.7 on page 194) to view the MSTP status.
- Use the **Multiple Rapid Spanning Tree Protocol** screen (Section 13.8 on page 198) to configure MRSTP.
- Use the **Multiple Rapid Spanning Tree Protocol Status** screen (Section 13.9 on page 200) to view the MRSTP status.

### 13.1.2 What You Need to Know

Read on for concepts on STP that can help you configure the screens in this chapter.

#### (Rapid) Spanning Tree Protocol

(R)STP detects and breaks network loops and provides backup links between switches, bridges or routers. It allows a switch to interact with other (R)STP-compliant switches in your network to ensure that only one path exists between any two stations on the network.

The Switch uses IEEE 802.1w RSTP (Rapid Spanning Tree Protocol) that allows faster convergence of the

spanning tree than STP (while also being backwards compatible with STP-only aware bridges). In RSTP, topology change information is directly propagated throughout the network from the device that generates the topology change. In STP, a longer delay is required as the device that causes a topology change first notifies the root bridge that then notifies the network. Both RSTP and STP flush unwanted learned addresses from the filtering database. In RSTP, the port states are Discarding, Learning, and Forwarding.

Note: In this user's guide, "STP" refers to both STP and RSTP.

## STP Terminology

The root bridge is the base of the spanning tree.

Path cost is the cost of transmitting a frame onto a LAN through that port. The recommended cost is assigned according to the speed of the link to which a port is attached. The slower the media, the higher the cost.

Table 69 STP Path Costs

| | LINK SPEED | RECOMMENDED VALUE | RECOMMENDED RANGE | ALLOWED RANGE |
|---|---|---|---|---|
| Path Cost | 4 Mbps | 250 | 100 to 1000 | 1 to 65535 |
| Path Cost | 10 Mbps | 100 | 50 to 600 | 1 to 65535 |
| Path Cost | 16 Mbps | 62 | 40 to 400 | 1 to 65535 |
| Path Cost | 100 Mbps | 19 | 10 to 60 | 1 to 65535 |
| Path Cost | 1 Gbps | 4 | 3 to 10 | 1 to 65535 |
| Path Cost | 10 Gbps | 2 | 1 to 5 | 1 to 65535 |

On each bridge, the root port is the port through which this bridge communicates with the root. It is the port on this switch with the lowest path cost to the root (the root path cost). If there is no root port, then this switch has been accepted as the root bridge of the spanning tree network.

For each LAN segment, a designated bridge is selected. This bridge has the lowest cost to the root among the bridges connected to the LAN.

## How STP Works

After a bridge determines the lowest cost-spanning tree with STP, it enables the root port and the ports that are the designated ports for connected LANs, and disables all other ports that participate in STP. Network packets are therefore only forwarded between enabled ports, eliminating any possible network loops.

STP-aware switches exchange Bridge Protocol Data Units (BPDUs) periodically. When the bridged LAN topology changes, a new spanning tree is constructed.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the root bridge. If a bridge does not get a Hello BPDU after a predefined interval (Max Age), the bridge assumes that the link to the root bridge is down. This bridge then initiates negotiations with other bridges to reconfigure the network to re-establish a valid network topology.

## STP Port States

STP assigns five port states to eliminate packet looping. A bridge port is not allowed to go directly from

blocking state to forwarding state so as to eliminate transient loops.

Table 70 STP Port States

| PORT STATE | DESCRIPTION |
|---|---|
| Disabled | STP is disabled (default). |
| Blocking | Only configuration and management BPDUs are received and processed. |
| Listening | All BPDUs are received and processed.<br><br>Note: The listening state does NOT exist in RSTP. |
| Learning | All BPDUs are received and processed. Information frames are submitted to the learning process but not forwarded. |
| Forwarding | All BPDUs are received and processed. All information frames are received and forwarded. |

## Multiple RSTP

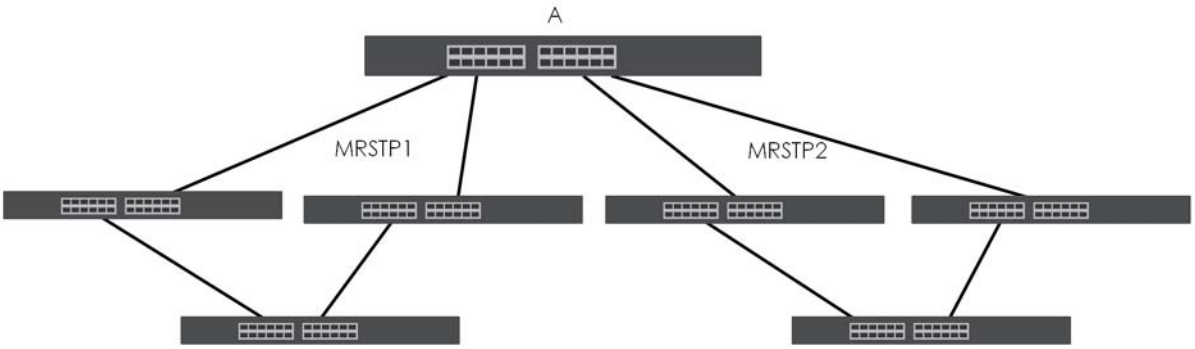
MRSTP (Multiple RSTP) is Zyxel's proprietary feature that is compatible with RSTP and STP. With MRSTP, you can have more than one spanning tree on your Switch and assign ports to each tree. Each spanning tree operates independently with its own bridge information.

In the following example, there are two RSTP instances (**MRSTP 1** and **MRSTP2**) on switch **A**.

To set up MRSTP, activate MRSTP on the Switch and specify which ports belong to which spanning tree.

Note: Each port can belong to one STP tree only.

**Figure 138** MRSTP Network Example




## Multiple STP

Multiple Spanning Tree Protocol (IEEE 802.1s) is backward compatible with STP/RSTP and addresses the limitations of existing spanning tree protocols (STP and RSTP) in networks to include the following features:

- One Common and Internal Spanning Tree (CIST) that represents the entire network's connectivity.
- Grouping of multiple bridges (or switching devices) into regions that appear as one single bridge on the network.
- A VLAN can be mapped to a specific Multiple Spanning Tree Instance (MSTI). MSTI allows multiple VLANs to use the same spanning tree.
- Load-balancing is possible as traffic from different VLANs can use distinct paths in a region.

# 13.2 Spanning Tree Protocol Status

The Spanning Tree Protocol status screen changes depending on what standard you choose to implement on your network. Click **Advanced Application** > **Spanning Tree Protocol** to see the screen as shown.

**Figure 139** Advanced Application > Spanning Tree Protocol (Standalone Mode)

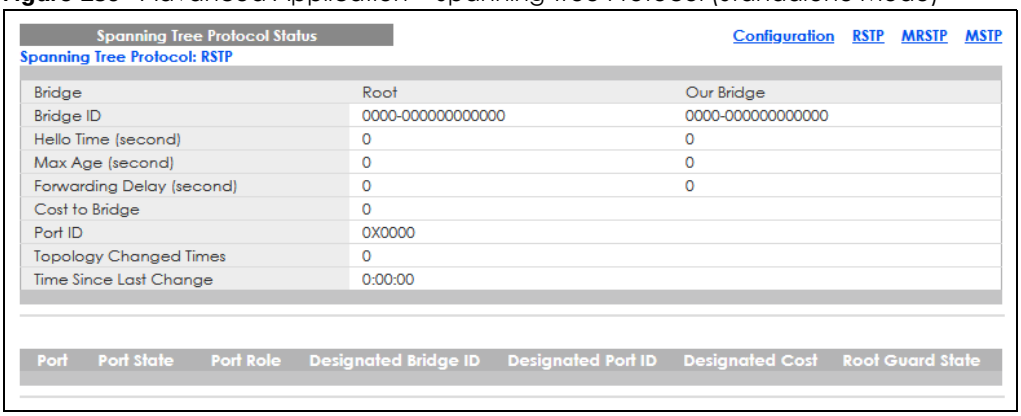
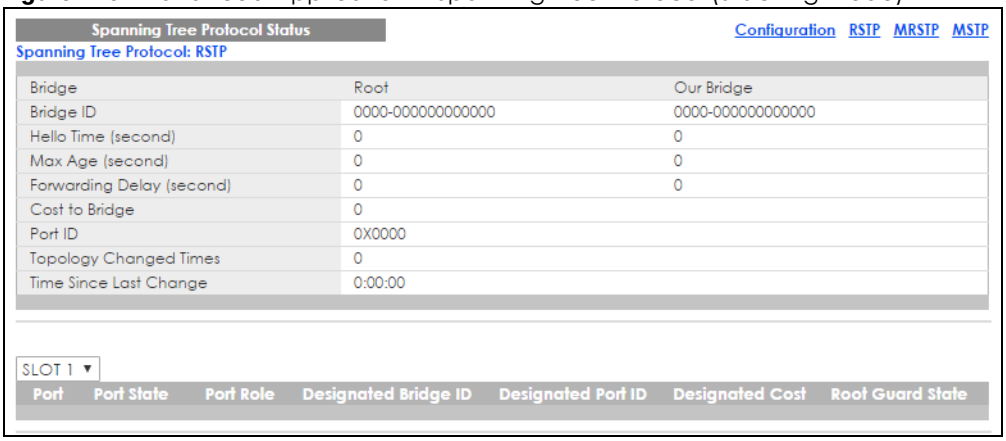


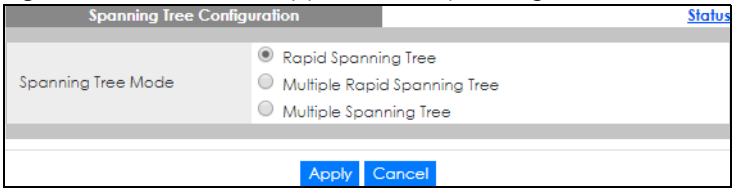

**Figure 140** Advanced Application > Spanning Tree Protocol (Stacking Mode)




# 13.3 Spanning Tree Configuration

Use the **Spanning Tree Configuration** screen to activate one of the STP modes on the Switch. Click **Configuration** in the **Advanced Application** > **Spanning Tree Protocol**.

**Figure 141** Advanced Application > Spanning Tree Protocol > Configuration



The following table describes the labels in this screen.

Table 71 Advanced Application > Spanning Tree Protocol > Configuration

| LABEL | DESCRIPTION |
|---|---|
| Spanning Tree Mode | You can activate one of the STP modes on the Switch.<br>Select **Rapid Spanning Tree**, **Multiple Rapid Spanning Tree** or **Multiple Spanning Tree**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 13.4 Rapid Spanning Tree Protocol Status

The Spanning Tree Protocol status screen changes depending on what standard you choose to implement on your network. Click **Advanced Application** > **Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See Section 13.1 on page 180 for more information on RSTP.

Note: This screen is only available after you activate RSTP on the Switch.

**Figure 142** Advanced Application > Spanning Tree Protocol (Standalone Mode)

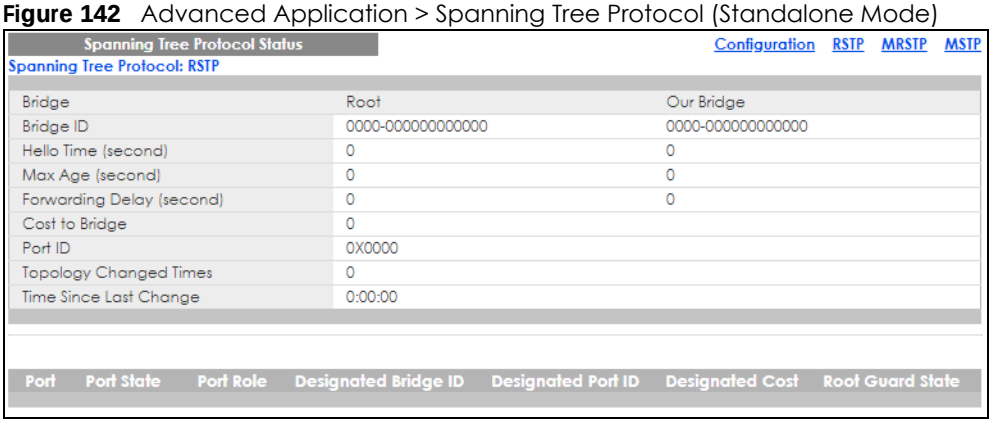
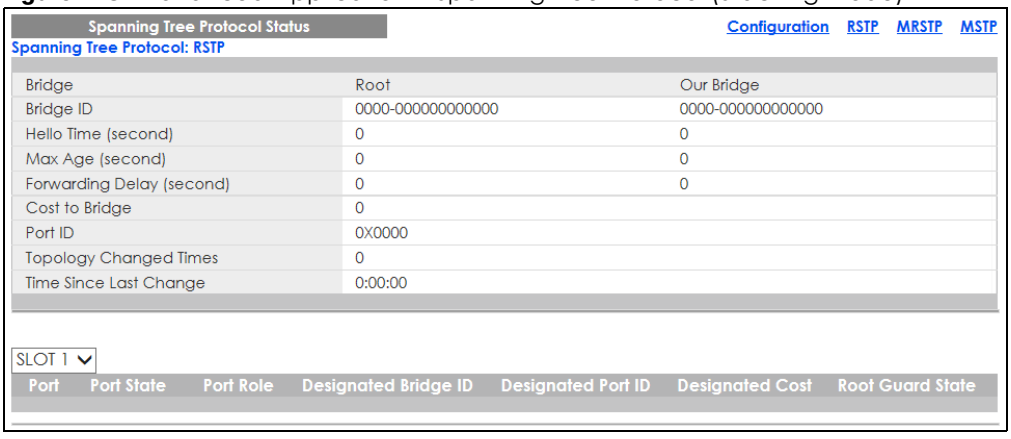



**Figure 143** Advanced Application > Spanning Tree Protocol (Stacking Mode)



The following table describes the labels in this screen.

Table 72 Advanced Application > Spanning Tree Protocol

| LABEL | DESCRIPTION |
|---|---|
| Configuration | Click **Configuration** to specify which STP mode you want to activate. Click **RSTP** to edit RSTP settings on the Switch. |
| Bridge | **Root** refers to the base of the spanning tree (the root bridge). **Our Bridge** is this Switch. This Switch may also be the root bridge. |
| Bridge ID | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for **Root** and **Our Bridge** if the Switch is the root switch. |
| Hello Time (second) | This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines **Hello Time**, **Max Age** and **Forwarding Delay**. |
| Max Age (second) | This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding).<br><br>Note: The listening state does NOT exist in RSTP. |
| Cost to Bridge | This is the path cost from the root port on this Switch to the root switch. |
| Port ID | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree. |
| Topology Changed Times | This is the number of times the spanning tree has been reconfigured. |
| Time Since Last Change | This is the time since the spanning tree was last reconfigured. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. |
| Port State | This field displays the port state in STP.<br><br>• **Discarding** – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs.<br>• **Learning** – The port learns MAC addresses and processes BPDUs, but does NOT forward frames yet.<br>• **Forwarding** – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames. |
| Port Role | This field displays the role of the port in STP.<br><br>• **Root** – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does NOT have a root port.<br>• **Designated** – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.<br>• **Alternate** – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.<br>• **Backup** – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.<br>• **Disabled** – Not strictly part of STP. The port can be disabled manually. |
| Designated Bridge ID | This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected. |
| Designated Port ID | This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages. |

Table 72 Advanced Application > Spanning Tree Protocol (continued)

| LABEL | DESCRIPTION |
|---|---|
| Designated Cost | This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected. |
| Root Guard State | This field displays the state of the port on which root guard is enabled.<br>• **Root-inconsistent** – the Switch receives superior BPDUs on the port and blocks the port.<br>• **Forwarding** – the Switch unblocks and allows the port to forward frames again. |

# 13.5 Configure Rapid Spanning Tree Protocol

Use this screen to configure RSTP settings, see Section 13.1 on page 180 for more information on RSTP. Click **RSTP** in the **Advanced Application** > **Spanning Tree Protocol** screen.

**Figure 144** Advanced Application > Spanning Tree Protocol > RSTP (Standalone Mode)

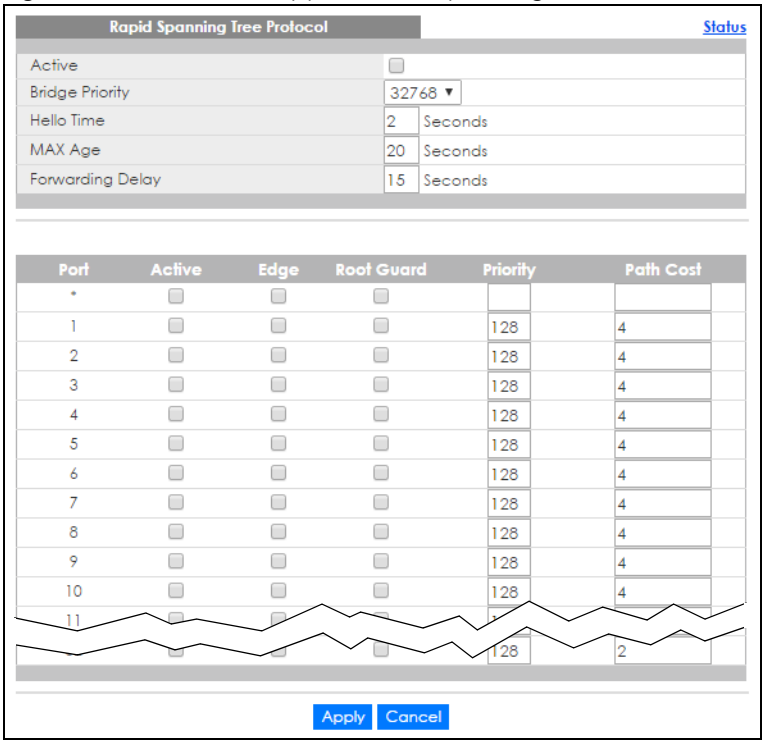
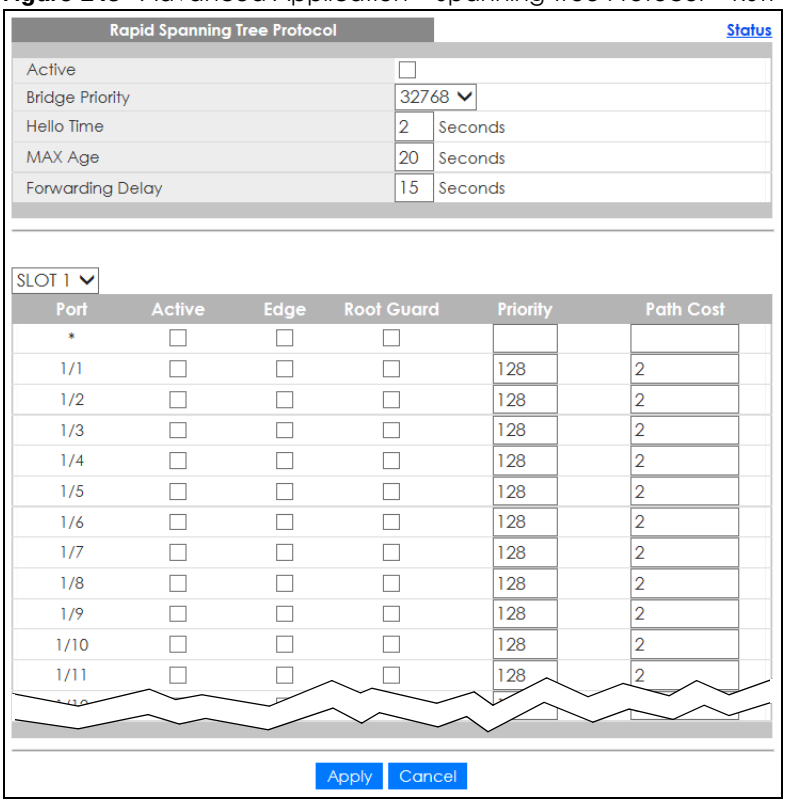


**Figure 145** Advanced Application > Spanning Tree Protocol > RSTP (Stacking Mode)




The following table describes the labels in this screen.

Table 73 Advanced Application > Spanning Tree Protocol > RSTP

| LABEL | DESCRIPTION |
|---|---|
| Status | Click **Status** to display the **RSTP Status** screen. |
| Bridge Priority | Bridge priority is used in determining the root switch, root port and designated port. The Switch with the highest priority (lowest numeric value) becomes the STP root switch. If all Switches have the same priority, the Switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box.<br><br>The lower the numeric value you assign, the higher the priority for this bridge.<br><br>Bridge Priority determines the root bridge, which in turn determines Hello Time, Max Age and Forwarding Delay. |
| Hello Time | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds. |
| Max Age | This is the maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. All Switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds. |

Table 73 Advanced Application > Spanning Tree Protocol > RSTP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Forwarding Delay | This is the maximum time (in seconds) the Switch will wait before changing states. This delay is required because every Switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds.<br>As a general rule:<br>2 * (Forward Delay – 1) >= Max Age >= 2 * (Hello Time + 1) |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to activate RSTP on this port. |
| Edge | Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.<br>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU). |
| Root Guard | Select this check box to enable root guard on this port in order to prevent the switches attached to the port from becoming the root bridge.<br>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs. |
| Priority | Configure the priority for each port here.<br>Priority decides which port should be disabled when more than one port forms a loop in a switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128. |
| Path Cost | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 13.6 Configure Multiple Spanning Tree Protocol

To configure MSTP, click **MSTP** in the **Advanced Application** > **Spanning Tree Protocol** screen.

**Figure 146** Advanced Application > Spanning Tree Protocol > MSTP (Standalone Mode)

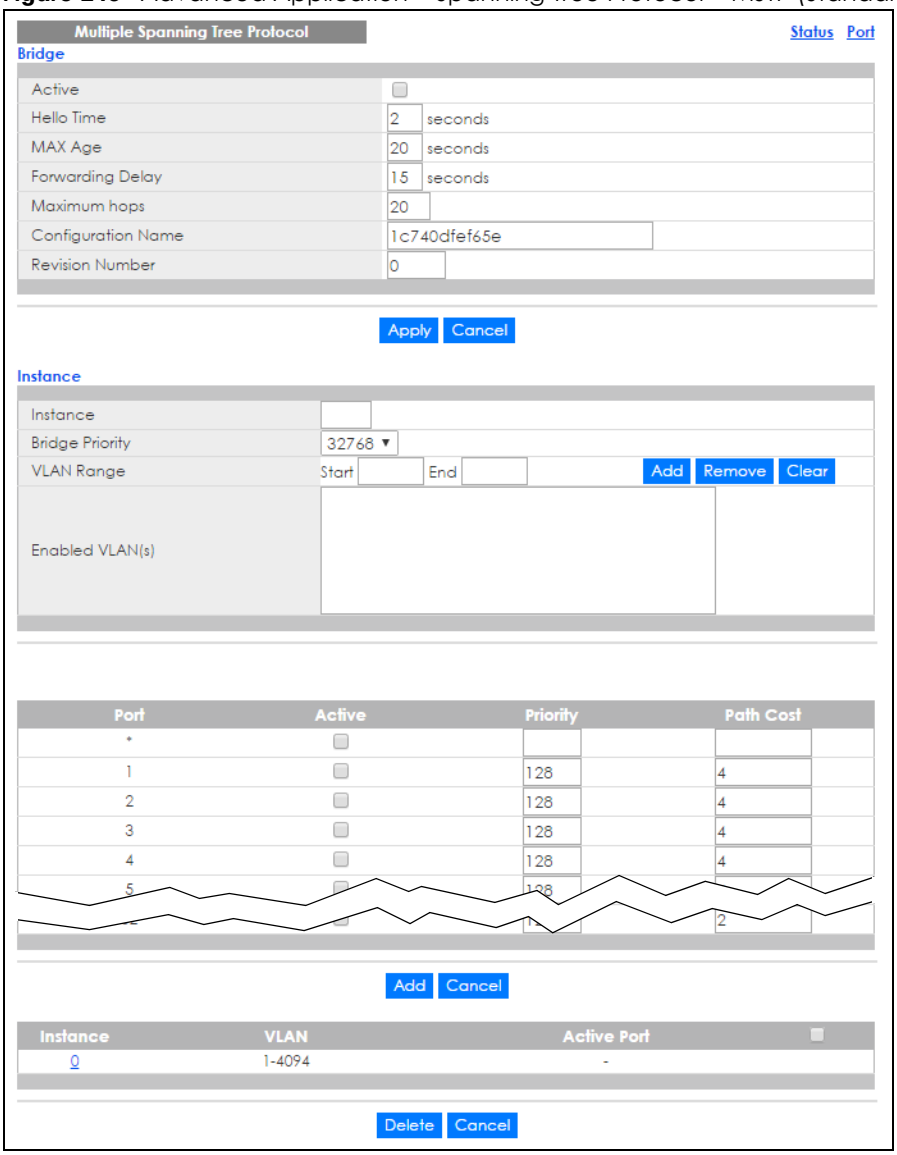
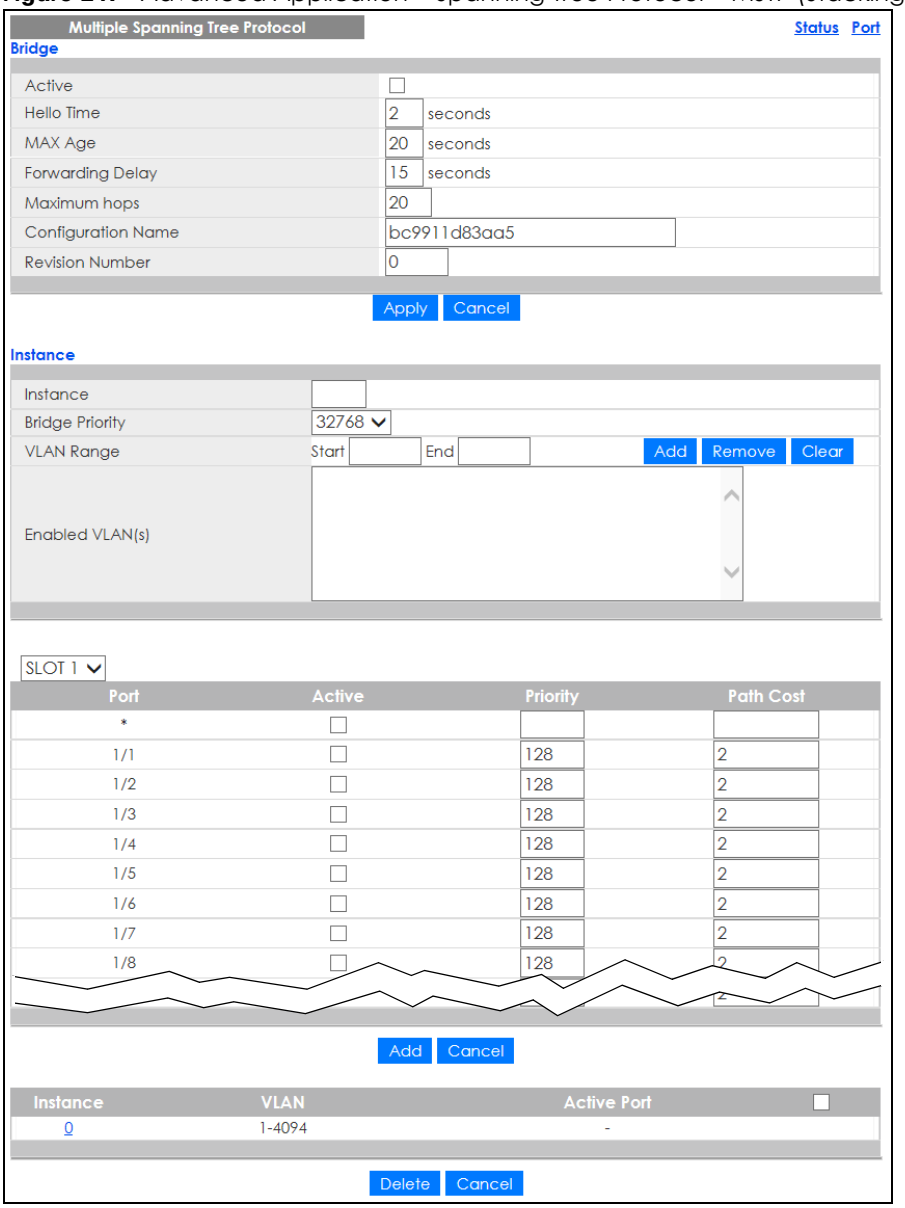


**Figure 147** Advanced Application > Spanning Tree Protocol > MSTP (Stacking Mode)




The following table describes the labels in this screen.

Table 74 Advanced Application > Spanning Tree Protocol > MSTP

| LABEL | DESCRIPTION |
|---|---|
| Status | Click **Status** to display the **MSTP Status** screen. |
| Port | Click **Port** to display the **MSTP Port** screen. |
| Active | Select this check box to activate MSTP on the Switch. Clear this check box to disable MSTP on the Switch.<br><br>Note: You must also activate **Multiple Spanning Tree** in the **Advanced Application** > **Spanning Tree Protocol** > **Configuration** screen to enable MSTP on the Switch. |
| Hello Time | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds. |

Table 74 Advanced Application > Spanning Tree Protocol > MSTP (continued)

| LABEL | DESCRIPTION |
|---|---|
| MaxAge | This is the maximum time (in seconds) a switch can wait without receiving a BPDU before attempting to reconfigure. All switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds. |
| Forwarding Delay | This is the maximum time (in seconds) a switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds. As a general rule:<br><br>Note: 2 * (Forward Delay – 1) >= Max Age >= 2 * (Hello Time + 1) |
| Maximum hops | Enter the number of hops (between 1 and 255) in an MSTP region before the BPDU is discarded and the port information is aged. |
| Configuration Name | Enter a descriptive name (up to 32 characters) of an MST region. |
| Revision Number | Enter a number to identify a region's configuration. Devices must have the same revision number to belong to the same region. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Instance | Use this section to configure MSTI (Multiple Spanning Tree Instance) settings. |
| Instance | Enter the number you want to use to identify this MST instance on the Switch. The Switch supports instance numbers 0 – 15. |
| Bridge Priority | Set the priority of the Switch for the specific spanning tree instance. The lower the number, the more likely the Switch will be chosen as the root bridge within the spanning tree instance.<br><br>Enter priority values between 0 and 61440 in increments of 4096 (thus valid values are 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344 and 61440). |
| VLAN Range | Enter the start of the VLAN ID range that you want to add or remove from the VLAN range edit area in the **Start** field. Enter the end of the VLAN ID range that you want to add or remove from the VLAN range edit area in the **End** field.<br><br>Next click:<br><br>• **Add** – to add this range of VLANs to be mapped to the MST instance.<br>• **Remove** – to remove this range of VLANs from being mapped to the MST instance.<br>• **Clear** – to remove all VLANs from being mapped to this MST instance. |
| Enabled VLAN(s) | This field displays which VLANs are mapped to this MST instance. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to add this port to the MST instance. |

Table 74 Advanced Application > Spanning Tree Protocol > MSTP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Priority | Configure the priority for each port here.<br>Priority decides which port should be disabled when more than one port forms a loop in the Switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128. |
| Path Cost | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses this change if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Instance | This field displays the ID of an MST instance. |
| VLAN | This field displays the VID (or VID ranges) to which the MST instance is mapped. |
| Active Port | This field display the ports configured to participate in the MST instance. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

## 13.6.1 Multiple Spanning Tree Protocol Port Configuration

Click **Advanced Application** > **Spanning Tree Protocol** > **MSTP** > **Port** in the navigation panel to display the status screen as shown next.

**Figure 148** Advanced Application > Spanning Tree Protocol > MSTP > Port (Standalone Mode)

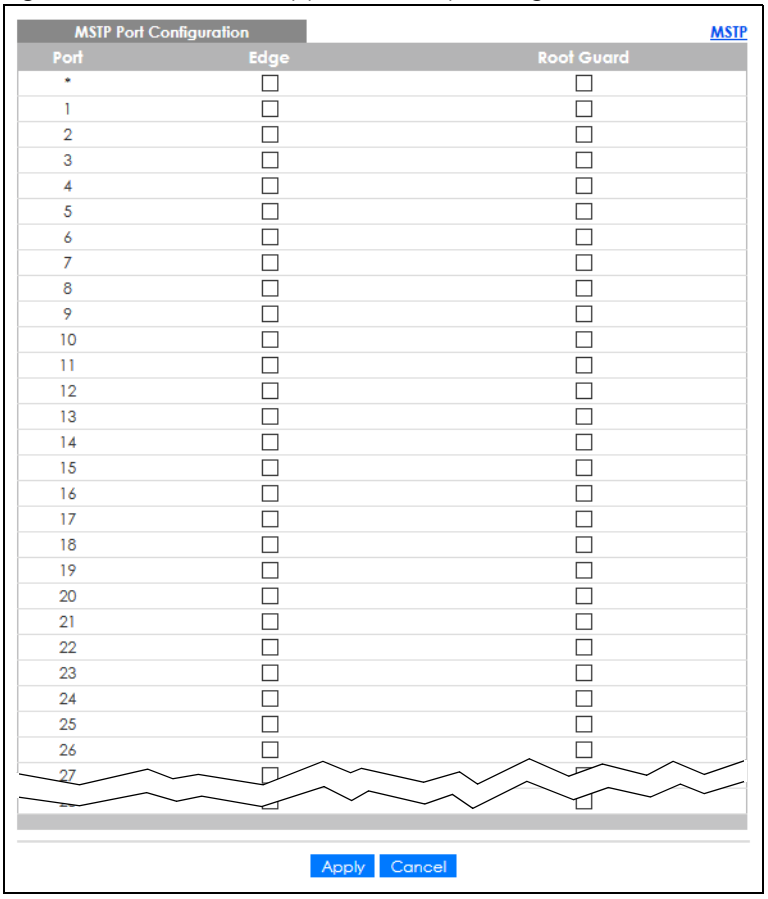
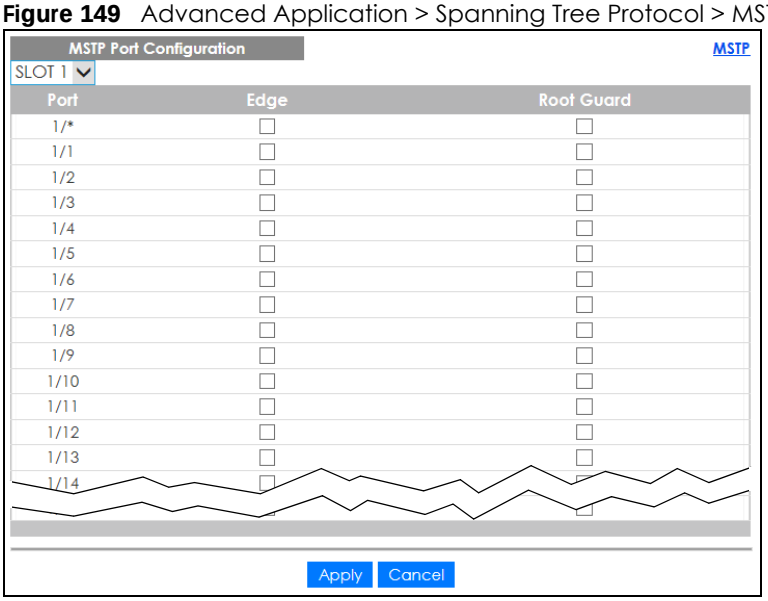



**Figure 149** Advanced Application > Spanning Tree Protocol > MSTP > Port (Stacking Mode)



The following table describes the labels in this screen.

Table 75 Advanced Application > Spanning Tree Protocol > MSTP > Port

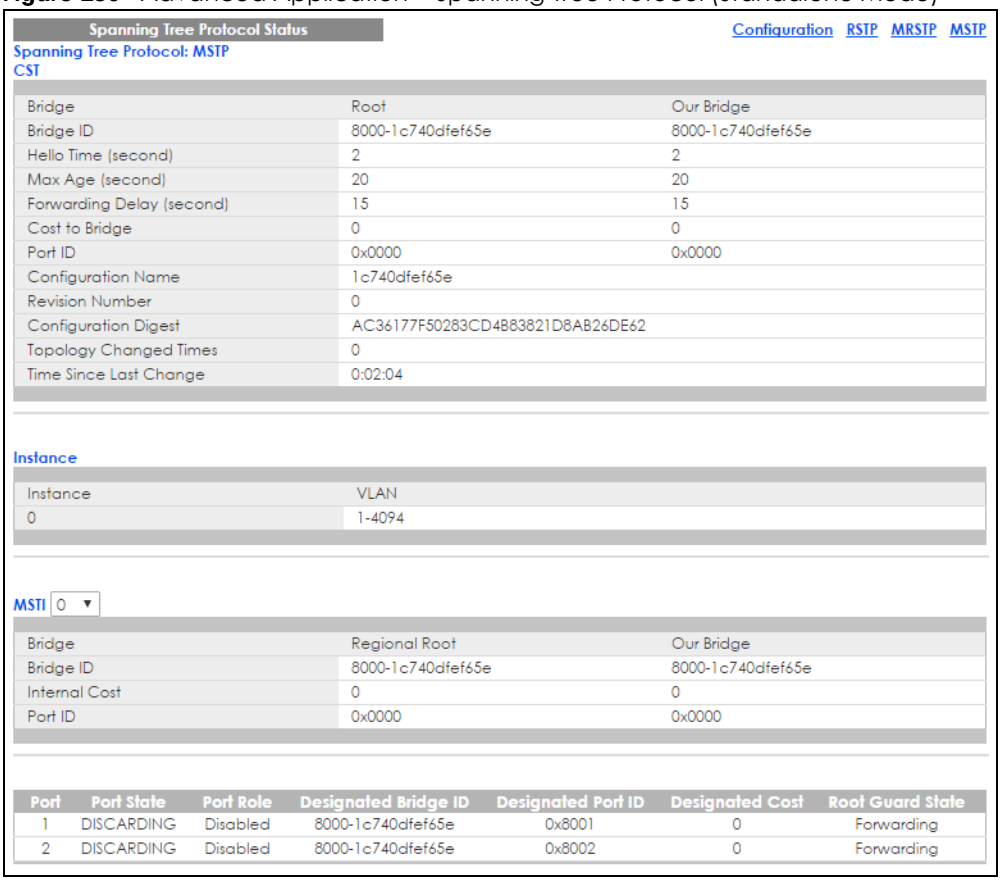
| LABEL | DESCRIPTION |
|---|---|
| MSTP | Click **MSTP** to edit MSTP settings on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Edge | Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.<br>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU). |
| Root Guard | Select this check box to enable root guard on this port in order to prevent the switches attached to the port from becoming the root bridge.<br>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 13.7 Multiple Spanning Tree Protocol Status

Click **Advanced Application** > **Spanning Tree Protocol** in the navigation panel to display the status screen as shown next.

Note: This screen is only available after you activate MSTP on the Switch.

**Figure 150** Advanced Application > Spanning Tree Protocol (Standalone Mode)



Spanning Tree Protocol Status

Configuration RSTP MRSTP MSTP

Spanning Tree Protocol: MSTP

CST

| Bridge | Root | Our Bridge |
|---|---|---|
| Bridge ID | 8000-1c740dfef65e | 8000-1c740dfef65e |
| Hello Time (second) | 2 | 2 |
| Max Age (second) | 20 | 20 |
| Forwarding Delay (second) | 15 | 15 |
| Cost to Bridge | 0 | 0 |
| Port ID | 0x0000 | 0x0000 |
| Configuration Name | 1c740dfef65e | |
| Revision Number | 0 | |
| Configuration Digest | AC36177F50283CD4B83821D8AB26DE62 | |
| Topology Changed Times | 0 | |
| Time Since Last Change | 0:02:04 | |

Instance

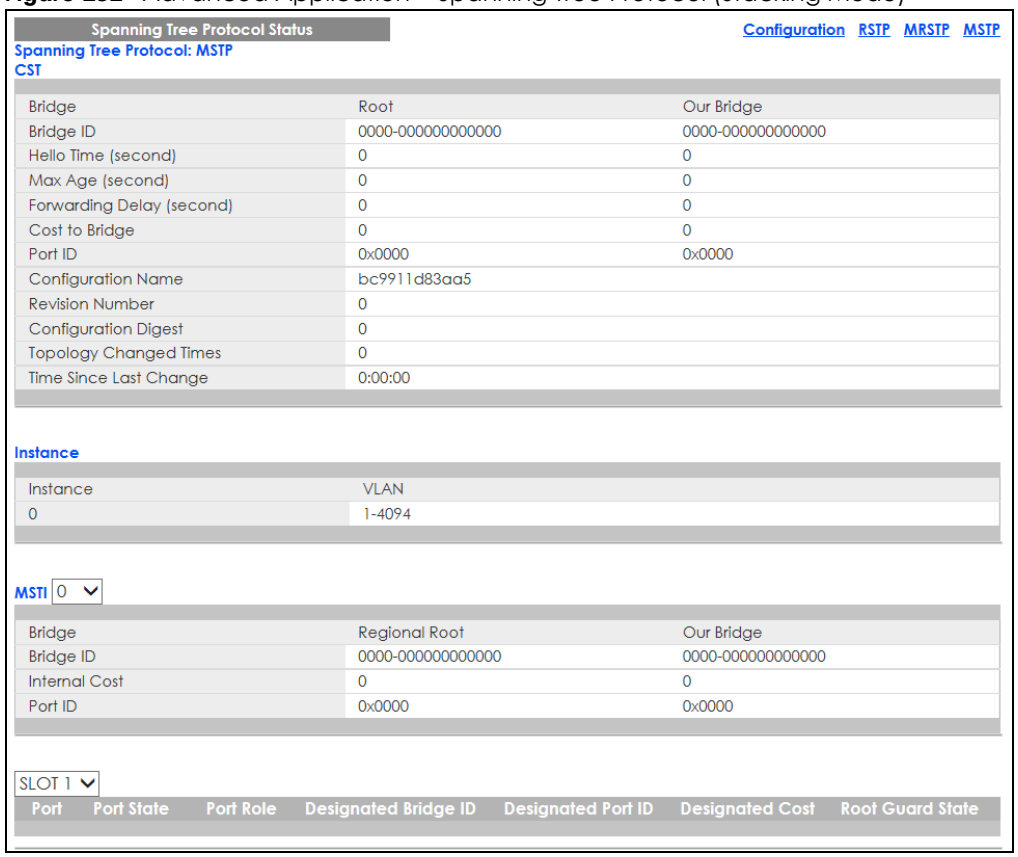
| Instance | VLAN |
|---|---|
| 0 | 1-4094 |

MSTI 0

| Bridge | Regional Root | Our Bridge |
|---|---|---|
| Bridge ID | 8000-1c740dfef65e | 8000-1c740dfef65e |
| Internal Cost | 0 | 0 |
| Port ID | 0x0000 | 0x0000 |

| Port | Port State | Port Role | Designated Bridge ID | Designated Port ID | Designated Cost | Root Guard State |
|---|---|---|---|---|---|---|
| 1 | DISCARDING | Disabled | 8000-1c740dfef65e | 0x8001 | 0 | Forwarding |
| 2 | DISCARDING | Disabled | 8000-1c740dfef65e | 0x8002 | 0 | Forwarding |

**Figure 151** Advanced Application > Spanning Tree Protocol (Stacking Mode)




The following table describes the labels in this screen.

Table 76 Advanced Application > Spanning Tree Protocol

| LABEL | DESCRIPTION |
|---|---|
| Configuration | Click **Configuration** to specify which STP mode you want to activate. Click **MSTP** to edit MSTP settings on the Switch. |
| CST | This section describes the Common Spanning Tree settings. |
| Bridge | **Root** refers to the base of the spanning tree (the root bridge). **Our Bridge** is this switch. This Switch may also be the root bridge. |
| Bridge ID | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for **Root** and **Our Bridge** if the Switch is the root switch. |
| Hello Time (second) | This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines **Hello Time**, **Max Age** and **Forwarding Delay**. |
| Max Age (second) | This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). |
| Cost to Bridge | This is the path cost from the root port on this Switch to the root switch. |
| Port ID | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree. |
| Configuration Name | This field displays the configuration name for this MST region. |
| Revision Number | This field displays the revision number for this MST region. |

Table 76 Advanced Application > Spanning Tree Protocol (continued)

| LABEL | DESCRIPTION |
|---|---|
| Configuration Digest | A configuration digest is generated from the VLAN-MSTI mapping information.<br>This field displays the 16-octet signature that is included in an MSTP BPDU. This field displays the digest when MSTP is activated on the system. |
| Topology Changed Times | This is the number of times the spanning tree has been reconfigured. |
| Time Since Last Change | This is the time since the spanning tree was last reconfigured. |
| Instance | These fields display the MSTI to VLAN mapping. In other words, which VLANs run on each spanning tree instance. |
| Instance | This field displays the MSTI ID. |
| VLAN | This field displays which VLANs are mapped to an MSTI. |
| MSTI | Select the MST instance settings you want to view. |
| Bridge | **Root** refers to the base of the MST instance. **Our Bridge** is this switch. This Switch may also be the root bridge. |
| Bridge ID | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for **Root** and **Our Bridge** if the Switch is the root switch. |
| Internal Cost | This is the path cost from the root port in this MST instance to the regional root switch. |
| Port ID | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the MST instance. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. |
| Port State | This field displays the port state in STP.<br>• **Discarding** – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs.<br>• **Learning** – The port learns MAC addresses and processes BPDUs, but does not forward frames yet.<br>• **Forwarding** – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames. |
| Port Role | This field displays the role of the port in STP.<br>• **Root** – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port.<br>• **Designated** – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.<br>• **Alternate** – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.<br>• **Backup** – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.<br>• **Disabled** – Not strictly part of STP. The port can be disabled manually. |
| Designated Bridge ID | This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected. |
| Designated Port ID | This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages. |

Table 76 Advanced Application > Spanning Tree Protocol (continued)

| LABEL | DESCRIPTION |
|---|---|
| Designated Cost | This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected. |
| Root Guard State | This field displays the state of the port on which root guard is enabled.<br>• **Root-inconsistent** – the Switch receives superior BPDUs on the port and blocks the port.<br>• **Forwarding** – the Switch unblocks and allows the port to forward frames again. |

# 13.8 Configure Multiple Rapid Spanning Tree Protocol

To configure MRSTP, click **MRSTP** in the **Advanced Application** > **Spanning Tree Protocol** screen.

**Figure 152** Advanced Application > Spanning Tree Protocol > MRSTP (Standalone Mode)

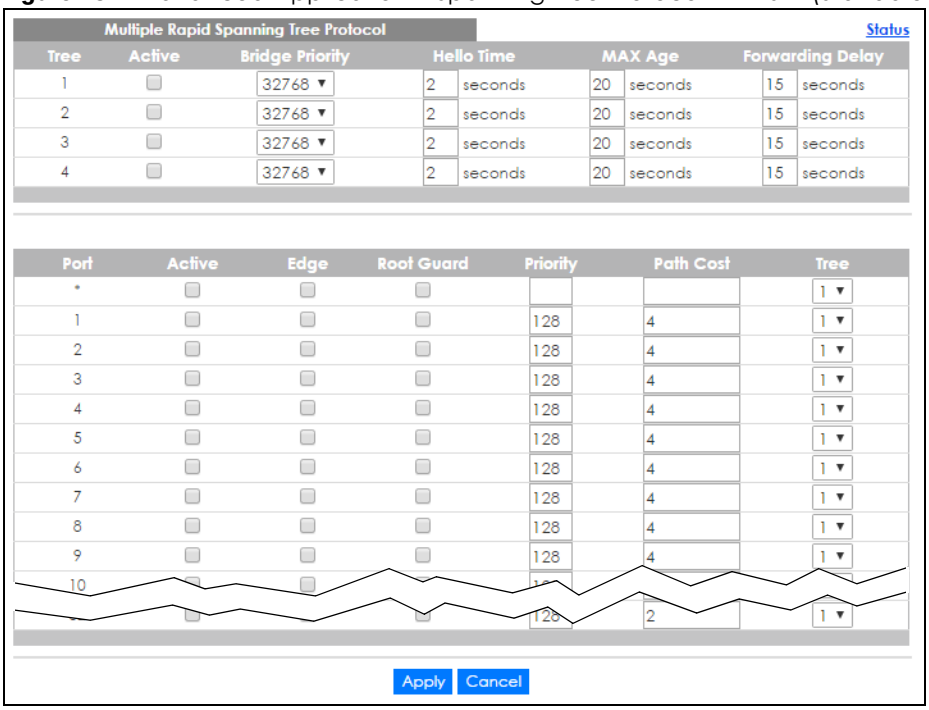
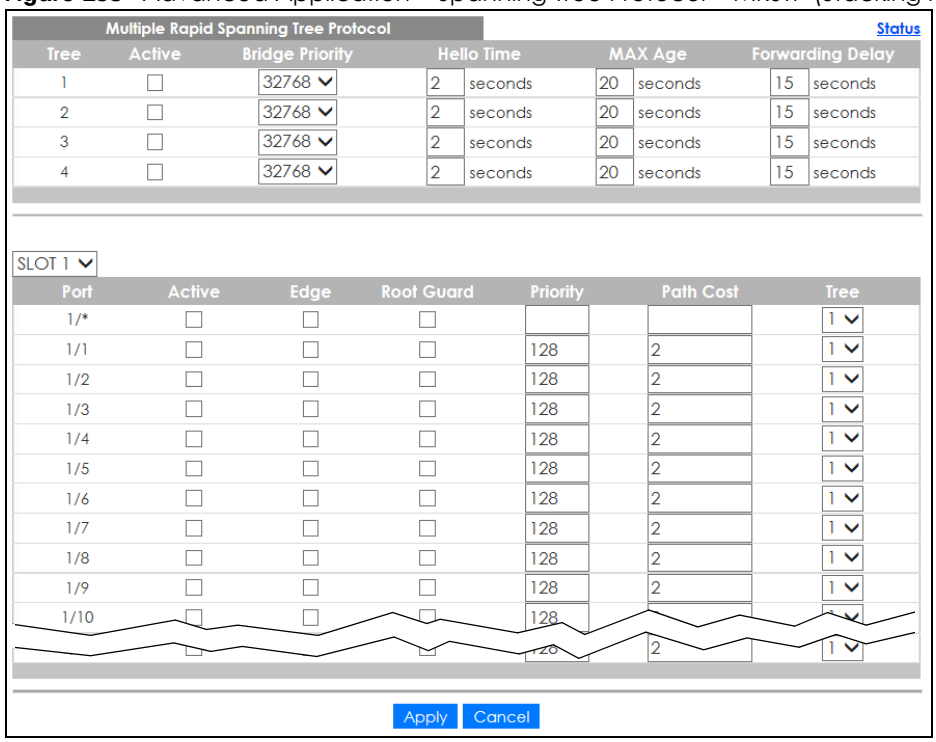


**Figure 153** Advanced Application > Spanning Tree Protocol > MRSTP (Stacking Mode)




The following table describes the labels in this screen.

Table 77 Advanced Application > Spanning Tree Protocol > MRSTP

| LABEL | DESCRIPTION |
|---|---|
| Status | Click **Status** to display the **MRSTP Status** screen. |
| Tree | This is a read only index number of the STP trees. |
| Active | Select this check box to activate an STP tree. Clear this check box to disable an STP tree.<br><br>Note: You must also activate **Multiple Rapid Spanning Tree** in the **Advanced Application** > **Spanning Tree Protocol** > **Configuration** screen to enable MRSTP on the Switch. |
| Bridge Priority | Bridge priority is used in determining the root switch, root port and designated port. The switch with the highest priority (lowest numeric value) becomes the STP root switch. If all switches have the same priority, the switch with the lowest MAC address will then become the root switch. Select a value from the drop-down list box.<br><br>The lower the numeric value you assign, the higher the priority for this bridge.<br><br>Bridge Priority determines the root bridge, which in turn determines **Hello Time**, **Max Age** and **Forwarding Delay**. |
| Hello Time | This is the time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. The allowed range is 1 to 10 seconds. |
| Max Age | This is the maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. All Switch ports (except for designated ports) should receive BPDUs at regular intervals. Any port that ages out STP information (provided in the last BPDU) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the Switch ports attached to the network. The allowed range is 6 to 40 seconds. |

Table 77 Advanced Application > Spanning Tree Protocol > MRSTP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Forwarding Delay | This is the maximum time (in seconds) the Switch will wait before changing states. This delay is required because every switch must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a blocking state; otherwise, temporary data loops might result. The allowed range is 4 to 30 seconds.<br>As a general rule:<br>2 * (Forward Delay – 1) >= Max Age >= 2 * (Hello Time + 1) |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to activate STP on this port. |
| Edge | Select this check box to configure a port as an edge port when it is directly attached to a computer. An edge port changes its initial STP port state from blocking state to forwarding state immediately without going through listening and learning states right after the port is configured as an edge port or when its link status changes.<br>Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Unit (BPDU). |
| Root Guard | Select this check box to enable root guard on this port in order to prevent the switch(es) attached to the port from becoming the root bridge.<br>With root guard enabled, a port is blocked when the Switch receives a superior BPDU on it. The Switch allows traffic to pass through this port again when the switch connected to the port stops to send superior BPDUs. |
| Priority | Configure the priority for each port here.<br>Priority decides which port should be disabled when more than one port forms a loop in a switch. Ports with a higher priority numeric value are disabled first. The allowed range is between 0 and 255 and the default value is 128. |
| Path Cost | Path cost is the cost of transmitting a frame on to a LAN through that port. It is recommended to assign this value according to the speed of the bridge. The slower the media, the higher the cost. |
| Tree | Select which STP tree configuration this port should participate in. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 13.9 Multiple Rapid Spanning Tree Protocol Status

Click **Advanced Application** > **Spanning Tree Protocol** in the navigation panel to display the status screen as shown next. See Section 13.9 on page 200 for more information on MRSTP.

Note: This screen is only available after you activate MRSTP on the Switch.

**Figure 154** Advanced Application > Spanning Tree Protocol (Standalone Mode)

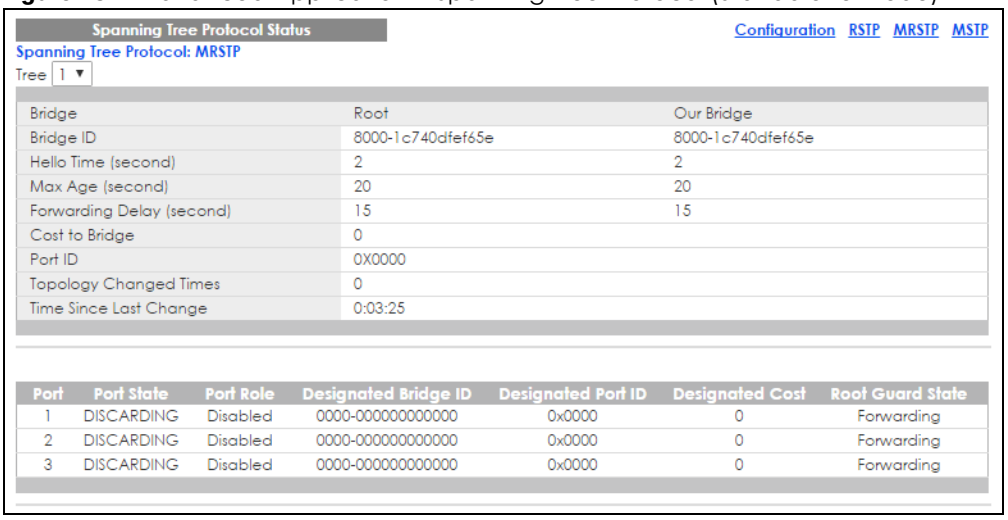
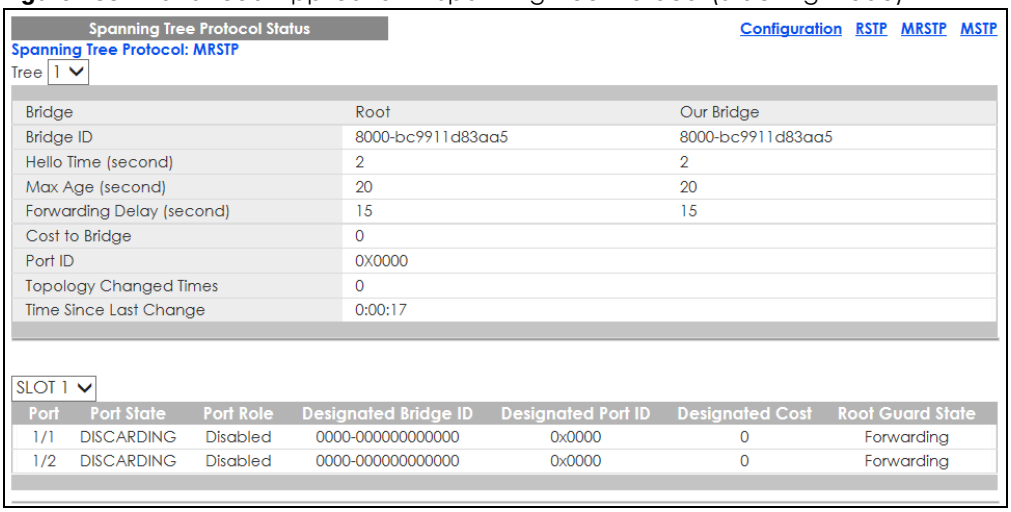



**Figure 155** Advanced Application > Spanning Tree Protocol (Stacking Mode)




The following table describes the labels in this screen.

Table 78 Advanced Application > Spanning Tree Protocol

| LABEL | DESCRIPTION |
|---|---|
| Configuration | Click **Configuration** to specify which STP mode you want to activate. Click **MRSTP** to edit MRSTP settings on the Switch. |
| Tree | Select which STP tree configuration you want to view. |
| Bridge | **Root** refers to the base of the spanning tree (the root bridge). **Our Bridge** is this switch. This Switch may also be the root bridge. |
| Bridge ID | This is the unique identifier for this bridge, consisting of bridge priority plus MAC address. This ID is the same for **Root** and **Our Bridge** if the Switch is the root switch. |
| Hello Time (second) | This is the time interval (in seconds) at which the root switch transmits a configuration message. The root bridge determines **Hello Time**, **Max Age** and **Forwarding Delay**. |
| Max Age (second) | This is the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |

Table 78 Advanced Application > Spanning Tree Protocol (continued)

| LABEL | DESCRIPTION |
|---|---|
| Forwarding Delay (second) | This is the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding).<br><br>Note: The listening state does not exist in RSTP. |
| Cost to Bridge | This is the path cost from the root port on this Switch to the root switch. |
| Port ID | This is the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree. |
| Topology Changed Times | This is the number of times the spanning tree has been reconfigured. |
| Time Since Last Change | This is the time since the spanning tree was last reconfigured. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the number of the port on the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. |
| Port State | This field displays the port state in STP.<br><br>• **Discarding** – The port does not forward or process received frames or learn MAC addresses, but still listens for BPDUs.<br>• **Learning** – The port learns MAC addresses and processes BPDUs, but does not forward frames yet.<br>• **Forwarding** – The port is operating normally. It learns MAC addresses, processes BPDUs and forwards received frames. |
| Port Role | This field displays the role of the port in STP.<br><br>• **Root** – A forwarding port on a non-root bridge, which has the lowest path cost and is the best port from the non-root bridge to the root bridge. A root bridge does not have a root port.<br>• **Designated** – A forwarding port on the designated bridge for each connected LAN segment. A designated bridge has the lowest path cost to the root bridge among the bridges connected to the LAN segment. All the ports on a root bridge (root switch) are designated ports.<br>• **Alternate** – A blocked port, which has a best alternate path to the root bridge. This path is different from using the root port. The port moves to the forwarding state when the designated port for the LAN segment fails.<br>• **Backup** – A blocked port, which has a backup or redundant path to a LAN segment where a designated port is already connected when a switch has two links to the same LAN segment.<br>• **Disabled** – Not strictly part of STP. The port can be disabled manually. |
| Designated Bridge ID | This field displays the identifier of the designated bridge to which this port belongs when the port is a designated port. Otherwise, it displays the identifier of the designated bridge for the LAN segment to which this port is connected. |
| Designated Port ID | This field displays the priority and number of the bridge port (on the designated bridge), through which the designated bridge transmits the stored configuration messages. |
| Designated Cost | This field displays the path cost to the LAN segment to which the port is connected when the port is a designated port. Otherwise, it displays the path cost to the root bridge from the designated port for the LAN segment to which this port is connected. |
| Root Guard State | This field displays the state of the port on which root guard is enabled.<br><br>• **Root** – inconsistent – the Switch receives superior BPDUs on the port and blocks the port.<br>• **Forwarding** – the Switch unblocks and allows the port to forward frames again. |

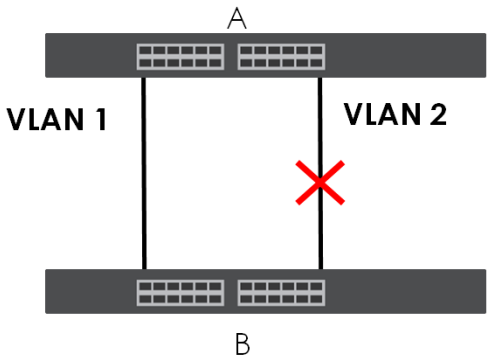
# 13.10 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 13.10.1 MSTP Network Example

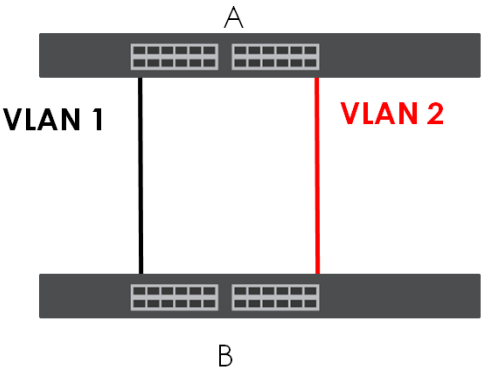
The following figure shows a network example where two VLANs are configured on the two switches. If the switches are using STP or RSTP, the link for VLAN 2 will be blocked as STP and RSTP allow only one link in the network and block the redundant link.

**Figure 156** STP/RSTP Network Example




With MSTP, VLANs 1 and 2 are mapped to different spanning trees in the network. Thus traffic from the two VLANs travel on different paths. The following figure shows the network example using MSTP.

**Figure 157** MSTP Network Example




## 13.10.2 MST Region

An MST region is a logical grouping of multiple network devices that appears as a single device to the rest of the network. Each MSTP-enabled device can only belong to one MST region. When BPDUs enter an MST region, external path cost (of paths outside this region) is increased by one. Internal path cost (of paths within this region) is increased by one when BPDUs traverse the region.

Devices that belong to the same MST region are configured to have the same MSTP configuration identification settings. These include the following parameters:

- Name of the MST region
- Revision level as the unique number for the MST region

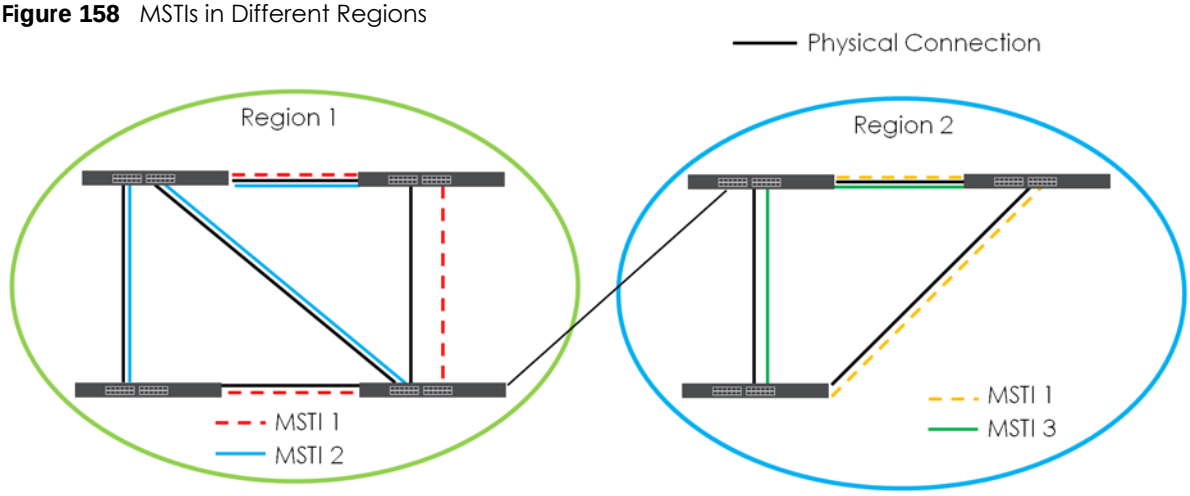
- VLAN-to-MST Instance mapping

## 13.10.3 MST Instance

An MST Instance (MSTI) is a spanning tree instance. VLANs can be configured to run on a specific MSTI. Each created MSTI is identified by a unique number (known as an MST ID) known internally to a region. Therefore an MSTI does not span across MST regions.

The following figure shows an example where there are two MST regions. Regions 1 and 2 have two spanning tree instances.

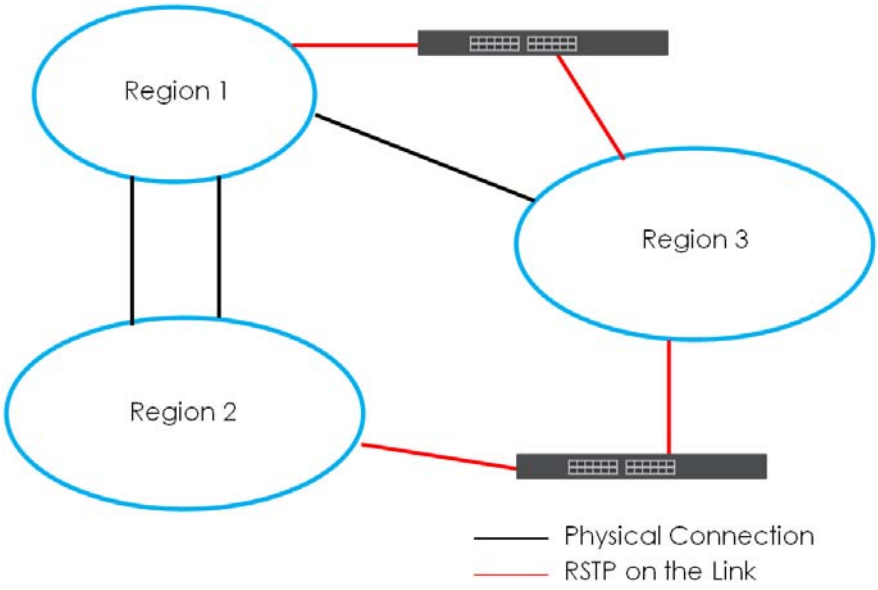
**Figure 158** MSTIs in Different Regions




## 13.10.4 Common and Internal Spanning Tree (CIST)

A CIST represents the connectivity of the entire network and it is equivalent to a spanning tree in an STP/RSTP. The CIST is the default MST instance (MSTID 0). Any VLANs that are not members of an MST instance are members of the CIST. In an MSTP-enabled network, there is only one CIST that runs between MST regions and single spanning tree devices. A network may contain multiple MST regions and other network segments running RSTP.

**Figure 159** MSTP and Legacy RSTP Network Example



# CHAPTER 14
# Bandwidth Control

## 14.1 Bandwidth Control Overview

This chapter shows you how you can cap the maximum bandwidth using the **Bandwidth Control** screen.

Bandwidth control means defining a maximum allowable bandwidth for incoming and/or out-going traffic flows on a port.

### 14.1.1 What You Can Do

Use the **Bandwidth Control** screen (Section 14.2 on page 206) to limit the bandwidth for traffic going through the Switch.

### 14.1.2 CIR and PIR

The Committed Information Rate (CIR) is the guaranteed bandwidth for the incoming traffic flow on a port. The Peak Information Rate (PIR) is the maximum bandwidth allowed for the incoming traffic flow on a port when there is no network congestion.

The CIR and PIR should be set for all ports that use the same uplink bandwidth. If the CIR is reached, packets are sent at the rate up to the PIR. When network congestion occurs, packets through the ingress port exceeding the CIR will be marked for drop.

Note: The CIR should be less than the PIR.

Note: The sum of CIRs cannot be greater than or equal to the uplink bandwidth.

## 14.2 Bandwidth Control Setup

Click **Advanced Application** > **Bandwidth Control** in the navigation panel to bring up the screen as shown next.

**Figure 160** Advanced Application > Bandwidth Control (Standalone Mode)

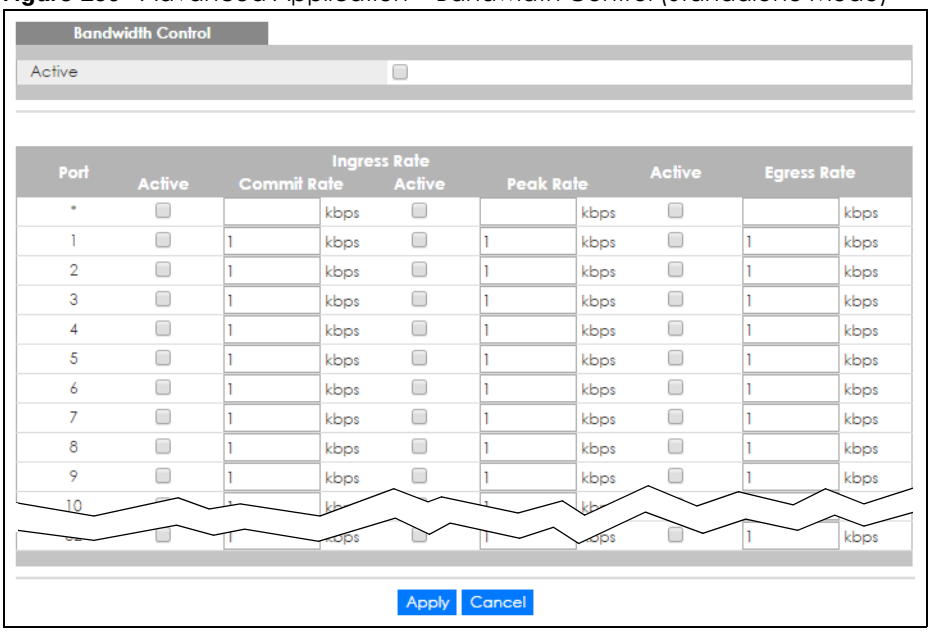
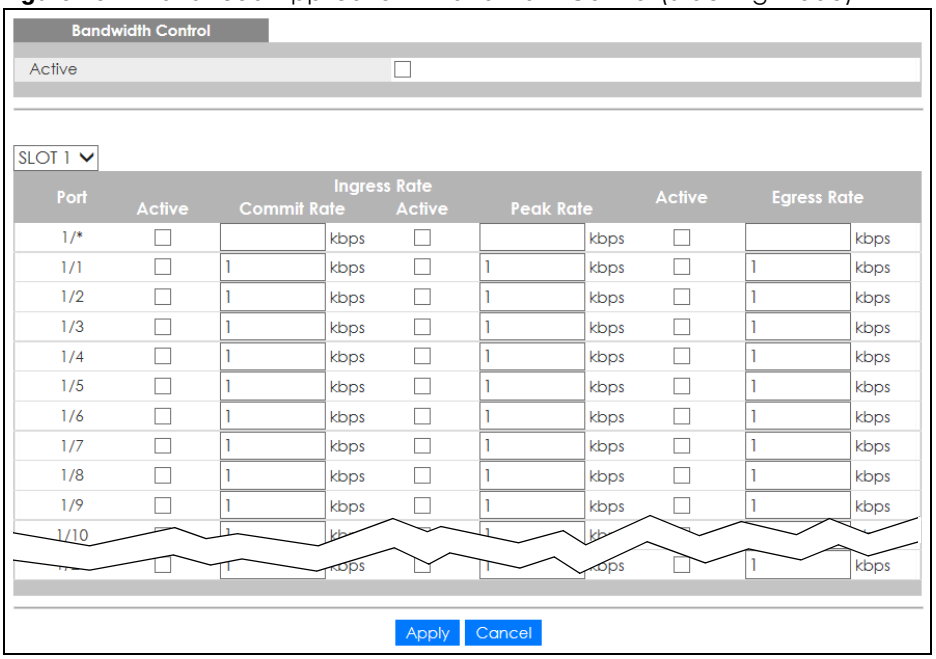



**Figure 161** Advanced Application > Bandwidth Control (Stacking Mode)




The following table describes the related labels in this screen.

Table 79 Advanced Application > Bandwidth Control

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable bandwidth control on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 79 Advanced Application > Bandwidth Control (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Ingress Rate | |
| Active | Select this check box to activate commit rate limits on this port. |
| Commit Rate | Specify the guaranteed bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port. The commit rate should be less than the peak rate. The sum of commit rates cannot be greater than or equal to the uplink bandwidth. |
| Active | Select this check box to activate peak rate limits on this port. |
| Peak Rate | Specify the maximum bandwidth allowed in kilobits per second (Kbps) for the incoming traffic flow on a port. |
| Active | Select this check box to activate egress rate limits on this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields. |

# CHAPTER 15
# Broadcast Storm Control

## 15.1 Broadcast Storm Control Overview

This chapter introduces and shows you how to configure the broadcast storm control feature.

Broadcast storm control limits the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports. When the maximum number of allowable broadcast, multicast and/or DLF packets is reached per second, the subsequent packets are discarded. Enable this feature to reduce broadcast, multicast and/or DLF packets in your network. You can specify limits for each packet type on each port.

### 15.1.1 What You Can Do

Use the **Broadcast Storm Control** screen (Section 15.2 on page 209) to limit the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports.

## 15.2 Broadcast Storm Control Setup

Click **Advanced Application** > **Broadcast Storm Control** in the navigation panel to display the screen as shown next.

**Figure 162** Advanced Application > Broadcast Storm Control (Standalone Mode)

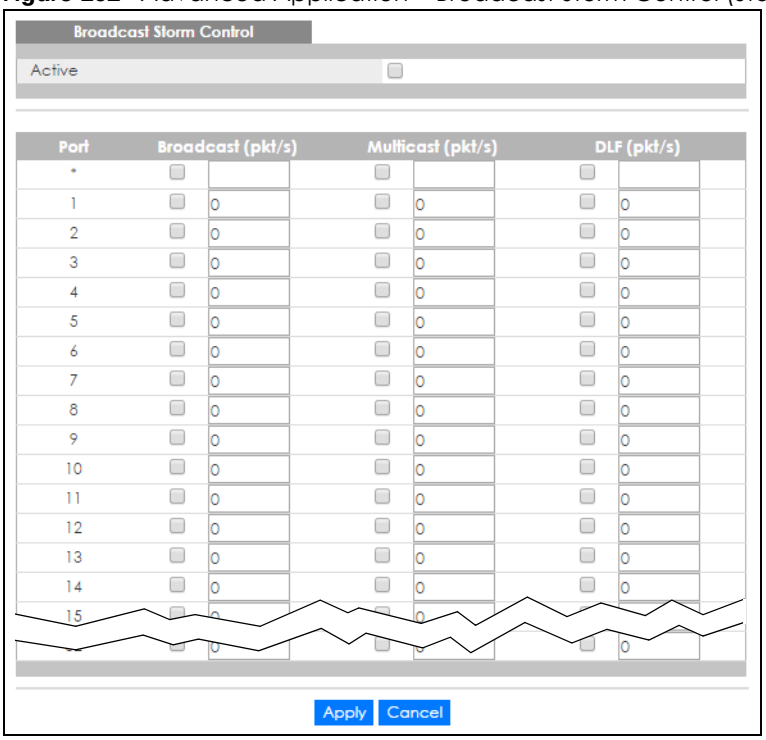
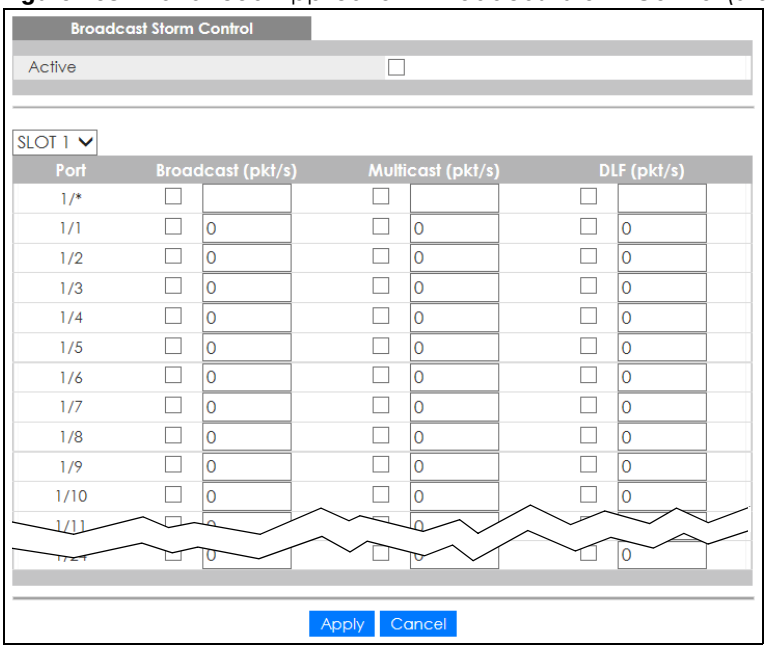



**Figure 163** Advanced Application > Broadcast Storm Control (Stacking Mode)




The following table describes the labels in this screen.

Table 80 Advanced Application > Broadcast Storm Control

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable traffic storm control on the Switch. Clear this check box to disable this feature. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

Table 80 Advanced Application > Broadcast Storm Control (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Broadcast (pkt/s) | Select this option to enable and specify how many broadcast packets the Switch accepts per second on the port.<br>The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold. |
| Multicast (pkt/s) | Select this option to enable and specify how many multicast packets the Switch accepts per second on the port.<br>The Switch will generate a trap and/or log when the actual rate is higher than the specified threshold. |
| DLF (pkt/s) | Select this option and specify how many destination lookup failure (DLF) packets the port receives per second. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields. |

# CHAPTER 16 Mirroring

## 16.1 Mirroring Overview

This chapter discusses port mirroring setup screens.

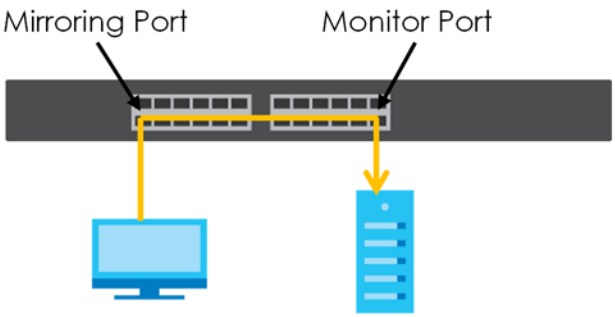
Port mirroring allows you to copy a traffic flow to a monitor port (the port you copy the traffic to) in order that you can examine the traffic from the monitor port without interference.

### 16.1.1 What You Need to Know

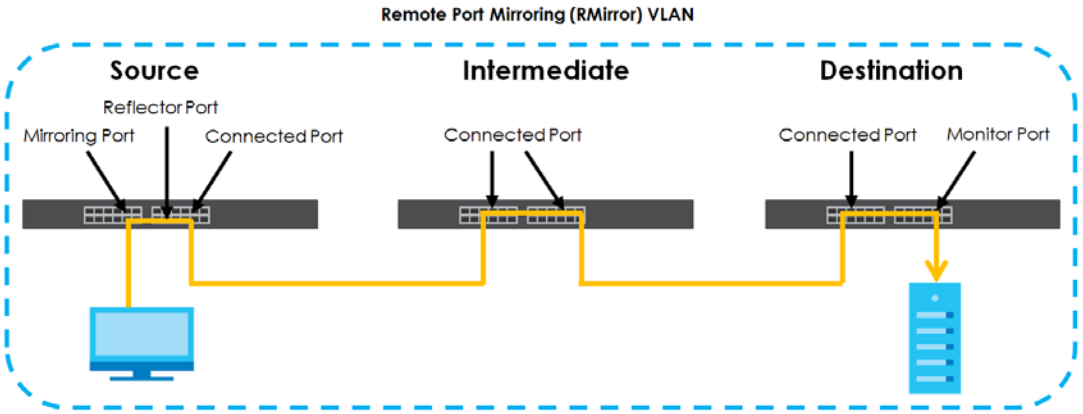
Read on for concepts on Mirroring that can help you configure the screens in this chapter.

The Switch supports both local port mirroring and remote port mirroring.

In local port mirroring, the mirroring ports (through which traffic you copy passes) and the monitor port are on the same device.

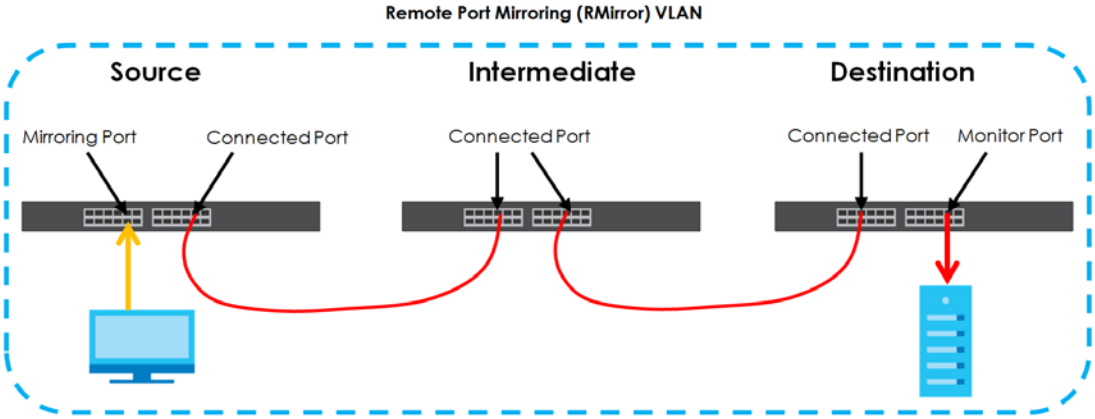



In remote port mirroring (RMirror), the mirroring ports and monitor port can be on different devices in a network. You can use it to monitor multiple switches across your network. The traffic from the source device's mirroring ports is sent to a reflector port for VLAN tagging and copied to the connected ports. Traffic are then carried over the specified remote port mirroring (RMirror) VLAN and sent to the destination device's monitor port through the connected ports that connect to other switches.




### Single-Destination RMirror

If the mirrored traffic is forwarded to one single destination switch, you can disable the reflector port. The Switch adds RMirror VLAN tag and forwards mirrored traffic from the mirroring port to the connected port directly.




# 16.2 Local Port Mirroring

Click **Advanced Application** > **Mirroring** in the navigation panel to display the **Mirroring** screen. Use this screen to select a monitor port and specify the traffic flow to be copied to the monitor port.

**Figure 164** Advanced Application > Mirroring (Standalone Mode)

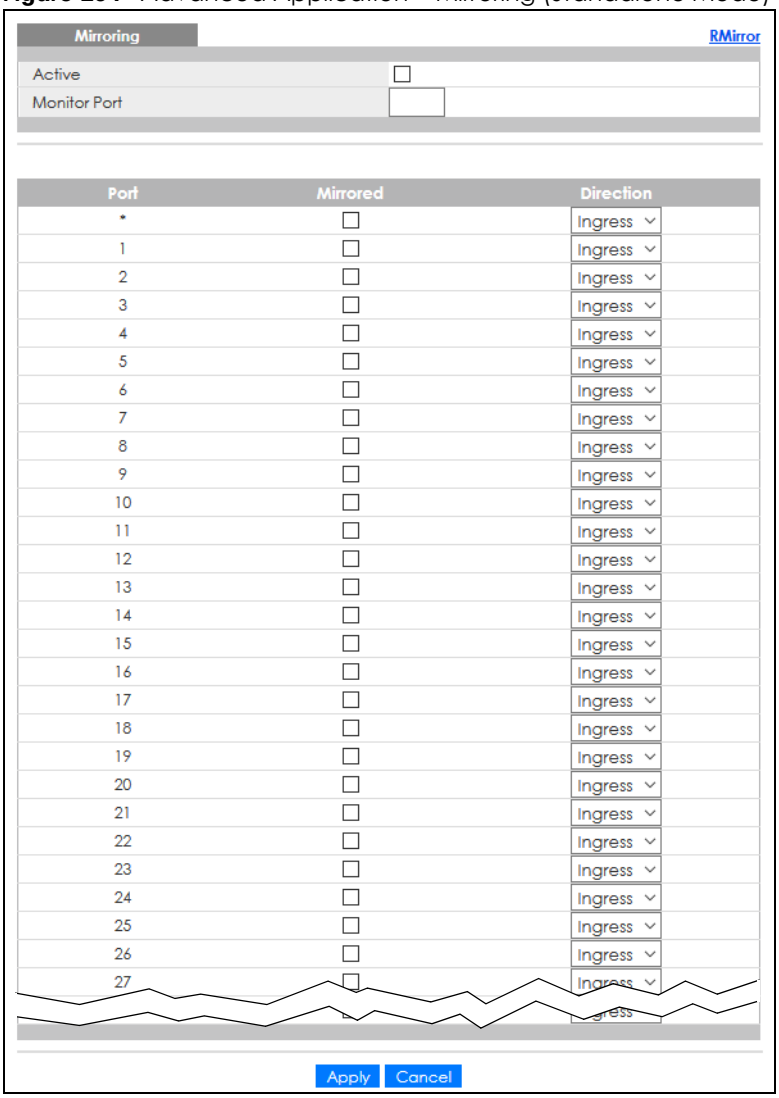
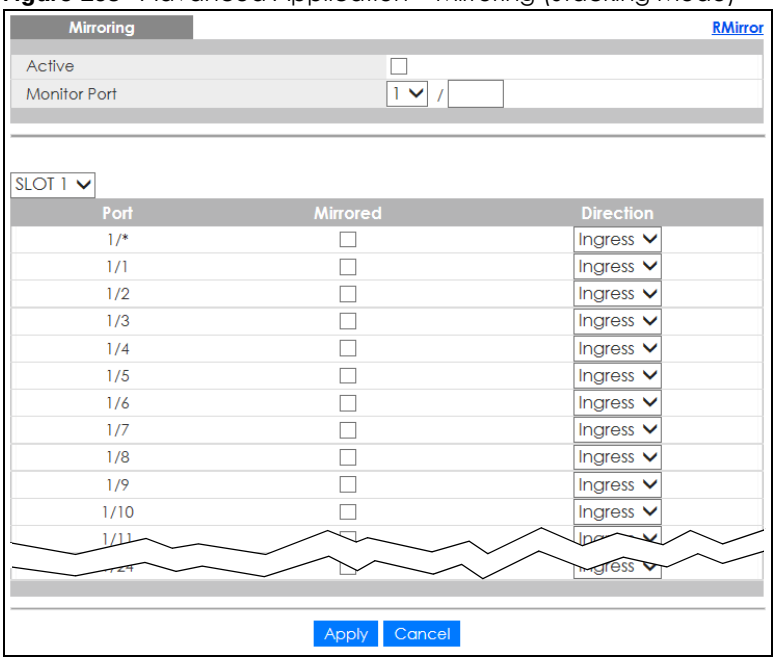


**Figure 165** Advanced Application > Mirroring (Stacking Mode)




The following table describes the labels in this screen.

Table 81 Advanced Application > Mirroring

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to activate port mirroring on the Switch. Clear this check box to disable the feature. |
| Monitor Port | The monitor port is the port you copy the traffic to in order to examine it in more detail without interfering with the traffic flow on the original ports. Type the port number of the monitor port.<br><br>In stacking mode, the first box field is the slot ID and the second field is the port number. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Mirrored | Select this option to mirror the traffic on a port. |
| Direction | Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are **Egress** (outgoing), **Ingress** (incoming) and **Both**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields. |

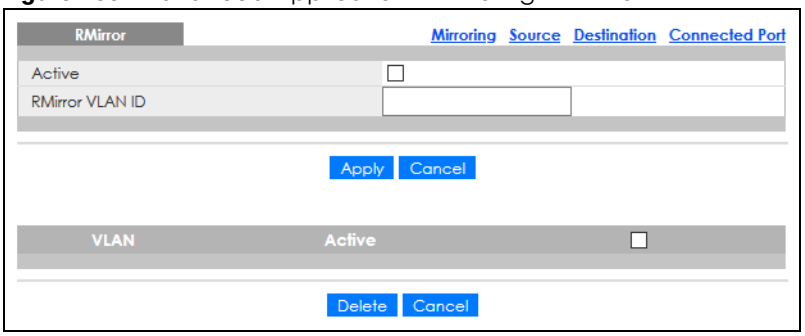
## 16.2.1 Remote Port Mirroring

Use this screen to create a remote port mirroring (RMirror) VLAN through which the mirrored traffic is forwarded.

Note: Your Switch automatically creates a static VLAN (with the same VID) when you create a RMirror VLAN in this screen.

Click the **RMirror** link in the **Advanced Application** > **Mirroring** screen. The following screen opens.

**Figure 166** Advanced Application > Mirroring > RMirror




The following table describes the labels in this screen.

Table 82 Advanced Application > Mirroring > RMirror

| LABEL | DESCRIPTION |
|---|---|
| Active | Select the option to enable the VLAN. |
| RMirror VLAN ID | Specify the ID number of remote port mirroring (RMirror) VLAN. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | This field displays the ID number of the RMirror VLAN. Click on the VLAN ID number to change the settings. |
| Active | This field displays whether the VLAN is enabled or not. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

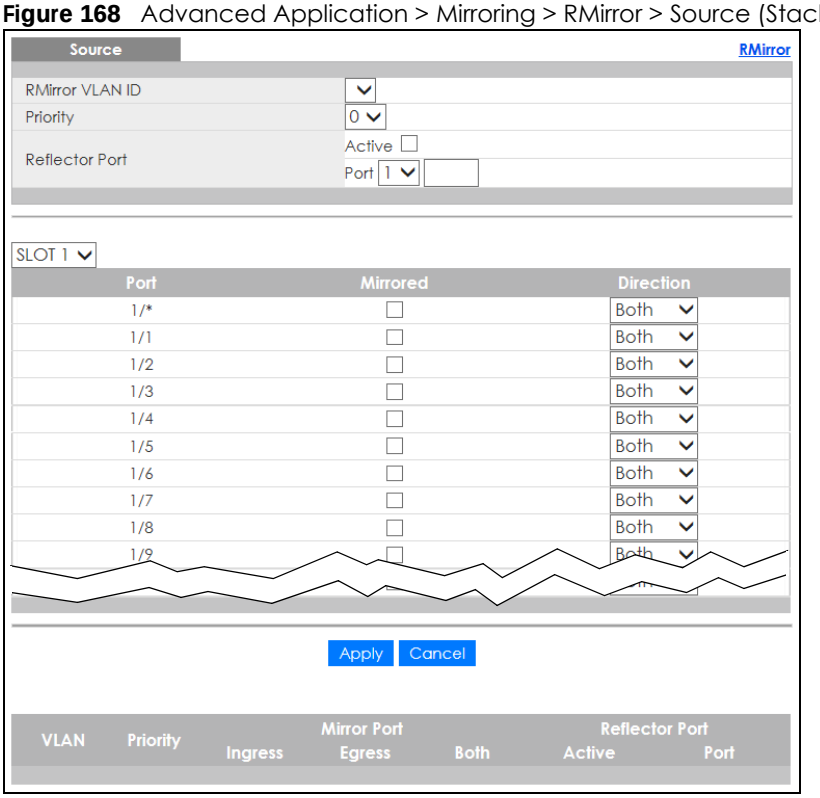
## 16.2.2 Source

Use this screen to configure the reflector port and specify the traffic flow to be copied to the monitor port when the Switch is the source device in remote port mirroring.

Click the **Source** link in the **RMirror** screen. The following screen opens.

**Figure 167** Advanced Application > Mirroring > RMirror > Source (Standalone Mode)

**Figure 168** Advanced Application > Mirroring > RMirror > Source (Stacking Mode)



The following table describes the labels in this screen.

Table 83 Advanced Application > Mirroring > RMirror > Source

| LABEL | DESCRIPTION |
|---|---|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded. |
| Priority | Enter the priority of the mirrored traffic. |
| Reflector Port | Select the check box to enable the specified reflector port.<br>Enter the number of reflector port that adds the RMirror VLAN tag to all mirrored traffic and forwards traffic to the connected ports in the same RMirror VLAN.<br>In stacking mode, the first box field is the slot ID and the second field is the port number. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Mirrored | Select this option to mirror the traffic on a port. |
| Direction | Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are **Egress** (outgoing), **Ingress** (incoming) and **Both**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded. |
| Priority | This field displays the priority of the mirrored traffic. |
| Mirror Port | |
| Ingress | This field displays the number of ports on which the incoming traffic is mirrored. |
| Egress | This field displays the number of ports on which the outgoing traffic is mirrored. |
| Both | This field displays the number of ports on which the incoming and outgoing traffic is mirrored. |
| Reflector Port | This field displays whether the reflector port is enabled and the number of reflector port in this RMirror VLAN. |

## 16.2.3 Destination

Use this screen to specify the RMirror VLAN and configure the monitor port when the Switch is the destination device in remote port mirroring.

Click the **Destination** link in the **RMirror** screen. The following screen opens.

**Figure 169** Advanced Application > Mirroring > RMirror > Destination (Standalone Mode)

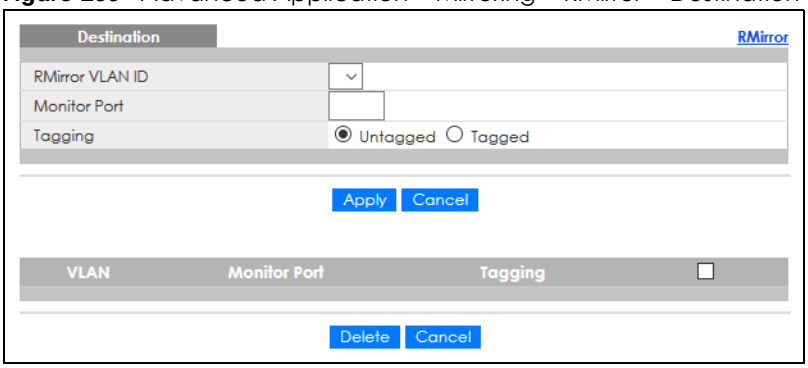
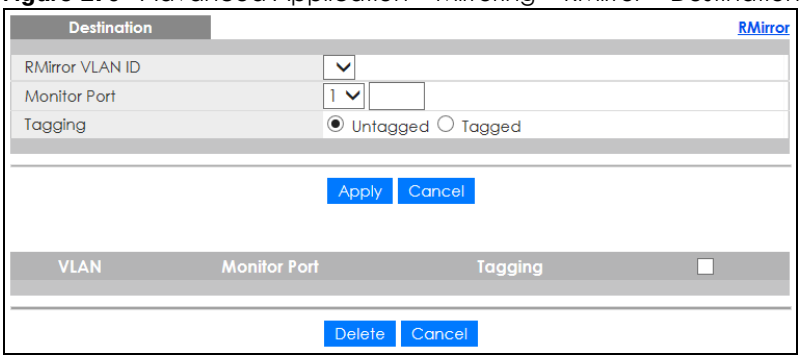



**Figure 170** Advanced Application > Mirroring > RMirror > Destination (Stacking Mode)




The following table describes the labels in this screen.

Table 84 Advanced Application > Mirroring > RMirror > Destination

| LABEL | DESCRIPTION |
|---|---|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded. |
| Monitor Port | Specify the port to which you copy the traffic in order to examine it in more detail without interfering with the traffic flow on the original ports.<br><br>In stacking mode, the first box field is the slot ID and the second field is the port number. |
| Tagging | Select whether to add the RMirror VLAN tag to mirrored traffic on the monitor port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | This field displays the ID number of RMirror VLAN over which the mirrored traffic is forwarded. |
| Monitor Port | This field displays the number of port that receives the mirrored traffic from the source device for analysis. |
| Tagging | This field displays whether the mirrored traffic is tagged with the RMirror VLAN ID. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove in the **Delete** column and then click the **Delete** button. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 16.2.4 Connected Port

Use this screen to select the RMirror VLAN and specify the ports that helps forward mirrored traffic to other connected switches and/or receive mirrored traffic from other connected port in the same RMirror VLAN.

Click the **Connected Port** link in the **RMirror** screen. The following screen opens.

**Figure 171** Advanced Application > Mirroring > RMirror > Connected Port (Standalone Mode)

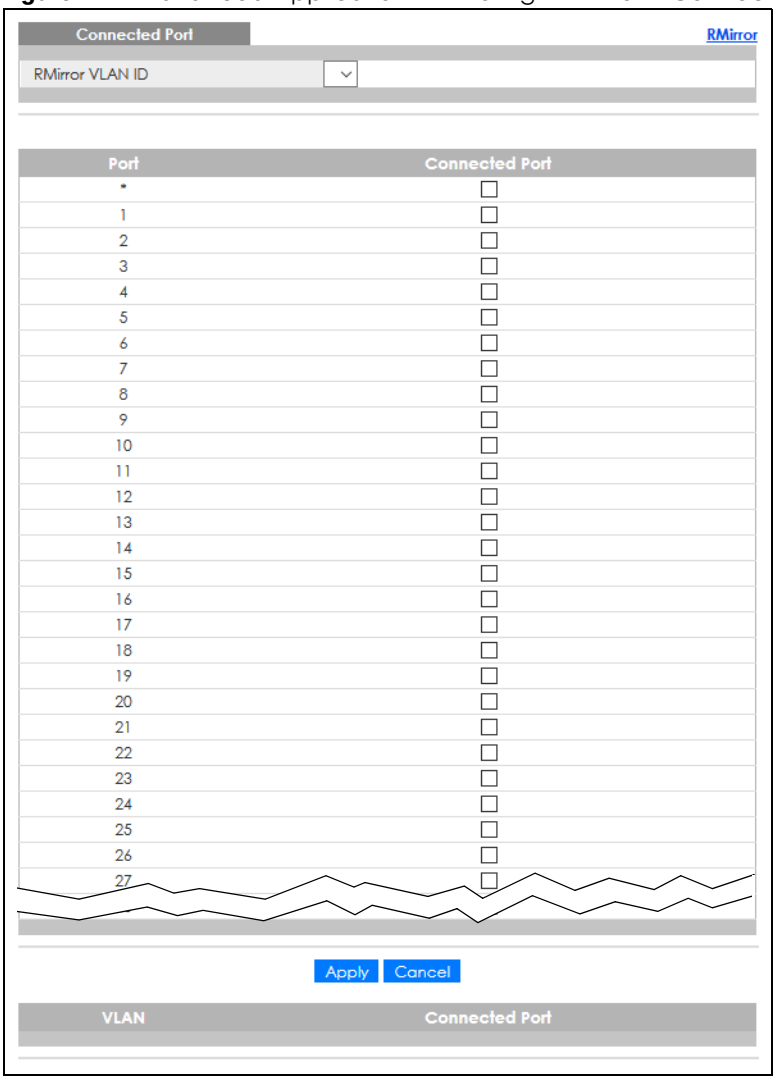
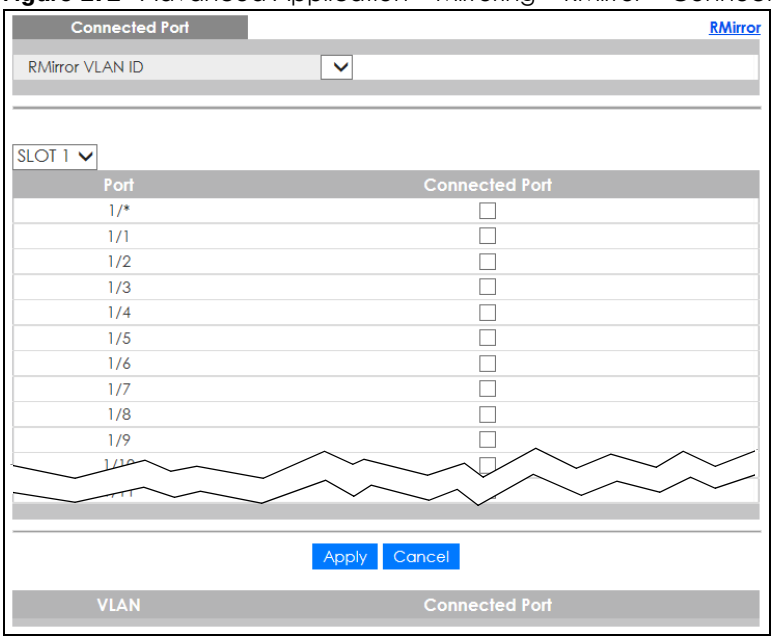


**Figure 172** Advanced Application > Mirroring > RMirror > Connected Port (Stacking Mode)




The following table describes the labels in this screen.

Table 85 Advanced Application > Mirroring > RMirror > Connected Port

| LABEL | DESCRIPTION |
|---|---|
| RMirror VLAN ID | Select the RMirror VLAN over which the mirrored traffic is forwarded. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Connected Port | When the Switch is a source device in remote port mirroring, select this option to have the port help forward mirrored traffic to the connected port of the intermediate or destination device in the same RMirror VLAN.<br>When the Switch is an intermediate device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or another intermediate device or forward mirrored traffic to the connected destination or another intermediate device in the same RMirror VLAN.<br>When the Switch is a destination device in remote port mirroring, select this option to have the port receive mirrored traffic from the connected source or intermediate device in the same RMirror VLAN. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

Table 85 Advanced Application > Mirroring > RMirror > Connected Port (continued)

| LABEL | DESCRIPTION |
|---|---|
| VLAN | This field displays the ID number of port mirroring VLAN over which the mirrored traffic is forwarded. |
| Connected Port | This field displays the number of ports that helps forward mirrored traffic to other connected switches. |

# CHAPTER 17
# Link Aggregation

## 17.1 Link Aggregation Overview

This chapter shows you how to logically aggregate physical links to form one logical, higher-bandwidth link.

Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. You may want to trunk ports if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link. However, the more ports you aggregate then the fewer available ports you have. A trunk group is one logical link containing multiple ports.

The beginning port of each trunk group must be physically connected to form a trunk group.

### 17.1.1 What You Can Do

- Use the **Link Aggregation Status** screen (Section 17.2 on page 224) to view ports you have configured to be in the trunk group, ports that are currently transmitting data as one logical link in the trunk group and so on.
- Use the **Link Aggregation Setting** screen (Section 17.3 on page 226) to configure static link aggregation.
- Use the **Link Aggregation Control Protocol** screen (Section 17.3.1 on page 228) to enable Link Aggregation Control Protocol (LACP).

### 17.1.2 What You Need to Know

The Switch supports both static and dynamic link aggregation.

Note: In a properly planned network, it is recommended to implement static link aggregation only. This ensures increased network stability and control over the trunk groups on your Switch.

See Section 17.4.1 on page 231 for a static port trunking example.

#### Dynamic Link Aggregation

The Switch adheres to the IEEE 802.3ad standard for static and dynamic (LACP) port trunking.

The IEEE 802.3ad standard describes the Link Aggregation Control Protocol (LACP) for dynamically creating and managing trunk groups.

When you enable LACP link aggregation on a port, the port can automatically negotiate with the ports at the remote end of a link to establish trunk groups. LACP also allows port redundancy, that is, if an

operational port fails, then one of the "standby" ports become operational without user intervention. Please note that:

- You must connect all ports point-to-point to the same Ethernet switch and configure the ports for LACP trunking.
- LACP only works on full-duplex links.
- All ports in the same trunk group must have the same media type, speed, duplex mode and flow control settings.

Configure trunk groups or LACP before you connect the Ethernet switch to avoid causing network topology loops.

### Link Aggregation ID

LACP aggregation ID consists of the following information[1]:

Table 86 Link Aggregation ID: Local Switch

| SYSTEM PRIORITY | MAC ADDRESS | KEY | PORT PRIORITY | PORT NUMBER |
|---|---|---|---|---|
| 0000 | 00-00-00-00-00-00 | 0000 | 00 | 0000 |

Table 87 Link Aggregation ID: Peer Switch

| SYSTEM PRIORITY | MAC ADDRESS | KEY | PORT PRIORITY | PORT NUMBER |
|---|---|---|---|---|
| 0000 | 00-00-00-00-00-00 | 0000 | 00 | 0000 |

### Traffic Distribution Criteria

The Switch supports both unicast and non-unicast traffic (broadcast and multicast) network load sharing over link aggregation. Load sharing works by statically splitting the traffic based on source or destination IP/MAC address, and then distributing the load across multiple paths. In link aggregation, this allows the trunk group (ports) to transmit data as one logical link to a single or group of hosts on the network.

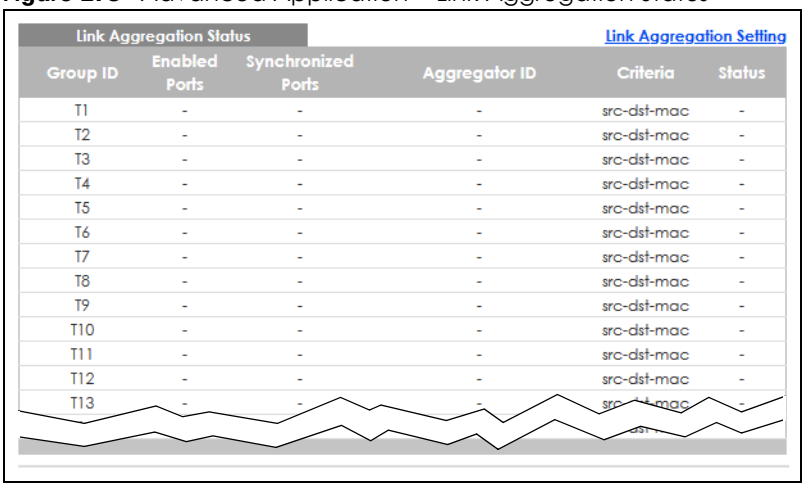
Unicast and non-unicast traffic network load sharing over link aggregation (trunking) is enabled by default.

## 17.2 Link Aggregation Status

Click **Advanced Application** > **Link Aggregation** in the navigation panel. The **Link Aggregation Status** screen displays by default. See Section 17.1 on page 223 for more information.

1. Port Priority and Port Number are 0 as it is the aggregator ID for the trunk group, not the individual port.

**Figure 173** Advanced Application > Link Aggregation Status




The following table describes the labels in this screen.

Table 88 Advanced Application > Link Aggregation Status

| LABEL | DESCRIPTION |
|---|---|
| Group ID | This field displays the group ID to identify a trunk group, that is, one logical link containing multiple ports. |
| Enabled Ports | These are the ports you have configured in the **Link Aggregation** screen to be in the trunk group.<br>The port numbers displays only when this trunk group is activated and there is a port belonging to this group. |
| Synchronized Ports | These are the ports that are currently transmitting data as one logical link in this trunk group. |
| Aggregator ID | Link Aggregator ID consists of the following: system priority, MAC address, key, port priority and port number.<br>The ID displays only when there is a port belonging to this trunk group and LACP is also enabled for this group. |
| Criteria | This shows the outgoing traffic distribution algorithm used in this trunk group. Packets from the same source and/or to the same destination are sent over the same link within the trunk.<br>**src-mac** means the Switch distributes traffic based on the packet's source MAC address.<br>**dst-mac** means the Switch distributes traffic based on the packet's destination MAC address.<br>**src-dst-mac** means the Switch distributes traffic based on a combination of the packet's source and destination MAC addresses.<br>**src-ip** means the Switch distributes traffic based on the packet's source IP address.<br>**dst-ip** means the Switch distributes traffic based on the packet's destination IP address.<br>**src-dst-ip** means the Switch distributes traffic based on a combination of the packet's source and destination IP addresses. |
| Status | This field displays how these ports were added to the trunk group. It displays:<br>• **Static** – if the ports are configured as static members of a trunk group.<br>• **LACP** – if the ports are configured to join a trunk group through LACP. |

# 17.3 Link Aggregation Setting

Click **Advanced Application** > **Link Aggregation** > **Link Aggregation Setting** to display the screen shown next. See Section 17.1 on page 223 for more information on link aggregation.

**Figure 174** Advanced Application > Link Aggregation > Link Aggregation Setting (Standalone Mode)

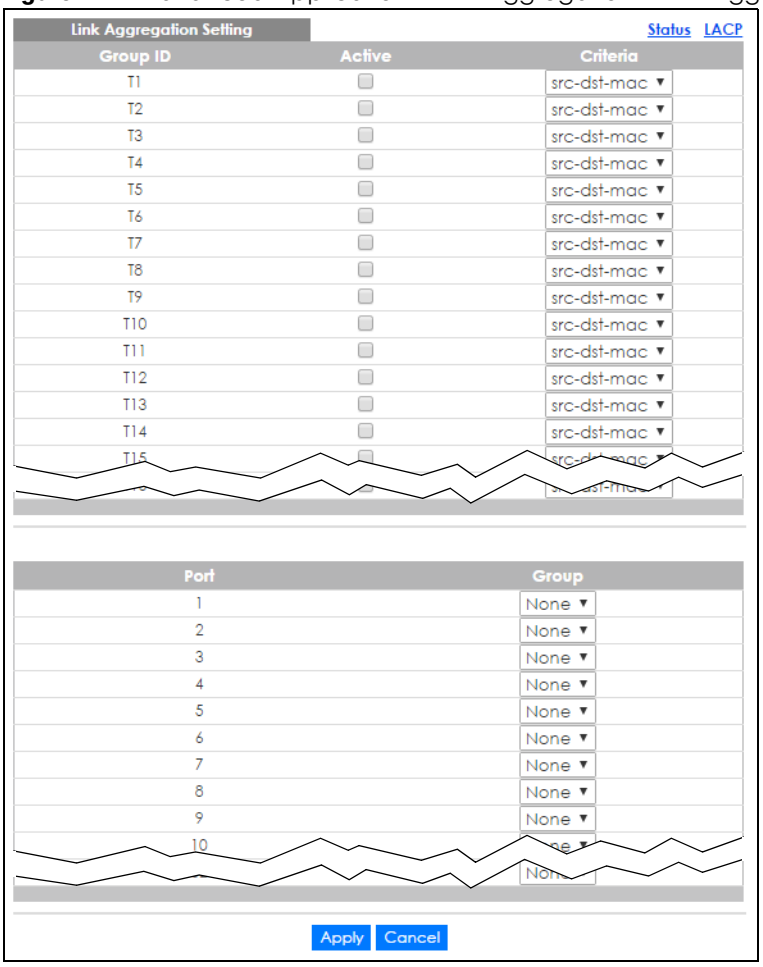
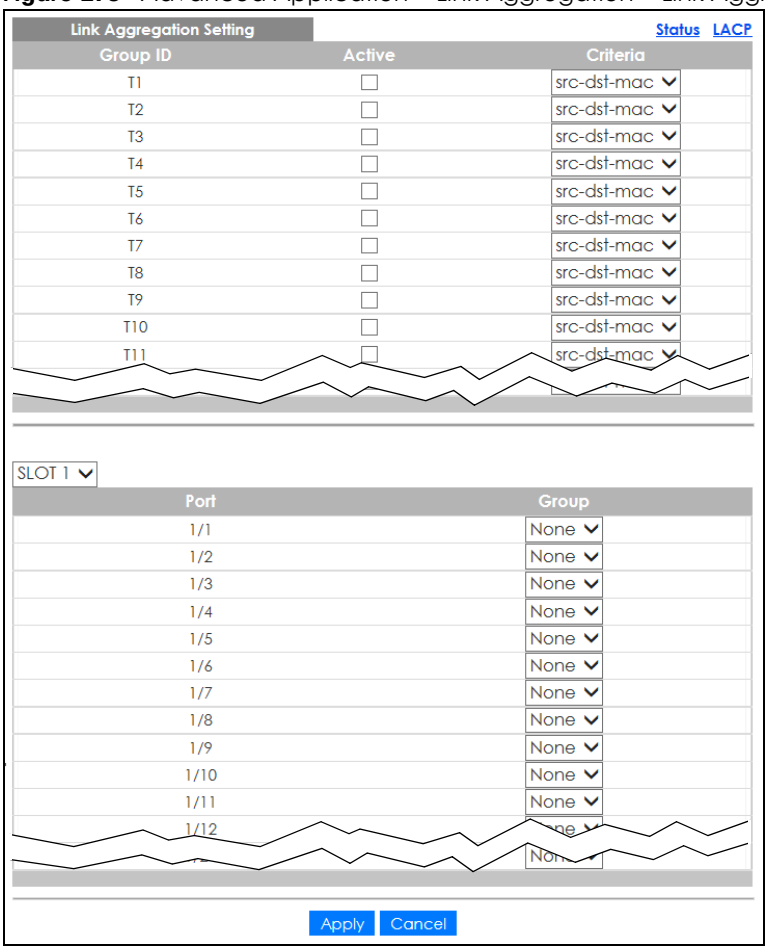


**Figure 175** Advanced Application > Link Aggregation > Link Aggregation Setting (Stacking Mode)




The following table describes the labels in this screen.

Table 89 Advanced Application > Link Aggregation > Link Aggregation Setting

| LABEL | DESCRIPTION |
|---|---|
| Link Aggregation Setting | This is the only screen you need to configure to enable static link aggregation. |
| Group ID | The field identifies the link aggregation group, that is, one logical link containing multiple ports. |
| Active | Select this option to activate a trunk group. |

Table 89 Advanced Application > Link Aggregation > Link Aggregation Setting (continued)

| LABEL | DESCRIPTION |
|---|---|
| Criteria | Select the outgoing traffic distribution type. Packets from the same source and/or to the same destination are sent over the same link within the trunk. By default, the Switch uses the **src-dst-mac** distribution type. If the Switch is behind a router, the packet's destination or source MAC address will be changed. In this case, set the Switch to distribute traffic based on its IP address to make sure port trunking can work properly.<br>Select **src-mac** to distribute traffic based on the packet's source MAC address.<br>Select **dst-mac** to distribute traffic based on the packet's destination MAC address.<br>Select **src-dst-mac** to distribute traffic based on a combination of the packet's source and destination MAC addresses.<br>Select **src-ip** to distribute traffic based on the packet's source IP address.<br>Select **dst-ip** to distribute traffic based on the packet's destination IP address.<br>Select **src-dst-ip** to distribute traffic based on a combination of the packet's source and destination IP addresses. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Group | Select the trunk group to which a port belongs.<br>Note: When you enable the port security feature on the Switch and configure port security settings for a port, you cannot include the port in an active trunk group. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 17.3.1 Link Aggregation Control Protocol

Click **Advanced Application** > **Link Aggregation** > **Link Aggregation Setting** > **LACP** to display the screen shown next. See Dynamic Link Aggregation on page 223 for more information on dynamic link aggregation.

**Figure 176** Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (Standalone Mode)

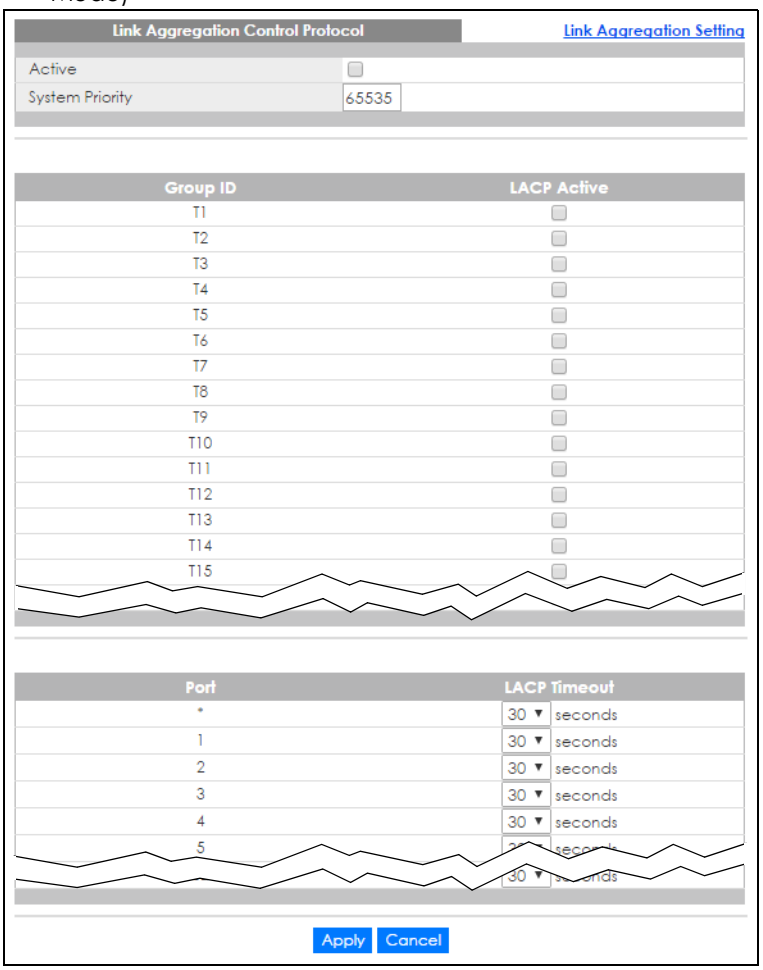
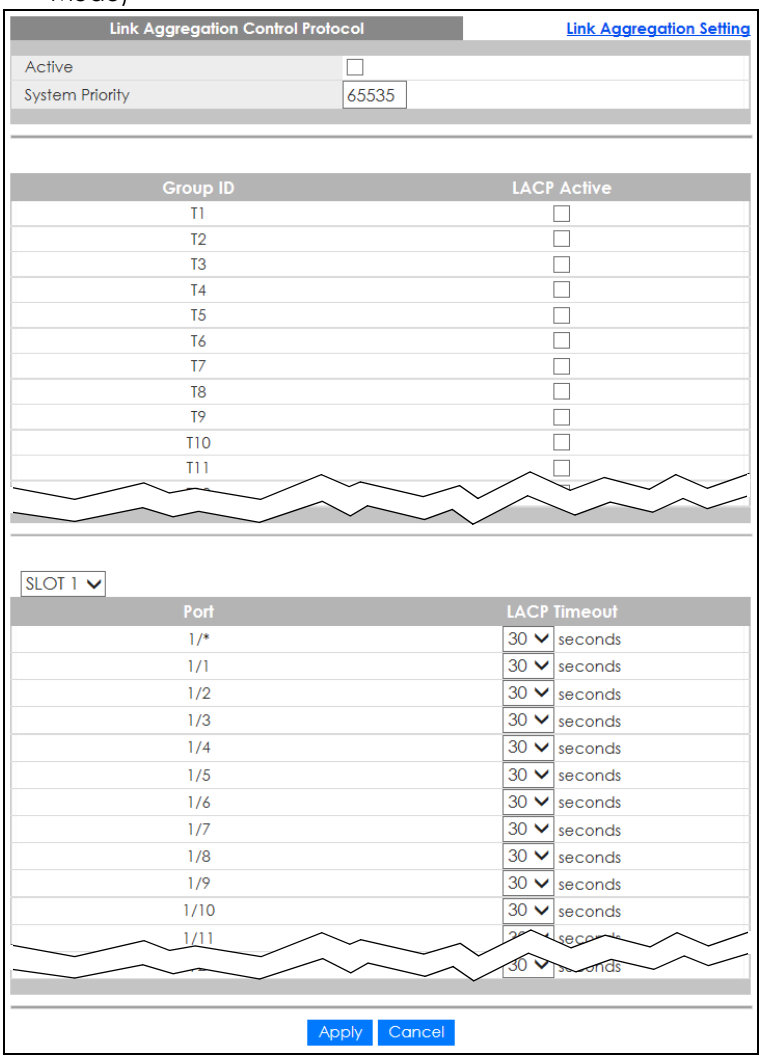


**Figure 177** Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (Stacking Mode)




The following table describes the labels in this screen.

Table 90 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP

| LABEL | DESCRIPTION |
|---|---|
| Link Aggregation Control Protocol | Note: Do NOT configure this screen unless you want to enable dynamic link aggregation. |
| Active | Select this check box to enable Link Aggregation Control Protocol (LACP). |
| System Priority | LACP system priority is a number between 1 and 65535. The switch with the lowest system priority (and lowest port number if system priority is the same) becomes the LACP "server". The LACP "server" controls the operation of LACP setup. Enter a number to set the priority of an active port using Link Aggregation Control Protocol (LACP). The smaller the number, the higher the priority level. |
| Group ID | The field identifies the link aggregation group, that is, one logical link containing multiple ports. |
| LACP Active | Select this option to enable LACP for a trunk. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

Table 90 Advanced Application > Link Aggregation > Link Aggregation Setting > LACP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| LACP Timeout | Timeout is the time interval between the individual port exchanges of LACP packets in order to check that the peer port in the trunk group is still up. If a port does not respond after three tries, then it is deemed to be "down" and is removed from the trunk. Set a short timeout (1 second) for busy trunked links to ensure that disabled ports are removed from the trunk group as soon as possible.<br>Select either 1 second or 30 seconds. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 17.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 17.4.1 Static Trunking Example

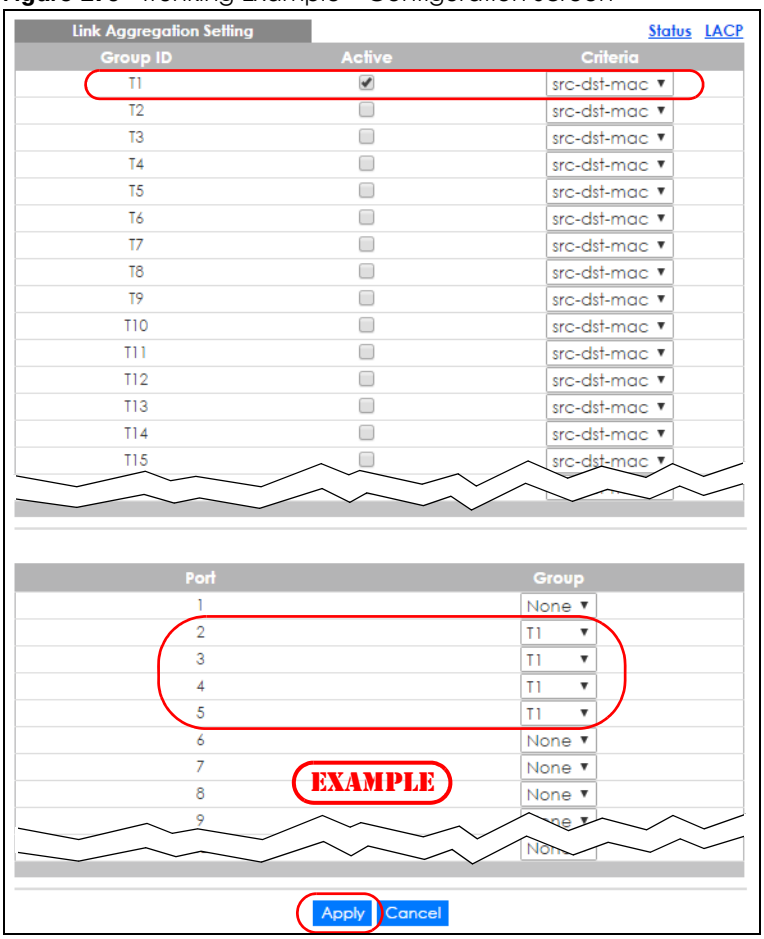
This example shows you how to create a static port trunk group for ports 2 – 5.

1 **Make your physical connections** – make sure that the ports that you want to belong to the trunk group are connected to the same destination. The following figure shows ports 2 – 5 on switch **A** connected to switch **B**.

**Figure 178** Trunking Example – Physical Connections

2 **Configure static trunking** – Click **Advanced Application** > **Link Aggregation** > **Link Aggregation Setting**. In this screen activate trunk group **T1**, select the traffic distribution algorithm used by this group and select the ports that should belong to this group as shown in the figure below. Click **Apply** when you are done.

**Figure 179** Trunking Example – Configuration Screen




Your trunk group 1 (**T1**) configuration is now complete.

# CHAPTER 18
# Port Authentication

## 18.1 Port Authentication Overview

This chapter describes the IEEE 802.1x, MAC, Guest VLAN, and Compound authentication methods.

Port authentication is a way to validate access to ports on the Switch to clients based on an external authentication server. The Switch supports the following methods for port authentication:

- **IEEE 802.1x**[2] – An authentication server validates access to a port based on a user name and password provided by the user.
- **MAC Authentication** – An authentication server validates access to a port based on the MAC address and password of the client.
- **Guest VLAN** – In either mode, if authentication fails the Switch can still allow the client to access the network on a **Guest VLAN**.
- **Compound Authentication** – An authentication server validates access to a port based on combination of IEEE 802.1x and MAC Authentication. There are two modes:
  - **Loose**: The client authenticates using either IEEE 802.1x authentication or MAC Authentication.
  - **Strict**: The client authenticates using both IEEE 802.1x authentication and MAC Authentication.

Note: All types of authentication use the RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) protocol to validate users. You must configure a RADIUS server before enabling port authentication.

Note: If you enable IEEE 802.1x authentication and MAC authentication on the same port, the Switch performs IEEE 802.1x authentication first. If a user fails to authenticate through the IEEE 802.1x method, then access to the port is denied.

Note: IEEE 802.1x is not supported by all user operating systems. For details on compatibility, see your operating system documentation. If your operating system does not support 802.1x, you must install 802.1x client software.

### 18.1.1 What You Can Do

- Use the **Port Authentication** screen (Section 18.2 on page 235) to display the links to the configuration screens where you can enable the port authentication methods.
- Use the **802.1x** screen (Section 18.3 on page 235) to activate IEEE 802.1x security.
- Use the **MAC Authentication** screen (Section 18.4 on page 238) to activate MAC authentication.

2. At the time of writing, IEEE 802.1x is not supported by all operating systems. See your operating system documentation. If your operating system does not support 802.1x, then you may need to install 802.1x client software.

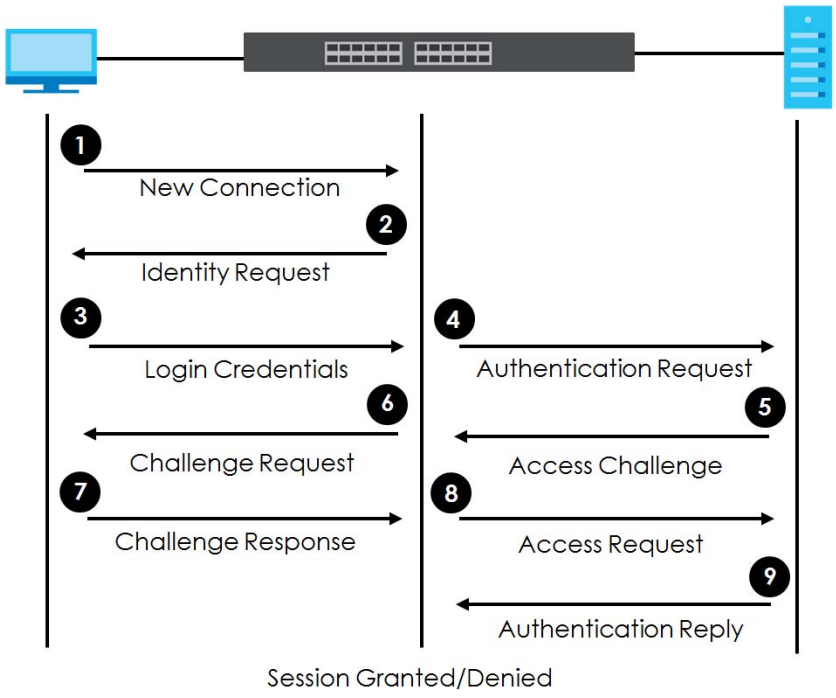
- Use the **Guest Vlan** screen (Section 18.5 on page 241) to enable and assign a guest VLAN to a port.
- Use the **Compound Authentication** screen (Section 18.6 on page 244) to allow network access for clients that pass either IEEE 802.1x authentication OR MAC authentication, or pass both IEEE 802.1x authentication AND MAC authentication.

## 18.1.2 What You Need to Know

### IEEE 802.1x Authentication

The following figure illustrates how a client connecting to a IEEE 802.1x authentication enabled port goes through a validation process. The Switch prompts the client for login information in the form of a user name and password after the client responds to its identity request. When the client provides the login credentials, the Switch sends an authentication request to a RADIUS server. The RADIUS server validates whether this client is allowed access to the port.

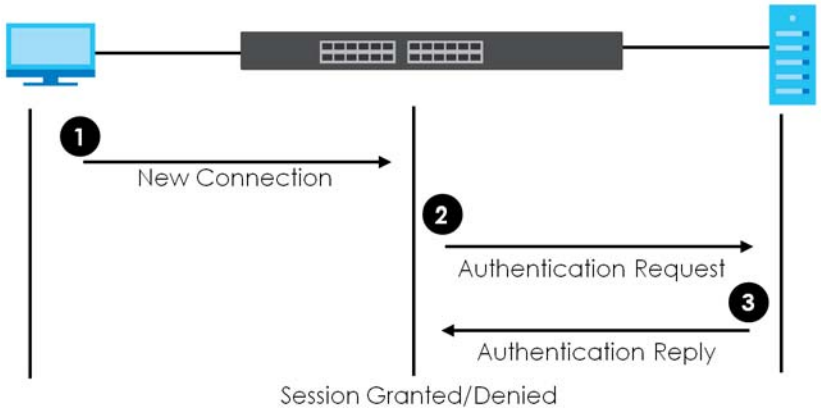
**Figure 180** IEEE 802.1x Authentication Process




## 18.1.3 MAC Authentication

MAC authentication works in a very similar way to IEEE 802.1x authentication. The main difference is that the Switch does not prompt the client for login credentials. The login credentials are based on the source MAC address of the client connecting to a port on the Switch along with a password configured specifically for MAC authentication on the Switch.

**Figure 181** MAC Authentication Process




# 18.2 Port Authentication Configuration

To enable port authentication, first activate the port authentication methods (both on the Switch and the ports), then configure the RADIUS server settings in the **AAA** > **RADIUS Server Setup** screen.

Click **Advanced Application** > **Port Authentication** in the navigation panel to display the screen as shown. Select a port authentication method's link in the screen that appears.

**Figure 182** Advanced Application > Port Authentication

# 18.3 Activate IEEE 802.1x Security

Use this screen to activate IEEE 802.1x security. In the **Port Authentication** screen click **802.1x** to display the configuration screen as shown.

**Figure 183** Advanced Application > Port Authentication > 802.1x (Standalone Mode)

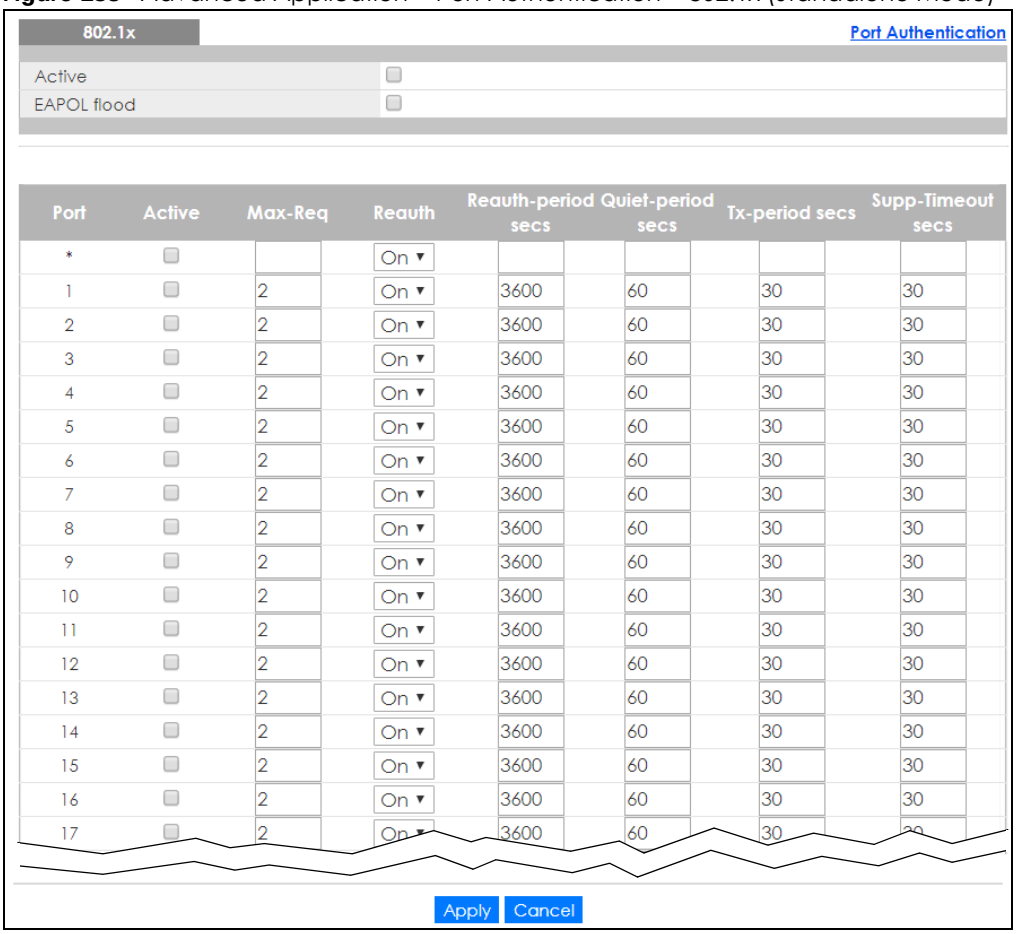
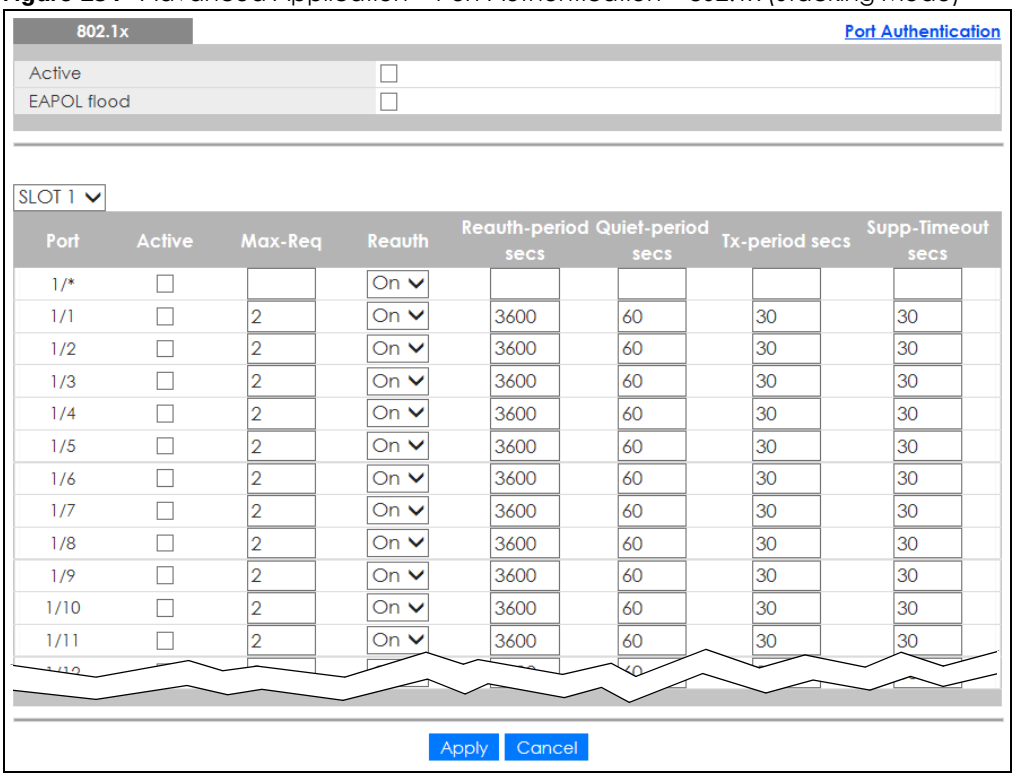


**Figure 184** Advanced Application > Port Authentication > 802.1x (Stacking Mode)




The following table describes the labels in this screen.

Table 91 Advanced Application > Port Authentication > 802.1x

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to permit 802.1x authentication on the Switch.<br><br>Note: You must first enable 802.1x authentication on the Switch before configuring it on each port. |
| EAPOL flood | Select this check box to flood EAPOL packets to all ports in the same VLAN.<br><br>EAP over LAN (EAPOL) is a port authentication protocol used in IEEE 802.1x. It is used to encapsulate and transmit EAP packets between the supplicant (a client device that requests access to the network resources or services) and authenticator (the Switch) directly over the LAN.<br><br>Note: **EAPOL flood** will not take effect when 802.1x authentication is enabled. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this to permit 802.1x authentication on this port. You must first allow 802.1x authentication on the Switch before configuring it on each port. |

Table 91 Advanced Application > Port Authentication > 802.1x (continued)

| LABEL | DESCRIPTION |
|---|---|
| Max-Req | Specify the number of times the Switch tries to authenticate clients before sending unresponsive ports to the Guest VLAN.<br>This is set to 2 by default. That is, the Switch attempts to authenticate a client twice. If the client does not respond to the first authentication request, the Switch tries again. If the client still does not respond to the second request, the Switch sends the client to the Guest VLAN. The client needs to send a new request to be authenticated by the Switch again. |
| Reauth | Specify if a subscriber has to periodically re-enter his or her user name and password to stay connected to the port. |
| Reauth-period secs | Specify the length of time required to pass before a client has to re-enter his or her user name and password to stay connected to the port. |
| Quiet-period secs | Specify the number of seconds the port remains in the HELD state and rejects further authentication requests from the connected client after a failed authentication exchange. |
| Tx-period secs | Specify the number of seconds the Switch waits for client's response before re-sending an identity request to the client. |
| Supp-Timeout secs | Specify the number of seconds the Switch waits for client's response to a challenge request before sending another request. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 18.4 Activate MAC Authentication

Use this screen to activate MAC authentication. In the **Port Authentication** screen click **MAC Authentication** to display the configuration screen as shown.

**Figure 185** Advanced Application > Port Authentication > MAC Authentication (Standalone Mode)

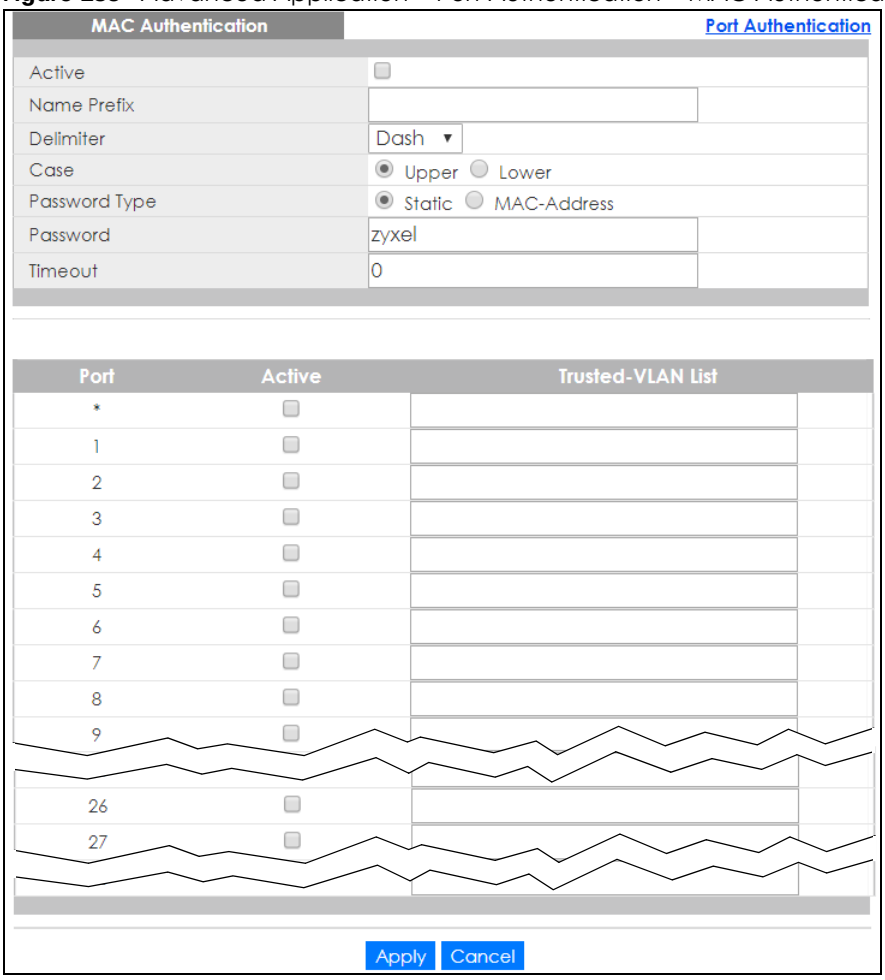
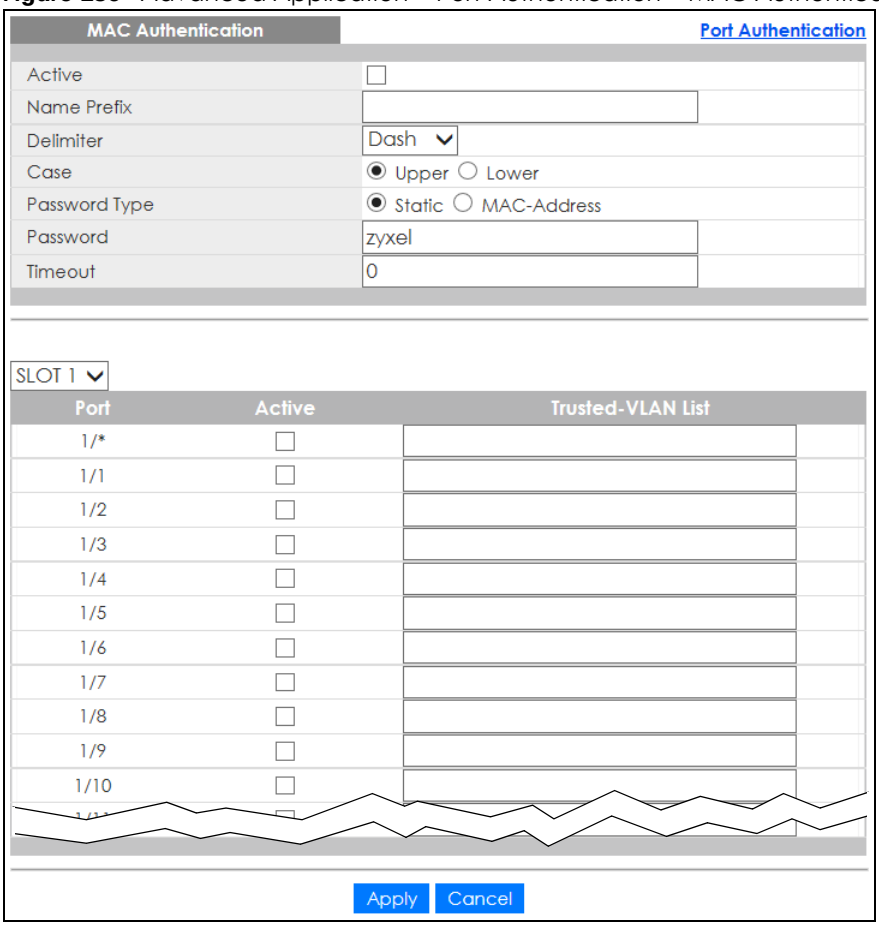


**Figure 186** Advanced Application > Port Authentication > MAC Authentication (Stacking Mode)




The following table describes the labels in this screen.

Table 92 Advanced Application > Port Authentication > MAC Authentication

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to permit MAC authentication on the Switch.<br><br>Note: You must first enable MAC authentication on the Switch before configuring it on each port. |
| Name Prefix | Type the prefix that is appended to all MAC addresses sent to the RADIUS server for authentication. You can enter up to 32 printable ASCII characters.<br><br>If you leave this field blank, then only the MAC address of the client is forwarded to the RADIUS server. |
| Delimiter | Select the delimiter the RADIUS server uses to separate the pairs in MAC addresses used as the account user name (and password). You can select **Dash** (–), **Colon** (:), or **None** to use no delimiters at all in the MAC address. |
| Case | Select the case (**Upper** or **Lower**) the RADIUS server requires for letters in MAC addresses used as the account user name (and password). |
| Password Type | Select **Static** to have the Switch send the password you specify below or **MAC-Address** to use the client MAC address as the password. |
| Password | Type the password the Switch sends along with the MAC address of a client for authentication with the RADIUS server. You can enter up to 32 printable ASCII characters except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]. |

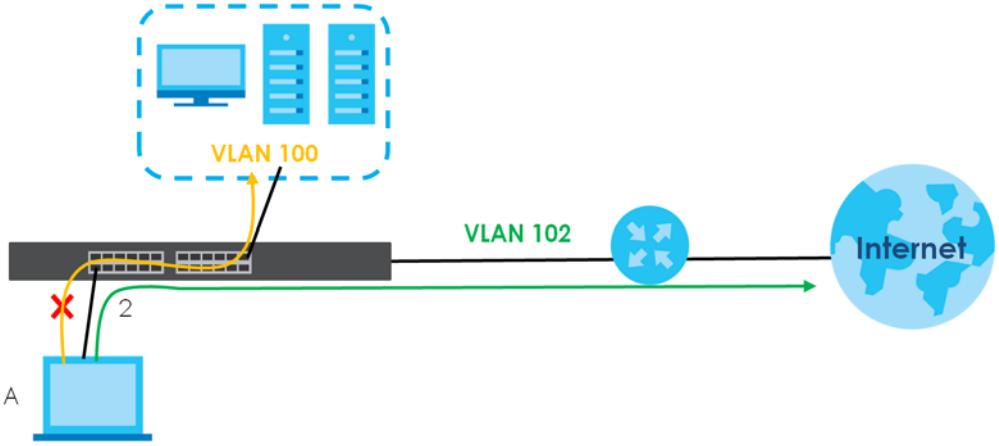
Table 92 Advanced Application > Port Authentication > MAC Authentication (continued)

| LABEL | DESCRIPTION |
|---|---|
| Timeout | Specify the amount of time before the Switch allows a client MAC address that fails authentication to try and authenticate again. Maximum time is 3000 seconds.<br><br>When a client fails MAC authentication, its MAC address is learned by the MAC address table with a status of denied. The timeout period you specify here is the time the MAC address entry stays in the MAC address table until it is cleared. If you specify 0 for the timeout value, the Switch uses the **Aging Time** configured in the **Switch Setup** screen.<br><br>Note: If the **Aging Time** in the **Switch Setup** screen is set to a lower value, then it supersedes this setting. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to permit MAC authentication on this port. You must first allow MAC authentication on the Switch before configuring it on each port. |
| Trusted VLAN List | Enter the ID numbers of the trusted VLANs (separated by a comma). If a client's VLAN ID is specified here, the client can access the port and the connected networks without MAC authentication. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 18.5 Guest VLAN

When 802.1x or MAC Authentication is enabled on the Switch and its ports, clients that do not have the correct credentials are blocked from using the ports. You can configure your Switch to have one VLAN that acts as a guest VLAN. If you enable the guest VLAN (**102** in the example) on a port (**2** in the example), the user (**A** in the example) that is not IEEE 802.1x capable or fails to enter the correct user name and password can still access the port, but traffic from the user is forwarded to the guest VLAN. That is, unauthenticated users can have access to limited network resources in the same guest VLAN, such as the Internet. The access granted to the Guest VLAN depends on how the network administrator configures switches or routers with the guest network feature.

**Figure 187** Guest VLAN Example




Use this screen to enable and assign a guest VLAN to a port. In the **Port Authentication** screen click **Guest Vlan** to display the configuration screen as shown.

**Figure 188** Advanced Application > Port Authentication > Guest VLAN (Standalone Mode)

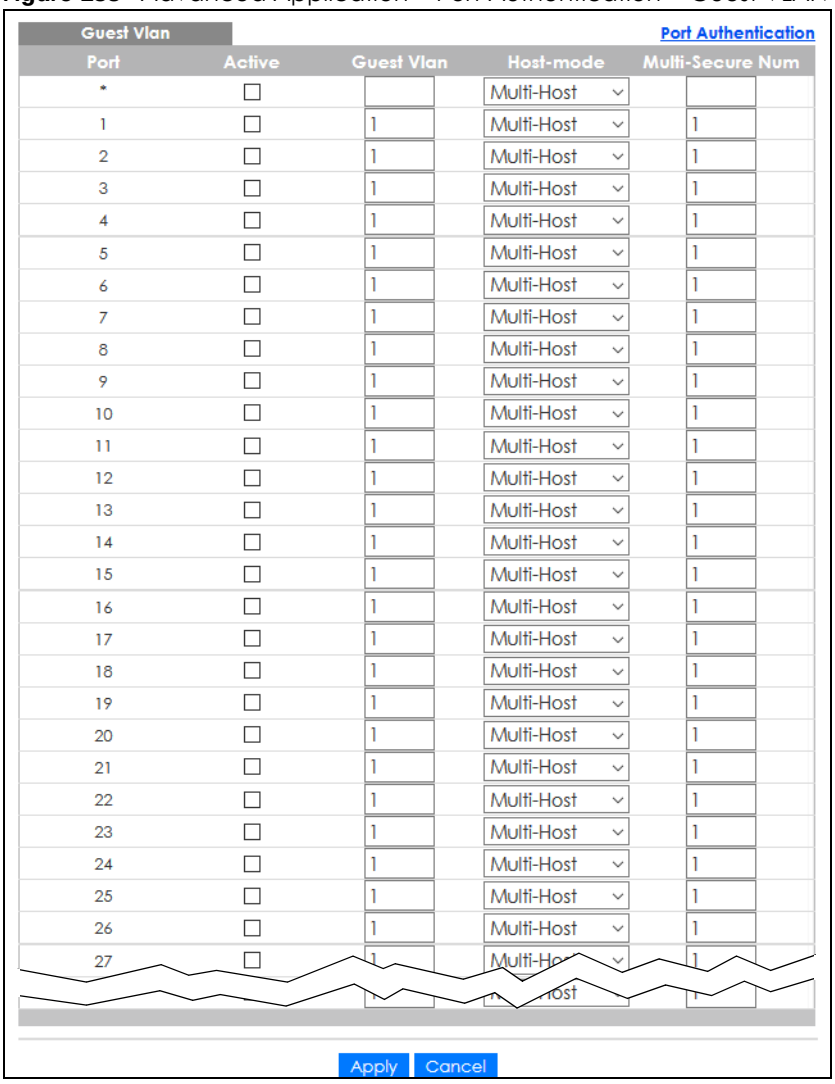
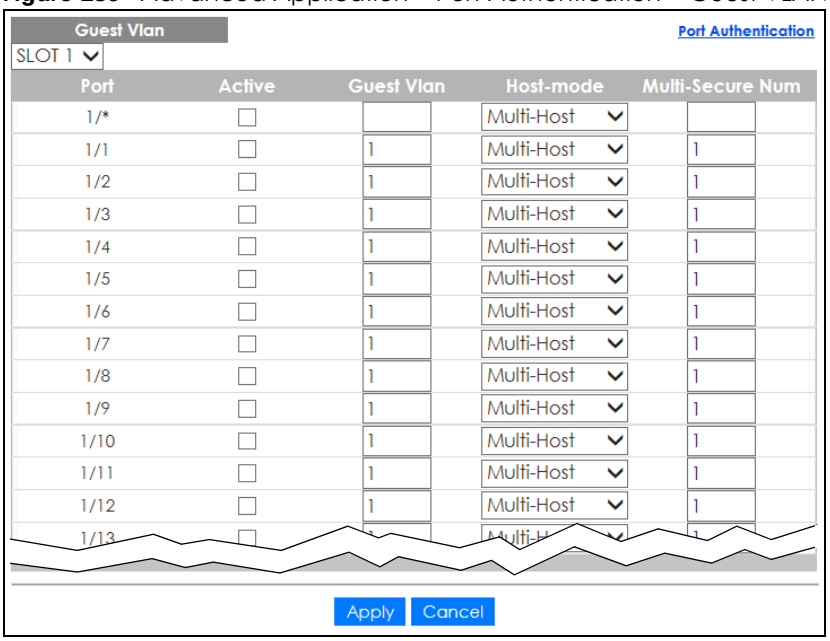


**Figure 189** Advanced Application > Port Authentication > Guest VLAN (Stacking Mode)




The following table describes the labels in this screen.

Table 93 Advanced Application > Port Authentication > Guest VLAN

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the guest VLAN feature on this port.<br>Clients that fail authentication are placed in the guest VLAN and can receive limited services. |
| Guest Vlan | A guest VLAN is a pre-configured VLAN on the Switch that allows non-authenticated users to access limited network resources through the Switch. You must also enable IEEE 802.1x authentication on the Switch and the associated ports. Enter the number that identifies the guest VLAN.<br>Make sure this is a VLAN recognized in your network. |
| Host-mode | Specify how the Switch authenticates users when more than one user connect to the port (using a hub).<br>Select **Multi-Host** to authenticate only the first user that connects to this port. If the first user enters the correct credential, any other users are allowed to access the port without authentication. If the first user fails to enter the correct credential, they are all put in the guest VLAN. Once the first user who did authentication logs out or disconnects from the port, the rest of the users are blocked until a user does the authentication process again.<br>Select **Multi-Secure** to authenticate each user that connects to this port. |
| Multi-Secure Num | If you set **Host-mode** to **Multi-Secure**, specify the maximum number of users (between 1 and 24) that the Switch will authenticate on this port. |

Table 93 Advanced Application > Port Authentication > Guest VLAN (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 18.6 Compound Authentication

Use this screen to allow network access for clients that:

- pass either IEEE 802.1x authentication OR MAC authentication, or
- pass both IEEE 802.1x authentication AND MAC authentication.

The authentication modes are:

- In IEEE 802.1x authentication, the Switch prompts the client for login information in the form of a user name and password. When the client provides the login credentials, the Switch sends an authentication request to a RADIUS server. The RADIUS server validates whether this client is allowed access to the port. Use the **AAA** > **RADIUS Server Setup** screen to configure the RADIUS server.
- In MAC authentication, the login credentials are based on the source MAC address of the client connecting to a port on the Switch along with a password configured specifically for MAC authentication on the Switch.

In the **Port Authentication** screen click **Compound Authentication Mode** to display the configuration screen as shown.

**Figure 190** Advanced Application > Port Authentication > Compound Authentication Mode (Standalone Mode)

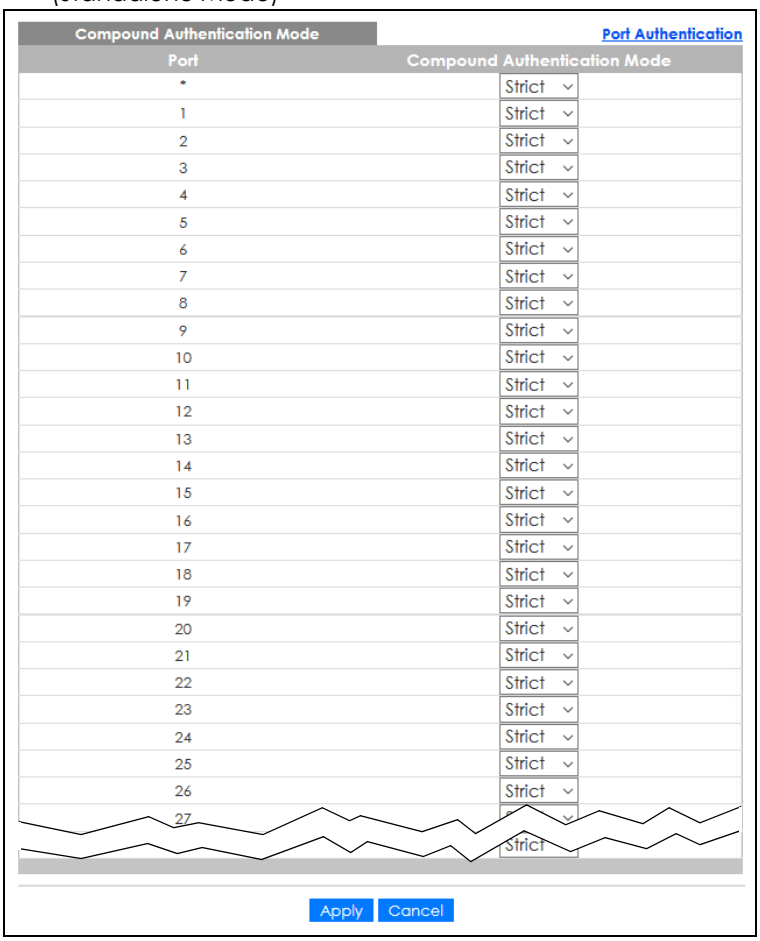
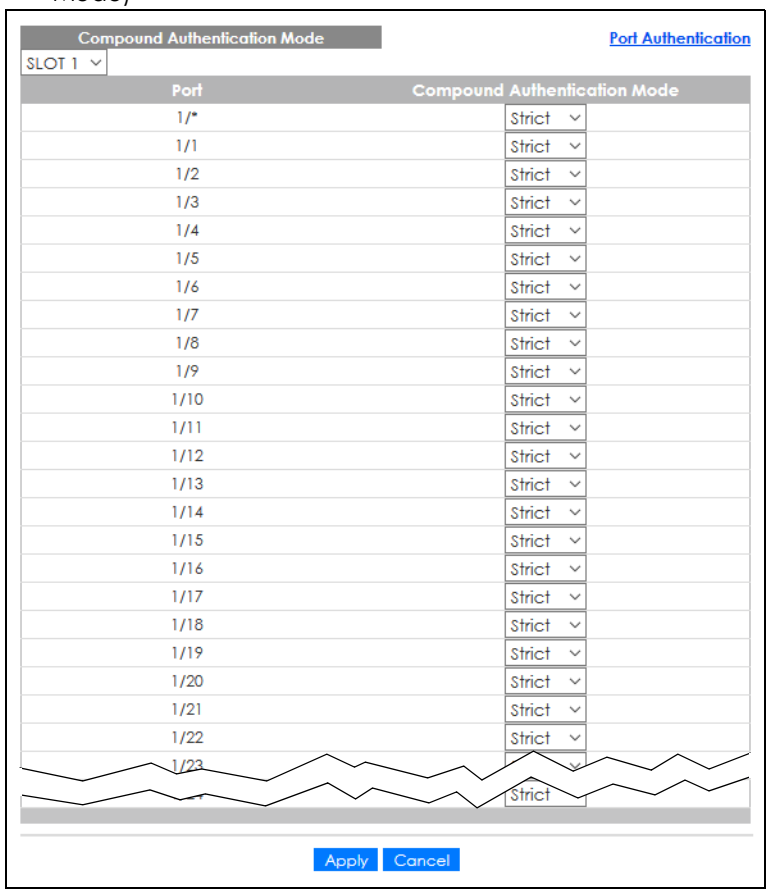


**Figure 191** Advanced Application > Port Authentication > Compound Authentication Mode (Stacking Mode)




The following table describes the labels in this screen.

Table 94 Advanced Application > Port Authentication > Compound Authentication Mode

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Compound Authentication Mode | Specify how the Switch authenticates clients for network access.<br>Select **Strict** to allow network access to clients only when clients passes IEEE 802.1x authentication AND MAC authentication at the same time.<br>Select **Loose** to allow network access to clients when clients passes IEEE 802.1x authentication OR MAC authentication. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 18.7 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 18.7.1 IEEE 802.1x

The IEEE 802.1x is a standard for authentication as well as providing additional accounting and control features. It can be implemented both on wired and wireless networks. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the switch or the wired clients.

## 18.7.2 RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The RADIUS server handles the following tasks:

- Authentication

Determines the identity of the users.

- Authorization

Determines the network services available to authenticated users once they are connected to the network.

- Accounting

Keeps track of the actions that are perform on the switch, such as login events.

RADIUS is a simple package exchange in which your switch acts as a message relay between the wired client and the network RADIUS server.

### 18.7.2.1 Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user authentication:

- Access-Request

Sent by a switch requesting authentication.

- Access-Reject

Sent by a RADIUS server rejecting access.

- Access-Accept

Sent by a RADIUS server allowing access.

- Access-Challenge

Sent by a RADIUS server requesting more information in order to allow access. The switch sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the switch and the RADIUS server for user accounting:

- Accounting-Request

Sent by the switch requesting accounting.

- Accounting-Response

Sent by the RADIUS server to indicate that it has started or stopped accounting.

The switch and the RADIUS server use a shared secret key, which is a password, they both know to authenticate the communications between them, and ensure network security. A shared key is not sent over the network.

The switch forwards the RADIUS requests of a client to the RADIUS server. The login password information exchanged is sent over the network and encrypted to protect the network from unauthorized access.

### 18.7.3 EAP (Extensible Authentication Protocol) Authentication

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wired LAN device may not support all authentication types.

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, a switch helps a wired station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary switch that supports IEEE 802.1x.

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificates from a certificate authority (CA). A certificate (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

- EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wired client. The wired client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plain text passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

- EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wired clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAPTLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

- EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending user name and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

- PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple user name and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

- LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

### 18.7.4 EAPOL (EAP over LAN)

EAPOL is a port authentication protocol used in IEEE 802.1x. It encapsulates and sends EAP packets from the LAN. EAPOL exchanges the following messages between a wired client and switch.

- EAPOL-Start

A wired client will send this message to a switch to let it know the wired client is ready.

- EAPOL-Key

The switch will send an encryption key to the wired client. It will be allowed access to the network when both of the switch and wired client have the correct encryption keys.

- EAP-Packet

Both of the wired client and the switch will send this message to complete the authentication process.

- EAPOL-Logoff

This message will be sent when the wired client wants to be disconnected from the network.

- EAPOL-Encapsulated-ASF-Alert

This message is sent If the authentication process is not completed yet, and alerts needs to be forwarded.

# CHAPTER 19
# Port Security

This chapter shows you how to set up port security.

## 19.1 About Port Security

Port security allows only packets with dynamically learned MAC addresses and/or configured static MAC addresses to pass through a port on the Switch. The Switch can learn up to 32K MAC addresses in total with no limit on individual ports other than the sum cannot exceed 32K.

For maximum port security, enable this feature, disable MAC address learning and configure static MAC addresses for a port. It is not recommended you disable port security together with MAC address learning as this will result in many broadcasts. By default, MAC address learning is still enabled even though the port security is not activated.

## 19.2 Port Security Setup

Click **Advanced Application** > **Port Security** in the navigation panel to display the screen as shown.

**Figure 192** Advanced Application > Port Security (Standalone Mode)

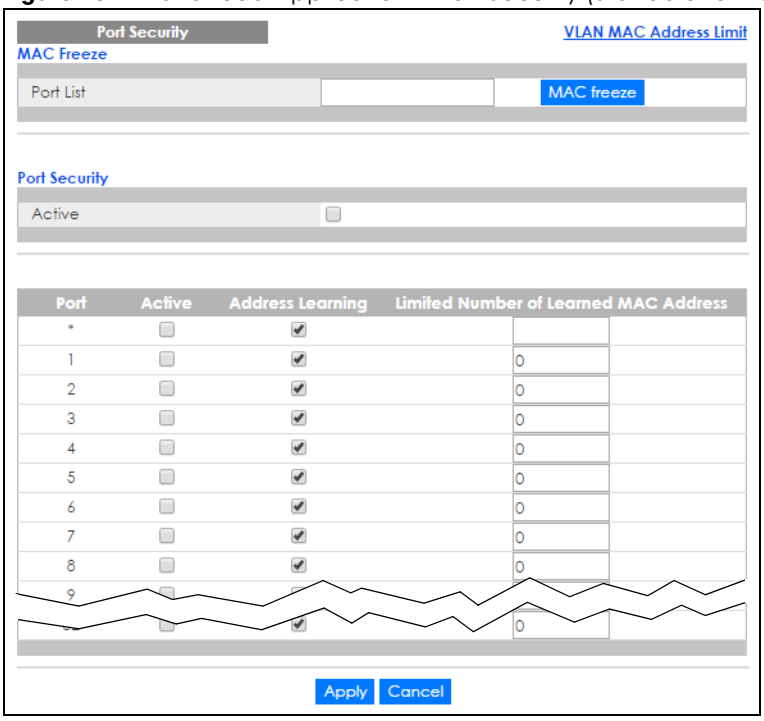
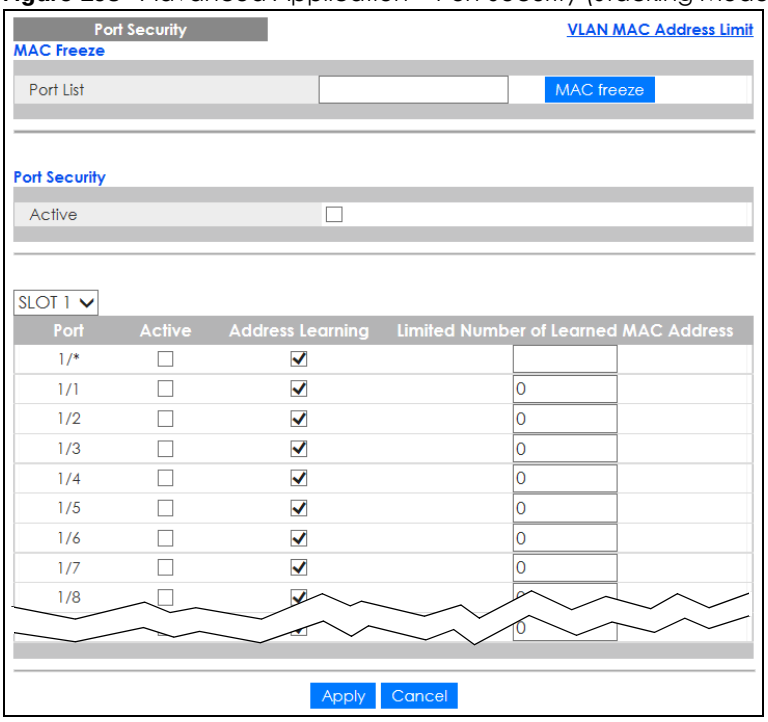


**Figure 193** Advanced Application > Port Security (Stacking Mode)




The following table describes the labels in this screen.

Table 95 Advanced Application > Port Security

| LABEL | DESCRIPTION |
|---|---|
| Port List | Enter the number of the ports (separated by a comma) on which you want to enable port security and disable MAC address learning. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. After you click **MAC freeze**, all previously learned MAC addresses on the specified ports will become static MAC addresses and display in the **Static MAC Forwarding** screen. |
| MAC freeze | Click **MAC freeze** to have the Switch automatically select the **Active** check boxes and clear the **Address Learning** check boxes only for the ports specified in the **Port List**. |
| Active | Select this option to enable port security on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the port security feature on this port. The Switch forwards packets whose MAC addresses is in the MAC address table on this port. Packets with no matching MAC addresses are dropped.<br>Clear this check box to disable the port security feature. The Switch forwards all packets on this port. |

Table 95 Advanced Application > Port Security (continued)

| LABEL | DESCRIPTION |
|---|---|
| Address Learning | MAC address learning reduces outgoing broadcast traffic. For MAC address learning to occur on a port, the port itself must be active with address learning enabled. |
| Limited Number of Learned MAC Address | Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device must wait until one of the five learned MAC addresses ages out. MAC address aging out time can be set in the **Switch Setup** screen. The valid range is from "0" to "32K". "0" means this feature is disabled. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 19.3 VLAN MAC Address Limit

Use this screen to set the MAC address learning limit on per-port and per-VLAN basis. Click **VLAN MAC Address Limit** in the **Advanced Application** > **Port Security** screen to display the screen as shown.

**Figure 194** Advanced Application > Port Security > VLAN MAC Address Limit (Standalone Mode)

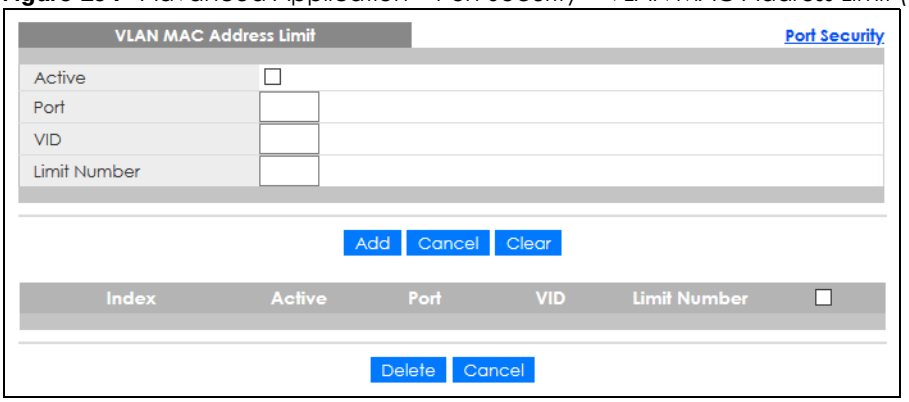
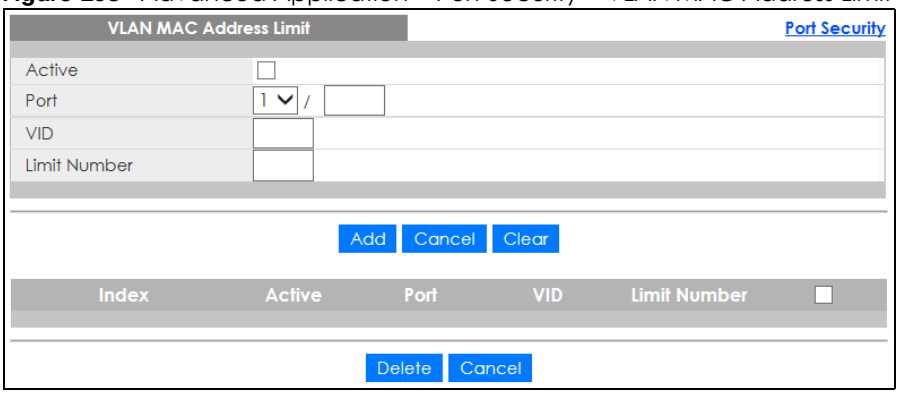



**Figure 195** Advanced Application > Port Security > VLAN MAC Address Limit (Stacking Mode)



The following table describes the labels in this screen.

Table 96 Advanced Application > Port Security > VLAN MAC Address Limit

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to activate this rule. |
| Port | Enter the number of the port to which this rule is applied. In stacking mode, the first box field is the slot ID and the second field is the port number. |
| VID | Enter the VLAN identification number. |
| Limit Number | Use this field to limit the number of (dynamic) MAC addresses that may be learned on a port in a specified VLAN. For example, if you set this field to "5" on port 2, then only the devices with these five learned MAC addresses may access port 2 at any one time. A sixth device would have to wait until one of the five learned MAC addresses aged out. MAC address aging out time can be set in the **Switch Setup** screen. The valid range is from "0" to "32K". "0" means this feature is disabled. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays the index number of the rule. Click an index number to change the settings. |
| Active | This field displays **Yes** when the rule is activated and **No** when is it deactivated. |
| Port | This field displays the number of the port to which this rule is applied. |
| VID | This is the VLAN ID number to which the port belongs. |
| Limit Number | This is the maximum number of MAC addresses which a port can learn in a VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove in the **Delete** column and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes in the **Delete** column. |

# CHAPTER 20 Time Range

## 20.1 Time Range Overview

You can set a time range for time-oriented features such as Classifier ACL (Access Control List) rule which categorizes data packets into different network traffic flow. The advantage of the time range feature is that it allows you to schedule the active time of configurations.

The time range can be configured in two ways – Absolute and Periodic. Absolute is a fixed time range with a start and end time. Periodic is recurrence of a time range and does not have an end time.

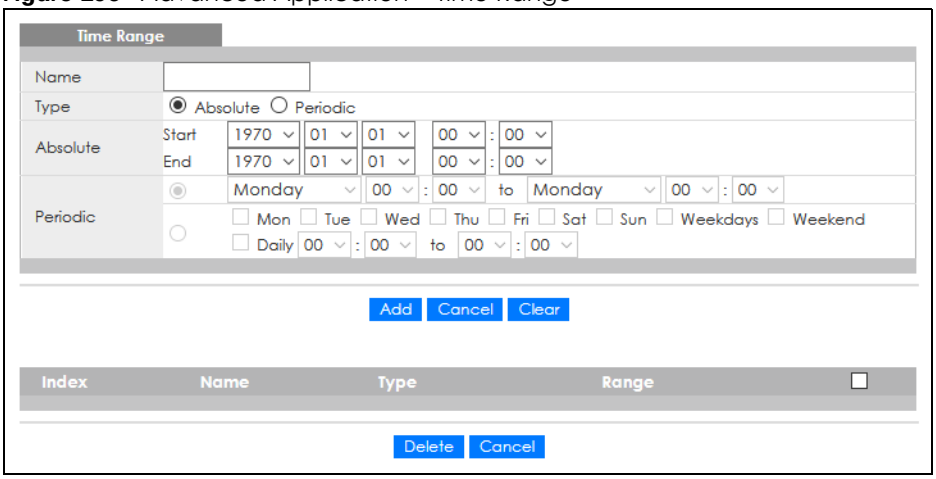
### 20.1.1 What You Can Do

Use the **Time Range** screen (Section 20.2 on page 254) to view or define a schedule on the Switch.

## 20.2 Configuring Time Range

Click **Advanced Application** > **Time Range** in the navigation panel to display the screen as shown.

**Figure 196** Advanced Application > Time Range



The following table describes the labels in this screen.

Table 97 Advanced Application > Time Range

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name for this rule for identifying purposes. |
| Type | Select **Absolute** to create a one-time schedule. One-time schedules begin on a specific start date and time and end on a specific stop date and time. One-time schedules are useful for long holidays and vacation periods.<br>Alternatively, select **Periodic** to create a recurring schedule. Recurring schedules begin at a specific start time and end at a specific stop time on selected days of the week (Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday). Recurring schedules are useful for defining the workday and off-work hours. |
| Absolute | This section is available only when you set **Type** to **Absolute**. |
| Start | Specify the year, month, day, hour and minute when the schedule begins. |
| End | Specify the year, month, day, hour and minute when the schedule ends. |
| Periodic | This section is available only when you set **Type** to **Periodic**.<br>Select the first option if you want to define a recurring schedule for a consecutive time period. You then select the day of the week, hour and minute when the schedule begins and ends respectively.<br>Select the second option if you want to define a recurring schedule for multiple non-consecutive time periods. You need to select each day of the week the recurring schedule is effective. You also need to specify the hour and minute when the schedule begins and ends each day. The schedule begins and ends in the same day. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to clear the fields to the factory defaults. |
| Index | This field displays the index number of the rule. Click an index number to change the settings. |
| Name | This field displays the descriptive name for this rule. This is for identification purpose only. |
| Type | This field displays the type of the schedule. |
| Range | This field displays the time periods to which this schedule applies. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# CHAPTER 21
# Classifier

## 21.1 Classifier Overview

This chapter introduces and shows you how to configure the packet classifier on the Switch. It also discusses Quality of Service (QoS) and classifier concepts as employed by the Switch.

### 21.1.1 What You Can Do

- Use the **Classifier Status** screen (Section 21.2 on page 257) to view the classifiers configured on the Switch and how many times the traffic matches the rules.
- Use the **Classifier Configuration** screen (Section 21.3 on page 257) to define the classifiers and view a summary of the classifier configuration. After you define the classifier, you can specify actions (or policy) to act upon the traffic that matches the rules.
- Use the **Classifier Global Setting** screen (Section 21.4 on page 262) to configure the match order and enable logging on the Switch.

### 21.1.2 What You Need to Know

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical application such as video-on-demand.

A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming port number. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

Configure QoS on the Switch to group and prioritize application traffic and fine-tune network performance. Setting up QoS involves two separate steps:

1. Configure classifiers to sort traffic into different flows.
2. Configure policy rules to define actions to be performed on a classified traffic flow (refer to Chapter 22 on page 265 to configure policy rules).

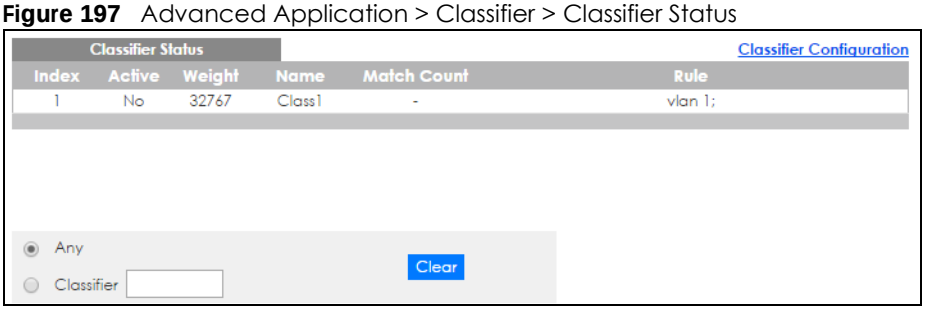
   You can also configure policy routing to forward a classified traffic flow to a different gateway for cost savings and load sharing.

# 21.2 Classifier Status

Use this screen to view the classifiers configured on the Switch and how many times the traffic matches the rules.

Click **Advanced Application** > **Classifier** in the navigation panel to display the configuration screen as shown.

**Figure 197** Advanced Application > Classifier > Classifier Status




The following table describes the labels in this screen.

Table 98 Advanced Application > Classifier > Classifier Status

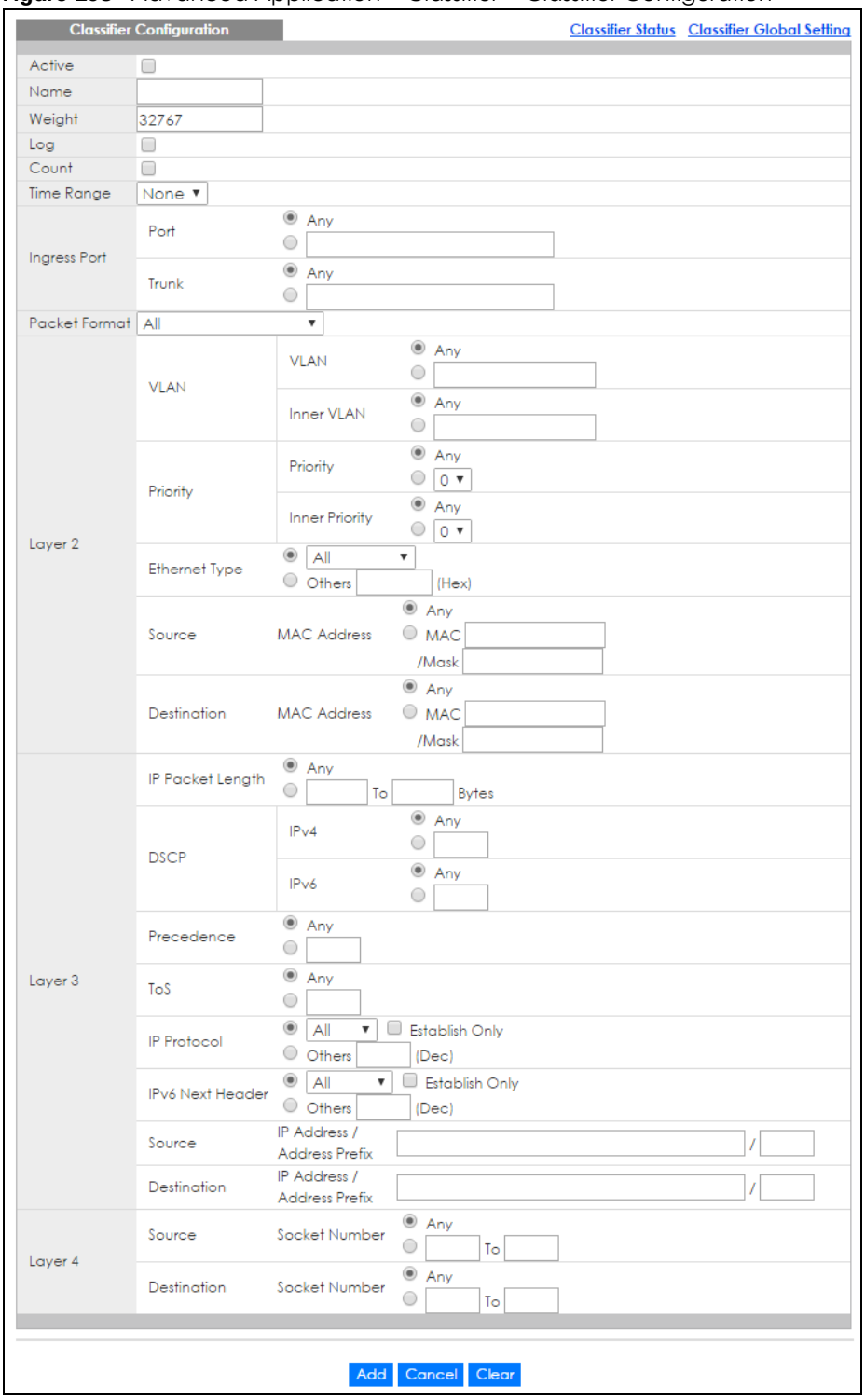
| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of the rule. Click an index number to edit the rule. |
| Active | This field displays **Yes** when the rule is activated and **No** when it is deactivated. |
| Weight | This field displays the rule's weight. This is to indicate a rule's priority when the match order is set to **manual** in the **Classifier** > **Classifier Configuration** > **Classifier Global Setting** screen.<br>The higher the number, the higher the rule's priority. |
| Name | This field displays the descriptive name for this rule. This is for identification purpose only. |
| Match Count | This field displays the number of times a rule is applied. It displays '–' if the rule does not have count enabled. |
| Rule | This field displays a summary of the classifier rule's settings. |
| Any | Select **Any**, then click **Clear** to clear the matched count for all classifiers. |
| Classifier | Select **Classifier**, enter a classifier rule name and then click **Clear** to erase the recorded statistical information for that classifier, or select **Any** to clear statistics for all classifiers. |
| Clear | Click **Clear** to erase the recorded statistical information for the classifier. |

# 21.3 Classifier Configuration

Use the **Classifier Configuration** screen to define the classifiers. After you define the classifier, you can specify actions (or policy) to act upon the traffic that matches the rules.

In the **Classifier Status** screen click **Classifier Configuration** to display the configuration screen as shown.

**Figure 198** Advanced Application > Classifier > Classifier Configuration



The following table describes the labels in this screen.

Table 99 Advanced Application > Classifier > Classifier Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable this rule. |
| Name | Enter a descriptive name for this rule for identifying purposes. |
| Weight | Enter a number between 0 and 65535 to specify the rule's weight. When the match order is in manual mode in the **Classifier Global Setting** screen, a higher weight means a higher priority. |
| Log | Select this option to have the Switch create a log message when the rule is applied and record the number of matched packets in a particular time interval.<br><br>Note: Make sure you also enable logging in the **Classifier Global Setting** screen. |
| Count | Select this option to have the Switch count how many times the rule is applied. |
| Time Range | Select the name of the pre-configured schedule that you want to apply to the rule. The rule will be active only at the scheduled date and/or time.<br><br>If you select **None**, the rule will be active all the time. |
| Ingress Port | |
| Port | Type the port number to which the rule should be applied. You may choose one port only or all ports (**Any**).<br><br>You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br><br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Trunk | Select **Any** to apply the rule to all trunk groups.<br><br>To specify a trunk group, select the second choice and type a trunk group ID. |
| Layer 2<br><br>Specify the fields below to configure a layer 2 classifier. | |
| VLAN | |
| VLAN | Select **Any** to classify traffic from any VLAN or select the second option and specify the source VLAN ID in the field provided. |
| Inner VLAN | Select **Any** to classify traffic from any inner VLAN (the customer's VLAN) or select the second option and specify the source VLAN ID in the field provided. |
| Priority | |
| Priority | Select **Any** to classify traffic from any priority level or select the second option and specify a priority level in the field provided. |
| Inner Priority | Select **Any** to classify traffic from any inner priority level or select the second option and specify a priority level in the field provided. |
| Ethernet Type | Select an Ethernet type or select **Other** and enter the Ethernet type number in hexadecimal value. |
| Source | |
| MAC Address | Select **Any** to apply the rule to all MAC addresses.<br><br>To specify a source, select **MAC/Mask** to enter the source MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match.<br><br>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. If you leave the **Mask** field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff. |

Table 99 Advanced Application > Classifier > Classifier Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Destination | |
| MAC Address | Select **Any** to apply the rule to all MAC addresses.<br>To specify a destination, select **MAC/Mask** to enter the destination MAC address of the packet in valid MAC address format (six hexadecimal character pairs) and type the mask for the specified MAC address to determine which bits a packet's MAC address should match.<br>Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bits of the matched traffic's MAC address, which can be of any hexadecimal characters. For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria. If you leave the **Mask** field blank, the Switch automatically sets the mask to ff:ff:ff:ff:ff:ff. |
| Layer 3<br>Specify the fields below to configure a layer 3 classifier. | |
| IP Packet Length | Click **Any** to classify any size of packet length or manually enter a range of number (from/to) of packet size in the field provided. |
| DSCP<br>IPv4/IPv6 | Select **Any** to classify traffic from any DSCP or select the second option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided. |
| Precedence | Select **Any** to classify traffic from any precedence or select the second option and specify an IP Precedence (the first 3 bits of the 8-bit ToS field) value between 0 and 7 in the field provided. |
| ToS | Select **Any** to classify traffic from any ToS or select the second option and specify Type of Service (the last 5 bits of the 8-bit ToS field) value between 0 and 255 in the field provided. |
| IP Protocol | Select an IPv4 protocol type or select **Other** and enter the protocol number in decimal value.<br>You may select **Establish Only** for **TCP** protocol type. This means that the Switch will pick out the packets that are sent to establish TCP connections. |
| IPv6 Next Header | Select an IPv6 protocol type or select **Other** and enter an 8-bit next header in the IPv6 packet. The Next Header field is similar to the IPv4 Protocol field. The IPv6 protocol number ranges from 1 to 255.<br>You may select **Establish Only** for **TCP** protocol type. This means that the Switch will identify packets that initiate or acknowledge (establish) TCP connections. |
| Source | |
| IP Address/ Address Prefix | Enter a source IP address in dotted decimal notation.<br>Specify the address prefix by entering the number of ones in the subnet mask.<br>A subnet mask can be represented in a 32-bit notation. For example, the subnet mask "255.255.255.0" can be represented as "11111111.11111111.11111111.00000000", and counting up the number of ones in this case results in 24. |
| Destination | |
| IP Address/ Address Prefix | Enter a destination IP address in dotted decimal notation.<br>Specify the address prefix by entering the number of ones in the subnet mask. |
| Layer 4<br>Specify the fields below to configure a layer 4 classifier. | |
| Source | |
| Socket Number | Note: You must select either **UDP** or **TCP** in the **IP Protocol** field before you configure the socket numbers.<br>Select **Any** to apply the rule to all TCP/UDP protocol port numbers or select the second option and enter a TCP/UDP protocol port number. |

Table 99 Advanced Application > Classifier > Classifier Configuration (continued)

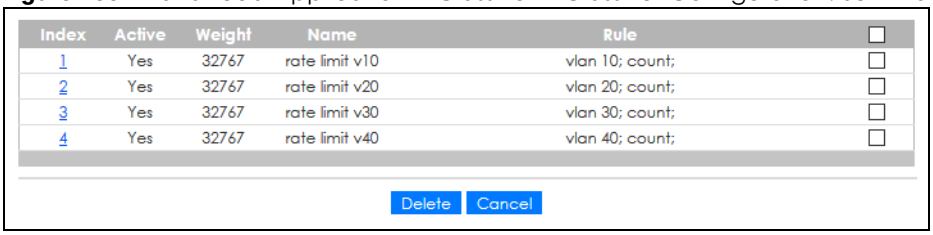
| LABEL | DESCRIPTION |
|---|---|
| Destination | |
| Socket Number | Note: You must select either **UDP** or **TCP** in the **IP Protocol** field before you configure the socket numbers.<br><br>Select **Any** to apply the rule to all TCP/UDP protocol port numbers or select the second option and enter a TCP/UDP protocol port number. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields back to your previous configuration. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |

## 21.3.1 Viewing and Editing Classifier Configuration Summary

To view a summary of the classifier configuration, scroll down to the summary table at the bottom of the **Classifier** screen. To change the settings of a rule, click a number in the **Index** field.

Note: When two rules conflict with each other, a higher layer rule has priority over lower layer rule.

**Figure 199** Advanced Application > Classifier > Classifier Configuration: Summary Table




The following table describes the labels in this screen.

Table 100 Advanced Application > Classifier > Classifier Configuration: Summary Table

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of the rule. Click an index number to edit the rule. |
| Active | This field displays **Yes** when the rule is activated and **No** when it is deactivated. |
| Weight | The field displays the priority of the rule when the match order is in **manual** mode. A higher weight means a higher priority. |
| Name | This field displays the descriptive name for this rule. This is for identification purpose only. |
| Rule | This field displays a summary of the classifier rule's settings. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

The following table shows some other common Ethernet types and the corresponding protocol number.

Table 101 Common Ethernet Types and Protocol Numbers

| ETHERNET TYPE | PROTOCOL NUMBER |
|---|---|
| IP ETHII | 0800 |
| X.75 Internet | 0801 |
| NBS Internet | 0802 |
| ECMA Internet | 0803 |
| Chaosnet | 0804 |
| X.25 Level 3 | 0805 |
| XNS Compat | 0807 |
| Banyan Systems | 0BAD |
| BBN Simnet | 5208 |
| IBM SNA | 80D5 |
| AppleTalk AARP | 80F3 |

Some of the most common TCP and UDP port numbers are:

Table 102 Common TCP and UDP Port Numbers

| PROTOCOL NAME | TCP/UDP PORT NUMBER |
|---|---|
| FTP | 21 |
| Telnet | 23 |
| SMTP | 25 |
| DNS | 53 |
| HTTP | 80 |
| POP3 | 110 |

# 21.4 Classifier Global Setting Configuration

Use this screen to configure the match order and enable logging on the Switch. In the **Classifier Configuration** screen click **Classifier Global Setting** to display the configuration screen as shown.

**Figure 200** Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

The following table describes the labels in this screen.

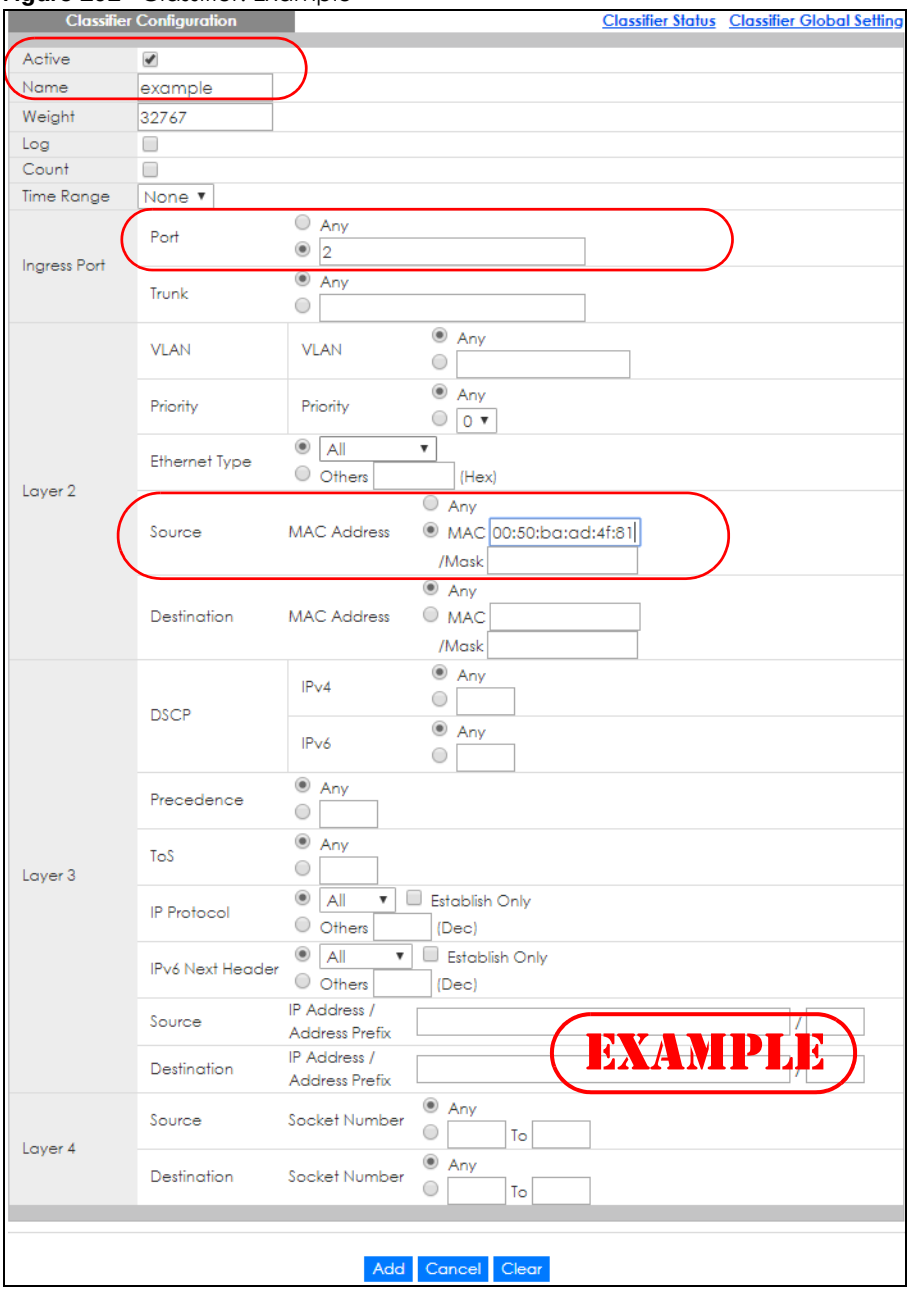
Table 103 Advanced Application > Classifier > Classifier Configuration > Classifier Global Setting

| LABEL | DESCRIPTION |
|---|---|
| Match Order | Select **manual** to have classifier rules applied according to the weight of each rule you configured in **Advanced Application** > **Classifier** > **Classifier Configuration**.<br><br>Alternatively, select **auto** to have classifier rules applied according to the layer of the item configured in the rule. Layer-4 items have the highest priority, and layer-2 items has the lowest priority. For example, you configure a layer-2 item (VLAN ID) in classifier A and configure a layer-3 item (source IP address) in classifier B. When an incoming packet matches both classifier rules, classifier B has priority over classifier A. |
| Logging | |
| Active | Select this to allow the Switch to create a log when packets match a classifier rule during a defined time interval. |
| Interval | Select the length of the time period (in seconds) to count matched packets for a classifier rule. Enter an integer from 0 – 65535. 0 means that no logging is done. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 21.5 Classifier Example

The following screen shows an example where you configure a classifier that identifies all traffic from MAC address 00:50:ba:ad:4f:81 on port 2.

**Figure 201** Classifier: Example




After you have configured a classifier, you can configure a policy (in the **Policy** screen) to define actions on the classified traffic flow.

# CHAPTER 22
# Policy Rule

## 22.1 Policy Rules Overview

This chapter shows you how to configure policy rules.

A classifier distinguishes traffic into flows based on the configured criteria (refer to Chapter 21 on page 256 for more information). A policy rule ensures that a traffic flow gets the requested treatment in the network.

### 22.1.1 What You Can Do

Use the **Policy Rule** screen (Section 22.2 on page 266) to enable the policy and display the active classifiers you configure in the **Classifier** screen.

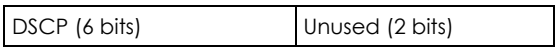
### 22.1.2 DiffServ

DiffServ (Differentiated Services) is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

### 22.1.3 DSCP and Per-Hop Behavior

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (TOS) field in the IP header. The DS field contains a 2-bit unused field and a 6-bit DSCP field which can define up to 64 service levels. The following figure illustrates the DS field.

DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.



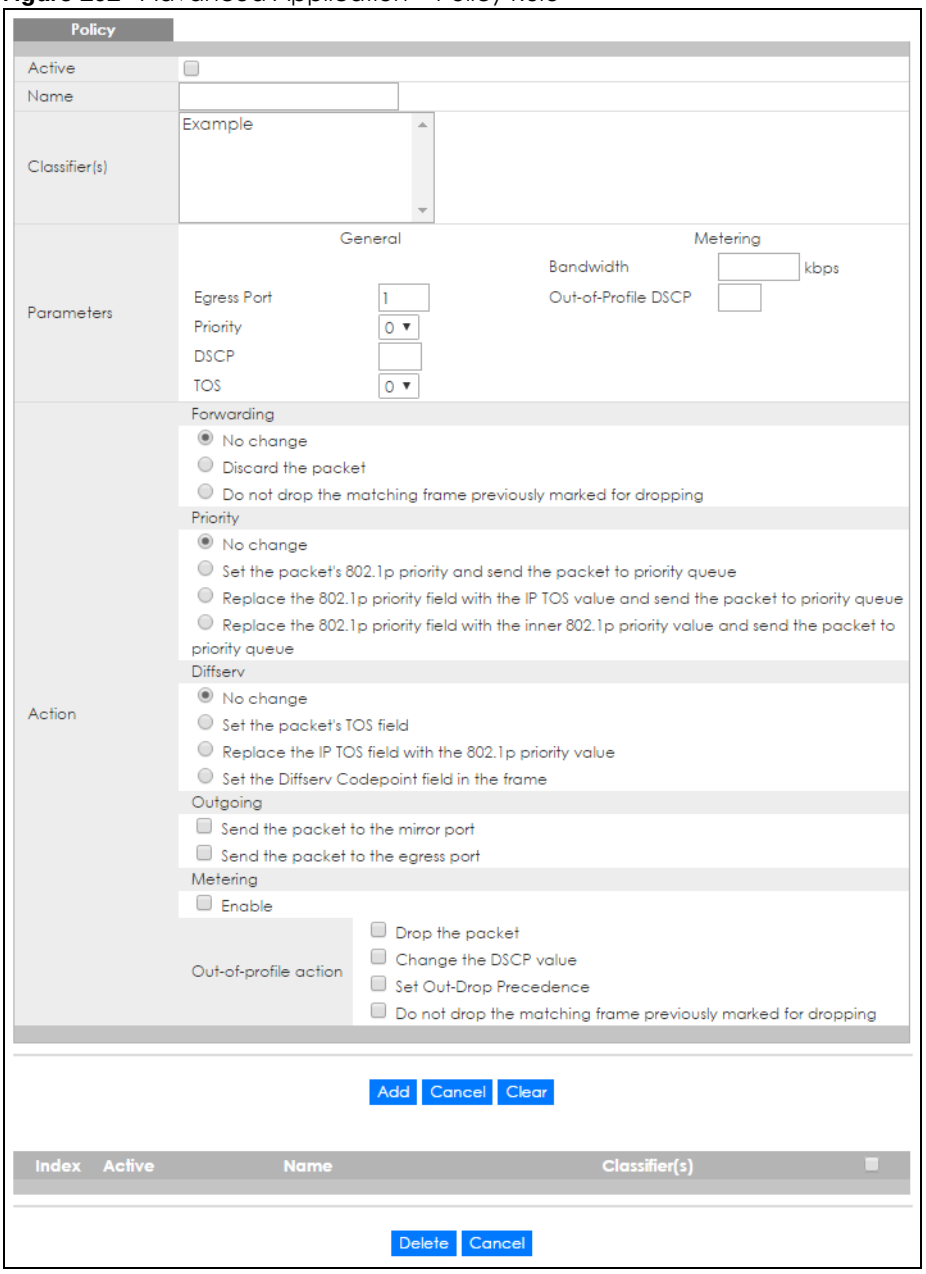

The DSCP value determines the forwarding behavior, the PHB (Per-Hop Behavior), that each packet gets across the DiffServ network. Based on the marking rule, different kinds of traffic can be marked for different kinds of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

# 22.2 Configuring Policy Rules

You must first configure a classifier in the **Classifier** screen.

Click **Advanced Application** > **Policy Rule** in the navigation panel to display the screen as shown.

**Figure 202** Advanced Application > Policy Rule




The following table describes the labels in this screen.

Table 104 Advanced Application > Policy Rule

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable the policy. |
| Name | Enter a descriptive name for identification purposes. |

Table 104 Advanced Application > Policy Rule (continued)

| LABEL | DESCRIPTION |
|---|---|
| Classifier(s) | This field displays the active classifiers you configure in the **Classifier** screen.<br>Select the classifiers to which this policy rule applies. To select more than one classifier, press [SHIFT] and select the choices at the same time. |
| Parameters<br>Set the fields below for this policy. You only have to set the fields that is related to the actions you configure in the **Action** field. | |
| General | |
| Egress Port | Type the number of an outgoing port. In stacking mode, the first number represents the slot and the second the port number. |
| Priority | Specify a priority level. |
| DSCP | Specify a DSCP (DiffServ Code Point) number between 0 and 63. |
| TOS | Specify the type of service (TOS) priority level. |
| Metering | You can configure the desired bandwidth available to a traffic flow. Traffic that exceeds the maximum bandwidth allocated (in cases where the network is congested) is called out-of-profile traffic. |
| Bandwidth | Specify the bandwidth in kilobit per second (Kbps). Enter a number between 1 and 1000000. |
| Out-of-Profile DSCP | Specify a new DSCP number (between 0 and 63) if you want to replace or remark the DSCP number for out-of-profile traffic. |
| Action<br>Specify the actions the Switch takes on the associated classified traffic flow. | |
| Forwarding | Select **No change** to forward the packets.<br>Select **Discard the packet** to drop the packets.<br>Select **Do not drop the matching frame previously marked for dropping** to retain the frames that were marked to be dropped before. |
| Priority | Select **No change** to keep the priority setting of the frames.<br>Select **Set the packet's 802.1p priority and send the packet to priority queue** to replace the packet's 802.1p priority field with the value you set in the **Priority** field and put the packets in the designated queue.<br>Select **Replace the 802.1p priority field with the IP TOS value and send the packet to priority queue** to replace the packet's 802.1p priority field with the value you set in the **TOS** field and put the packets in the designated queue.<br>Select **Replace the 802.1p priority field with the inner 802.1p priority value and send the packet to priority queue** to replace the packet's 802.1p priority field with the existing customer priority level carried in the frames and put the packets in the designated queue. |
| Diffserv | Select **No change** to keep the TOS and/or DSCP fields in the packets.<br>Select **Set the packet's TOS field** to set the TOS field with the value you configure in the **TOS** field.<br>Select **Replace the IP TOS with the 802.1p priority value** to replace the TOS field with the value you configure in the **Priority** field.<br>Select **Set the Diffserv Codepoint field in the frame** to set the DSCP field with the value you configure in the **DSCP** field. |
| Outgoing | Select **Send the packet to the mirror port** to send the packet to the mirror port.<br>Select **Send the packet to the egress port** to send the packet to the egress port. |
| Metering | Select **Enable** to activate bandwidth limitation on the traffic flows then set the actions to be taken on out-of-profile packets. |

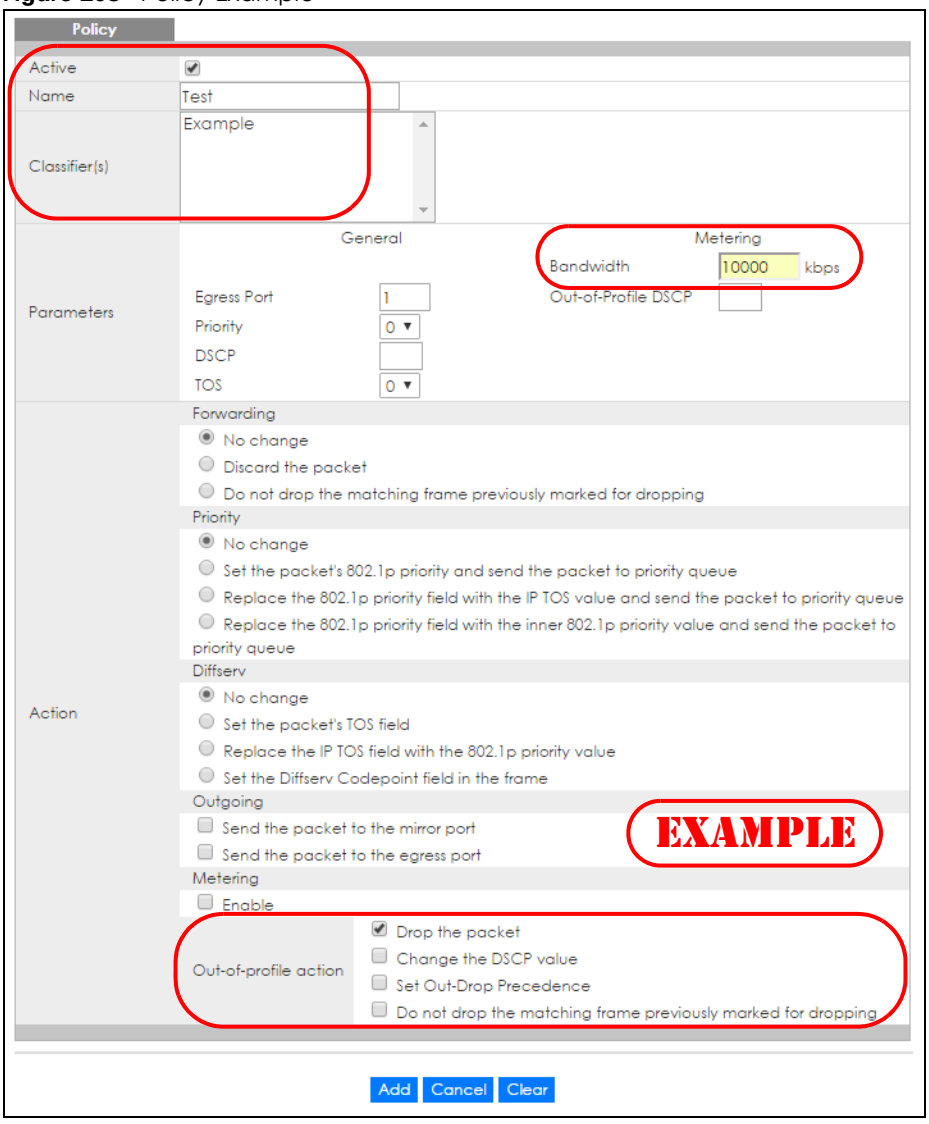
Table 104 Advanced Application > Policy Rule (continued)

| LABEL | DESCRIPTION |
|---|---|
| Out-of-profile action | Select the actions to be performed for out-of-profile traffic.<br>Select **Drop the packet** to discard the out-of-profile traffic.<br>Select **Change the DSCP value** to replace the DSCP field with the value specified in the **Out of profile DSCP** field.<br>Select **Set Out-Drop Precedence** to mark out-of-profile traffic and drop it when network is congested.<br>Select **Do not drop the matching frame previously marked for dropping** to queue the frames that are marked to be dropped. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays the policy index number. Click an index number to edit the policy. |
| Active | This field displays **Yes** when policy is activated and **No** when is it deactivated. |
| Name | This field displays the name you have assigned to this policy. |
| Classifier(s) | This field displays the names of the classifier to which this policy applies. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 22.3 Policy Example

The figure below shows an example **Policy** screen where you configure a policy to limit bandwidth and discard out-of-profile traffic on a traffic flow classified using the **Example** classifier (refer to Section 21.5 on page 263).

**Figure 203** Policy Example



# CHAPTER 23
# Queuing Method

## 23.1 Queuing Method Overview

This chapter introduces the queuing methods supported.

Queuing is used to help solve performance degradation when there is network congestion. Use the **Queuing Method** screen to configure queuing algorithms for outgoing traffic. See also **Priority Queue Assignment** in **Switch Setup** and **802.1p Priority** in **Port Setup** for related information.

### 23.1.1 What You Can Do

Use the **Queuing Method** screen (Section 23.2 on page 271) to set priorities for the queues of the Switch. This distributes bandwidth across the different traffic queues.

### 23.1.2 What You Need to Know

Queuing algorithms allow switches to maintain separate queues for packets from each individual source or flow and prevent a source from monopolizing the bandwidth.

#### Strictly Priority Queuing

Strictly Priority Queuing (SPQ) services queues based on priority only. As traffic comes into the Switch, traffic on the highest priority queue, Q7 is transmitted first. When that queue empties, traffic on the next highest-priority queue, Q6 is transmitted until Q6 empties, and then traffic is transmitted on Q5 and so on. If higher priority queues never empty, then traffic on lower priority queues never gets sent. SPQ does not automatically adapt to changing network requirements.

#### Weighted Fair Queuing

Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on its bandwidth weight (portion) (the number you configure in the Weight field) when there is traffic congestion. WFQ is activated only when a port has more traffic than it can handle. Queues with larger weights get more guaranteed bandwidth than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues. By default, the weight for Q0 is 1, for Q1 is 2, for Q2 is 3, and so on.

#### Weighted Round Robin Scheduling (WRR)

Round Robin Scheduling services queues on a rotating basis and is activated only when a port has more traffic than it can handle. A queue is given an amount of bandwidth irrespective of the incoming traffic on that port. This queue then moves to the back of the list. The next queue is given an equal amount of bandwidth, and then moves to the end of the list; and so on, depending on the number of queues being used. This works in a looping fashion until a queue is empty.

Weighted Round Robin Scheduling (WRR) uses the same algorithm as round robin scheduling, but services queues based on their priority and queue weight (the number you configure in the queue **Weight** field) rather than a fixed amount of bandwidth. WRR is activated only when a port has more traffic than it can handle. Queues with larger weights get more service than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues and returns to queues that have not yet emptied.

# 23.2 Configuring Queuing

Use this screen to set priorities for the queues of the Switch. This distributes bandwidth across the different traffic queues.

Click **Advanced Application** > **Queuing Method** in the navigation panel.

**Figure 204** Advanced Application > Queuing Method (Standalone Mode)

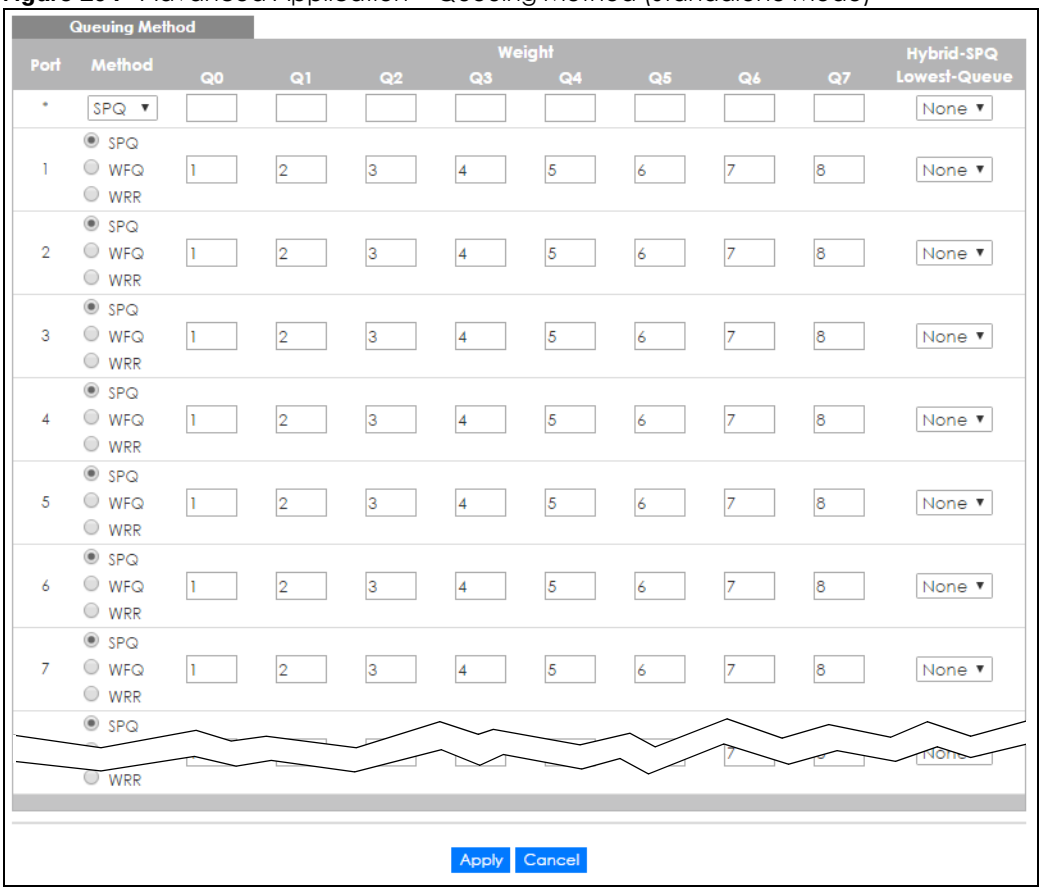
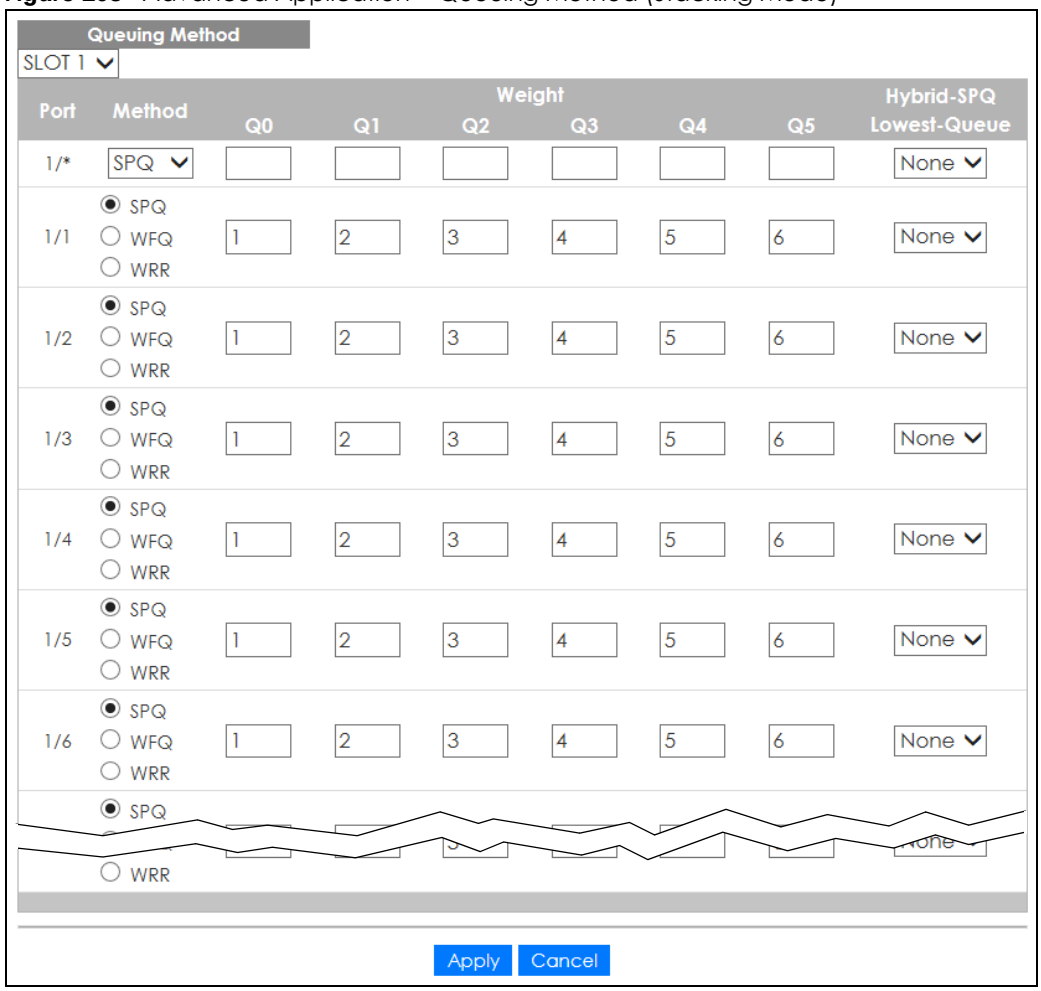


**Figure 205** Advanced Application > Queuing Method (Stacking Mode)




The following table describes the labels in this screen.

Table 105 Advanced Application > Queuing Method

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |

Table 105 Advanced Application > Queuing Method (continued)

| LABEL | DESCRIPTION |
|---|---|
| Method | Select **SPQ** (Strictly Priority Queuing), **WFQ** (Weighted Fair Queuing) or **WRR** (Weighted Round Robin).<br><br>Strictly Priority Queuing services queues based on priority only. When the highest priority queue empties, traffic on the next highest-priority queue begins. Q7 has the highest priority and Q0 the lowest.<br><br>Weighted Fair Queuing is used to guarantee each queue's minimum bandwidth based on their bandwidth portion (weight) (the number you configure in the **Weight** field). Queues with larger weights get more guaranteed bandwidth than queues with smaller weights.<br><br>Weighted Round Robin Scheduling services queues on a rotating basis based on their queue weight (the number you configure in the queue **Weight** field). Queues with larger weights get more service than queues with smaller weights. |
| Weight | When you select **WFQ** or **WRR** enter the queue weight here. Bandwidth is divided across the different traffic queues according to their weights. |
| Hybrid-SPQ Lowest-Queue | This field is applicable only when you select **WFQ** or **WRR**.<br><br>Select a queue (**Q0** to **Q7**) to have the Switch use **SPQ** to service the subsequent queues after and including the specified queue for the port. For example, if you select **Q5**, the Switch services traffic on **Q5**, **Q6** and **Q7** using **SPQ**.<br><br>Select **None** to always use **WFQ** or **WRR** for the port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 24
# VLAN Stacking

This chapter shows you how to configure VLAN stacking on your Switch. See the chapter on VLANs for more background information on Virtual LANs (VLANs).

## 24.1 VLAN Stacking Overview

A service provider can use VLAN stacking to allow it to distinguish multiple customers VLANs, even those with the same (customer-assigned) VLAN ID, within its network.

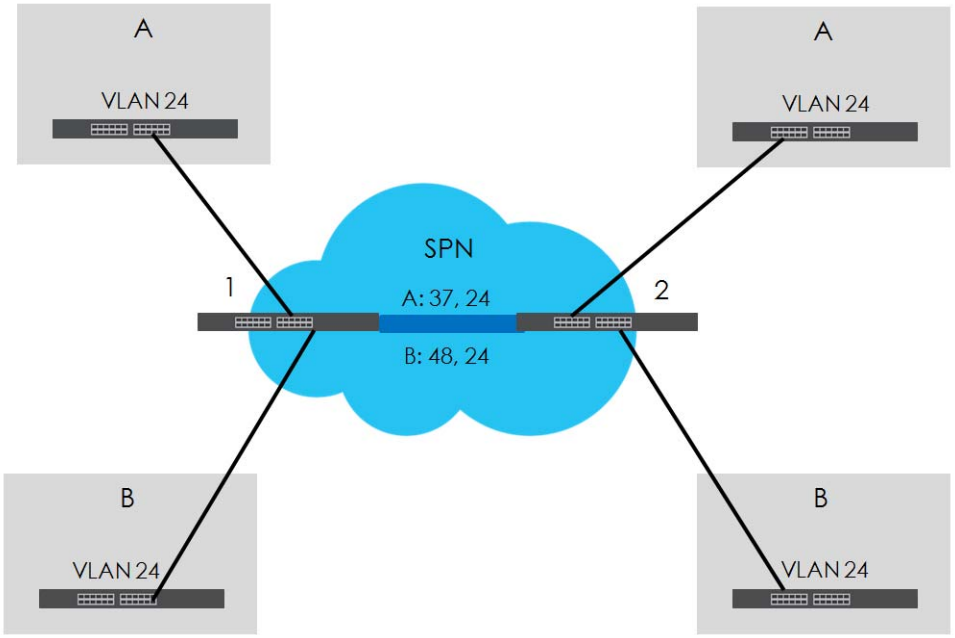
Use VLAN stacking to add an outer VLAN tag to the inner IEEE 802.1Q tagged frames that enter the network. By tagging the tagged frames ("double-tagged" frames), the service provider can manage up to 4094 VLAN groups with each group containing up to 4094 customer VLANs. This allows a service provider to provide different service, based on specific VLANs, for many different customers.

A service provider's customers may require a range of VLANs to handle multiple applications. A service provider's customers can assign their own inner VLAN tags on ports for these applications. The service provider can assign an outer VLAN tag for each customer. Therefore, there is no VLAN tag overlap among customers, so traffic from different customers is kept separate.

### 24.1.1 VLAN Stacking Example

In the following example figure, both **A** and **B** are Service Provider's Network (SPN) customers with VPN tunnels between their head offices and branch offices respectively. Both have an identical VLAN tag for their VLAN group. The service provider can separate these two VLANs within its network by adding tag 37 to distinguish customer **A** and tag 48 to distinguish customer **B** at edge device **1** and then stripping those tags at edge device **2** as the data frames leave the network.

**Figure 206** VLAN Stacking Example




# 24.2 VLAN Stacking Port Roles

Each port can have three VLAN stacking "roles", **Normal**, **Access Port** and **Tunnel Port** (the latter is for Gigabit ports only).

- Select **Normal** for "regular" (non-VLAN stacking) IEEE 802.1Q frame switching.
- Select **Access Port** for ingress ports on the service provider's edge devices (**1** and **2** in the VLAN stacking example figure). The incoming frame is treated as "untagged", so a second VLAN tag (outer VLAN tag) can be added.

Note: Static VLAN **Tx Tagging** MUST be disabled on a port where you choose **Normal** or **Access Port**.

- Select **Tunnel Port** (available for Gigabit ports only) for egress ports at the edge of the service provider's network. All VLANs belonging to a customer can be aggregated into a single service provider's VLAN (using the outer VLAN tag defined by the Service Provider's (SP) VLAN ID (VID)).

Note: Static VLAN **Tx Tagging** MUST be enabled on a port where you choose **Tunnel Port**.

# 24.3 VLAN Tag Format

A VLAN tag (service provider VLAN stacking or customer IEEE 802.1Q) consists of the following three fields.

Table 106 VLAN Tag Format

| Type | Priority | VID |
|---|---|---|

**Type** is a standard Ethernet type code identifying the frame and indicates that whether the frame carries IEEE 802.1Q tag information. **SP TPID** (Service Provider Tag Protocol Identifier) is the service provider VLAN stacking tag type. Many vendors use 0x8100 or 0x9100.

**TPID** (Tag Protocol Identifier) is the customer IEEE 802.1Q tag.

- If the VLAN stacking port role is **Access Port**, then the Switch adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure).
- If the VLAN stacking port role is **Tunnel Port**, then the Switch only adds the **SP TPID** tag to all incoming frames on the service provider's edge devices (1 and 2 in the VLAN stacking example figure) that have an **SP TPID** different to the one configured on the Switch. (If an incoming frame's **SP TPID** is the same as the one configured on the Switch, then the Switch will not add the tag.)

**Priority** refers to the IEEE 802.1p standard that allows the service provider to prioritize traffic based on the class of service (CoS) the customer has paid for.

- On the Switch, configure priority level of the inner IEEE 802.1Q tag in the **Port Setup** screen.
- "0" is the lowest priority level and "7" is the highest.

**VID** is the VLAN ID. **SP VID** is the VID for the second (service provider's) VLAN tag.

### 24.3.1 Frame Format

The frame format for an untagged Ethernet frame, a single-tagged 802.1Q frame (customer) and a "double-tagged" 802.1Q frame (service provider) is shown next.

Configure the fields as highlighted in the Switch **VLAN Stacking** screen.

Table 107 Single and Double Tagged 802.1Q Frame Format

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | DA | SA | Len/Etype | Data | FCS | Untagged Ethernet frame |
| | | | DA | SA | **TPID** | **Priority** | **VID** | Len/Etype | Data | FCS | IEEE 802.1Q customer tagged frame |
| DA | SA | **SPTPID** | **Priority** | **VID** | **TPID** | **Priority** | **VID** | Len/Etype | Data | FCS | Double-tagged frame |

Table 108 802.1Q Frame

| | | | |
|---|---|---|---|
| DA | Destination Address | Priority | 802.1p Priority |
| SA | Source Address | Len/Etype | Length and type of Ethernet frame |
| (SP)TPID | (Service Provider) Tag Protocol IDentifier | Data | Frame data |
| VID | VLAN ID | FCS | Frame Check Sequence |

## 24.4 Configuring VLAN Stacking

Click **Advanced Application** > **VLAN Stacking** to display the screen as shown.

**Figure 207** Advanced Application > VLAN Stacking (Standalone Mode)

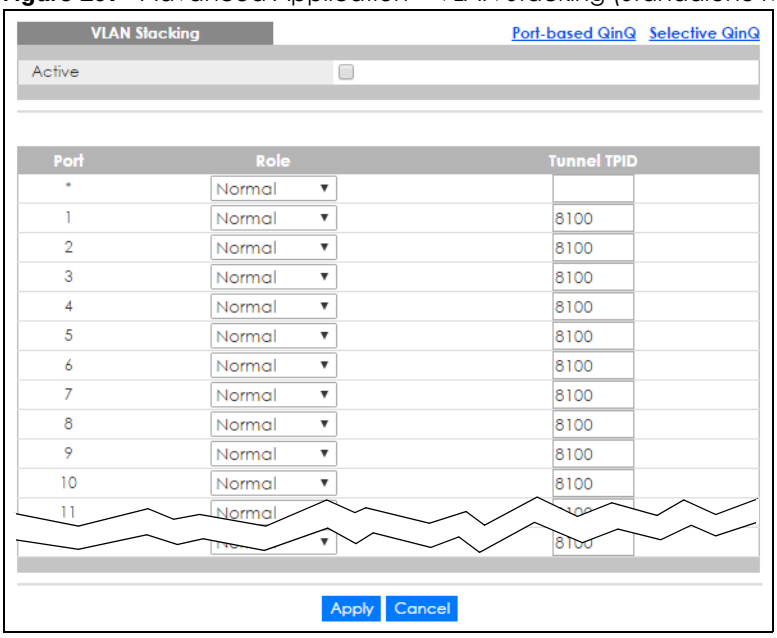
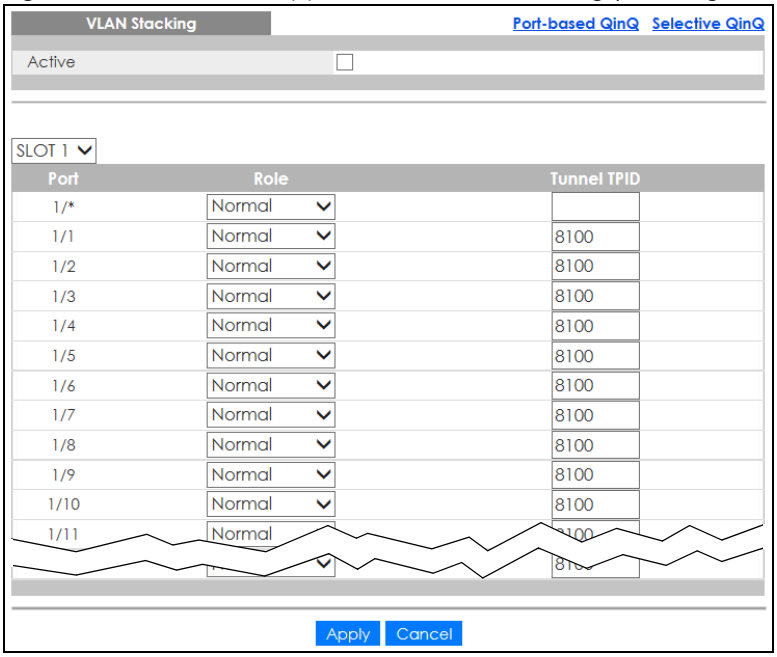



**Figure 208** Advanced Application > VLAN Stacking (Stacking Mode)




The following table describes the labels in this screen.

Table 109 Advanced Application > VLAN Stacking

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable VLAN stacking on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 109 Advanced Application > VLAN Stacking (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Role | Select **Normal** to have the Switch ignore frames received (or transmitted) on this port with VLAN stacking tags. Anything you configure in **SPVID** and **Priority** of the **Port-based QinQ** or the **Selective QinQ** screen are ignored.<br>Select **Access Port** to have the Switch add the SP TPID tag to all incoming frames received on this port. Select **Access Port** for ingress ports at the edge of the service provider's network.<br>Select **Tunnel Port** (available for Gigabit ports only) for egress ports at the edge of the service provider's network. Select **Tunnel Port** to have the Switch add the **Tunnel TPID** tag to all outgoing frames sent on this port.<br>In order to support VLAN stacking on a port, the port must be able to allow frames of 1526 Bytes (1522 Bytes + 4 Bytes for the second tag) to pass through it. |
| Tunnel TPID | TPID is a standard Ethernet type code identifying the frame and indicates whether the frame carries IEEE 802.1Q tag information. Enter a four-digit hexadecimal number from 0000 to FFFF that the Switch adds in the outer VLAN tag of the frames sent on the tunnel ports. The Switch also uses this to check if the received frames are double-tagged.<br>The value of this field is 0x8100 as defined in IEEE 802.1Q. It is used to identify the customer tag of an incoming frame. If the Switch needs to communicate with other vendors' devices, they should use the same TPID.<br>Note: You can define up to four different tunnel TPIDs (including **8100**) in this screen at a time. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 24.4.1 Port-based Q-in-Q

Port-based Q-in-Q lets the Switch treat all frames received on the same port as the same VLAN flows and add the same outer VLAN tag to them, even if they have different customer VLAN IDs.

Click **Port-based QinQ** in the **Advanced Application** > **VLAN Stacking** screen to display the screen as shown.

**Figure 209** Advanced Application > VLAN Stacking > Port-based QinQ (Standalone Mode)

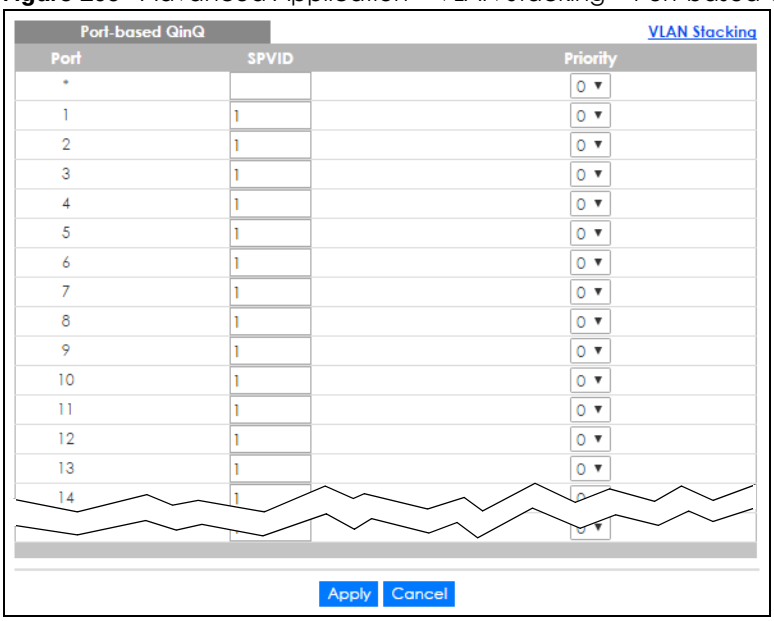
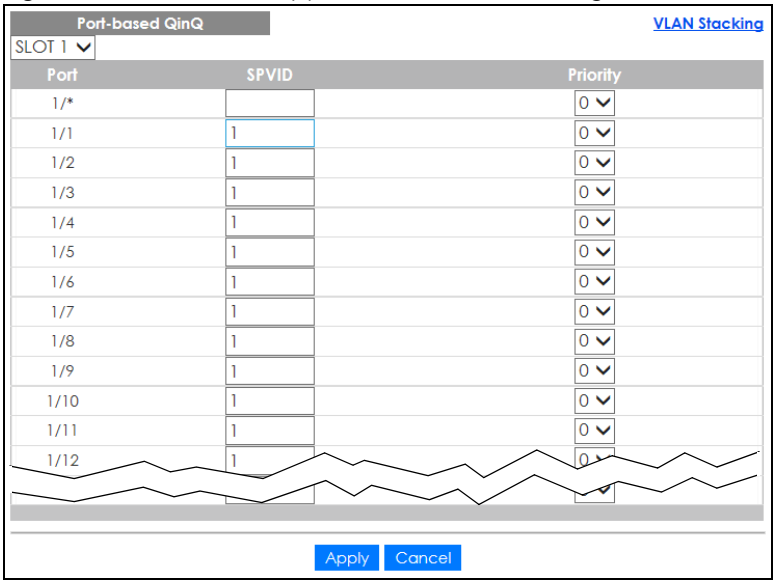



**Figure 210** Advanced Application > VLAN Stacking > Port-based QinQ (Stacking Mode)




The following table describes the labels in this screen.

Table 110 Advanced Application > VLAN Stacking > Port-based QinQ

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 110 Advanced Application > VLAN Stacking > Port-based QinQ (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| SPVID | **SPVID** is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port. |
| Priority | Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port.<br>"0" is the lowest priority level and "7" is the highest. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 24.4.2 Selective Q-in-Q

Selective Q-in-Q is VLAN-based. It allows the Switch to add different outer VLAN tags to the incoming frames received on one port according to their inner VLAN tags.

Note: Selective Q-in-Q rules are only applied to single-tagged frames received on the access ports. If the incoming frames are untagged or single-tagged but received on a tunnel port or cannot match any selective Q-in-Q rules, the Switch applies the port-based Q-in-Q rules to them.

Click **Selective QinQ** in the **Advanced Application** > **VLAN Stacking** screen to display the screen as shown.

**Figure 211** Advanced Application > VLAN Stacking > Selective QinQ (Standalone Mode)

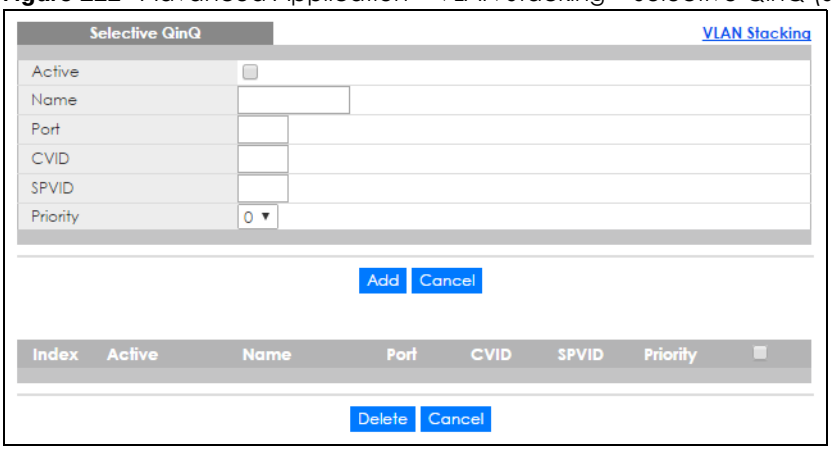
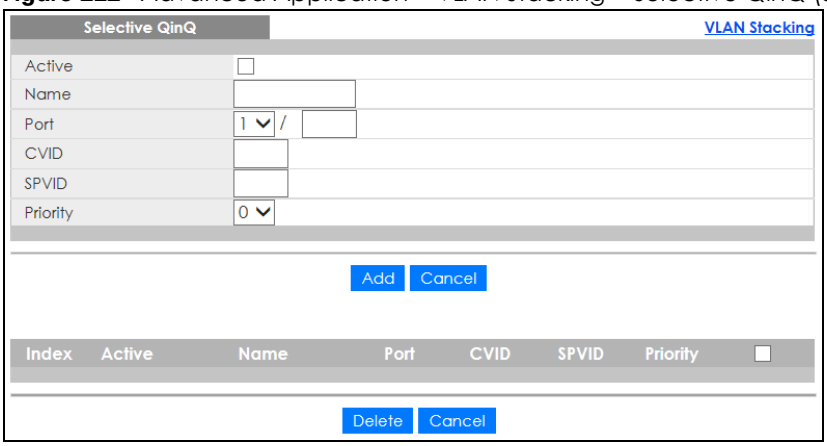


**Figure 212** Advanced Application > VLAN Stacking > Selective QinQ (Stacking Mode)




The following table describes the labels in this screen.

Table 111 Advanced Application > VLAN Stacking > Selective QinQ

| LABEL | DESCRIPTION |
|---|---|
| Active | Check this box to activate this rule. |
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Port | The port number identifies the port you are configuring. In stacking mode, the first field is the slot ID and the second field is the port number. |
| CVID | Enter a customer VLAN ID (the inner VLAN tag) from 1 to 4094. This is the VLAN tag carried in the packets from the subscribers. |
| SPVID | **SPVID** is the service provider's VLAN ID (the outer VLAN tag). Enter the service provider ID (from 1 to 4094) for frames received on this port. |
| Priority | Select a priority level (from 0 to 7). This is the service provider's priority level that adds to the frames received on this port.<br>"0" is the lowest priority level and "7" is the highest. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Index | This is the number of the selective VLAN stacking rule. Click an index number to change the settings. |
| Active | This shows whether this rule is activated or not. |
| Name | This is the descriptive name for this rule. |
| Port | This is the port number to which this rule is applied. In stacking mode, the first number represents the slot and the second the port number. |
| CVID | This is the customer VLAN ID in the incoming packets. |
| SPVID | This is the service provider's VLAN ID that adds to the packets from the subscribers. |
| Priority | This is the service provider's priority level in the packets. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove in the **Delete** column and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the **Delete** check boxes. |

# CHAPTER 25
# Multicast

## 25.1 Multicast Overview

This chapter shows you how to configure various multicast features.

Traditionally, IP packets are transmitted in one of either two ways – Unicast (one sender to one recipient) or Broadcast (one sender to everybody on the network). Multicast delivers IP packets to just a group of hosts on the network.

IGMP (Internet Group Management Protocol) is a network-layer protocol used to establish membership in a multicast group – it is not used to carry user data. Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively.

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is similar to IGMPv2 and MLDv2 is similar to IGMPv3. MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4. MLD filtering controls which multicast groups a port can join.

### 25.1.1 What You Can Do

- Use the **Multicast Setup** screen (Section 25.2 on page 286) to display the links to the configuration screens where you can configure IPv4 multicast settings.
- Use the **IPv4 Multicast Status** screen (Section 25.3 on page 286) to view IPv4 multicast group information.
- Use the **IGMP Snooping** screen (Section 25.3.1 on page 287) to enable IGMP snooping to forward group multicast traffic only to ports that are members of that group.
- Use the **IGMP Snooping VLAN** screen (Section 25.3.2 on page 291) to perform IGMP snooping on up to 16 VLANs.
- Use the **IGMP Filtering Profile** (Section 25.3.3 on page 292) to specify a range of multicast groups that clients connected to the Switch are able to join.
- Use the **IPv6 Multicast Status** screen (Section 25.4 on page 293) to view IPv6 multicast group information.
- Use the **MLD Snooping-proxy** screen (Section 25.4.1 on page 294) to enable the upstream port to report group changes to a connected multicast router and forward MLD messages to other upstream ports.
- Use the **MVR** screens (Section 25.5 on page 301) to create multicast VLANs and select the receiver ports and a source port for each multicast VLAN.

## 25.1.2 What You Need to Know

Read on for concepts on Multicasting that can help you configure the screens in this chapter.

### IP Multicast Addresses

In IPv4, a multicast address allows a device to send packets to a specific group of hosts (multicast group) in a different subnetwork. A multicast IP address represents a traffic receiving group, not individual receiving devices. IP addresses in the Class D range (224.0.0.0 to 239.255.255.255) are used for IP multicasting. Certain IP multicast numbers are reserved by IANA for special purposes (see the IANA website for more information).

In IPv6, multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A multicast address allows a host to send packets to all hosts in a multicast group. Multicast scope allows you to determine the size of the multicast group. A multicast address has a predefined prefix of ff00::/8.

### IGMP Filtering

With the IGMP filtering feature, you can control which IGMP groups a subscriber on a port can join. This allows you to control the distribution of multicast services (such as content information distribution) based on service plans and types of subscription.

You can set the Switch to filter the multicast group join reports on a per-port basis by configuring an IGMP filtering profile and associating the profile to a port.

### IGMP Snooping

A Switch can passively snoop on IGMP packets transferred between IP multicast routers or switches and IP multicast hosts to learn the IP multicast group membership. It checks IGMP packets passing through it, picks out the group registration information, and configures multicasting accordingly. IGMP snooping allows the Switch to learn multicast groups without you having to manually configure them.

The Switch forwards multicast traffic destined for multicast groups (that it has learned from IGMP snooping or that you have manually configured) to ports that are members of that group. IGMP snooping generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through your Switch.

### IGMP Snooping and VLANs

The Switch can perform IGMP snooping on up to 16 VLANs. You can configure the Switch to automatically learn multicast group membership of any VLANs. The Switch then performs IGMP snooping on the first 16 VLANs that send IGMP packets. This is referred to as auto mode. Alternatively, you can specify the VLANs that IGMP snooping should be performed on. This is referred to as fixed mode. In fixed mode the Switch does not learn multicast group membership of any VLANs other than those explicitly added as an IGMP snooping VLAN.

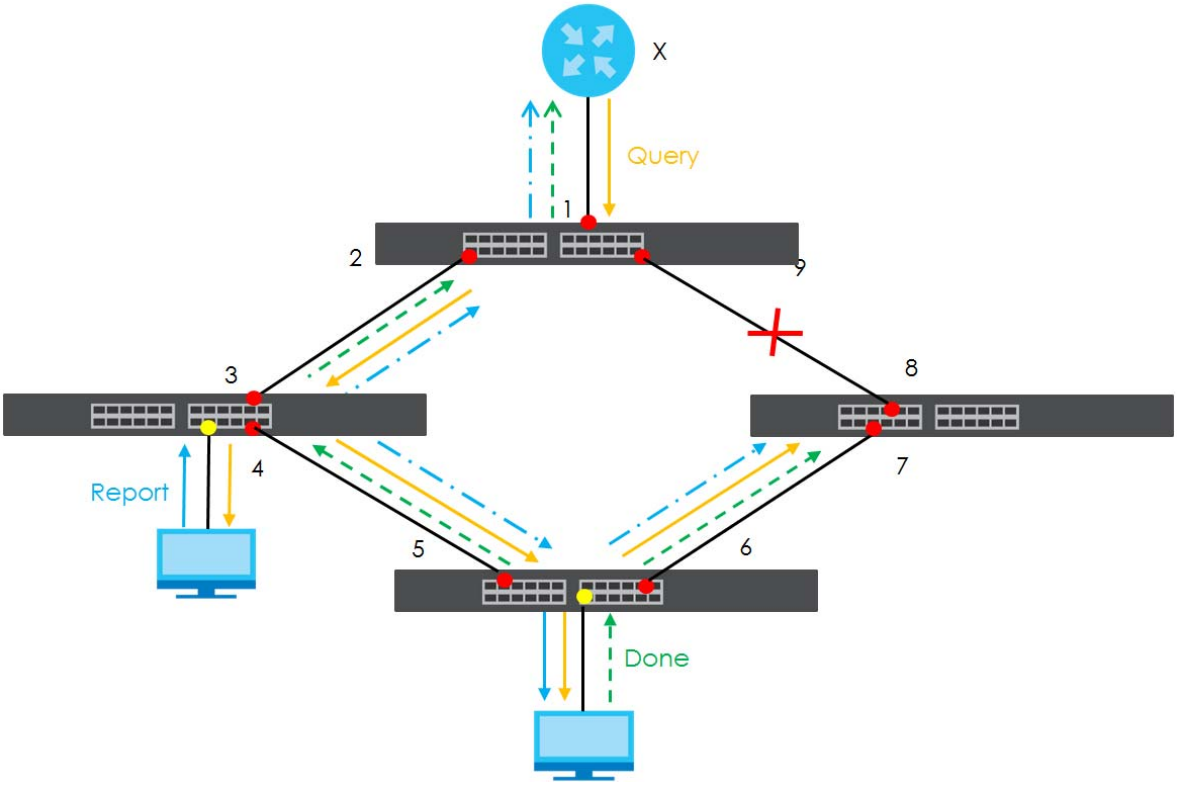
### MLD Snooping-proxy

MLD snooping-proxy is a Zyxel-proprietary feature. IPv6 MLD proxy allows only one upstream interface on a switch, while MLD snooping-proxy supports more than one upstream port on a switch. The upstream port in MLD snooping-proxy can report group changes to a connected multicast router and forward

MLD messages to other upstream ports. This helps especially when you want to have a network that uses STP to provide backup links between switches and also performs MLD snooping and proxy functions. MLD snooping-proxy, like MLD proxy, can minimize MLD control messages and allow better network performance.

In MLD snooping-proxy, if one upstream port is learned through snooping, all other upstream ports on the same device will be added to the same group. If one upstream port requests to leave a group, all other upstream ports on the same device will also be removed from the group.

In the following MLD snooping-proxy example, all connected upstream ports (1 – 7) are treated as one interface. The connection between ports 8 and 9 is blocked by STP to break the loop. If there is one query from a router (**X**) or MLD Done or Report message from any upstream port, it will be broadcast to all connected upstream ports.




## MLD Messages

A multicast router or switch periodically sends general queries to MLD hosts to update the multicast forwarding table. When an MLD host wants to join a multicast group, it sends an MLD Report message for that address.

An MLD Done message is similar to an IGMP Leave message. When an MLD host wants to leave a multicast group, it can send a Done message to the router or switch. If the leave mode is not set to **Immediate**, the router or switch sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

## MVR Overview

Multicast VLAN Registration (MVR) is designed for applications (such as Media-on-Demand (MoD)) that use multicast traffic across an Ethernet ring-based service provider network.

MVR allows one single multicast VLAN to be shared among different subscriber VLANs on the network. While isolated in different subscriber VLANs, connected devices can subscribe to and unsubscribe from the multicast stream in the multicast VLAN. This improves bandwidth utilization with reduced multicast traffic in the subscriber VLANs and simplifies multicast group management.

MVR only responds to IGMP join and leave control messages from multicast groups that are configured under MVR. Join and leave reports from other multicast groups are managed by IGMP snooping.

The following figure shows a network example. The subscriber VLAN (**1**, **2** and **3**) information is hidden from the streaming media server, **S**. In addition, the multicast VLAN information is only visible to the Switch and **S**.

**Figure 213** MVR Network Example

## Types of MVR Ports

In MVR, a source port is a port on the Switch that can send and receive multicast traffic in a multicast VLAN while a receiver port can only receive multicast traffic. Once configured, the Switch maintains a forwarding table that matches the multicast stream to the associated multicast group.

## MVR Modes

You can set your Switch to operate in either dynamic or compatible mode.

In dynamic mode, the Switch sends IGMP leave and join reports to the other multicast devices (such as multicast routers or servers) in the multicast VLAN. This allows the multicast devices to update the multicast forwarding table to forward or not forward multicast traffic to the receiver ports.

In compatible mode, the Switch does not send any IGMP reports. In this case, you must manually configure the forwarding settings on the multicast devices in the multicast VLAN.

## How MVR Works

The following figure shows a multicast television example where a subscriber device (such as a computer) in VLAN 1 receives multicast traffic from the streaming media server, **S**, through the Switch. Multiple subscriber devices can connect through a port configured as the receiver on the Switch.

When the subscriber selects a television channel, computer **A** sends an IGMP report to the Switch to join

the appropriate multicast group. If the IGMP report matches one of the configured MVR multicast group addresses on the Switch, an entry is created in the forwarding table on the Switch. This maps the subscriber VLAN to the list of forwarding destinations for the specified multicast traffic.

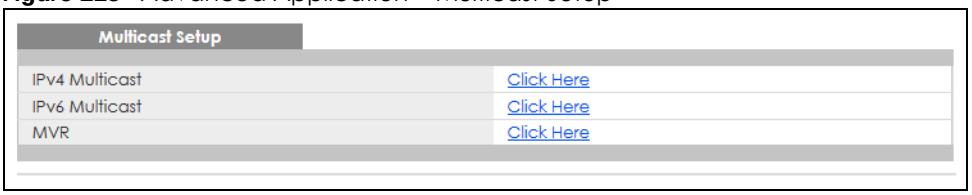
When the subscriber changes the channel or turns off the computer, an IGMP leave message is sent to the Switch to leave the multicast group. The Switch sends a query to VLAN 1 on the receiver port (in this case, an uplink port on the Switch). If there is another subscriber device connected to this port in the same subscriber VLAN, the receiving port will still be on the list of forwarding destination for the multicast traffic. Otherwise, the Switch removes the receiver port from the forwarding table.

**Figure 214** MVR Multicast Television Example

# 25.2 Multicast Setup

Use this screen to configure IGMP for IPv4. Click **Advanced Application** > **Multicast** in the navigation panel.

**Figure 215** Advanced Application > Multicast Setup




The following table describes the labels in this screen.

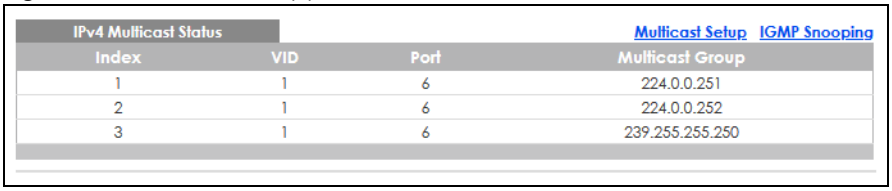
Table 112 Advanced Application > Multicast Setup

| LABEL | DESCRIPTION |
|---|---|
| IPv4 Multicast | Click the link to open screens where you can configure IGMP snooping and IGMP filtering for IPv4. |
| IPv6 Multicast | Click the link to open screens where you can configure MLD snooping-proxy and MLD filtering for IPv6. |
| MVR | Click the link to open screens where you can create multicast VLANs. |

# 25.3 IPv4 Multicast Status

Click **Advanced Application** > **Multicast** > **IPv4 Multicast** to display the screen as shown. This screen shows the IPv4 multicast group information. See Section 25.1 on page 282 for more information on multicasting.

**Figure 216** Advanced Application > Multicast > IPv4 Multicast




The following table describes the labels in this screen.

Table 113 Advanced Application > Multicast > IPv4 Multicast

| LABEL | DESCRIPTION |
|---|---|
| Index | This is the index number of the entry. |
| VID | This field displays the multicast VLAN ID. |
| Port | This field displays the port number that belongs to the multicast group.<br>In stacking mode, the first number represents the slot and the second is the port number. |
| Multicast Group | This field displays IP multicast group addresses. |

## 25.3.1 IGMP Snooping

Click the **IGMP Snooping** link in the **Advanced Application** > **Multicast** > **IPv4 Multicast** screen to display the screen as shown. See Section 25.1 on page 282 for more information on multicasting.

**Figure 217** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (Standalone Mode)

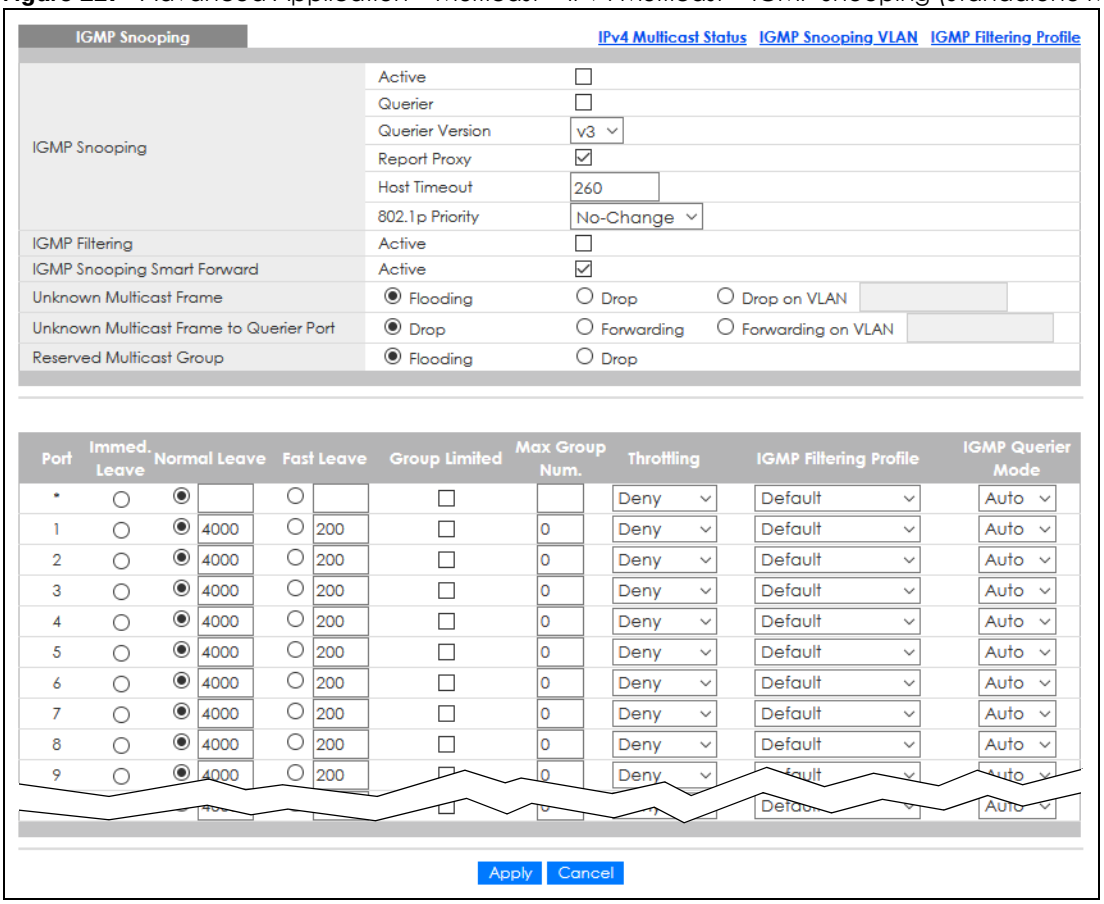
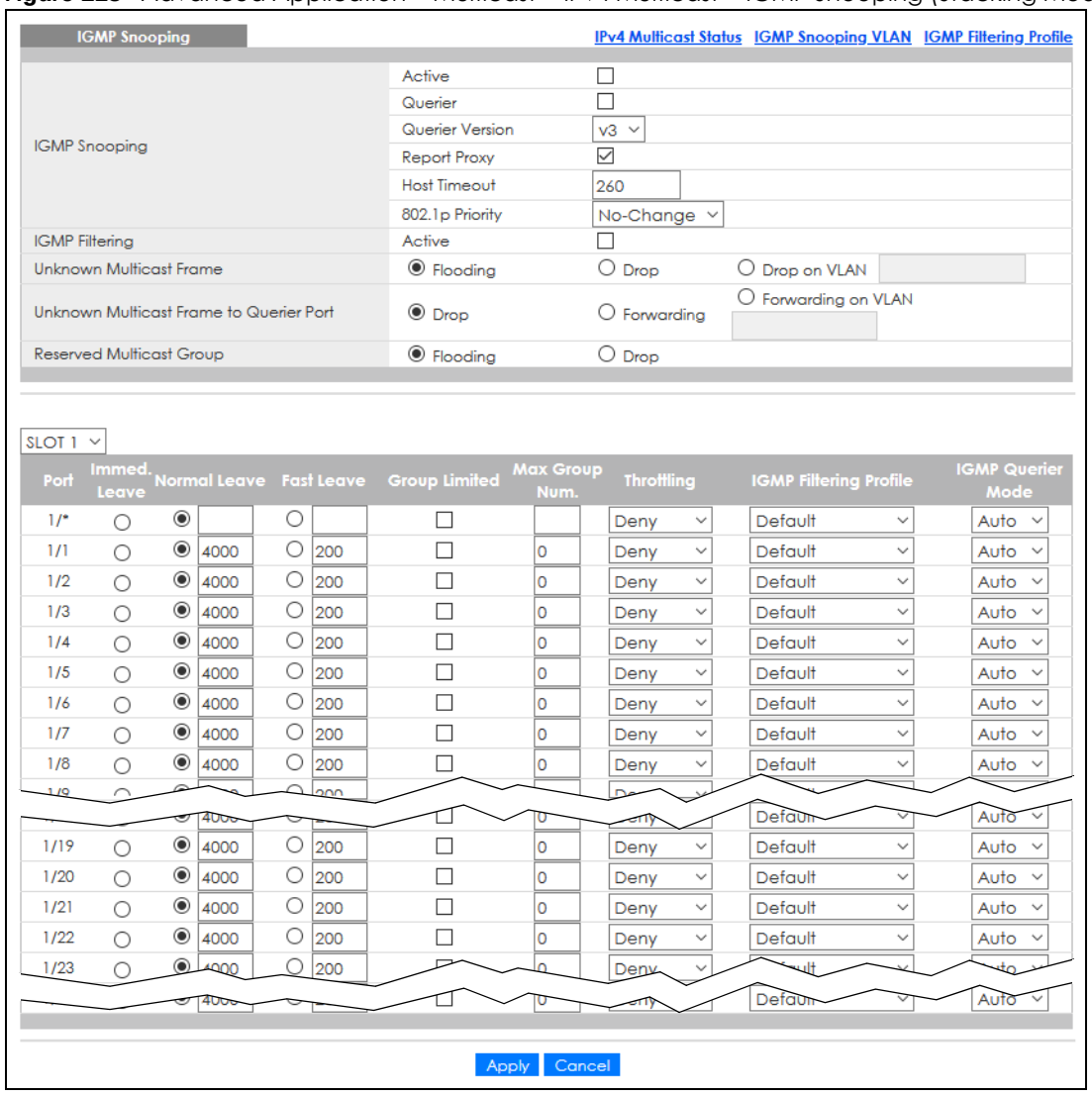


**Figure 218** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (Stacking Mode)




The following table describes the labels in this screen.

Table 114 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping

| LABEL | DESCRIPTION |
|---|---|
| IGMP Snooping | Use these settings to configure IGMP snooping. |
| Active | Select **Active** to enable IGMP Snooping to forward group multicast traffic only to ports that are members of that group. |
| Querier | Select this option to allow the Switch to send IGMP General Query messages to the VLANs with the multicast hosts attached. |
| Querier Version | IGMP snooping query works only when both host and Switch support the same IGMP version.<br>Select **v2** to allow the Switch to send IGMPv2 queries only.<br>Select **v3** to allow the Switch to send IGMPv3 queries only. |

Table 114 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

| LABEL | DESCRIPTION |
|---|---|
| Report Proxy | Select this option to allow the Switch to act as the IGMP report proxy and leave proxy. It will report group changes to a connected multicast router.<br><br>The Switch not only checks IGMP packets between multicast routers or switches and multicast hosts to learn the multicast group membership, but also replaces the source MAC address in an IGMP v1/v2 report with its own MAC address before forwarding to the multicast router or switch. When the Switch receives more than one IGMP v1/v2 join report that requests to join the same multicast group, it only sends a new join report with its MAC address. This helps reduce the number of multicast join reports passed to the multicast router or switch.<br><br>The Switch sends a leave message with its MAC address to the multicast router or switch only when it receives the leave message from the last host in a multicast group. |
| Host Timeout | Specify the time (from 1 to 16711450) in seconds that elapses before the Switch removes an IGMP group membership entry if it does not receive report messages from the port. |
| 802.1p Priority | Select a priority level (0 – 7) to which the Switch changes the priority in outgoing IGMP control packets. Otherwise, select **No-Change** to not replace the priority. |
| IGMP Filtering | Select **Active** to enable IGMP filtering to control which IGMP groups a subscriber on a port can join.<br><br>If you enable IGMP filtering, you must create and assign IGMP filtering profiles for the ports that you want to allow to join multicast groups. |
| IGMP Snooping Smart Forward | Select **Active** to enable sending of multicast frame to querier port and IGMP subscriber groups. Otherwise, the querier port forwards the frames only when it receives a join report and it belongs to the IGMP group. |
| Unknown Multicast Frame | Specify the action to perform when the Switch receives an unknown multicast frame.<br><br>• Select **Drop** to discard the frames.<br>• Select **Flooding** to send the frames to all ports.<br>• Select **Drop on VLAN** and enter the VLAN ID numbers to discard the frames on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52. |
| Unknown Multicast Frame to Querier Port | Specify the action to perform when **Unknown Multicast Frame** is set to **Drop**.<br><br>• Select **Drop** to discard the frames.<br>• Select **Forwarding** to send the frames to all querier ports.<br>• Select **Forwarding on VLAN** and enter the VLAN ID numbers to send the frames to the ports which are used as an IGMP query port on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52. |
| Reserved Multicast Group | The IP address range of 224.0.0.0 to 224.0.0.255 are reserved for multicasting on the local network only. For example, 224.0.0.1 is for all hosts on a local network segment and 224.0.0.9 is used to send RIP routing information to all RIP v2 routers on the same network segment. A multicast router will not forward a packet with the destination IP address within this range to other networks. See the IANA web site for more information.<br><br>The layer-2 multicast MAC addresses used by Cisco layer-2 protocols, 01:00:0C:CC:CC:CC and 01:00:0C:CC:CC:CD, are also included in this group.<br><br>Specify the action to perform when the Switch receives a frame with a reserved multicast address.<br><br>• Select **Drop** to discard the frames.<br>• Select **Flooding** to send the frames to all ports. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 114 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Immed. Leave | Select this option to set the Switch to remove this port from the multicast tree when an IGMP version 2 leave message is received on this port.<br>Select this option if there is only one host connected to this port. |
| Normal Leave | Enter an IGMP normal leave timeout value (from 200 to 6348800) in miliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.<br>In normal leave mode, when the Switch receives an IGMP leave message from a host on a port, it forwards the message to the multicast router. The multicast router then sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. The Switch forwards the query message to all hosts connected to the port and waits for IGMP reports from hosts to update the forwarding table.<br>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. |
| Fast Leave | Enter an IGMP fast leave timeout value (from 200 to 6348800) in miliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.<br>In fast leave mode, right after receiving an IGMP leave message from a host on a port, the Switch itself sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. This helps speed up the leave process.<br>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. |
| Group Limited | Select this option to limit the number of multicast groups this port is allowed to join. |
| Max Group Num. | Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new IGMP join report frames is dropped on this port. |
| Throttling | IGMP throttling controls how the Switch deals with the IGMP reports when the maximum number of the IGMP groups a port can join is reached.<br>Select **Deny** to drop any new IGMP join report received on this port until an existing multicast forwarding table entry is aged out.<br>Select **Replace** to replace an existing entry in the multicast forwarding table with the new IGMP reports received on this port. |
| IGMP Filtering Profile | Select the name of the IGMP filtering profile to use for this port. Otherwise, select **Default** to prohibit the port from joining any multicast group.<br>You can create IGMP filtering profiles in the **Multicast** > **IPv4 Multicast** > **IGMP Snooping** > **IGMP Filtering Profile** screen. |

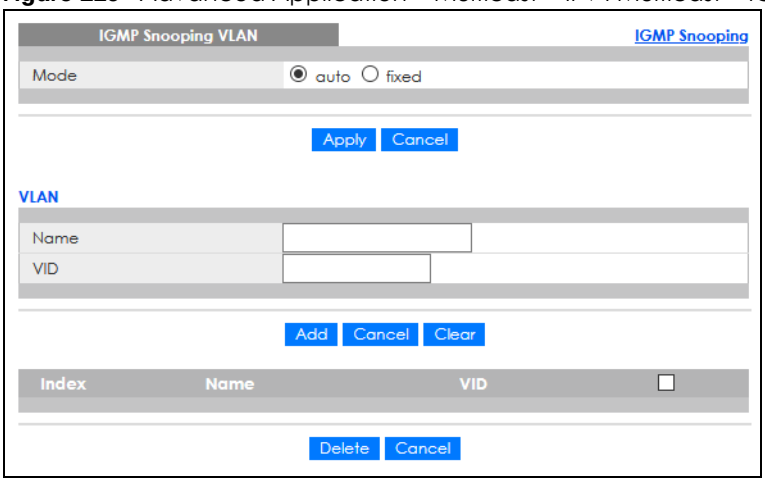
Table 114 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping (continued)

| LABEL | DESCRIPTION |
|---|---|
| IGMP Querier Mode | The Switch treats an IGMP query port as being connected to an IGMP multicast router (or server). The Switch forwards IGMP join or leave packets to an IGMP query port.<br><br>Select **Auto** to have the Switch use the port as an IGMP query port if the port receives IGMP query packets.<br><br>Select **Fixed** to have the Switch always use the port as an IGMP query port. Select this when you connect an IGMP multicast server to the port.<br><br>Select **Edge** to stop the Switch from using the port as an IGMP query port. The Switch will not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 25.3.2 IGMP Snooping VLAN

Click **Advanced Application** > **Multicast** > **IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Snooping VLAN** link to display the screen as shown. See IGMP Snooping and VLANs on page 283 for more information on IGMP Snooping VLAN.

**Figure 219** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN



The following table describes the labels in this screen.

Table 115 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Snooping VLAN

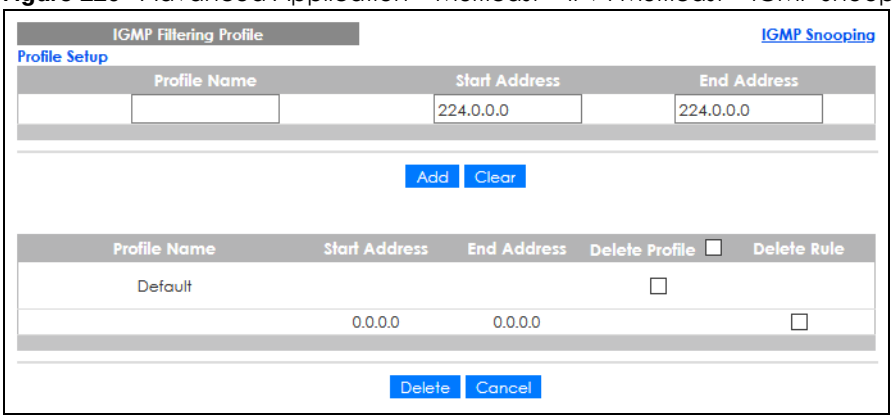
| LABEL | DESCRIPTION |
|---|---|
| Mode | Select **auto** to have the Switch learn multicast group membership information of any VLANs automatically.<br>Select **fixed** to have the Switch only learn multicast group membership information of the VLANs that you specify below.<br>In either **auto** or **fixed** mode, the Switch can learn up to 16 VLANs (including up to five VLANs you configured in the **MVR** screen). For example, if you have configured one multicast VLAN in the **MVR** screen, you can only specify up to 15 VLANs in this screen.<br>The Switch drops any IGMP control messages which do not belong to these 16 VLANs.<br>You must also enable IGMP snooping in the **Multicast** > **IPv4 Multicast** > **IGMP Snooping** screen first. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | Use this section of the screen to add VLANs upon which the Switch is to perform IGMP snooping. |
| Name | Enter the descriptive name of the VLAN for identification purposes. |
| VID | Enter the ID of a static VLAN; the valid range is between 1 and 4094.<br>Note: You cannot configure the same VLAN ID as in the **MVR** screen. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the index number of the IGMP snooping VLAN entry in the table. Click on an index number to view more details or change the settings. |
| Name | This field displays the descriptive name for this VLAN group. |
| VID | This field displays the ID number of the VLAN group. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove, then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 25.3.3 IGMP Filtering Profile

An IGMP filtering profile specifies a range of multicast groups that clients connected to the Switch are able to join. A profile contains a range of multicast IP addresses which you want clients to be able to join. Profiles are assigned to ports (in the **IGMP Snooping** screen). Clients connected to those ports are then able to join the multicast groups specified in the profile. Each port can be assigned a single profile. A profile can be assigned to multiple ports.

Click **Advanced Application** > **Multicast** > **IPv4 Multicast** in the navigation panel. Click the **IGMP Snooping** link and then the **IGMP Filtering Profile** link to display the screen as shown.

**Figure 220** Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile




The following table describes the labels in this screen.

Table 116 Advanced Application > Multicast > IPv4 Multicast > IGMP Snooping > IGMP Filtering Profile

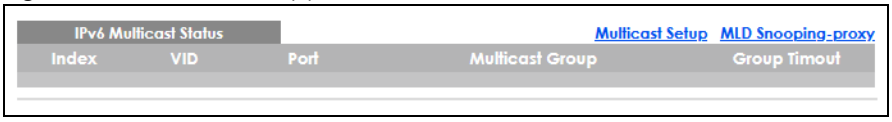
| LABEL | DESCRIPTION |
|---|---|
| Profile Name | Enter a descriptive name for the profile for identification purposes.<br><br>To configure additional rules for a profile that you have already added, enter the profile name and specify a different IP multicast address range. |
| Start Address | Type the starting multicast IP address for a range of multicast IP addresses that you want to belong to the IGMP filter profile. |
| End Address | Type the ending multicast IP address for a range of IP addresses that you want to belong to the IGMP filter profile.<br><br>If you want to add a single multicast IP address, enter it in both the **Start Address** and **End Address** fields. |
| Add | Click this to create a new entry.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Profile Name | This field displays the descriptive name of the profile. |
| Start Address | This field displays the start of the multicast address range. |
| End Address | This field displays the end of the multicast address range. |
| Delete Profile | Select a profile's check box to select a specific profile. Otherwise, select the check box in the table heading row to select all profiles. |
| Delete Rule | Select the check boxes of the rules that you want to remove from a profile. |
| Delete | To delete the profiles and all the accompanying rules, select the profiles that you want to remove in the **Delete Profile** column, then click the **Delete** button.<br><br>To delete a rules from a profile, select the rules that you want to remove in the **Delete Rule** column, then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the **Delete Profile** or **Delete Rule** check boxes. |

# 25.4 IPv6 Multicast Status

Click **Advanced Application** > **Multicast** > **IPv6 Multicast** to display the screen as shown. This screen

shows the IPv6 multicast group information. See Section 25.1 on page 282 for more information on multicasting.

**Figure 221** Advanced Application > Multicast > IPv6 Multicast




The following table describes the fields in the above screen.

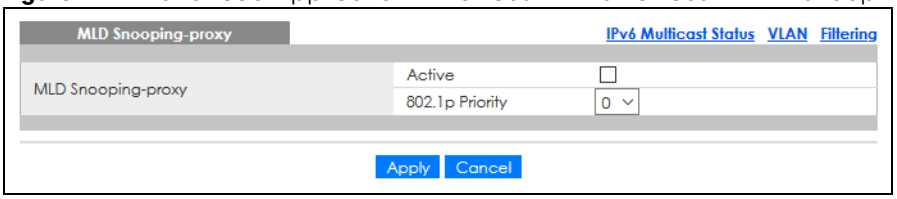
Table 117 Advanced Application > Multicast > IPv6 Multicast

| LABEL | DESCRIPTION |
|---|---|
| Index | This is the index number of the entry. |
| VID | This field displays the multicast VLAN ID. |
| Port | This field displays the port number that belongs to the multicast group. In stacking mode, the first number represents the slot and the second is the port number. |
| Multicast Group | This field displays IP multicast group addresses. |
| Group Timeout | This field displays the time (in seconds) that elapses before the Switch removes a MLD group membership entry if it does not receive report messages from the port. |

## 25.4.1 MLD Snooping-proxy

Click the **MLD Snooping-proxy** link in the **Advanced Application** > **Multicast** > **IPv6 Multicast** screen to display the screen as shown. See Section 25.1 on page 282 for more information on multicasting.

**Figure 222** Advanced Application > Multicast > IPv6Multicast > MLD Snooping-proxy




The following table describes the fields in the above screen.

Table 118 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy

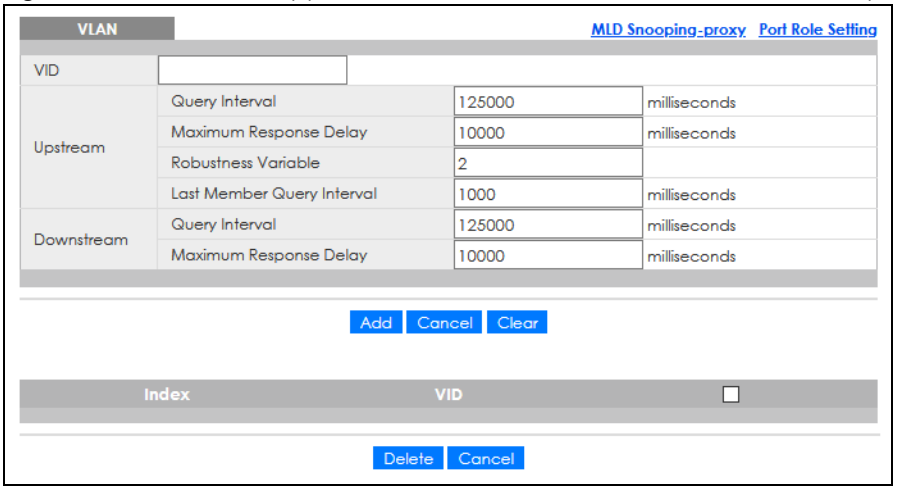
| LABEL | DESCRIPTION |
|---|---|
| MLD Snooping-proxy | Use these settings to configure MLD snooping-proxy. |
| Active | Select **Active** to enable MLD snooping-proxy on the Switch to minimize MLD control messages and allow better network performance. |
| 802.1p Priority | Select a priority level (0 – 7) to which the Switch changes the priority in outgoing MLD messages. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 25.4.2 MLD Snooping-proxy VLAN

Click the **VLAN** link in the **Advanced Application** > **Multicast** > **IPv6 Multicast** > **MLD Snooping-proxy** screen to display the screen as shown. See Section 25.1 on page 282 for more information on

multicasting.

**Figure 223** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN




The following table describes the fields in the above screen.

Table 119 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

| LABEL | DESCRIPTION |
|---|---|
| VID | Enter the ID number of the VLAN on which you want to enable MLD snooping-proxy and configure related settings. |
| Upstream | |
| Query Interval | Enter the amount of time (in miliseconds) between general query messages sent by the router connected to the upstream port. This value should be exactly the same as what is configured in the connected multicast router.<br><br>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.<br><br>When an MLD Report message is received, the Switch sets the timeout period of the entry to be T = (QI*RV) + MRD, where T = Timeout, QI = Query Interval, RV = Robustness Variable, and MRD = Maximum Response Delay. |
| Maximum Response Delay | Enter the amount of time (in miliseconds) the router connected to the upstream port waits for a response to an MLD general query message. This value should be exactly the same as what is configured in the connected multicast router.<br><br>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table.<br><br>When an MLD Report message is received, the Switch sets the timeout period of the entry to be T = (QI*RV) + MRD, where T = Timeout, QI = Query Interval, RV = Robustness Variable, and MRD = Maximum Response Delay.<br><br>When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of **Last Member Query Interval** and **Robustness Variable**. |
| Robustness Variable | Enter the number of queries. A multicast address entry (learned only on an upstream port by snooping) is removed from the forwarding table when there is no response to the configured number of queries sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router.<br><br>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. |

Table 119 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN

| LABEL | DESCRIPTION |
|---|---|
| Last Member Query Interval | Enter the amount of time (in miliseconds) between the MLD group-specific queries sent by an upstream port when an MLD Done message is received. This value should be exactly the same as what's configured in the connected multicast router.<br>This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table after a Done message is received.<br>When an MLD Done message is received, the Switch sets the entry's lifetime to be the product of **Last Member Query Interval** and **Robustness Variable**. |
| Downstream | |
| Query Interval | Enter the amount of time (in miliseconds) between general query messages sent by the downstream port. |
| Maximum Response Delay | Enter the maximum time (in miliseconds) that the Switch waits for a response to a general query message sent by the downstream port. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is the index number of the MLD snooping-proxy VLAN entry in the table. Click on an index number to view more details or change the settings. |
| VID | This field displays the ID number of the VLAN group. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entries permanently. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 25.4.3 MLD Snooping-proxy VLAN Port Role Setting

Click the **Port Role Setting** link in the **Advanced Application** > **Multicast** > **IPv6 Multicast** > **MLD Snooping-proxy** > **VLAN** screen to display the screen as shown. See Section 25.1 on page 282 for more information on multicasting.

**Figure 224** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting (Standalone Mode)

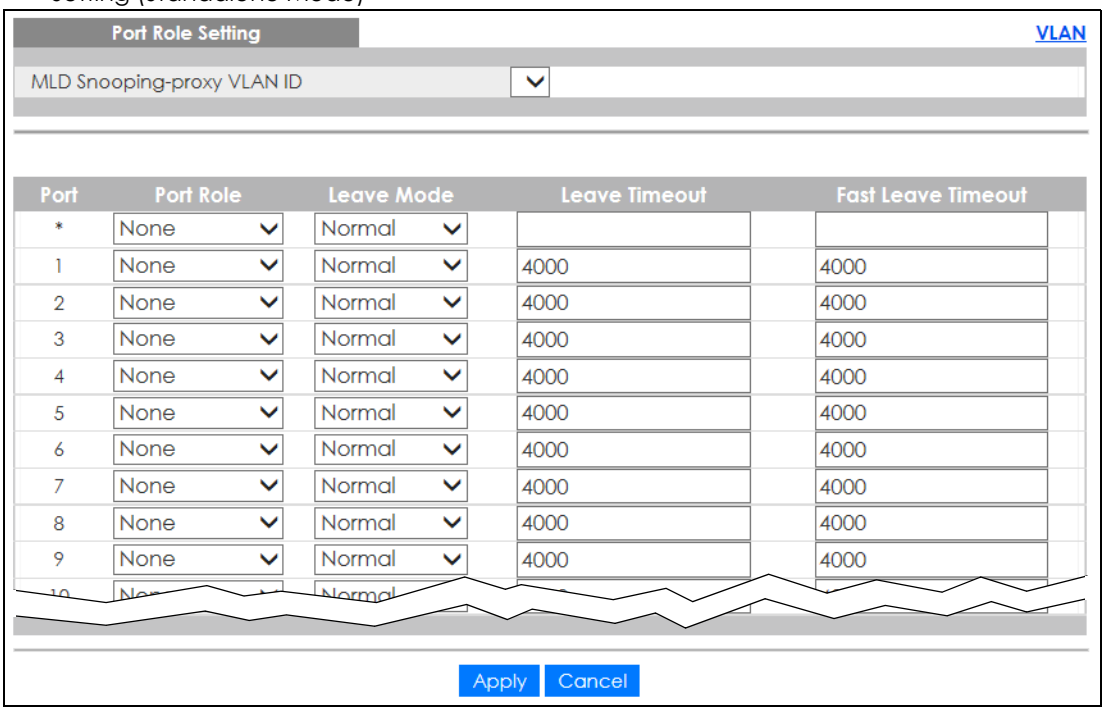
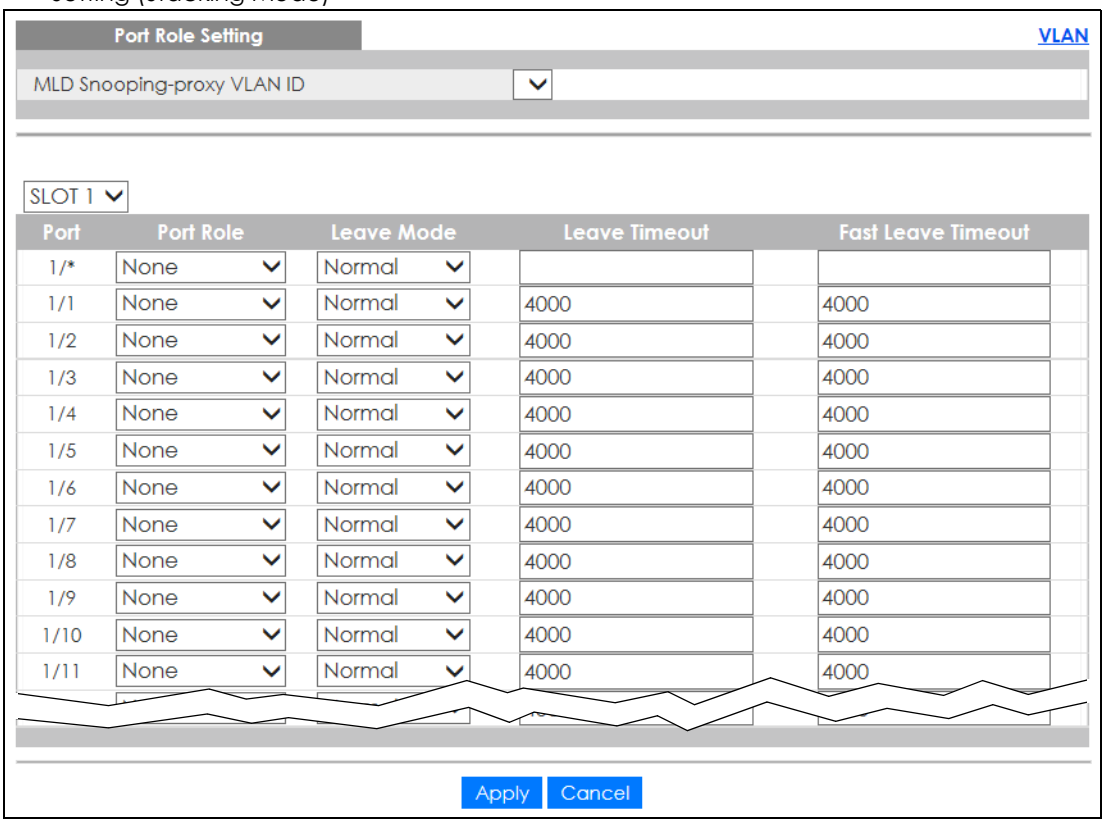



**Figure 225** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting (Stacking Mode)



The following table describes the fields in the above screen.

Table 120 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > VLAN > Port Role Setting

| LABEL | DESCRIPTION |
|---|---|
| MLD Snooping-proxy VLAN ID | Select the VLAN ID for which you want to configure a port's MLD snooping-proxy settings. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Port Role | A port on the Switch can be either a **Downstream** port or **Upstream** port in MLD. A downstream port connects to MLD hosts and acts as a multicast router to send MLD queries and listen to the MLD host's Report and Done messages. An upstream port connects to a multicast router and works as a host to send Report or Done messages when receiving queries from a multicast router.<br>Otherwise, select **None** if the port is not joining a multicast group or does not belong to this VLAN. |
| Leave Mode | Select the leave mode for the specified downstream ports in this VLAN.<br>This specifies whether the Switch removes an MLD snooping membership entry (learned on a downstream port) immediately (**Immediate**) or wait for an MLD report before the leave timeout (**Normal**) or fast leave timeout (**Fast**) when an MLD leave message is received on this port from a host. |
| Leave Timeout | Enter the MLD snooping normal leave timeout (in milliseconds) the Switch uses to update the forwarding table for the specified downstream ports.<br>This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host. |
| Fast Leave Timeout | Enter the fast leave timeout (in milliseconds) for the specified downstream ports.<br>This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |

## 25.4.4 MLD Snooping-proxy Filtering

Use this screen to configure the Switch's MLD filtering settings. Click the **Filtering** link in the **Advanced Application** > **Multicast** > **IPv6 Multicast** > **MLD Snooping-proxy** screen to display the screen as shown.

**Figure 226** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering (Standalone Mode)

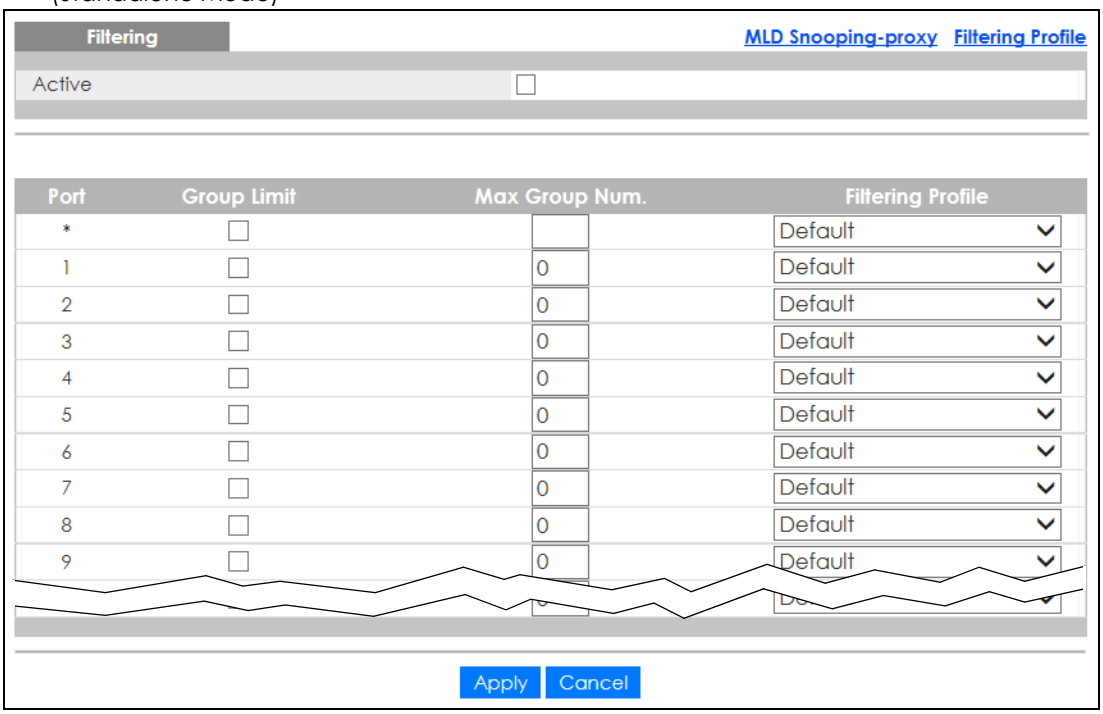
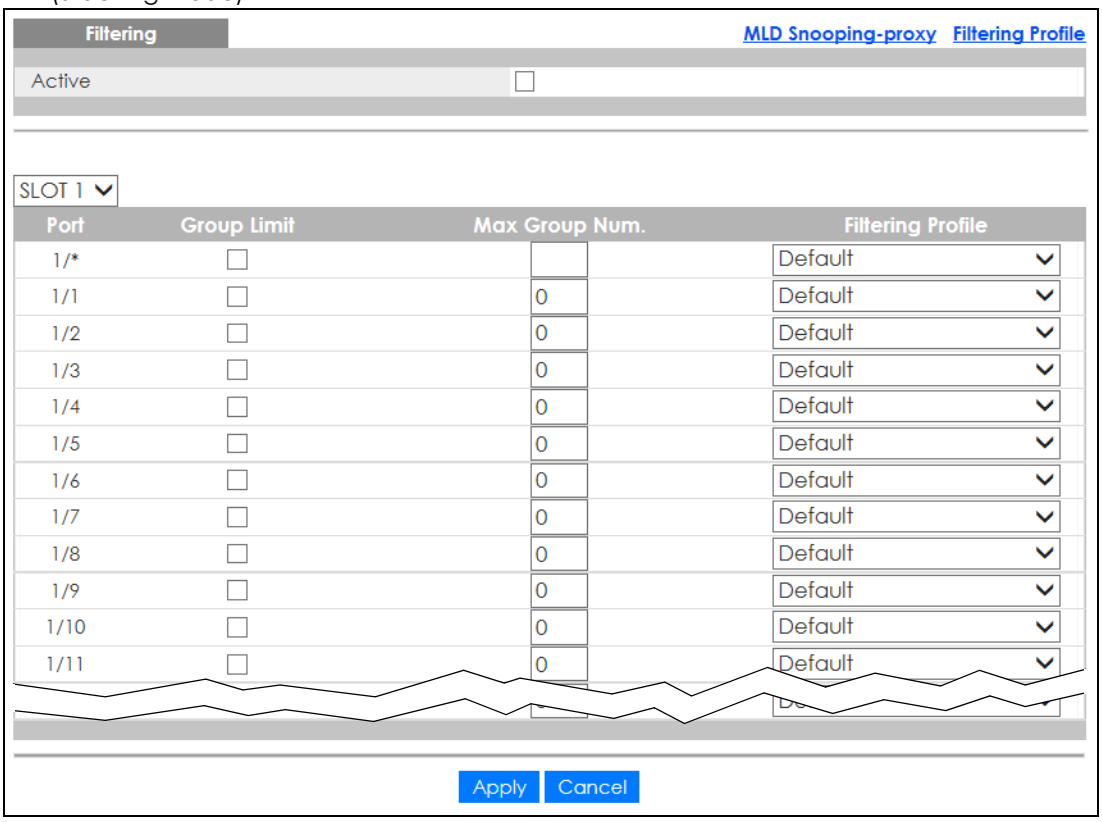



**Figure 227** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering (Stacking Mode)



The following table describes the fields in the above screen.

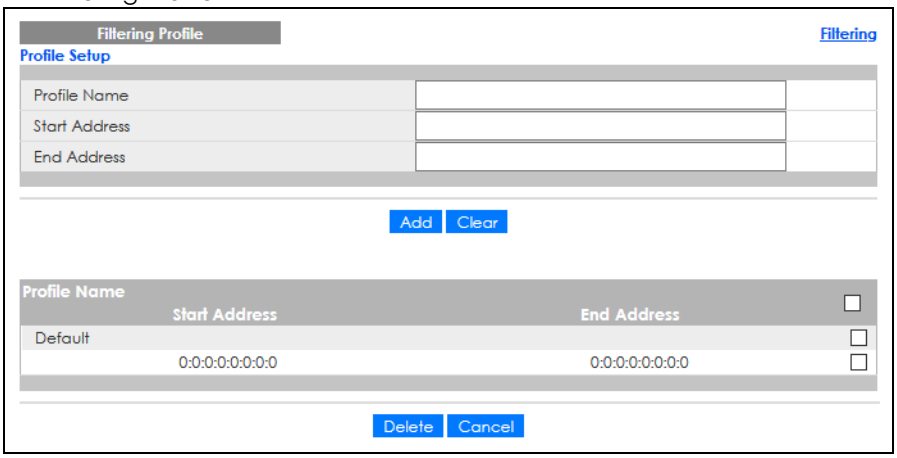
Table 121 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable MLD filtering on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Group Limit | Select this option to limit the number of multicast groups this port is allowed to join. |
| Max Group Num. | Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new MLD Report message is dropped on this port. |
| Filtering Profile | Select the name of the MLD filtering profile to use for this port. Otherwise, select **Default** to prohibit the port from joining any multicast group.<br>You can create MLD filtering profiles in the **Multicast** > **IPv6 Multicast** > **MLD Snooping-proxy** > **Filtering** > **Filtering Profile** screen. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |

## 25.4.5 MLD Snooping-proxy Filtering Profile

Use this screen to create an MLD filtering profile and set the range of the multicast addresses. Click the **Filtering Profile** link in the **Advanced Application** > **Multicast** > **IPv6 Multicast** > **MLD Snooping-proxy** > **Filtering** screen to display the screen as shown.

**Figure 228** Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile



The following table describes the fields in the above screen.

Table 122 Advanced Application > Multicast > IPv6 Multicast > MLD Snooping-proxy > Filtering > Filtering Profile

| LABEL | DESCRIPTION |
|---|---|
| Profile Name | Enter a descriptive name for the profile for identification purposes.<br>To configure additional rules for a profile that you have already added, enter the profile name and specify a different IP multicast address range. |
| Start Address | Type the starting multicast IPv6 address for a range of multicast IPv6 addresses that you want to belong to the MLD filtering profile. |
| End Address | Type the ending multicast IPv6 address for a range of IPv6 addresses that you want to belong to the MLD filtering profile.<br>If you want to add a single multicast IPv6 address, enter it in both the **Start Address** and **End Address** fields. |
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Profile Name | This field displays the descriptive name of the profile. |
| Start Address | This field displays the start of the multicast IPv6 address range. |
| End Address | This field displays the end of the multicast IPv6 address range. |
| | To delete the profiles and all the accompanying rules, select the profiles that you want to remove, then click the **Delete** button. You can select the check box in the table heading row to select all profiles.<br>To delete a rules from a profile, select the rules that you want to remove, then click the **Delete** button. |
| Delete | Click **Delete** button to permanently delete the entries you selected. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 25.5 General MVR Configuration

Use the **MVR** screen to create multicast VLANs and select the receiver ports and a source port for each multicast VLAN. Click **Advanced Application** > **Multicast** > **MVR** to display the screen as shown next.

Note: You can create up to five multicast VLANs and up to 256 multicast rules on the Switch.

Note: Your Switch automatically creates a static VLAN (with the same VID) when you create a multicast VLAN in this screen.

**Figure 229** Advanced Application > Multicast > MVR (Standalone Mode)

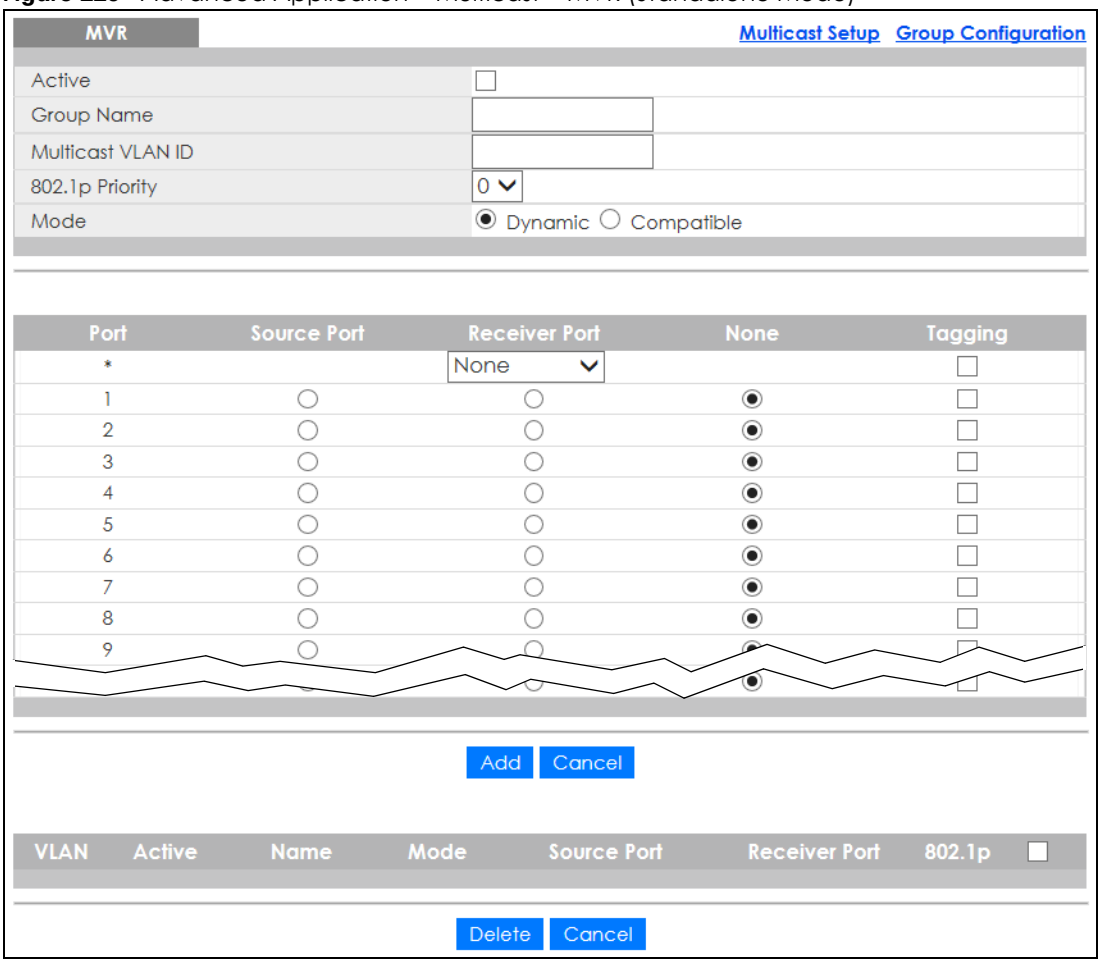
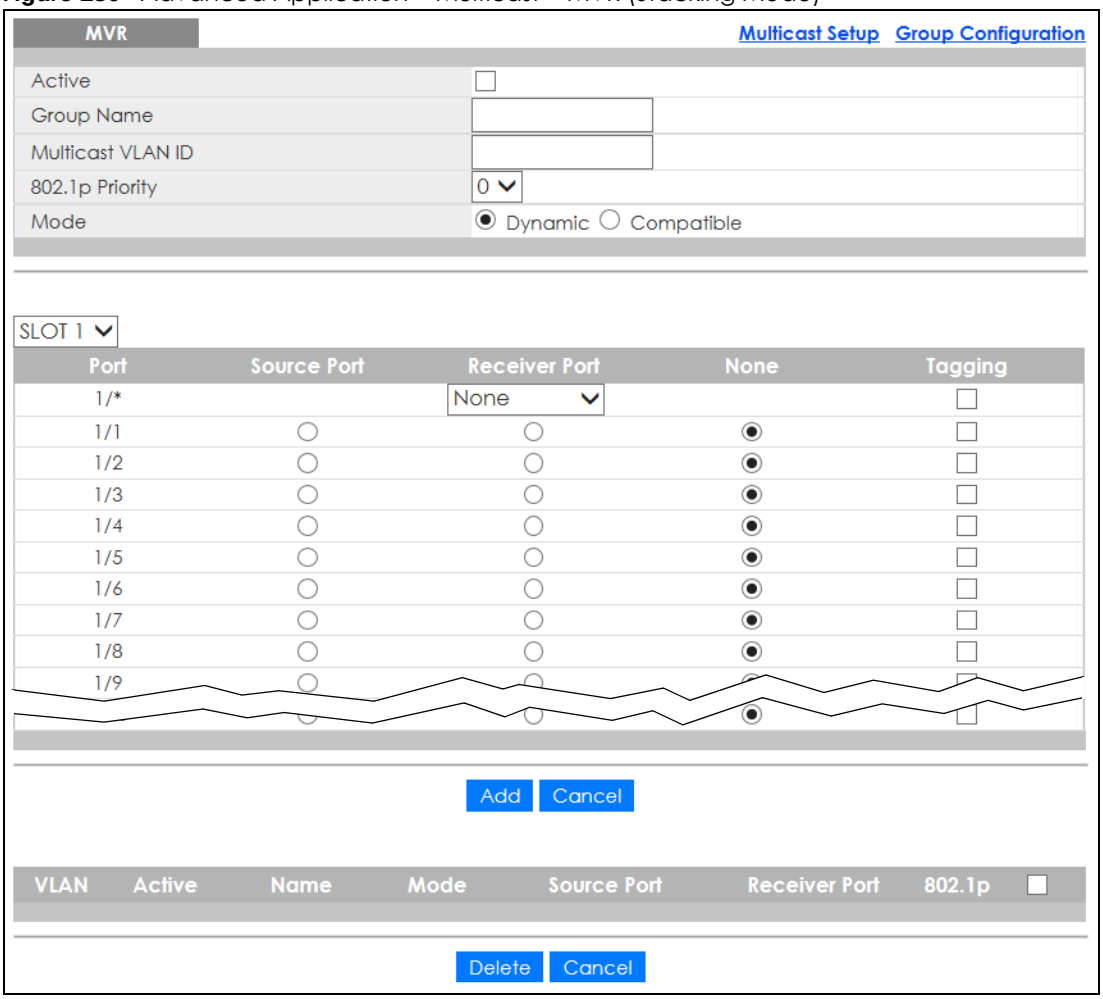


**Figure 230** Advanced Application > Multicast > MVR (Stacking Mode)




The following table describes the related labels in this screen.

Table 123 Advanced Application > Multicast > MVR

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable MVR to allow one single multicast VLAN to be shared among different subscriber VLANs on the network. |
| Group Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Multicast VLAN ID | Enter the VLAN ID (1 to 4094) of the multicast VLAN. |
| 802.1p Priority | Select a priority level (0 – 7) with which the Switch replaces the priority in outgoing IGMP or MLD control packets (belonging to this multicast VLAN). |
| Mode | Specify the MVR mode on the Switch. Choices are **Dynamic** and **Compatible**.<br>Select **Dynamic** to send IGMP reports or MLD messages to all MVR source ports in the multicast VLAN.<br>Select **Compatible** to set the Switch not to send IGMP reports or MLD messages. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 123 Advanced Application > Multicast > MVR (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Source Port | Select this option to set this port as the MVR source port that sends and receives multicast traffic. All source ports must belong to a single multicast VLAN. |
| Receiver Port | Select this option to set this port as a receiver port that only receives multicast traffic. |
| None | Select this option to set the port not to participate in MVR. No MVR multicast traffic is sent or received on this port. |
| Tagging | Select this check box if you want the port to tag the VLAN ID in all outgoing frames transmitted. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | This field displays the multicast VLAN ID. Click on an index number to change the settings. |
| Active | This field displays whether the multicast group is enabled or not. |
| Name | This field displays the descriptive name for this setting. |
| Mode | This field displays the MVR mode. |
| Source Port | This field displays the source port numbers. |
| Receiver Port | This field displays the receiver port numbers. |
| 802.1p | This field displays the priority level. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | To delete a multicast VLANs, select the rules that you want to remove, then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the check boxes. |

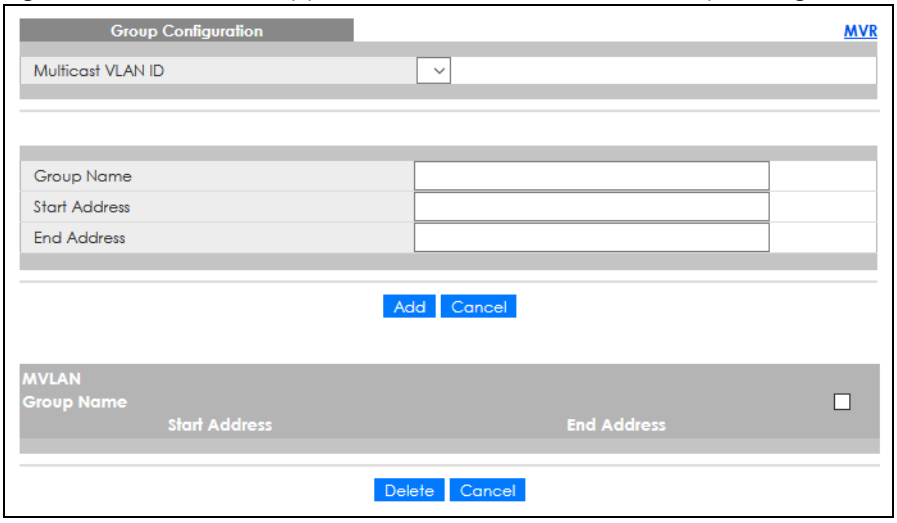
## 25.5.1 MVR Group Configuration

All source ports and receiver ports belonging to a multicast group can receive multicast data sent to this multicast group.

Use this screen to configure MVR IP multicast group addresses. Click the **Group Configuration** link in the **MVR** screen.

Note: A port can belong to more than one multicast VLAN. However, IP multicast group addresses in different multicast VLANs cannot overlap.

**Figure 231** Advanced Application > Multicast > MVR > Group Configuration




The following table describes the labels in this screen.

Table 124 Advanced Application > Multicast > MVR > Group Configuration

| LABEL | DESCRIPTION |
|---|---|
| Multicast VLAN ID | Select a multicast VLAN ID (that you configured in the **MVR** screen) from the drop-down list box. |
| Group Name | Enter a descriptive name for identification purposes. |
| Start Address | Enter the starting IP multicast address of the multicast group in dotted decimal notation. |
| End Address | Enter the ending IP multicast address of the multicast group in dotted decimal notation.<br>Enter the same IP address as the **Start Address** field if you want to configure only one IP address for a multicast group. |
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| MVLAN | This field displays the multicast VLAN ID. |
| Group Name | This field displays the descriptive name for this setting. |
| Start Address | This field displays the starting IP address of the multicast group. |
| End Address | This field displays the ending IP address of the multicast group. |
| | To delete the profiles and all the accompanying rules, select the profiles that you want to remove, then click the **Delete** button. You can select the check box in the table heading row to select all profiles.<br>To delete rules from a profile, select the rules that you want to remove, then click the **Delete** button. |
| Delete | Select the entries that you want to remove, then click the **Delete** button to remove the selected entries from the table.<br>If you delete a multicast VLAN, all multicast groups in this VLAN will also be removed. |
| Cancel | Select **Cancel** to clear the check boxes in the table. |

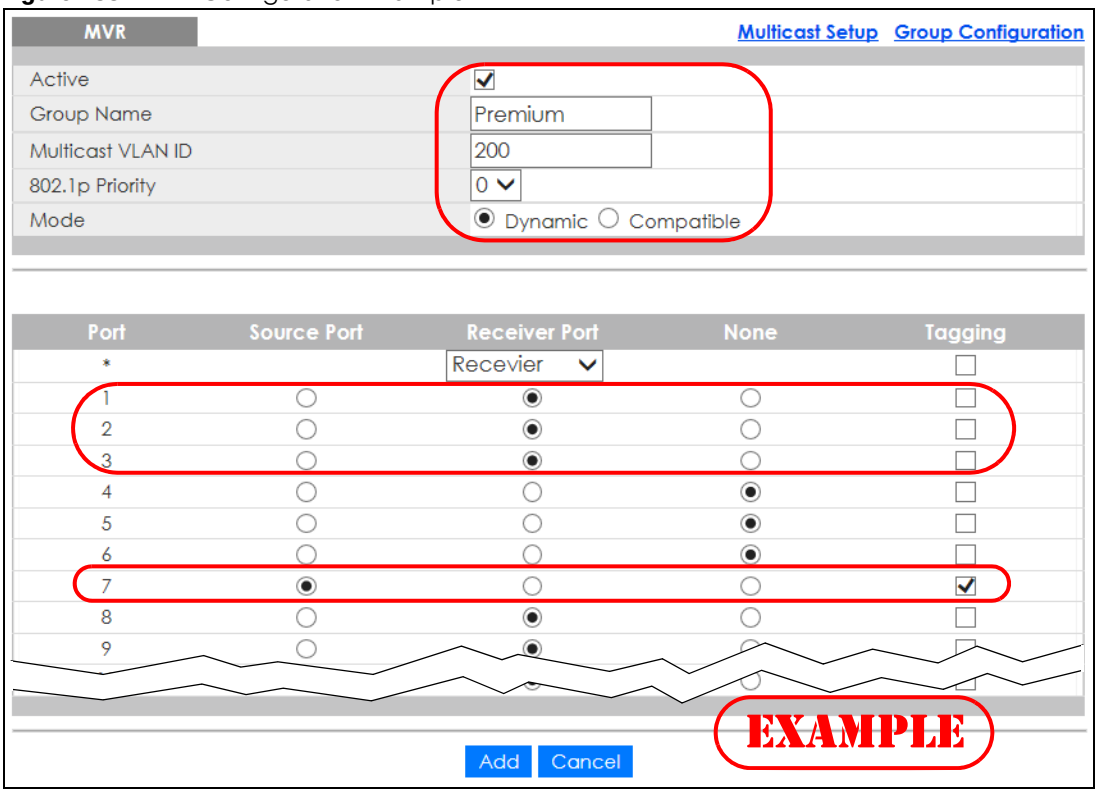
## 25.5.2 MVR Configuration Example

The following figure shows a network example where ports 1, 2 and 3 on the Switch belong to VLAN 1. In addition, port 7 belongs to the multicast group with VID 200 to receive multicast traffic (the **News** and **Movie** channels) from the remote streaming media server, **S**. Computers A, B and C in VLAN 1 are able to receive the traffic.

**Figure 232** MVR Configuration Example

To configure the MVR settings on the Switch, create a multicast VLAN in the **MVR** screen and set the receiver and source ports.

**Figure 233** MVR Configuration Example




To set the Switch to forward the multicast group traffic to the subscribers, configure multicast group settings in the **Group Configuration** screen. The following figure shows an example where two IPv4 multicast groups (**News** and **Movie**) are configured for the multicast VLAN 200.

**Figure 234** MVR Group Configuration Example-1

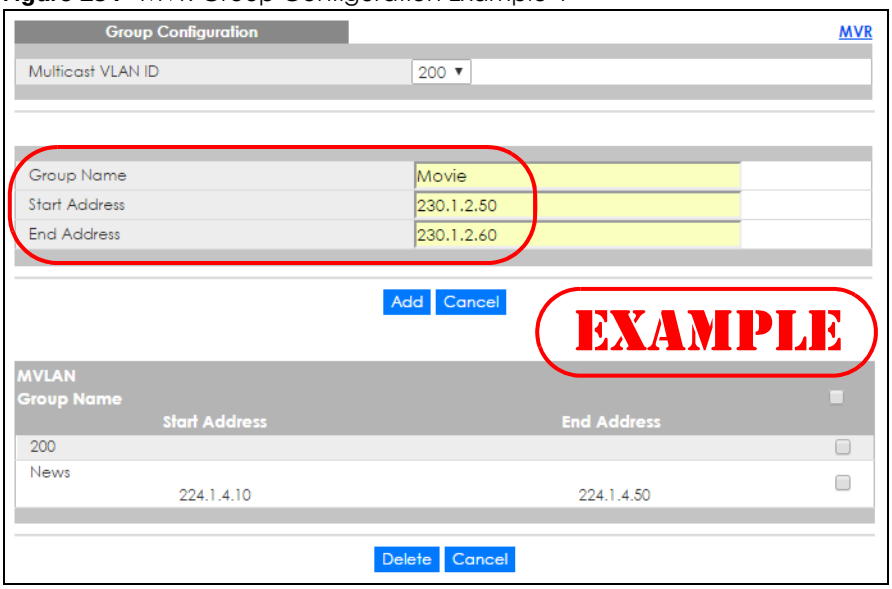
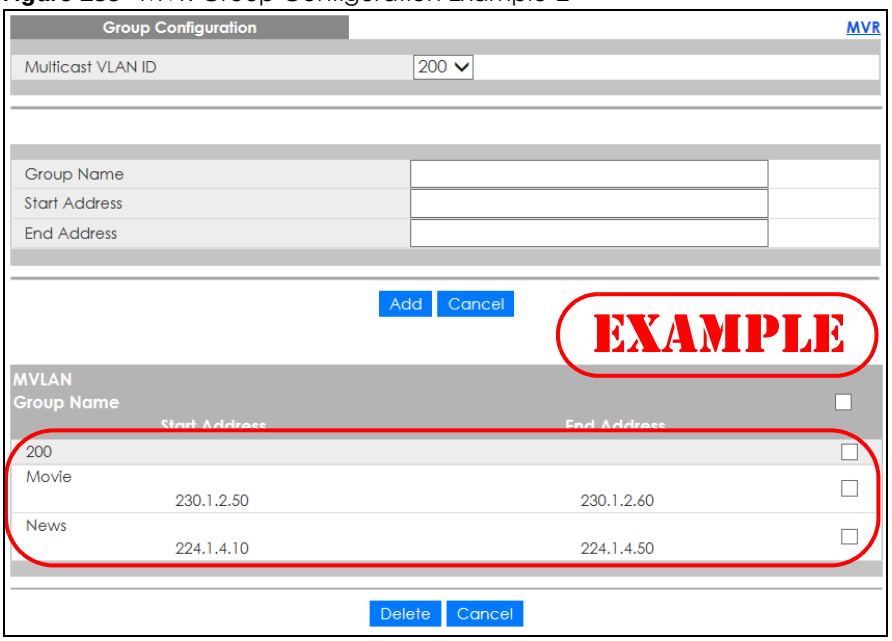



**Figure 235** MVR Group Configuration Example-2



# CHAPTER 26
# AAA

## 26.1 Authentication, Authorization and Accounting (AAA)

This chapter describes how to configure authentication, authorization and accounting settings on the Switch.

The external servers that perform authentication, authorization and accounting functions are known as AAA servers. The Switch supports RADIUS (Remote Authentication Dial-In User Service) and TACACS+ (Terminal Access Controller Access-Control System Plus) as the external authentication, authorization, and accounting server.

**Figure 236** AAA Server

### 26.1.1 What You Can Do

- Use the **AAA** screen (Section 26.2 on page 309) to display the links to the screens where you can enable authentication and authorization or both of them on the Switch.
- use the **RADIUS Server Setup** screen (Section 26.3 on page 310) to configure your RADIUS server settings.
- Use the **TACACS+ Server Setup** screen (Section 26.4 on page 311) to configure your TACACS+ authentication settings.
- Use the **AAA Setup** screen (Section 26.5 on page 313) to configure authentication, authorization and accounting settings, such as the methods used to authenticate users accessing the Switch and which database the Switch should use first.

### 26.1.2 What You Need to Know

Authentication is the process of determining who a user is and validating access to the Switch. The Switch can authenticate users who try to log in based on user accounts configured on the Switch itself. The Switch can also use an external authentication server to authenticate a large number of users.

Authorization is the process of determining what a user is allowed to do. Different user accounts may have higher or lower privilege levels associated with them. For example, user A may have the right to create new login accounts on the Switch but user B cannot. The Switch can authorize users based on user accounts configured on the Switch itself or it can use an external server to authorize a large number of users.

Accounting is the process of recording what a user is doing. The Switch can use an external server to

track when users log in, log out, execute commands and so on. Accounting can also record system related actions such as boot up and shut down times of the Switch.

### Local User Accounts

By storing user profiles locally on the Switch, your Switch is able to authenticate and authorize users without interacting with a network AAA server. However, there is a limit on the number of users you may authenticate in this way.

### RADIUS

RADIUS is a security protocol used to authenticate users by means of an external server instead of (or in addition to) an internal device user database that is limited to the memory capacity of the device. In essence, RADIUS authentication allows you to validate an unlimited number of users from a central location.

### RADIUS and TACACS+

RADIUS and TACACS+ are security protocols used to authenticate users by means of an external server instead of (or in addition to) an internal device user database that is limited to the memory capacity of the device. In essence, RADIUS and TACACS+ authentication both allow you to validate an unlimited number of users from a central location.

The following table describes some key differences between RADIUS and TACACS+.

Table 125 RADIUS vs. TACACS+

| | RADIUS | TACACS+ |
|---|---|---|
| Transport Protocol | UDP (User Datagram Protocol) | TCP (Transmission Control Protocol) |
| Encryption | Encrypts the password sent for authentication. | All communication between the client (the Switch) and the TACACS server is encrypted. |

## 26.2 AAA Screens

The **AAA** screens allow you to enable authentication and authorization or both of them on the Switch. First, configure your authentication server settings (RADIUS, TACACS+ or both) and then set up the authentication priority, activate authorization.

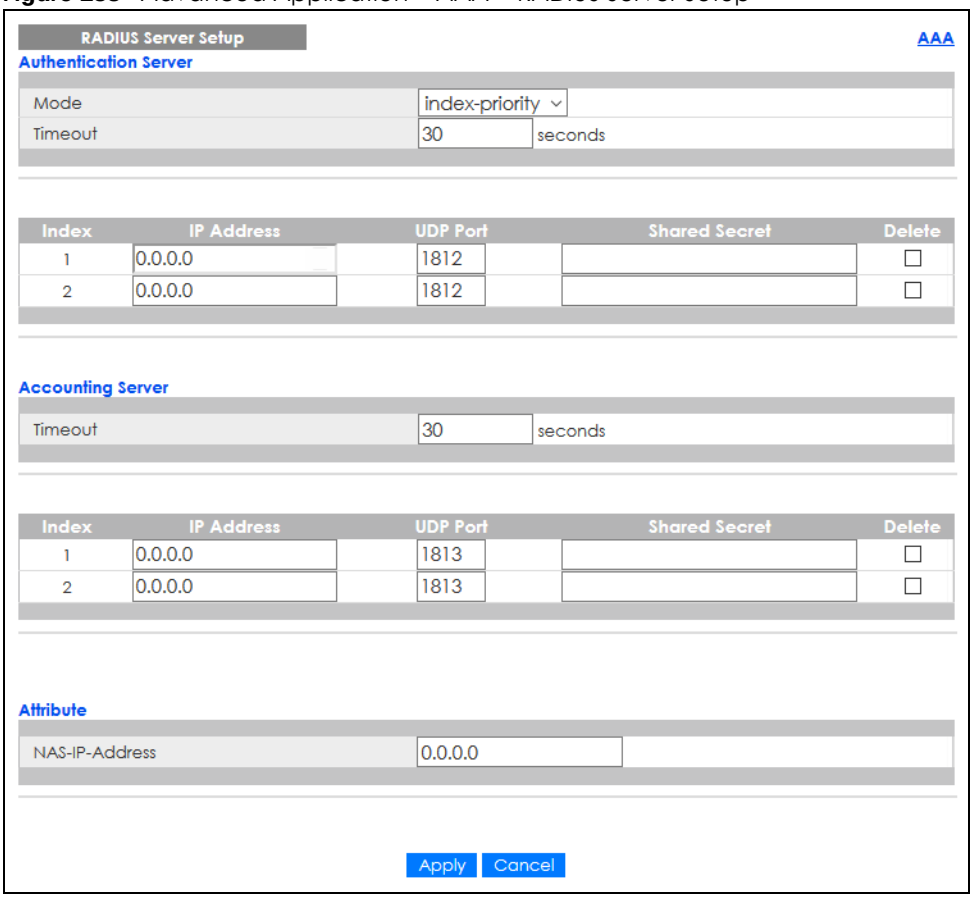
Click **Advanced Application** > **AAA** in the navigation panel to display the screen as shown.

**Figure 237** Advanced Application > AAA

# 26.3 RADIUS Server Setup

Use this screen to configure your RADIUS server settings. Click the **RADIUS Server Setup** link in the **AAA** screen to view the screen as shown.

**Figure 238** Advanced Application > AAA > RADIUS Server Setup




The following table describes the labels in this screen.

Table 126 Advanced Application > AAA > RADIUS Server Setup

| LABEL | DESCRIPTION |
|---|---|
| Authentication Server | Use this section to configure your RADIUS authentication settings. |
| Mode | This field is only valid if you configure multiple RADIUS servers.<br><br>Select **index-priority** and the Switch tries to authenticate with the first configured RADIUS server, if the RADIUS server does not respond then the Switch tries to authenticate with the second RADIUS server.<br><br>Select **round-robin** to alternate between the RADIUS servers that it sends authentication requests to. |
| Timeout | Specify the amount of time in seconds that the Switch waits for an authentication request response from the RADIUS server.<br><br>If you are using two RADIUS servers then the timeout value is divided between the two RADIUS servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first RADIUS server for 15 seconds and then tries the second RADIUS server. |

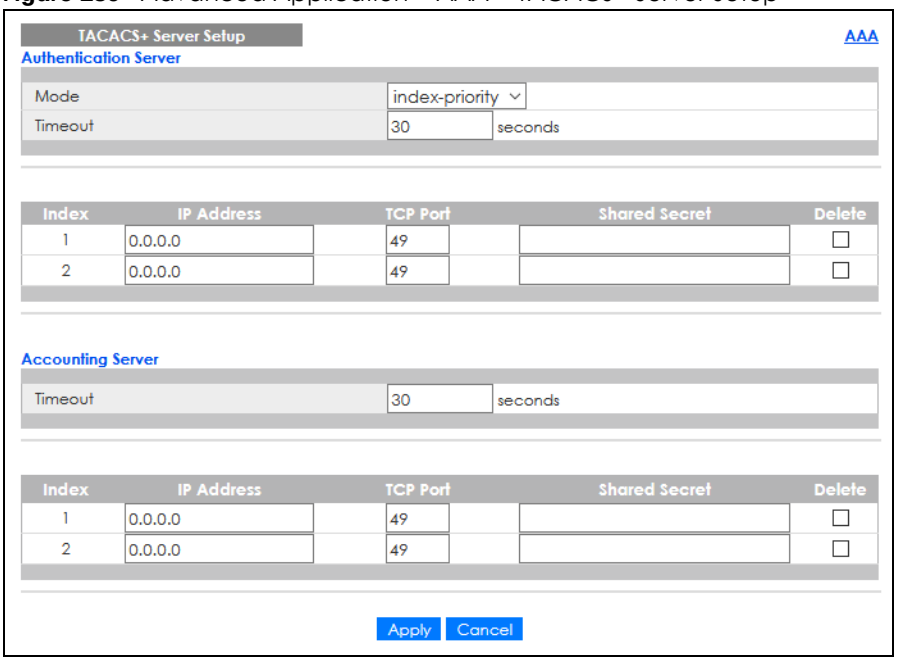
Table 126 Advanced Application > AAA > RADIUS Server Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Index | This is a read-only number representing a RADIUS server entry. |
| IP Address | Enter the IP address of an external RADIUS server in dotted decimal notation. |
| UDP Port | The default port of a RADIUS server for authentication is **1812**. You need not change this value unless your network administrator instructs you to do so. |
| Shared Secret | Specify a password (up to 32 alphanumeric characters except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) as the key to be shared between the external RADIUS server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS server and the Switch. |
| Delete | Check this box if you want to remove an existing RADIUS server entry from the Switch. This entry is deleted when you click **Apply**. |
| Accounting Server | Use this section to configure your RADIUS accounting server settings. |
| Timeout | Specify the amount of time in seconds that the Switch waits for an accounting request response from the RADIUS accounting server. |
| Index | This is a read-only number representing a RADIUS accounting server entry. |
| IP Address | Enter the IP address of an external RADIUS accounting server in dotted decimal notation. |
| UDP Port | The default port of a RADIUS accounting server for accounting is **1813**. You need not change this value unless your network administrator instructs you to do so. |
| Shared Secret | Specify a password (up to 32 alphanumeric characters except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) as the key to be shared between the external RADIUS accounting server and the Switch. This key is not sent over the network. This key must be the same on the external RADIUS accounting server and the Switch. |
| Delete | Check this box if you want to remove an existing RADIUS accounting server entry from the Switch. This entry is deleted when you click **Apply**. |
| Attribute | Use this section to define the RADIUS server attribute for its account. |
| NAS-IP-Address | Enter the IP address of the NAS (Network Access Server). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 26.4 TACACS+ Server Setup

Use this screen to configure your TACACS+ server settings. Click on the **TACACS+ Server Setup** link in the **AAA** screen to view the screen as shown.

**Figure 239** Advanced Application > AAA > TACACS+ Server Setup




The following table describes the labels in this screen.

Table 127 Advanced Application > AAA > TACACS+ Server Setup

| LABEL | DESCRIPTION |
|---|---|
| Authentication Server | Use this section to configure your TACACS+ authentication settings. |
| Mode | This field is only valid if you configure multiple TACACS+ servers.<br><br>Select **index-priority** and the Switch tries to authenticate with the first configured TACACS+ server, if the TACACS+ server does not respond then the Switch tries to authenticate with the second TACACS+ server.<br><br>Select **round-robin** to alternate between the TACACS+ servers that it sends authentication requests to. |
| Timeout | Specify the amount of time in seconds that the Switch waits for an authentication request response from the TACACS+ server.<br><br>If you are using two TACACS+ servers then the timeout value is divided between the two TACACS+ servers. For example, if you set the timeout value to 30 seconds, then the Switch waits for a response from the first TACACS+ server for 15 seconds and then tries the second TACACS+ server. |
| Index | This is a read-only number representing a TACACS+ server entry. |
| IP Address | Enter the IP address of an external TACACS+ server in dotted decimal notation. |
| TCP Port | The default port of a TACACS+ server for authentication is **49**. You need not change this value unless your network administrator instructs you to do so. |
| Shared Secret | Specify a password (up to 32 alphanumeric characters except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) as the key to be shared between the external TACACS+ server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ server and the Switch. |
| Delete | Check this box if you want to remove an existing TACACS+ server entry from the Switch. This entry is deleted when you click **Apply**. |
| Accounting Server | Use this section to configure your TACACS+ accounting settings. |

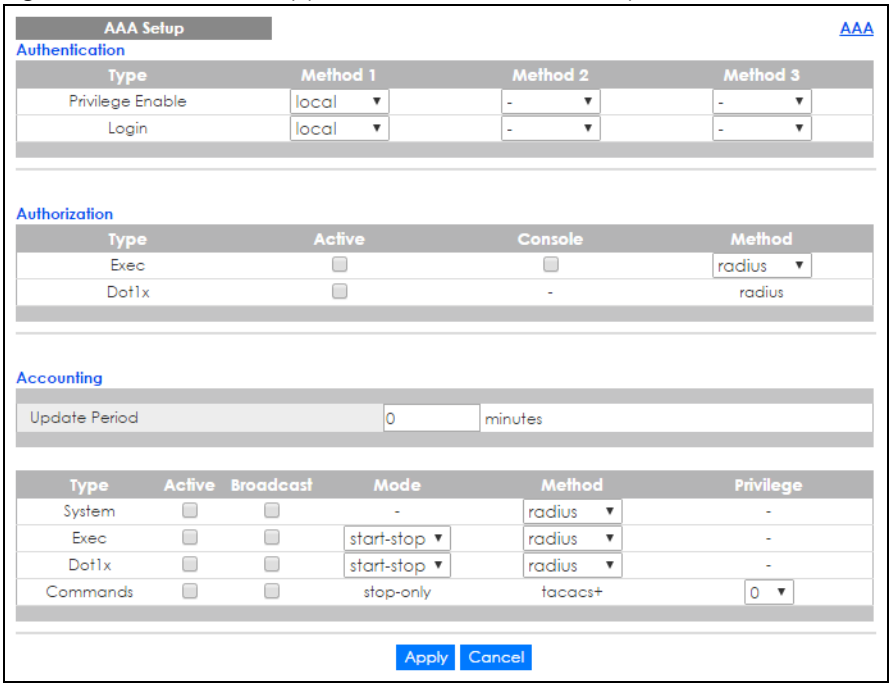
Table 127 Advanced Application > AAA > TACACS+ Server Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Timeout | Specify the amount of time in seconds that the Switch waits for an accounting request response from the TACACS+ server. |
| Index | This is a read-only number representing a TACACS+ accounting server entry. |
| IP Address | Enter the IP address of an external TACACS+ accounting server in dotted decimal notation. |
| TCP Port | The default port of a TACACS+ accounting server is **49**. You need not change this value unless your network administrator instructs you to do so. |
| Shared Secret | Specify a password (up to 32 alphanumeric characters except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) as the key to be shared between the external TACACS+ accounting server and the Switch. This key is not sent over the network. This key must be the same on the external TACACS+ accounting server and the Switch. |
| Delete | Check this box if you want to remove an existing TACACS+ accounting server entry from the Switch. This entry is deleted when you click **Apply**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 26.5 AAA Setup

Use this screen to configure authentication, authorization and accounting settings on the Switch. Click on the **AAA Setup** link in the **AAA** screen to view the screen as shown.

**Figure 240** Advanced Application > AAA > AAA Setup



The following table describes the labels in this screen.

Table 128 Advanced Application > AAA > AAA Setup

| LABEL | DESCRIPTION |
|---|---|
| Authentication | Use this section to specify the methods used to authenticate users accessing the Switch. |
| Privilege Enable | These fields specify which database the Switch should use (first, second and third) to authenticate access privilege level for administrator accounts (users for Switch management).<br><br>Configure the access privilege of accounts through commands (see the Ethernet Switch CLI Reference Guide) for **local** authentication. The **TACACS+** and **RADIUS** are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first.<br><br>You can specify up to three methods for the Switch to authenticate the access privilege level of administrators. The Switch checks the methods in the order you configure them (first **Method 1**, then **Method 2** and finally **Method 3**). You must configure the settings in the **Method 1** field. If you want the Switch to check other sources for access privilege level specify them in **Method 2** and **Method 3** fields.<br><br>Select **local** to have the Switch check the access privilege configured for local authentication.<br><br>Select **radius** or **tacacs+** to have the Switch check the access privilege through the external servers. |
| Login | These fields specify which database the Switch should use (first, second and third) to authenticate administrator accounts (users for Switch management).<br><br>Configure the local user accounts in the **Access Control** > **Logins** screen. The TACACS+ and RADIUS are external servers. Before you specify the priority, make sure you have set up the corresponding database correctly first.<br><br>You can specify up to three methods for the Switch to authenticate administrator accounts. The Switch checks the methods in the order you configure them (first **Method 1**, then **Method 2** and finally **Method 3**). You must configure the settings in the **Method 1** field. If you want the Switch to check other sources for administrator accounts, specify them in **Method 2** and **Method 3** fields.<br><br>Select **local** to have the Switch check the administrator accounts configured in the **Access Control** > **Logins** screen.<br><br>Select **radius** to have the Switch check the administrator accounts configured through the RADIUS Server.<br><br>Select **tacacs+** to have the Switch check the administrator accounts configured through the TACACS+ Server**.** |
| Authorization | Use this section to configure authorization settings on the Switch. |
| Type | Set whether the Switch provides the following services to a user.<br><br>• **Exec**: Allow an administrator which logs into the Switch through Telnet or SSH to have a different access privilege level assigned through the external server.<br>• **Dot1x**: Allow an IEEE 802.1x client to have different bandwidth limit or VLAN ID assigned through the external server. |
| Active | Select this to activate authorization for a specified event type. |
| Console | Select this to allow an administrator which logs in the Switch through the console port to have different access privilege level assigned through the external server. |
| Method | Select whether you want to use RADIUS or TACACS+ for authorization of specific types of events.<br><br>RADIUS is the only method for IEEE 802.1x authorization. |
| Accounting | Use this section to configure accounting settings on the Switch. |
| Update Period | This is the amount of time in minutes before the Switch sends an update to the accounting server. This is only valid if you select the **start-stop** option for the **Exec** or **Dot1x** entries. |

Table 128 Advanced Application > AAA > AAA Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Type | The Switch supports the following types of events to be sent to the accounting servers:<br>• **System** – Configure the Switch to send information when the following system events occur: system boots up, system shuts down, system accounting is enabled, system accounting is disabled.<br>• **Exec** – Configure the Switch to send information when an administrator logs in and logs out through the console port, telnet or SSH.<br>• **Dot1x** – Configure the Switch to send information when an IEEE 802.1x client begins a session (authenticates through the Switch), ends a session as well as interim updates of a session.<br>• **Commands** – Configure the Switch to send information when commands of specified privilege level and higher are executed on the Switch. |
| Active | Select this to activate accounting for a specified event type. |
| Broadcast | Select this to have the Switch send accounting information to all configured accounting servers at the same time.<br>If you do not select this and you have two accounting servers set up, then the Switch sends information to the first accounting server and if it does not get a response from the accounting server then it tries the second accounting server. |
| Mode | The Switch supports two modes of recording login events. Select:<br>• **start-stop** – to have the Switch send information to the accounting server when a user begins a session, during a user's session (if it lasts past the **Update Period**), and when a user ends a session.<br>• **stop-only** – to have the Switch send information to the accounting server only when a user ends a session. |
| Method | Select whether you want to use RADIUS or TACACS+ for accounting of specific types of events.<br>TACACS+ is the only method for recording **Commands** type of event. |
| Privilege | This field is only configurable for **Commands** type of event. Select the threshold command privilege level for which the Switch should send accounting information. The Switch will send accounting information when commands at the level you specify and higher are executed on the Switch. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 26.6 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 26.6.1 Vendor Specific Attribute

RFC 2865 standard specifies a method for sending vendor-specific information between a RADIUS server and a network access device (for example, the Switch). A company can create Vendor Specific Attributes (VSAs) to expand the functionality of a RADIUS server.

The Switch supports VSAs that allow you to perform the following actions based on user authentication:

- Limit bandwidth on incoming or outgoing traffic for the port the user connects to.
- Assign account privilege levels (See the CLI Reference Guide for more information on account

privilege levels) for the authenticated user.

The VSAs are composed of the following:

- **Vendor-ID**: An identification number assigned to the company by the IANA (Internet Assigned Numbers Authority). Zyxel's vendor ID is 890.
- **Vendor-Type**: A vendor specified attribute, identifying the setting you want to modify.
- **Vendor-data**: A value you want to assign to the setting.

Note: Refer to the documentation that comes with your RADIUS server on how to configure VSAs for users authenticating through the RADIUS server.

The following table describes the VSAs supported on the Switch. Note that these attributes only work when you enable authorization (see Section 26.5 on page 313).

Table 129 Supported VSAs

| FUNCTION | ATTRIBUTE |
|---|---|
| Ingress Bandwidth Assignment | `Vendor-Id = 890`<br>`Vendor-Type = 1`<br>`Vendor-data =` ingress rate (Kbps in decimal format) |
| Egress Bandwidth Assignment | `Vendor-Id = 890`<br>`Vendor-Type = 2`<br>`Vendor-data =` egress rate (Kbps in decimal format) |
| Privilege Assignment | `Vendor-ID = 890`<br>`Vendor-Type = 3`<br>`Vendor-Data = "shell:priv-lvl=N"`<br>or<br>`Vendor-ID = 9` (CISCO)<br>`Vendor-Type = 1` (CISCO-AVPAIR)<br>`Vendor-Data = "shell:priv-lvl=N"`<br>where `N` is a privilege level (from 0 to 14).<br>Note: If you set the privilege level of a login account differently on the RADIUS servers and the Switch, the user is assigned a privilege level from the database (RADIUS or local) the Switch uses first for user authentication. |

### 26.6.1.1 Tunnel Protocol Attribute

You can configure tunnel protocol attributes on the RADIUS server (refer to your RADIUS server documentation) to assign a port on the Switch to a VLAN based on IEEE 802.1x authentication. The port VLAN settings are fixed and untagged. This will also set the port's VID. The following table describes the values you need to configure. Note that these attributes only work when you enable authorization (see Section 26.5 on page 313).

Table 130 Supported Tunnel Protocol Attribute

| FUNCTION | ATTRIBUTE |
|---|---|
| VLAN Assignment | `Tunnel-Type = VLAN(13)`<br>`Tunnel-Medium-Type = 802(6)`<br>`Tunnel-Private-Group-ID = VLAN ID`<br><br>Note: You must also create a VLAN with the specified VID on the Switch.<br><br>Note: The bolded values in this table are fixed values as defined in RFC 3580. |

## 26.6.2 Supported RADIUS Attributes

Remote Authentication Dial-In User Service (RADIUS) attributes are data used to define specific authentication elements in a user profile, which is stored on the RADIUS server. This section lists the RADIUS attributes supported by the Switch.

Refer to RFC 2865 for more information about RADIUS attributes used for authentication.

Refer to RFC 2866 and RFC 2869 for RADIUS attributes used for accounting.

This section lists the attributes used by authentication functions on the Switch. In cases where the attribute has a specific format associated with it, the format is specified.

## 26.6.3 Attributes Used for Authentication

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

### 26.6.3.1 Attributes Used for Authenticating Privilege Access

User-Name

– The format of the User-Name attribute is **$enab**#**$**, where # is the privilege level (1 – 14).

User-Password

NAS-Identifier

NAS-IP-Address

### 26.6.3.2 Attributes Used to Login Users

User-Name

User-Password

NAS-Identifier

NAS-IP-Address

#### 26.6.3.3 Attributes Used by the IEEE 802.1x Authentication

User-Name

NAS-Identifier

NAS-IP-Address

NAS-Port

NAS-Port-Type

– This value is set to **Ethernet(15)** on the Switch.

Calling-Station-Id

Frame-MTU

EAP-Message

State

Message-Authenticator

### 26.6.4 Attributes Used for Accounting

The following sections list the attributes sent from the Switch to the RADIUS server when performing authentication.

#### 26.6.4.1 Attributes Used for Accounting System Events

NAS-IP-Address

NAS-Identifier

Acct-Status-Type

Acct-Session-ID

– The format of Acct-Session-Id is **date+time+8-digit sequential number**, for example, 200704191721030000000001. (date: 2007/04/19, time: 17:21:03, serial number: 00000001)

Acct-Delay-Time

#### 26.6.4.2 Attributes Used for Accounting Exec Events

The attributes are listed in the following table along with the time that they are sent (the difference between Console and Telnet/SSH Exec events is that the Telnet/SSH events utilize the Calling-Station-Id attribute):

Table 131 RADIUS Attributes – Exec Events through Console

| ATTRIBUTE | START | INTERIM-UPDATE | STOP |
|---|---|---|---|
| User-Name | ✔ | ✔ | ✔ |
| NAS-Identifier | ✔ | ✔ | ✔ |
| NAS-IP-Address | ✔ | ✔ | ✔ |
| Service-Type | ✔ | ✔ | ✔ |
| Acct-Status-Type | ✔ | ✔ | ✔ |
| Acct-Delay-Time | ✔ | ✔ | ✔ |
| Acct-Session-Id | ✔ | ✔ | ✔ |
| Acct-Authentic | ✔ | ✔ | ✔ |

Table 131 RADIUS Attributes – Exec Events through Console (continued)

| ATTRIBUTE | START | INTERIM-UPDATE | STOP |
|---|---|---|---|
| Acct-Session-Time | | ✔ | ✔ |
| Acct-Terminate-Cause | | | ✔ |

Table 132 RADIUS Attributes – Exec Events through Telnet/SSH

| ATTRIBUTE | START | INTERIM-UPDATE | STOP |
|---|---|---|---|
| User-Name | ✔ | ✔ | ✔ |
| NAS-Identifier | ✔ | ✔ | ✔ |
| NAS-IP-Address | ✔ | ✔ | ✔ |
| Service-Type | ✔ | ✔ | ✔ |
| Calling-Station-Id | ✔ | ✔ | ✔ |
| Acct-Status-Type | ✔ | ✔ | ✔ |
| Acct-Delay-Time | ✔ | ✔ | ✔ |
| Acct-Session-Id | ✔ | ✔ | ✔ |
| Acct-Authentic | ✔ | ✔ | ✔ |
| Acct-Session-Time | | ✔ | ✔ |
| Acct-Terminate-Cause | | | ✔ |

### 26.6.4.3 Attributes Used for Accounting IEEE 802.1x Events

The attributes are listed in the following table along with the time of the session they are sent:

Table 133 RADIUS Attributes – Exec Events through Console

| ATTRIBUTE | START | INTERIM-UPDATE | STOP |
|---|---|---|---|
| User-Name | ✔ | ✔ | ✔ |
| NAS-IP-Address | ✔ | ✔ | ✔ |
| NAS-Port | ✔ | ✔ | ✔ |
| Class | ✔ | ✔ | ✔ |
| Called-Station-Id | ✔ | ✔ | ✔ |
| Calling-Station-Id | ✔ | ✔ | ✔ |
| NAS-Identifier | ✔ | ✔ | ✔ |
| NAS-Port-Type | ✔ | ✔ | ✔ |
| Acct-Status-Type | ✔ | ✔ | ✔ |
| Acct-Delay-Time | ✔ | ✔ | ✔ |
| Acct-Session-Id | ✔ | ✔ | ✔ |
| Acct-Authentic | ✔ | ✔ | ✔ |
| Acct-Input-Octets | | ✔ | ✔ |
| Acct-Output-Octets | | ✔ | ✔ |
| Acct-Session-Time | | ✔ | ✔ |
| Acct-Input-Packets | | ✔ | ✔ |

Table 133 RADIUS Attributes – Exec Events through Console (continued)

| ATTRIBUTE | START | INTERIM-UPDATE | STOP |
|---|---|---|---|
| Acct-Output-Packets | | ✔ | ✔ |
| Acct-Terminate-Cause | | | ✔ |
| Acct-Input-Gigawords | | ✔ | ✔ |
| Acct-Output-Gigawords | | ✔ | ✔ |

# CHAPTER 27
# IP Source Guard

## 27.1 IP Source Guard Overview

IP source guard uses a binding table to distinguish between authorized and unauthorized DHCP and ARP packets in your network. A binding contains these key attributes:

- MAC address
- VLAN ID
- IP address
- Port number

When the Switch receives a DHCP or ARP packet, it looks up the appropriate MAC address, VLAN ID, IP address, and port number in the binding table. If there is a binding, the Switch forwards the packet. If there is not a binding, the Switch discards the packet.

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

### 27.1.1 What You Can Do

- Use the **IP Source Guard** screen (Section 27.3 on page 322) to look at the current bindings for DHCP snooping and ARP inspection.
- Use the **IP Source Guard Static Binding** screen (Section 27.4 on page 323) to manage static bindings for DHCP snooping and ARP inspection.

### 27.1.2 What You Need to Know

The Switch builds the binding table by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings).

IP source guard consists of the following features:

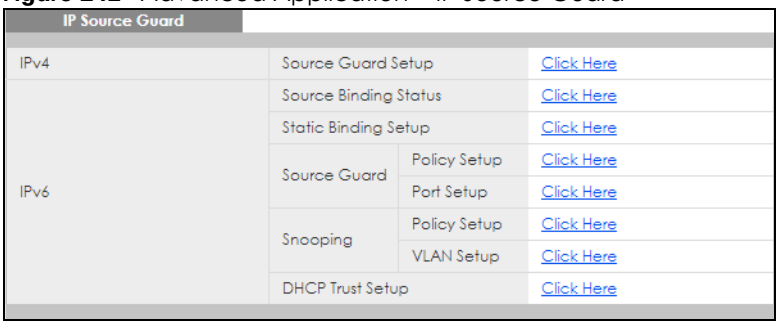
- Static bindings. Use this to create static bindings in the binding table.
- DHCP snooping. Use this to filter unauthorized DHCP packets on the network and to build the binding table dynamically.
- ARP inspection. Use this to filter unauthorized ARP packets on the network.

If you want to use dynamic bindings to filter unauthorized ARP packets (typical implementation), you have to enable DHCP snooping before you enable ARP inspection.

# 27.2 IP Source Guard

Use this screen to go to the configuration screens where you can configure IPv4 or IPv6 source guard settings. Click **Advanced Application** > **IP Source Guard** in the navigation panel.

**Figure 241** Advanced Application > IP Source Guard




The following table describes the labels in this screen.

Table 134 Advanced Application > IP Source Guard

| LABEL | DESCRIPTION |
|---|---|
| IPv4 Source Guard Setup | Click the link to open screens where you can view and manage static bindings, configure DHCP snooping or ARP inspection and look at various statistics. |
| IPv6 Source Binding Status | Click the link to open a screen where you can view the current IPv6 dynamic and static bindings or remove dynamic bindings based on IPv6 address and/or IPv6 prefix. |
| IPv6 Static Binding Setup | Click the link to open a screen where you can manually create IPv6 source guard static binding entries. |
| IPv6 Source Guard Policy Setup | Click the link to open a screen where you can define policies to have IPv6 source guard forward valid addresses and/or prefixes and allow or block data traffic from all link-local addresses. |
| IPv6 Source Guard Port Setup | Click the link to open a screen where you can apply the configured IPv6 source guard policy to a port. |
| IPv6 Snooping Policy Setup | Click the link to open a screen where you can set up DHCPv6 snooping policies for the binding table. |
| IPv6 Snooping VLAN Setup | Click the link to open a screen where you can enable a DHCPv6 snooping policy on a specific VLAN interface. |
| IPv6 DHCP Trust Setup | Click the link to open a screen where you can specify which ports are trusted for DHCPv6 snooping. |

# 27.3 IPv4 Source Guard Setup

Use this screen to look at the current bindings for DHCP snooping and ARP inspection. Bindings are used

by DHCP snooping and ARP inspection to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup**.

**Figure 242** Advanced Application > IP Source Guard > IPv4 Source Guard Setup

The following table describes the labels in this screen.

Table 135 Advanced Application > IP Source Guard > IPv4 Source Guard Setup

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays a sequential number for each binding. |
| IP Address | This field displays the IP address assigned to the MAC address in the binding. |
| VLAN | This field displays the source VLAN ID in the binding. |
| MAC Address | This field displays the source MAC address in the binding. |
| Port | This field displays the port number in the binding. If this field is blank, the binding applies to all ports. |
| Lease | This field displays how many days, hours, minutes, and seconds the binding is valid; for example, **2d3h4m5s** means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays **infinity** if the binding is always valid (for example, a static binding). |
| Type | This field displays how the Switch learned the binding.<br>**static**: This binding was learned from information provided manually by an administrator.<br>**dhcp-snooping**: This binding was learned by snooping DHCP packets. |

# 27.4 IPv4 Source Guard Static Binding

Use this screen to manage static bindings for DHCP snooping and ARP inspection. Static bindings are uniquely identified by the MAC address and VLAN ID. Each MAC address and VLAN ID can only be in one static binding. If you try to create a static binding with the same MAC address and VLAN ID as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **Static Binding**.

**Figure 243** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding (Standalone Mode)

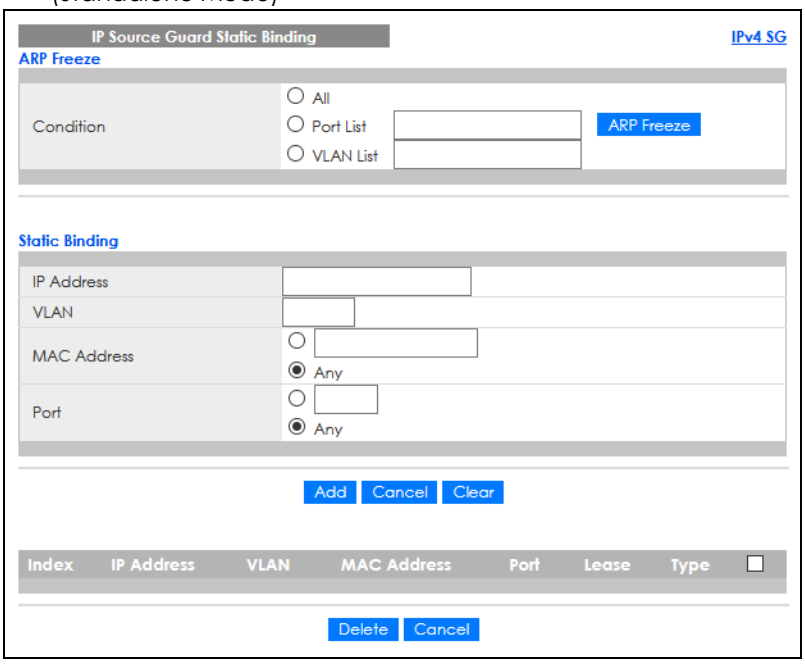
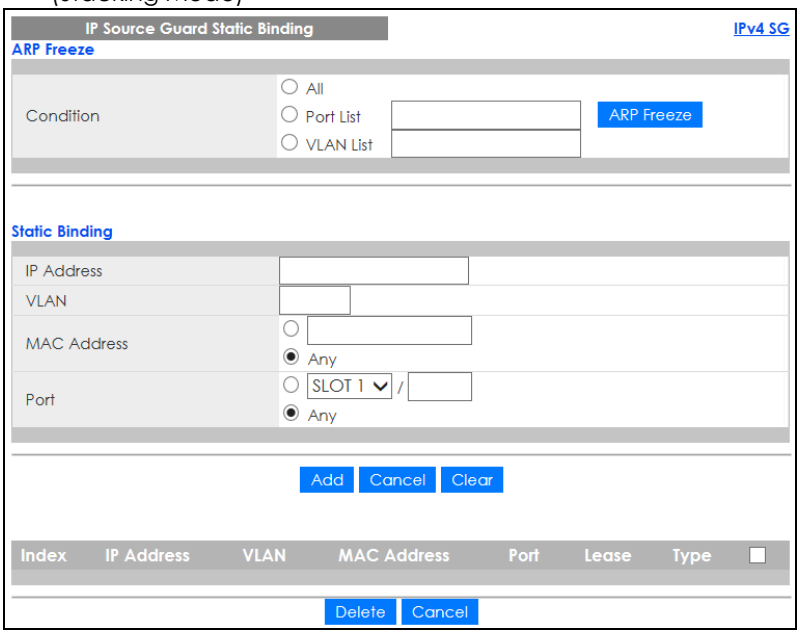



**Figure 244** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding (Stacking Mode)



The following table describes the labels in this screen.

Table 136 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > Static Binding

| LABEL | DESCRIPTION |
|---|---|
| ARP Freeze | ARP Freeze allows you to automatically create static bindings from the current ARP entries (either dynamically learned or static ARP entries) until the Switch's binding table is full.<br><br>Note: The ARP learning mode should be set to **ARP-Request** in the **IP Application** > **ARP Setup** > **ARP Learning** screen before you use the ARP Freeze feature. |
| Condition | **All** – Select this and click **ARP Freeze** to have the Switch automatically add all the current ARP entries to the static bindings table.<br><br>**Port List** – Select this and enter the number of the ports (separated by a comma).<br><br>ARP entries learned on the specified ports are added to the static bindings table after you click **ARP Freeze**.<br><br>**VLAN List** – Select this and enter the ID number of the VLANs (separated by a comma). ARP entries for the specified VLANs are added to the static bindings table after you click **ARP Freeze**. |
| Static Binding | |
| IP Address | Enter the IP address assigned to the MAC address in the binding. |
| VLAN | Enter the source VLAN ID in the binding. |
| MAC Address | Enter the source MAC address in the binding. If this binding applies to all MAC addresses, select **Any**. |
| Port | Specify the ports in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. In stacking mode, the first field is the slot ID and the second field is the port number. If this binding applies to all ports, select **Any**. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values above based on the last selected static binding or, if not applicable, to clear the fields above. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each binding. Click on an index number to view more details or change the settings. |
| IP Address | This field displays the IP address assigned to the MAC address in the binding. |
| VLAN | This field displays the source VLAN ID in the binding. |
| MAC Address | This field displays the source MAC address in the binding. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. |
| Lease | This field displays how long the binding is valid. |
| Type | This field displays how the Switch learned the binding.<br><br>**static**: This binding was learned from information provided manually by an administrator. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select the entries that you want to remove, then click the **Delete** button to remove the selected entries from the table. |
| Cancel | Click this to clear the check boxes above. |

# CHAPTER 28
# DHCP Snooping

## 28.1 DHCP Snooping Overview

With DHCP snooping, the Switch can build the binding table dynamically by snooping DHCP packets (dynamic bindings) and filter unauthorized DHCP packets in your network.

The Switch uses a binding table to distinguish between authorized and unauthorized DHCP packets in your network. A binding contains these key attributes:

- MAC address
- VLAN ID
- IP address
- Port number

When the Switch receives a DHCP packet, it looks up the appropriate MAC address, VLAN ID, IP address, and port number in the binding table. If there is a binding, the Switch forwards the packet. If there is not a binding, the Switch discards the packet.

### 28.1.1 What You Can Do

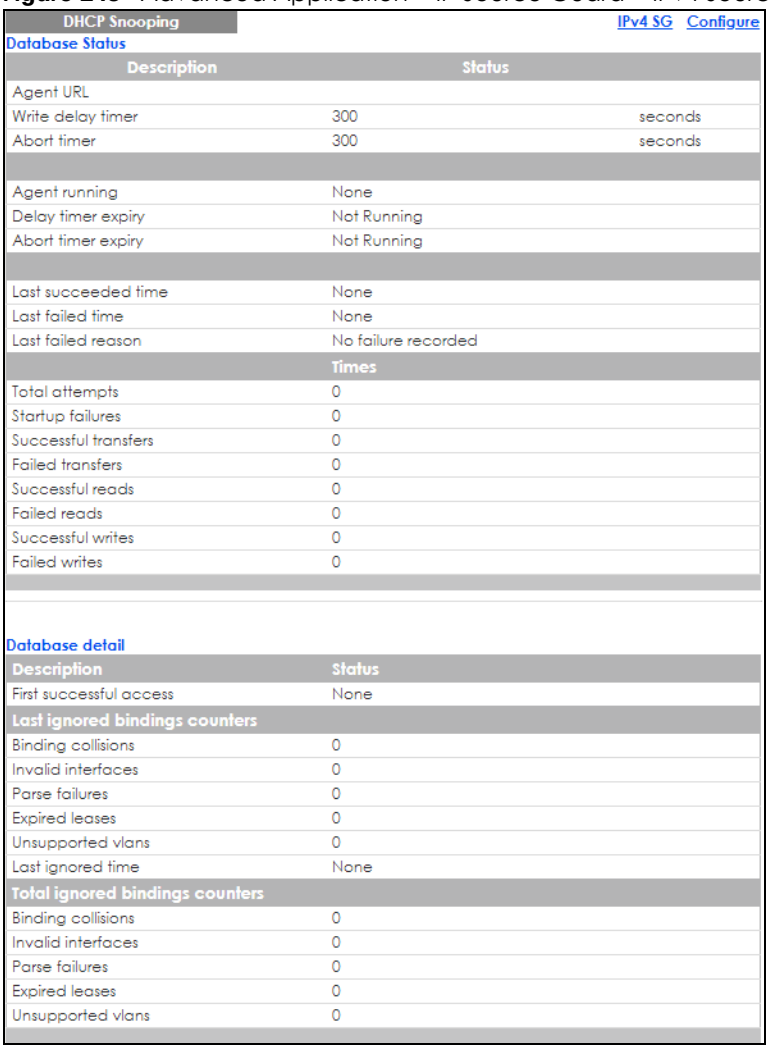
- Use the **DHCP Snooping** screen (Section 28.2 on page 326) to look at various statistics about the DHCP snooping database.
- Use this **DHCP Snooping Configure** screen (Section 28.3 on page 329) to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database.
- Use the **DHCP Snooping Port Configure** screen (Section 28.3.1 on page 331) to specify whether ports are trusted or untrusted ports for DHCP snooping.
- Use the **DHCP Snooping VLAN Configure** screen (Section 28.3.2 on page 333) to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information to DHCP requests that the Switch relays to a DHCP server for each VLAN.
- Use the **DHCP Snooping VLAN Port Configure** screen (Section 28.3.3 on page 334) to apply a different DHCP option 82 profile to certain ports in a VLAN.

## 28.2 DHCP Snooping

Use this screen to look at various statistics about the DHCP snooping database.

To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping**.

**Figure 245** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping



DHCP Snooping — IPv4 SG | Configure

Database Status

| Description | Status | |
|---|---|---|
| Agent URL | | |
| Write delay timer | 300 | seconds |
| Abort timer | 300 | seconds |
| | | |
| Agent running | None | |
| Delay timer expiry | Not Running | |
| Abort timer expiry | Not Running | |
| | | |
| Last succeeded time | None | |
| Last failed time | None | |
| Last failed reason | No failure recorded | |
| | Times | |
| Total attempts | 0 | |
| Startup failures | 0 | |
| Successful transfers | 0 | |
| Failed transfers | 0 | |
| Successful reads | 0 | |
| Failed reads | 0 | |
| Successful writes | 0 | |
| Failed writes | 0 | |

Database detail

| Description | Status |
|---|---|
| First successful access | None |
| **Last ignored bindings counters** | |
| Binding collisions | 0 |
| Invalid interfaces | 0 |
| Parse failures | 0 |
| Expired leases | 0 |
| Unsupported vlans | 0 |
| Last ignored time | None |
| **Total ignored bindings counters** | |
| Binding collisions | 0 |
| Invalid interfaces | 0 |
| Parse failures | 0 |
| Expired leases | 0 |
| Unsupported vlans | 0 |

The following table describes the labels in this screen.

Table 137 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

| LABEL | DESCRIPTION |
|---|---|
| Database Status | |
| | This section displays the current settings for the DHCP snooping database. You can configure them in the **DHCP Snooping Configure** screen. |
| Agent URL | This field displays the location of the DHCP snooping database. |
| Write delay timer | This field displays how long (in seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up. |
| Abort timer | This field displays how long (in seconds) the Switch waits to update the DHCP snooping database after the current bindings change. |
| | This section displays information about the current update and the next update of the DHCP snooping database. |

Table 137 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

| LABEL | DESCRIPTION |
|---|---|
| Agent running | This field displays the status of the current update or access of the DHCP snooping database.<br>**none**: The Switch is not accessing the DHCP snooping database.<br>**read**: The Switch is loading dynamic bindings from the DHCP snooping database.<br>**write**: The Switch is updating the DHCP snooping database. |
| Delay timer expiry | This field displays how much longer (in seconds) the Switch tries to complete the current update before it gives up. It displays **Not Running** if the Switch is not updating the DHCP snooping database right now. |
| Abort timer expiry | This field displays when (in seconds) the Switch is going to update the DHCP snooping database again. It displays **Not Running** if the current bindings have not changed since the last update. |
| | This section displays information about the last time the Switch updated the DHCP snooping database. |
| Last succeeded time | This field displays the last time the Switch updated the DHCP snooping database successfully. |
| Last failed time | This field displays the last time the Switch updated the DHCP snooping database unsuccessfully. |
| Last failed reason | This field displays the reason the Switch updated the DHCP snooping database unsuccessfully. |
| | This section displays historical information about the number of times the Switch successfully or unsuccessfully read or updated the DHCP snooping database. |
| Total attempts | This field displays the number of times the Switch has tried to access the DHCP snooping database for any reason. |
| Startup failures | This field displays the number of times the Switch could not create or read the DHCP snooping database when the Switch started up or a new URL is configured for the DHCP snooping database. |
| Successful transfers | This field displays the number of times the Switch read bindings from or updated the bindings in the DHCP snooping database successfully. |
| Failed transfers | This field displays the number of times the Switch was unable to read bindings from or update the bindings in the DHCP snooping database. |
| Successful reads | This field displays the number of times the Switch read bindings from the DHCP snooping database successfully. |
| Failed reads | This field displays the number of times the Switch was unable to read bindings from the DHCP snooping database. |
| Successful writes | This field displays the number of times the Switch updated the bindings in the DHCP snooping database successfully. |
| Failed writes | This field displays the number of times the Switch was unable to update the bindings in the DHCP snooping database. |
| Database detail | |
| First successful access | This field displays the first time the Switch accessed the DHCP snooping database for any reason. |
| Last ignored bindings counters | This section displays the number of times and the reasons the Switch ignored bindings the last time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide. |
| Binding collisions | This field displays the number of bindings the Switch ignored because the Switch already had a binding with the same MAC address and VLAN ID. |
| Invalid interfaces | This field displays the number of bindings the Switch ignored because the port number was a trusted interface or does not exist anymore. |

Table 137 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping

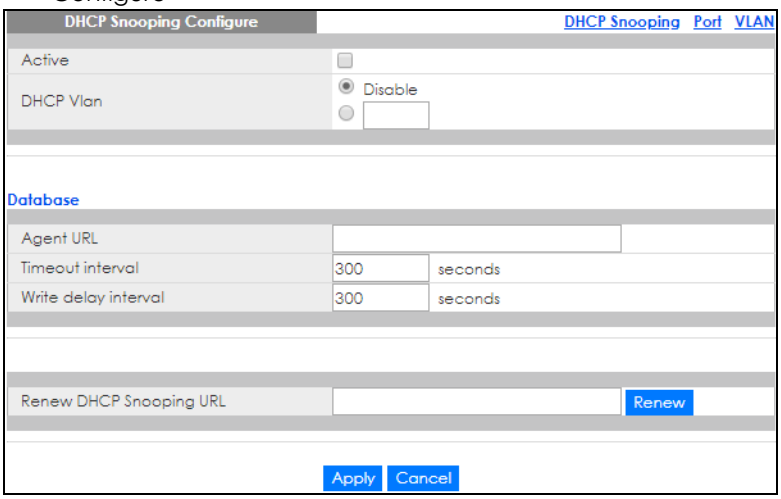
| LABEL | DESCRIPTION |
|---|---|
| Parse failures | This field displays the number of bindings the Switch ignored because the Switch was unable to understand the binding in the DHCP binding database. |
| Expired leases | This field displays the number of bindings the Switch ignored because the lease time had already expired. |
| Unsupported vlans | This field displays the number of bindings the Switch ignored because the VLAN ID does not exist anymore. |
| Last ignored time | This field displays the last time the Switch ignored any bindings for any reason from the DHCP binding database. |
| Total ignored bindings counters | This section displays the reasons the Switch has ignored bindings any time it read bindings from the DHCP binding database. You can clear these counters by restarting the Switch or using CLI commands. See the Ethernet Switch CLI Reference Guide. |
| Binding collisions | This field displays the number of bindings the Switch has ignored because the Switch already had a binding with the same MAC address and VLAN ID. |
| Invalid interfaces | This field displays the number of bindings the Switch has ignored because the port number was a trusted interface or does not exist anymore. |
| Parse failures | This field displays the number of bindings the Switch has ignored because the Switch was unable to understand the binding in the DHCP binding database. |
| Expired leases | This field displays the number of bindings the Switch has ignored because the lease time had already expired. |
| Unsupported vlans | This field displays the number of bindings the Switch has ignored because the VLAN ID does not exist anymore. |

# 28.3 DHCP Snooping Configure

Use this screen to enable DHCP snooping on the Switch (not on specific VLAN), specify the VLAN where the default DHCP server is located, and configure the DHCP snooping database. The DHCP snooping database stores the current bindings on a secure, external TFTP server so that they are still available after a restart.

To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure**.

**Figure 246** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure




The following table describes the labels in this screen.

Table 138 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable DHCP snooping on the Switch. You still have to enable DHCP snooping on specific VLAN and specify trusted ports.<br><br>Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports. |
| DHCP Vlan | Select a VLAN ID if you want the Switch to forward DHCP packets to DHCP servers on a specific VLAN.<br><br>Note: You have to enable DHCP snooping on the DHCP VLAN too.<br><br>You can select an option 82 profile in the **DHCP Snooping VLAN Configure** screen to help the DHCP servers distinguish between DHCP requests from different VLAN.<br><br>Select **Disable** if you do not want the Switch to forward DHCP packets to a specific VLAN. |
| Database | If **Timeout interval** is greater than **Write delay interval**, it is possible that the next update is scheduled to occur before the current update has finished successfully or timed out. In this case, the Switch waits to start the next update until it completes the current one. |
| Agent URL | Enter the location of the DHCP snooping database. The location should be expressed like this: **tftp://{domain name or IP address}/directory, if applicable/file name**; for example, **tftp://192.168.10.1/database.txt.** |
| Timeout interval | Enter how long (10 – 65535 seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up. |
| Write delay interval | Enter how long (10 – 65535 seconds) the Switch waits to update the DHCP snooping database the first time the current bindings change after an update. Once the next update is scheduled, additional changes in current bindings are automatically included in the next update. |
| Renew DHCP Snooping URL | Enter the location of a DHCP snooping database, and click **Renew** if you want the Switch to load it. You can use this to load dynamic bindings from a different DHCP snooping database than the one specified in **Agent URL**.<br><br>When the Switch loads dynamic bindings from a DHCP snooping database, it does not discard the current dynamic bindings first. If there is a conflict, the Switch keeps the dynamic binding in volatile memory and updates the **Binding collisions** counter in the **DHCP Snooping** screen. |

Table 138 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

## 28.3.1 DHCP Snooping Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for DHCP snooping.

Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports.

You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second.

To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure** > **Port**.

**Figure 247** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port (Standalone Mode)

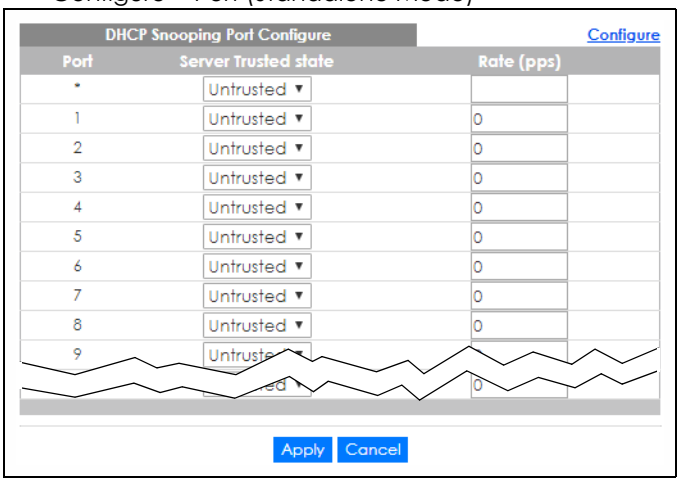
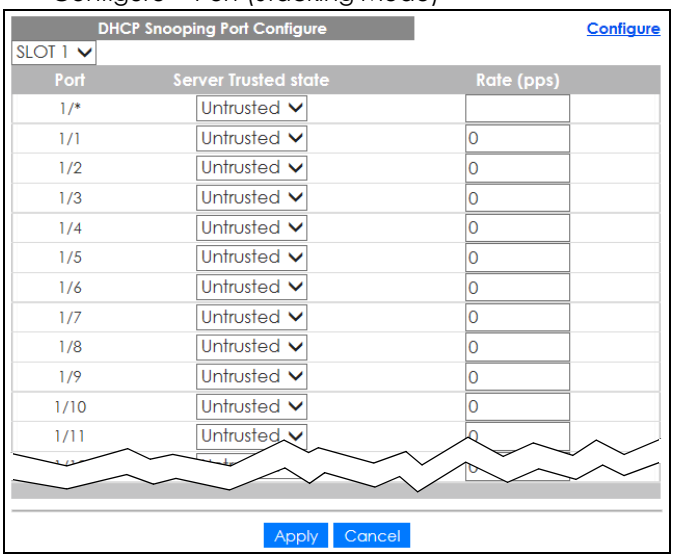


**Figure 248** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port (Stacking Mode)




The following table describes the labels in this screen.

Table 139 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > Port

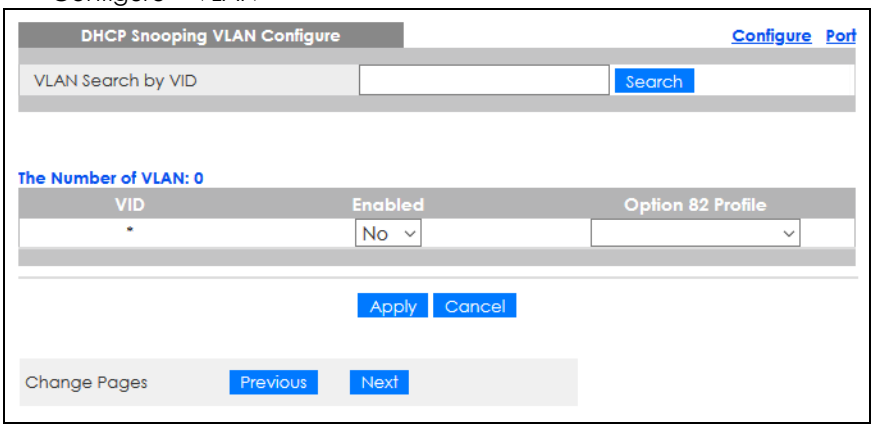
| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Server Trusted state | Select whether this port is a trusted port (**Trusted**) or an untrusted port (**Untrusted**).<br>Trusted ports are connected to DHCP servers or other switches, and the Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high.<br>Untrusted ports are connected to subscribers, and the Switch discards DHCP packets from untrusted ports in the following situations:<br>• The packet is a DHCP server packet (for example, OFFER, ACK, or NACK).<br>• The source MAC address and source IP address in the packet do not match any of the current bindings.<br>• The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings.<br>• The rate at which DHCP packets arrive is too high. |
| Rate (pps) | Specify the maximum number for DHCP packets (1 – 2048) that the Switch receives from each port each second. The Switch discards any additional DHCP packets. Enter 0 to disable this limit, which is recommended for trusted ports. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

## 28.3.2 DHCP Snooping VLAN Configure

Use this screen to enable DHCP snooping on each VLAN and to specify whether or not the Switch adds DHCP relay agent option 82 information to DHCP requests that the Switch relays to a DHCP server for each VLAN.

To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure** > **VLAN**.

**Figure 249** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN




The following table describes the labels in this screen.

Table 140 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN

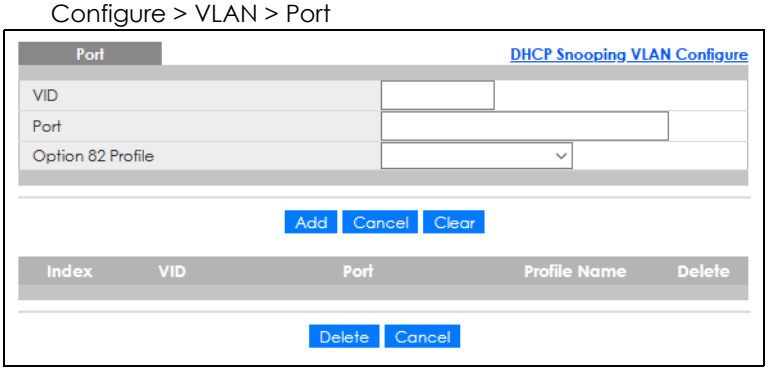
| LABEL | DESCRIPTION |
|---|---|
| VLAN Search by VID | Enter the VLAN ID you want to manage. Use a comma (,) to separate individual VLANs or a dash (–) to indicates a range of VLANs. For example, "3,4" or "3–9". |
| Search | Click this to display the specified range of VLANs in the section below. |
| VID | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the ***** VLAN, the settings are applied to all VLANs. |
| Enabled | Select **Yes** to enable DHCP snooping on the VLAN. You still have to enable DHCP snooping on the Switch and specify trusted ports.<br><br>Note: The Switch will drop all DHCP requests if you enable DHCP snooping and there are no trusted ports. |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in the specified VLANs. The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the **DHCP Snooping Configure** screen. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |
| Change Pages | Click **Previous** or **Next** to show the previous/next screen if all status information cannot be seen in one screen. |

## 28.3.3 DHCP Snooping VLAN Port Configure

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN.

To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **DHCP Snooping** > **Configure** > **VLAN** > **Port**.

**Figure 250** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port




The following table describes the labels in this screen.

Table 141 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port

| LABEL | DESCRIPTION |
|---|---|
| VID | Enter the ID number of the VLAN you want to configure here. |
| Port | Enter the number of ports to which you want to apply the specified DHCP option 82 profile.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports in this VLAN. The Switch adds the information (such as slot number, port number, VLAN ID and/or system name) specified in the profile to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. You can specify the DHCP VLAN in the **DHCP Snooping Configure** screen.<br>Note: The profile you select here has priority over the one you select in the **DHCP Snooping** > **Configure** > **VLAN** screen. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each entry. Click an index number to change the settings. |
| VID | This field displays the VLAN to which the ports belongs. |
| Port | This field displays the ports to which the Switch applies the settings. In stacking mode, the first number represents the slot and the second the port number. |

Table 141 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > DHCP Snooping > Configure > VLAN > Port (continued)

| LABEL | DESCRIPTION |
|---|---|
| Profile Name | This field displays the DHCP option 82 profile that the Switch applies to the ports. |
| Delete | Select the entries that you want to remove in the **Delete** column, and then click the **Delete** button to remove the selected entries from the table. |
| Cancel | Click this to clear the **Delete** check boxes above. |

# 28.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 28.4.1 DHCP Snooping Overview

Use DHCP snooping to filter unauthorized DHCP packets on the network and to build the binding table dynamically. This can prevent clients from getting IP addresses from unauthorized DHCP servers.

### 28.4.1.1 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for DHCP snooping. This setting is independent of the trusted or untrusted setting for ARP inspection. You can also specify the maximum number for DHCP packets that each port (trusted or untrusted) can receive each second.

Trusted ports are connected to DHCP servers or other switches. The Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. The Switch learns dynamic bindings from trusted ports.

Note: If DHCP is enabled and there are no trusted ports, DHCP requests will not succeed.

Untrusted ports are connected to subscribers. The Switch discards DHCP packets from untrusted ports in the following situations:

- The packet is a DHCP server packet (for example, OFFER, ACK, or NACK).
- The source MAC address and source IP address in the packet do not match any of the current bindings.
- The packet is a RELEASE or DECLINE packet, and the source MAC address and source port do not match any of the current bindings.
- The rate at which DHCP packets arrive is too high.

### 28.4.1.2 DHCP Snooping Database

The Switch stores the binding table in volatile memory. If the Switch restarts, it loads static bindings from permanent memory but loses the dynamic bindings, in which case the devices in the network have to send DHCP requests again. As a result, it is recommended you configure the DHCP snooping database.

The DHCP snooping database maintains the dynamic bindings for DHCP snooping and ARP inspection in a file on an external TFTP server. If you set up the DHCP snooping database, the Switch can reload the dynamic bindings from the DHCP snooping database after the Switch restarts.

You can configure the name and location of the file on the external TFTP server. The file has the following format:

**Figure 251** DHCP Snooping Database File Format

```
<initial-checksum>
TYPE DHCP-SNOOPING
VERSION 1
BEGIN
<binding-1> <checksum-1>
<binding-2> <checksum-1-2>
...
...
<binding-n> <checksum-1-2-..-n>
END
```

The <initial-checksum> helps distinguish between the bindings in the latest update and the bindings from previous updates. Each binding consists of 72 bytes, a space, and another checksum that is used to validate the binding when it is read. If the calculated checksum is not equal to the checksum in the file, that binding and all others after it are ignored.

### 28.4.1.3 DHCP Relay Option 82 Information

The Switch can add information to DHCP requests that it does not discard. This provides the DHCP server more information about the source of the requests. The Switch can add the following information:

- Slot ID (1 byte), port ID (1 byte), and source VLAN ID (2 bytes)
- System name (up to 32 bytes)

This information is stored in an Agent Information field in the option 82 field of the DHCP headers of client DHCP request frames.

When the DHCP server responds, the Switch removes the information in the Agent Information field before forwarding the response to the original source.

You can configure this setting for each source VLAN. This setting is independent of the DHCP relay settings.

### 28.4.1.4 Configuring DHCP Snooping

Follow these steps to configure DHCP snooping on the Switch.

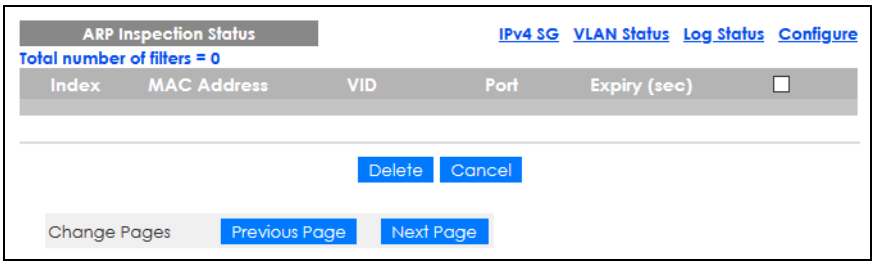
1. Enable DHCP snooping on the Switch.
2. Enable DHCP snooping on each VLAN, and configure DHCP relay option 82.
3. Configure trusted and untrusted ports, and specify the maximum number of DHCP packets that each port can receive per second.
4. Configure static bindings.

# CHAPTER 29
# ARP Inspection

## 29.1 ARP Inspection Status

Use this screen to look at the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet. When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection**.

**Figure 252** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status




The following table describes the labels in this screen.

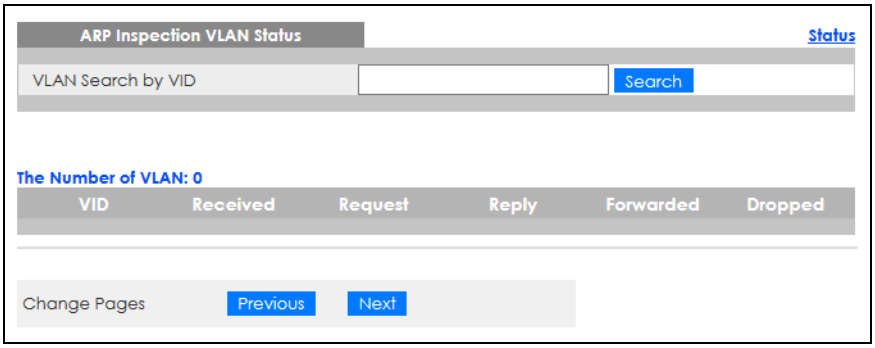
Table 142 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection Status

| LABEL | DESCRIPTION |
|---|---|
| Total number of filters | This field displays the current number of MAC address filters that were created because the Switch identified unauthorized ARP packets. |
| Index | This field displays a sequential number for each MAC address filter. |
| MAC Address | This field displays the source MAC address in the MAC address filter. |
| VID | This field displays the source VLAN ID in the MAC address filter. |
| Port | This field displays the source port of the discarded ARP packet. In stacking mode, the first number represents the slot and the second the port number. |
| Expiry (sec) | This field displays how long (in seconds) the MAC address filter remains in the Switch. You can also delete the record manually (**Delete**). |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click this to remove the selected entries. |
| Cancel | Click this to clear the **Delete** check boxes above. |
| Change Pages | Click **Previous Page** or **Next Page** to show the previous or next screen if all status information cannot be seen in one screen. |

## 29.1.1 ARP Inspection VLAN Status

Use this screen to look at various statistics about ARP packets in each VLAN. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection** > **VLAN Status**.

**Figure 253** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status




The following table describes the labels in this screen.

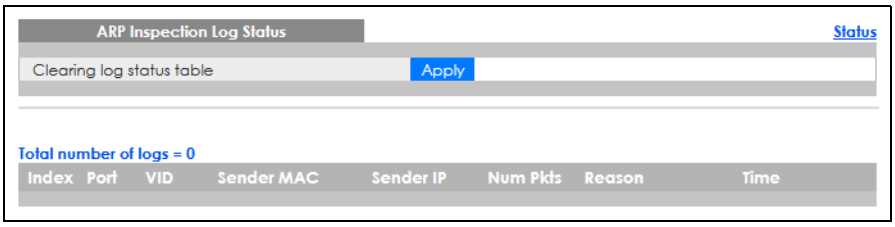
Table 143 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > VLAN Status

| LABEL | DESCRIPTION |
|---|---|
| VLAN Search by VID | Specify the VLANs you want to view in the section below. Use a comma (,) to separate individual VLANs or a dash (–) to indicates a range of VLANs. For example, "3,4" or "3–9". |
| Search | Click this to display the specified range of VLANs in the section below. |
| The Number of VLAN | This is the number of VLANs that match the searching criteria and display in the list below.<br><br>This field displays only when you use the **Search** button to look for certain VLANs. |
| VID | This field displays the VLAN ID of each VLAN in the range specified above. |
| Received | This field displays the total number of ARP packets received from the VLAN since the Switch last restarted. |
| Request | This field displays the total number of ARP Request packets received from the VLAN since the Switch last restarted. |
| Reply | This field displays the total number of ARP Reply packets received from the VLAN since the Switch last restarted. |
| Forwarded | This field displays the total number of ARP packets the Switch forwarded for the VLAN since the Switch last restarted. |
| Dropped | This field displays the total number of ARP packets the Switch discarded for the VLAN since the Switch last restarted. |
| Change Pages | Click **Previous** or **Next** to show the previous/next screen if all status information cannot be seen in one screen. |

## 29.1.2 ARP Inspection Log Status

Use this screen to look at log messages that were generated by ARP packets and that have not been sent to the syslog server yet. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection** > **Log Status**.

**Figure 254** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status




The following table describes the labels in this screen.

Table 144 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Log Status

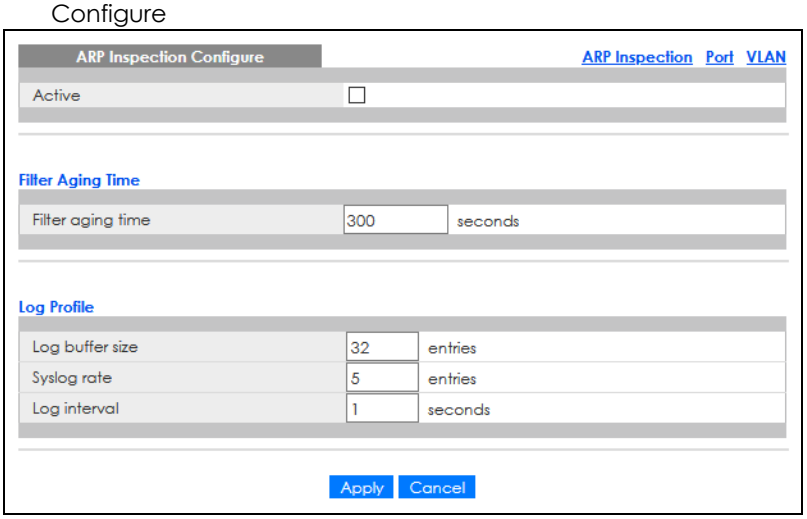
| LABEL | DESCRIPTION |
|---|---|
| Clearing log status table | Click **Apply** to remove all the log messages that were generated by ARP packets and that have not been sent to the syslog server yet. |
| Total number of logs | This field displays the number of log messages that were generated by ARP packets and that have not been sent to the syslog server yet. If one or more log messages are dropped due to unavailable buffer, there is an entry called **overflow** with the current number of dropped log messages. |
| Index | This field displays a sequential number for each log message. |
| Port | This field displays the source port of the ARP packet. In stacking mode, the first number represents the slot and the second the port number. |
| VID | This field displays the source VLAN ID of the ARP packet. |
| Sender MAC | This field displays the source MAC address of the ARP packet. |
| Sender IP | This field displays the source IP address of the ARP packet. |
| Num Pkts | This field displays the number of ARP packets that were consolidated into this log message. The Switch consolidates identical log messages generated by ARP packets in the log consolidation interval into one log message. You can configure this interval in the **ARP Inspection Configure** screen. |
| Reason | This field displays the reason the log message was generated.<br>**dhcp deny**: An ARP packet was discarded because it violated a dynamic binding with the same MAC address and VLAN ID.<br>**static deny**: An ARP packet was discarded because it violated a static binding with the same MAC address and VLAN ID.<br>**deny**: An ARP packet was discarded because there were no bindings with the same MAC address and VLAN ID.<br>**dhcp permit**: An ARP packet was forwarded because it matched a dynamic binding.<br>**static permit**: An ARP packet was forwarded because it matched a static binding.<br>In the **ARP Inspection VLAN Configure** screen, you can configure the Switch to generate log messages when ARP packets are discarded or forwarded based on the VLAN ID of the ARP packet. |
| Time | This field displays when the log message was generated. |

# 29.2 ARP Inspection Configure

Use this screen to enable ARP inspection on the Switch. You can also configure the length of time the Switch stores records of discarded ARP packets and global settings for the ARP inspection log. To open

this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection** > **Configure**.

**Figure 255** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure




The following table describes the labels in this screen.

Table 145 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable ARP inspection on the Switch. You still have to enable ARP inspection on specific VLAN and specify trusted ports. |
| Filter Aging Time | |
| Filter aging time | This setting has no effect on existing MAC address filters.<br>Enter how long (1 – 2147483647 seconds) the MAC address filter remains in the Switch after the Switch identifies an unauthorized ARP packet. The Switch automatically deletes the MAC address filter afterwards. Type 0 if you want the MAC address filter to be permanent. |
| Log Profile | |
| Log buffer size | Enter the maximum number (1 – 1024) of log messages that were generated by ARP packets and have not been sent to the syslog server yet. Make sure this number is appropriate for the specified **Syslog rate** and **Log interval**.<br>If the number of log messages in the Switch exceeds this number, the Switch stops recording log messages and simply starts counting the number of entries that were dropped due to unavailable buffer. Click **Clearing log status table** in the **ARP Inspection Log Status** screen to clear the log and reset this counter. |
| Syslog rate | Type the maximum number of syslog messages the Switch can send to the syslog server in one batch. This number is expressed as a rate because the batch frequency is determined by the **Log Interval**. You must configure the syslog server to use this. Enter 0 if you do not want the Switch to send log messages generated by ARP packets to the syslog server.<br>The relationship between **Syslog rate** and **Log interval** is illustrated in the following examples:<br>• Four invalid ARP packets per second, **Syslog rate** is 5, **Log interval** is 1: the Switch sends 4 syslog messages every second.<br>• Six invalid ARP packets per second, **Syslog rate** is 5, **Log interval** is 2: the Switch sends 5 syslog messages every 2 seconds. |
| Log interval | Type how often (1 – 86400 seconds) the Switch sends a batch of syslog messages to the syslog server. Enter 0 if you want the Switch to send syslog messages immediately. See **Syslog rate** for an example of the relationship between **Syslog rate** and **Log interval**. |

Table 145 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

## 29.2.1 ARP Inspection Port Configure

Use this screen to specify whether ports are trusted or untrusted ports for ARP inspection. You can also specify the maximum rate at which the Switch receives ARP packets on each untrusted port. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection** > **Configure** > **Port**.

**Figure 256** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port (Standalone Mode)

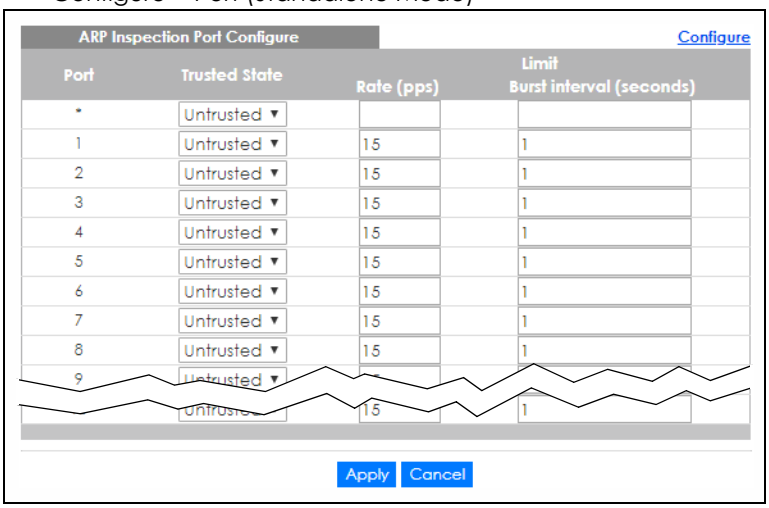
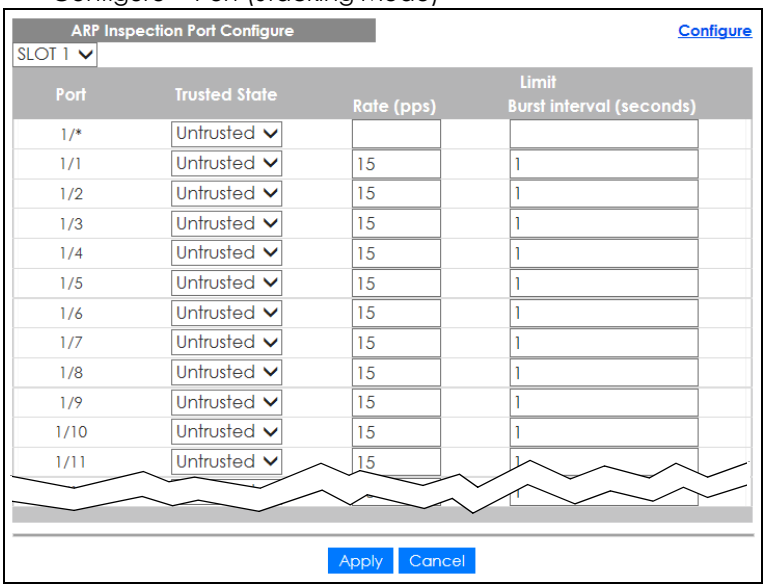



**Figure 257** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port (Stacking Mode)



The following table describes the labels in this screen.

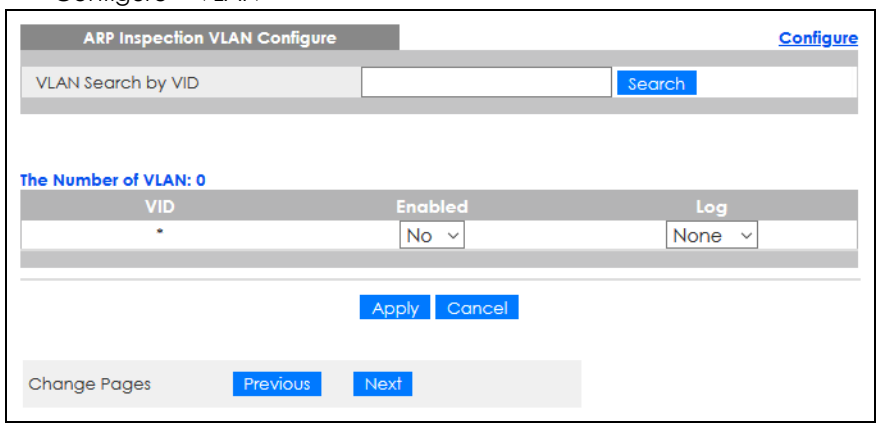
Table 146 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > Port

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Trusted State | Select whether this port is a trusted port (**Trusted**) or an untrusted port (**Untrusted**).<br>The Switch does not discard ARP packets on trusted ports for any reason.<br>The Switch discards ARP packets on untrusted ports in the following situations:<br>• The sender's information in the ARP packet does not match any of the current bindings.<br>• The rate at which ARP packets arrive is too high. You can specify the maximum rate at which ARP packets can arrive on untrusted ports. |
| Limit | Rate and Burst Interval settings have no effect on trusted ports. |
| Rate (pps) | Specify the maximum rate (1 – 2048 packets per second) at which the Switch receives ARP packets from each port. The Switch discards any additional ARP packets. Enter 0 to disable this limit. |
| Burst interval (seconds) | The burst interval is the length of time over which the rate of ARP packets is monitored for each port. For example, if the Rate is 15 pps and the burst interval is 1 second, then the Switch accepts a maximum of 15 ARP packets in every one-second interval. If the burst interval is 5 seconds, then the Switch accepts a maximum of 75 ARP packets in every five-second interval.<br>Enter the length (1 – 15 seconds) of the burst interval. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

## 29.2.2 ARP Inspection VLAN Configure

Use this screen to enable ARP inspection on each VLAN and to specify when the Switch generates log messages for receiving ARP packets from each VLAN. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv4 Source Guard Setup** > **ARP Inspection** > **Configure** > **VLAN**.

**Figure 258** Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN




The following table describes the labels in this screen.

Table 147 Advanced Application > IP Source Guard > IPv4 Source Guard Setup > ARP Inspection > Configure > VLAN

| LABEL | DESCRIPTION |
|---|---|
| VLAN Search by VID | Specify the VLANs you want to manage in the section below. Use a comma (,) to separate individual VLANs or a dash (–) to indicates a range of VLANs. For example, "3,4" or "3–9". |
| Search | Click this to display the specified range of VLANs in the section below. |
| VID | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the ***** VLAN, the settings are applied to all VLANs. |
| Enabled | Select **Yes** to enable ARP inspection on the VLAN. Select **No** to disable ARP inspection on the VLAN. |
| Log | Specify when the Switch generates log messages for receiving ARP packets from the VLAN.<br>**None**: The Switch does not generate any log messages when it receives an ARP packet from the VLAN.<br>**Deny**: The Switch generates log messages when it discards an ARP packet from the VLAN.<br>**Permit**: The Switch generates log messages when it forwards an ARP packet from the VLAN.<br>**All**: The Switch generates log messages every time it receives an ARP packet from the VLAN. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |
| Change Pages | Click **Previous** or **Next** to show the previous or next screen if all status information cannot be seen in one screen. |

# 29.3 IPv6 Source Guard Overview

The purpose of IPv6 source guard is to distinguish between authorized and unauthorized users by using a binding table that validates the source of IPv6 traffic. The binding table can be manually created or be learned through Dynamic Host Configuration Protocol version 6 snooping (DHCPv6 snooping). IPv6 source guard can deny IPv6 traffic from an unknown source. The IPv6 source guard binding table includes:

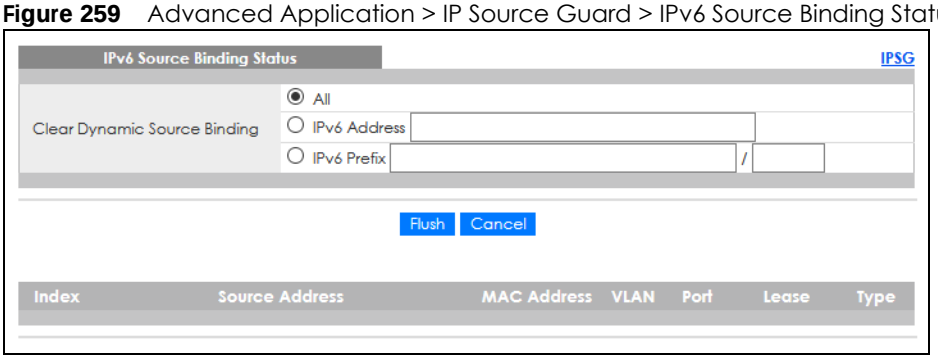
- IPv6 address
- IPv6 prefix
- VLAN ID
- Port number
- MAC address

Enable IPv6 source guard on a port for the Switch to check incoming IPv6 packets on that port. A packet is allowed when it matches any entry in the IPSG binding table. If a user tries to send IPv6 packets to the Switch that do not match an entry in the IPSG binding table, the Switch will drop these packets. The Switch forwards matching traffic normally. The IPv6 source guard related screens are available in standalone mode.

# 29.4 IPv6 Source Binding Status

Use this screen to look at the current IPv6 dynamic and static bindings and to remove dynamic bindings based on IPv6 address and/or IPv6 prefix. Bindings are used to distinguish between authorized and unauthorized packets in the network. The Switch learns the bindings by snooping DHCP packets (dynamic bindings) and from information provided manually by administrators (static bindings). To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Source Binding Status**.

**Figure 259** Advanced Application > IP Source Guard > IPv6 Source Binding Status




The following table describes the labels in this screen.

Table 148 Advanced Application > IP Source Guard > IPv6 Source Binding Status

| LABEL | DESCRIPTION |
|---|---|
| Clear Dynamic Source Binding | Specify how you want the Switch to remove dynamic IPv6 source binding entries when you click **Flush**.<br>• Select **All** to remove all of the dynamic entries from the IPv6 source binding table.<br>• Select **IPv6 Address** and enter an IPv6 address to remove the dynamic entries snooped with the specified IPv6 address.<br>• Select **IPv6 Prefix** and enter a Prefix address to remove the dynamic entries snooped with the specified Prefix address. |
| Flush | Click this to remove dynamic IPv6 source binding entries according to your selections. |
| Cancel | Click this to reset the values above based or if not applicable, to clear the fields above. |
| Index | This field displays a sequential number for each binding. |
| Source Address | This field displays the source IP address in the binding. If the entry is blank, this field will not be checked in the binding. |

Table 148 Advanced Application > IP Source Guard > IPv6 Source Binding Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| MAC Address | This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding. |
| VLAN | This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding. |
| Port | This field displays the port number in the binding. If this field is blank, the binding applies to all ports. |
| Lease | This field displays how many days, hours, minutes, and seconds the binding is valid; for example, **2d3h4m5s** means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays **infinity** if the binding is always valid (for example, a static binding). |
| Type | This field displays how the Switch learned the binding.<br>**S**: This static binding was learned from information provided manually by an administrator.<br>**DH**: This dhcp-snooping binding was learned by snooping DHCP packets. |

# 29.5 IPv6 Static Binding Setup

Use this screen to manually create an IPv6 source guard binding table entry and manage IPv6 static bindings. Static bindings are uniquely identified by the source IPv6 address / prefix. Each source IPv6 address / prefix can only be in one static binding. If you try to create a static binding with the same source IPv6 address / prefix as an existing static binding, the new static binding replaces the original one. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Static Binding Setup**.

**Figure 260** Advanced Application > IP Source Guard > IPv6 Static Binding Setup (Standalone Mode)

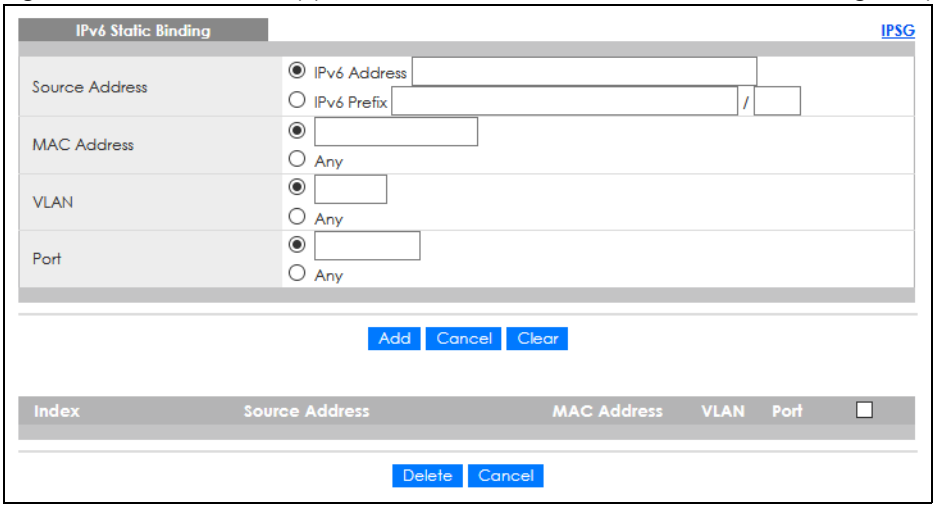
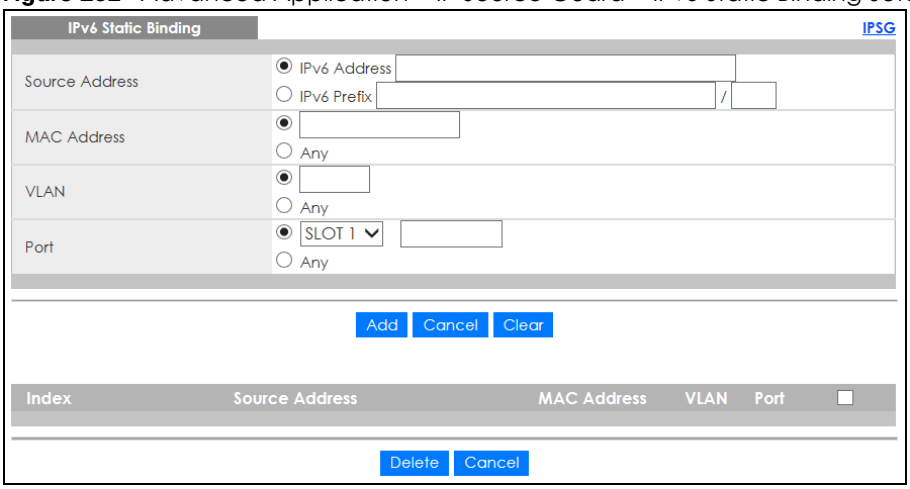


**Figure 261** Advanced Application > IP Source Guard > IPv6 Static Binding Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 149 Advanced Application > IP Source Guard > IPv6 Static Binding Setup

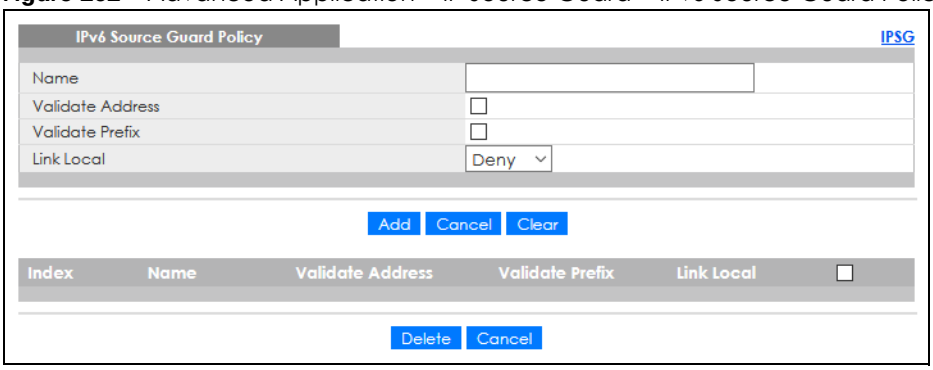
| LABEL | DESCRIPTION |
|---|---|
| IPv6 Static Binding | |
| Source Address | Enter the IPv6 address or IPv6 prefix and prefix length in the binding. |
| MAC Address | Enter the source MAC address in the binding. If this binding does not check this field, select **Any**.<br><br>Note: You cannot choose **Any** for all three of **MAC Address**, **VLAN** and **Port**. You must fill in at least one. |
| VLAN | Enter the source VLAN ID in the binding. If this binding does not check this field, select **Any**. |
| Port | Specify the ports in the binding. If this binding has one port, select the first radio button and enter the port number in the field to the right. In stacking mode, the first field is the slot ID and the second field is the port number. If this binding applies to all ports, select **Any**. |
| Add | Click this to create the specified static binding or to update an existing one. |
| Cancel | Click this to reset the values above based or if not applicable, to clear the fields above. |
| Clear | Click this to clear the fields above. |
| Index | This field displays a sequential number for each binding. |
| Source Address | This field displays the IPv6 address or IPv6 prefix and prefix length in the binding. |
| MAC Address | This field displays the source MAC address in the binding. If the entry is blank, this field will not be checked in the binding. |
| VLAN | This field displays the source VLAN ID in the binding. If the entry is blank, this field will not be checked in the binding. |
| Port | This field displays the port number in the binding. If this field is blank, the binding applies to all ports. In stacking mode, the first number represents the slot and the second the port number |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry check box and click **Delete** to remove the specified entry. |
| Cancel | Click this to clear the **Delete** check boxes above. |

# 29.6 IPv6 Source Guard Policy Setup

Use this screen to have IPv6 source guard forward valid IPv6 addresses and/or IPv6 prefixes that are stored in the binding table and allow or block data traffic from all link-local addresses. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Source Guard Policy Setup**.

- If you select **Validate Address** and not **Validate Prefix**, traffic for a binding entry that matches a IPv6 address and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 prefix, the traffic will be denied.
- If you select **Validate Prefix** and not **Validate Address**, traffic for a binding entry that matches a IPv6 prefix and VLAN ID, port number, and MAC address will be forwarded. If this binding entry is a IPv6 address, the traffic will be denied.
- If you select both **Validate Prefix** and **Validate Address** then traffic matching either IPv6 address or prefix will be forwarded.

**Figure 262** Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup




The following table describes the labels in this screen.

Table 150 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name for identification purposes for this IPv6 source guard policy. |
| Validate Address | Select **Validate Address** to have IPv6 source guard forward valid addresses that are stored in the binding table. |
| Validate Prefix | Select **Validate Prefix** to have IPv6 source guard forward valid prefixes that are stored in the binding table. |
| Link Local | Select **Permit** to allow data traffic from all link-local addresses; otherwise leave the setting at **Deny**. A link-local address is an IPv6 unicast address that can be automatically configured on any interface using the link-local prefix FE80::/10 and the interface identifier in the modified EUI-64 format. |
| Add | Click this to create the IPv6 source guard policy or to update an existing one. |
| Cancel | Click this to reset the values above or if not applicable, to clear the fields above. |
| Clear | Click this to clear the fields above. |
| Index | This field displays a sequential number for each policy. |
| Name | This field displays the descriptive name for identification purposes for this IPv6 source guard policy. |
| Validate Address | This field displays the **Validate Address** status for this IPv6 source guard policy. |
| Validate Prefix | This field displays the **Validate Prefix** status for this IPv6 source guard policy. |
| Link Local | This field displays the **Link Local** traffic status for this IPv6 source guard policy. |

Table 150 Advanced Application > IP Source Guard > IPv6 Source Guard Policy Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry check box and click **Delete** to remove the specified entry. |
| Cancel | Click this to clear the **Delete** check boxes above. |

# 29.7 IPv6 Source Guard Port Setup

Use this screen to apply configured IPv6 source guard policies to ports you specify. Use port * to apply a policy to all ports. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Source Guard Port Setup**.

**Figure 263** Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup (Standalone Mode)

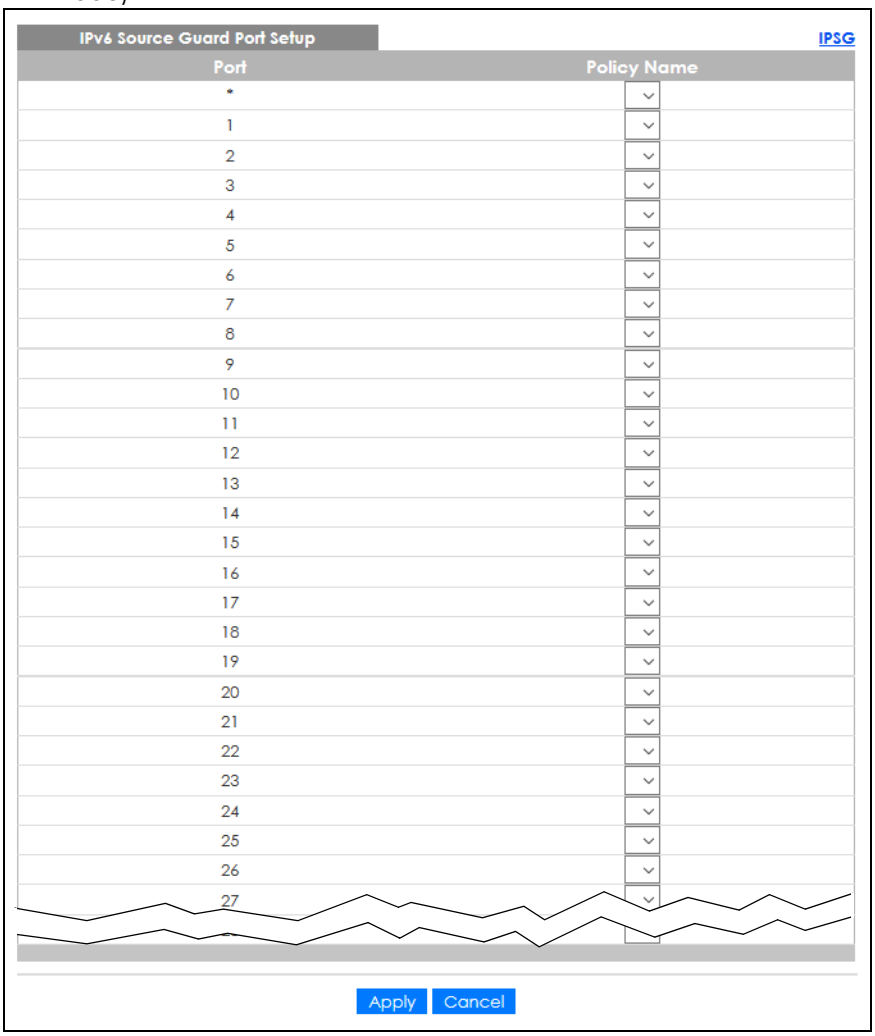
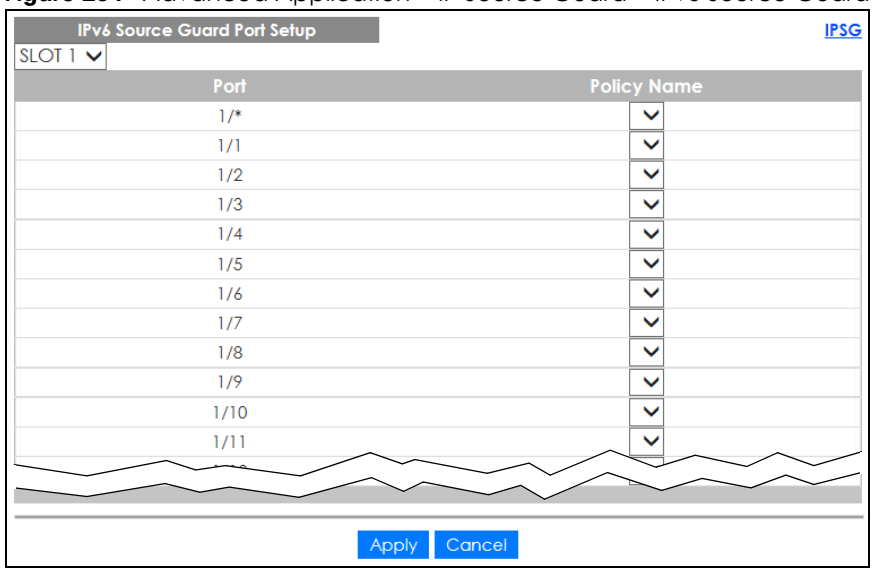


**Figure 264** Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 151 Advanced Application > IP Source Guard > IPv6 Source Guard Port Setup

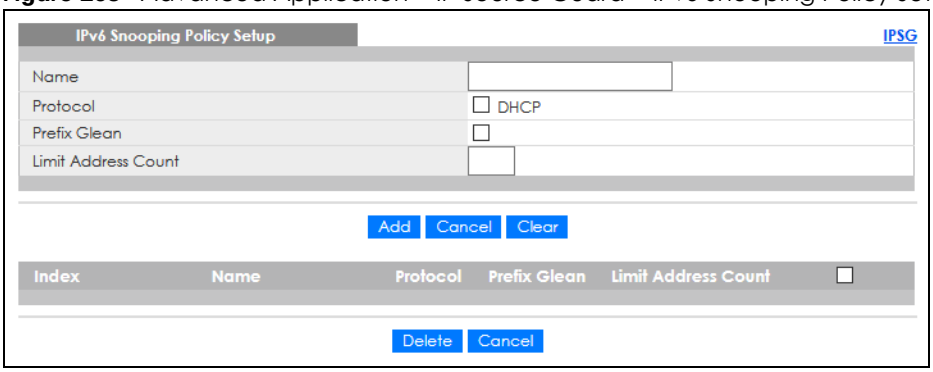
| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Policy Name | Select an IPv6 source guard policy that the Switch will apply to this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

# 29.8 IPv6 Snooping Policy Setup

Use this screen to dynamically create an IPv6 source guard binding table using a DHCPv6 snooping policy. A DHCPv6 snooping policy lets the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client when it is assigning an IPv6 address. When a DHCPv6 client successfully gets a valid IPv6 address, DHCPv6 snooping builds the binding table dynamically. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Snooping Policy Setup**.

Note: If you do not select **Protocol** and **Prefix Glean**, then the Switch cannot perform DHCPv6 snooping.

**Figure 265** Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup




The following table describes the labels in this screen.

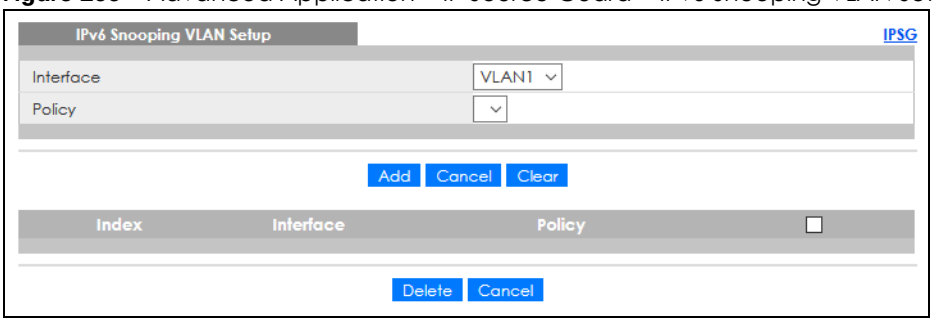
Table 152 Advanced Application > IP Source Guard > IPv6 Snooping Policy Setup

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name for identification purposes for this IPv6 snooping policy. |
| Protocol | Select **DHCP** to let the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client. |
| Prefix Glean | Select this to learn the IPv6 prefix and length from DHCPv6 sniffed packets. |
| Limit Address Count | This is the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy.<br><br>Note: The maximum limit address count is the maximum size of the IPv6 source guard binding table. See the product data sheet for the latest specifications. |
| Add | Click this to create the IPv6 source guard policy or to update an existing one. |
| Cancel | Click this to reset the values above or if not applicable, to clear the fields above. |
| Clear | Click this to clear the fields above. |
| Index | This field displays a sequential number for each IPv6 snooping policy. |
| Name | This field displays the descriptive name for identification purposes for this IPv6 source guard policy. |
| Protocol | This field displays the protocols learned from DHCPv6 sniffed packets. |
| Prefix Glean | This field displays the IPv6 prefixes learned from DHCPv6 sniffed packets. |
| Limit Address Count | This field displays the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry check box and click **Delete** to remove the specified entry. |
| Cancel | Click this to clear the **Delete** check boxes above. |

# 29.9 IPv6 Snooping VLAN Setup

Use this screen to enable a DHCPv6 snooping policy on a specific VLAN interface. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 Snooping VLAN Setup**.

**Figure 266** Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup




The following table describes the labels in this screen.

Table 153 Advanced Application > IP Source Guard > IPv6 Snooping VLAN Setup

| LABEL | DESCRIPTION |
|---|---|
| Interface | Select the VLAN interface to apply the selected DHCPv6 snooping policy. |
| Policy | Select the IPv6 snooping policy to apply to this VLAN interface. |
| Add | Click this to create the IPv6 source guard policy or to update an existing one. |
| Cancel | Click this to reset the values above or if not applicable, to clear the fields above. |
| Clear | Click this to clear the fields above. |
| Index | This field displays a sequential number for each binding. |
| Interface | This field displays the VLAN interface. |
| Policy | This field displays the DHCPv6 snooping policy. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry check box and click **Delete** to remove the specified entry. |
| Cancel | Click this to clear the **Delete** check boxes above. |

# 29.10 IPv6 DHCP Trust Setup

Use this screen to specify which ports are trusted for DHCPv6 snooping. To open this screen, click **Advanced Application** > **IP Source Guard** > **IPv6 DHCP Trust Setup**.

Note: DHCPv6 solicit packets are sent from a DHCPv6 client to a DHCPv6 server. Reply packets from a DHCPv6 server connected to an untrusted port are discarded.

Use port * to have all ports be **Untrusted** or **Trusted**.

**Figure 267** Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (Standalone Mode)

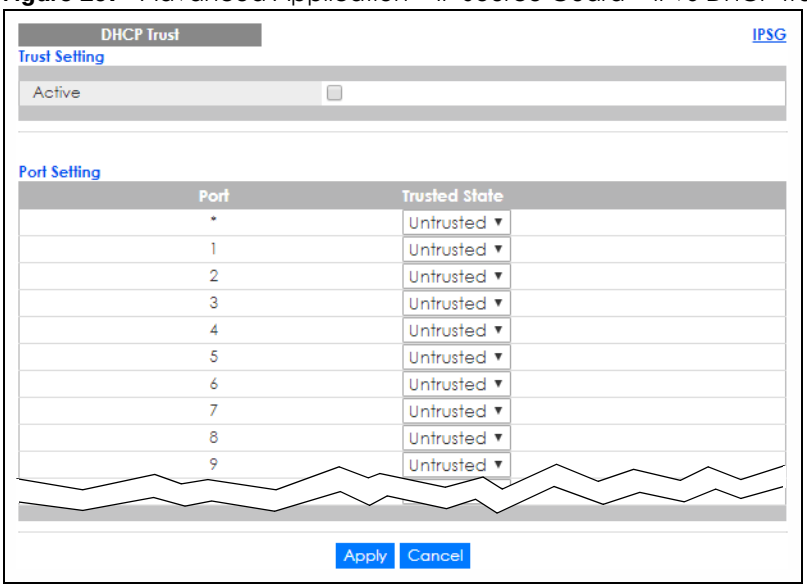
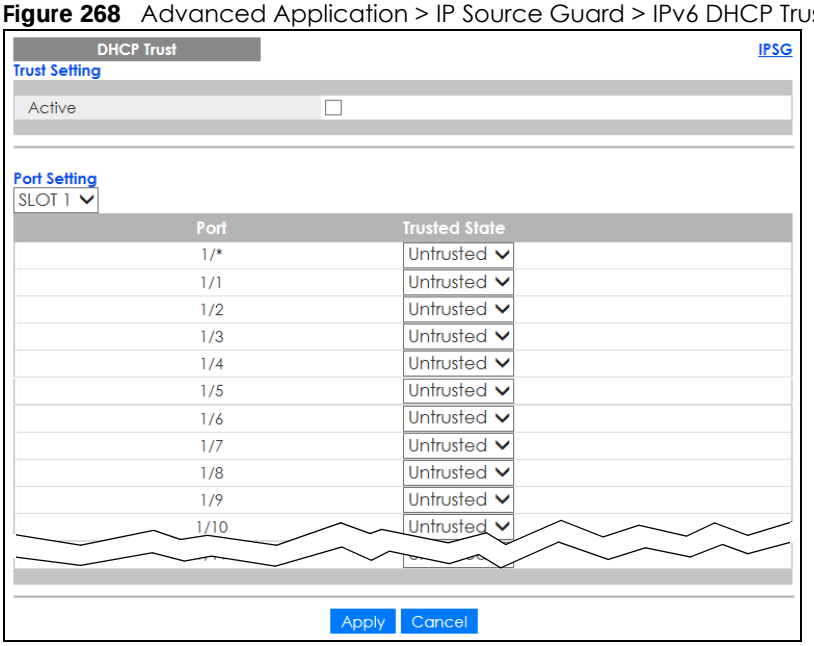



**Figure 268** Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (Stacking Mode)




The following table describes the labels in this screen.

Table 154 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup

| LABEL | DESCRIPTION |
|---|---|
| Trust Setting | |
| Active | Select this to specify whether ports are trusted or untrusted ports for DHCP snooping. If you do not select this then **IPv6 DHCP Trust** is not used and all ports are automatically trusted. |
| Port Setting | |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 154 Advanced Application > IP Source Guard > IPv6 DHCP Trust Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Trusted State | Select whether this port is a trusted port (**Trusted**) or an untrusted port (**Untrusted**).<br>Trusted ports are connected to DHCPv6 servers or other switches.<br>Untrusted ports are connected to subscribers, and the Switch discards DHCPv6 packets from untrusted ports in the following situations:<br>• The packet is a DHCPv6 server packet (for example, ADVERTISE, REPLY, or RELAY-REPLY).<br>• The source MAC address and source IP address in the packet do not match any of the current bindings. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

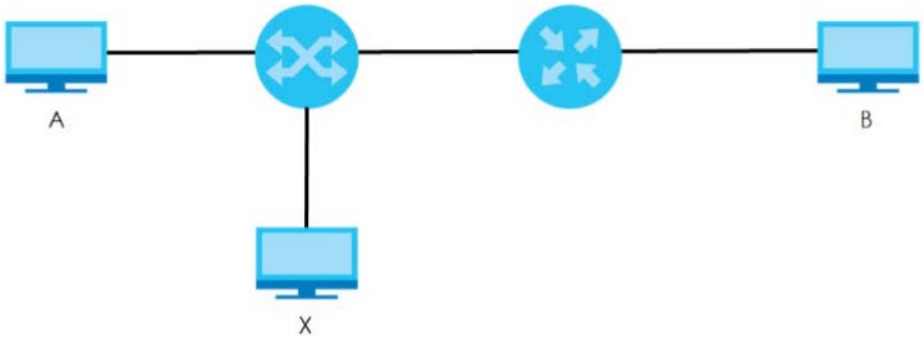
# 29.11 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 29.11.1 ARP Inspection Overview

Use ARP inspection to filter unauthorized ARP packets on the network. This can prevent many kinds of man-in-the-middle attacks, such as the one in the following example.

**Figure 269** Example: Man-in-the-middle Attack




In this example, computer **B** tries to establish a connection with computer **A**. Computer **X** is in the same broadcast domain as computer **A** and intercepts the ARP request for computer **A**. Then, computer **X** does the following things:

- It pretends to be computer **A** and responds to computer **B**.
- It pretends to be computer **B** and sends a message to computer **A**.

As a result, all the communication between computer **A** and computer **B** passes through computer **X**.

Computer **X** can read and alter the information passed between them.

#### 29.11.1.1 ARP Inspection and MAC Address Filters

When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet. You can configure how long the MAC address filter remains in the Switch.

These MAC address filters are different than regular MAC address filters.

- They are stored only in volatile memory.
- They do not use the same space in memory that regular MAC address filters use.
- They appear only in the **ARP Inspection** screens and commands, not in the **MAC Address Filter** screens and commands.

#### 29.11.1.2 Trusted vs. Untrusted Ports

Every port is either a trusted port or an untrusted port for ARP inspection. This setting is independent of the trusted or untrusted setting for DHCP snooping. You can also specify the maximum rate at which the Switch receives ARP packets on untrusted ports.

The Switch does not discard ARP packets on trusted ports for any reason.

The Switch discards ARP packets on untrusted ports in the following situations:

- The sender's information in the ARP packet does not match any of the current bindings.
- The rate at which ARP packets arrive is too high.

#### 29.11.1.3 Syslog

The Switch can send syslog messages to the specified syslog server when it forwards or discards ARP packets. The Switch can consolidate log messages and send log messages in batches to make this mechanism more efficient.

#### 29.11.1.4 Configuring ARP Inspection

Follow these steps to configure ARP inspection on the Switch.

1. Configure DHCP snooping.

   Note: It is recommended you enable DHCP snooping at least one day before you enable ARP inspection so that the Switch has enough time to build the binding table.

2. Enable ARP inspection on each VLAN.

3. Configure trusted and untrusted ports, and specify the maximum number of ARP packets that each port can receive per second.

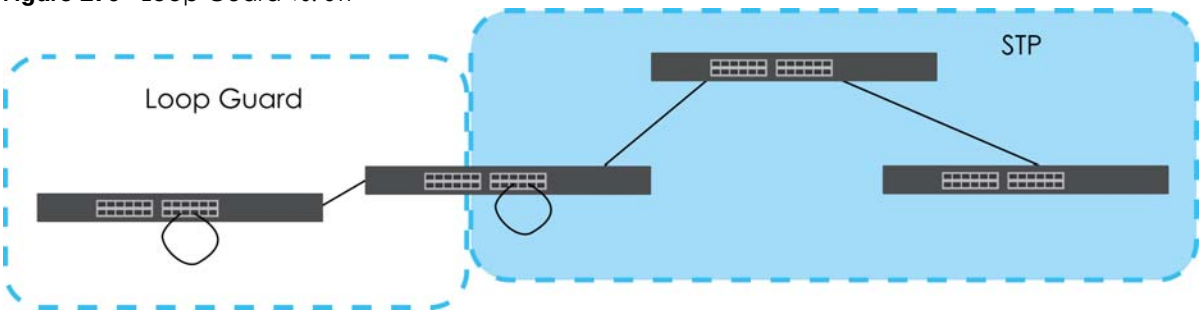
# CHAPTER 30
# Loop Guard

## 30.1 Loop Guard Overview

This chapter shows you how to configure the Switch to guard against loops on the edge of your network.

Loop guard allows you to configure the Switch to shut down a port if it detects that packets sent out on that port loop back to the Switch. While you can use Spanning Tree Protocol (STP) to prevent loops in the core of your network. STP cannot prevent loops that occur on the edge of your network.

**Figure 270** Loop Guard vs. STP




Refer to Section 30.1.2 on page 355 for more information.

### 30.1.1 What You Can Do

Use the **Loop Guard** screen (Section 30.2 on page 357) to enable loop guard on the Switch and in specific ports.

### 30.1.2 What You Need to Know

Loop guard is designed to handle loop problems on the edge of your network. This can occur when a port is connected to a Switch that is in a loop state. Loop state occurs as a result of human error. It happens when two ports on a switch are connected with the same cable. When a switch in loop state sends out broadcast messages the messages loop back to the switch and are re-broadcast again and again causing a broadcast storm.

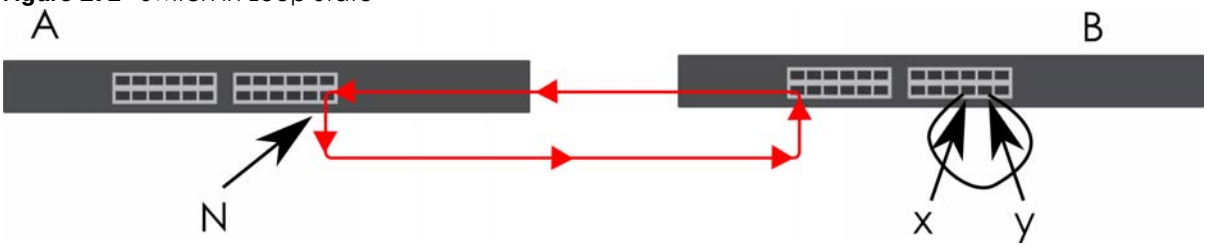
If a switch (not in loop state) connects to a switch in loop state, then it will be affected by the switch in loop state in the following way:

- The switch (not in loop state) will receive broadcast messages sent out from the switch in loop state.
- The switch (not in loop state) will receive its own broadcast messages that it sends out as they loop back. It will then re-broadcast those messages again.

The following figure shows port **N** on switch **A** connected to switch **B**. Switch **B** has two ports, **x** and **y**, mistakenly connected to each other. It forms a loop. When broadcast or multicast packets leave port **N**

and reach switch **B**, they are sent back to port **N** on **A** as they are rebroadcast from **B**.

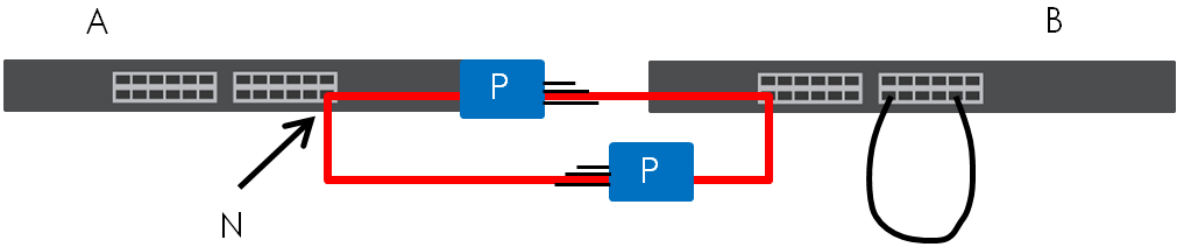
**Figure 271** Switch in Loop State




The loop guard feature checks to see if a loop guard enabled port is connected to a Switch in loop state. This is accomplished by periodically sending a probe packet and seeing if the packet returns on the same port. If this is the case, the Switch will shut down the port connected to the switch in loop state.

Loop guard can be enabled on both Ethernet ports. The following figure shows a loop guard enabled port **N** on switch **A** sending a probe packet **P** to switch **B**. Since switch **B** is in loop state, the probe packet **P** returns to port **N** on **A**. The Switch then shuts down port **N** to ensure that the rest of the network is not affected by the switch in loop state.

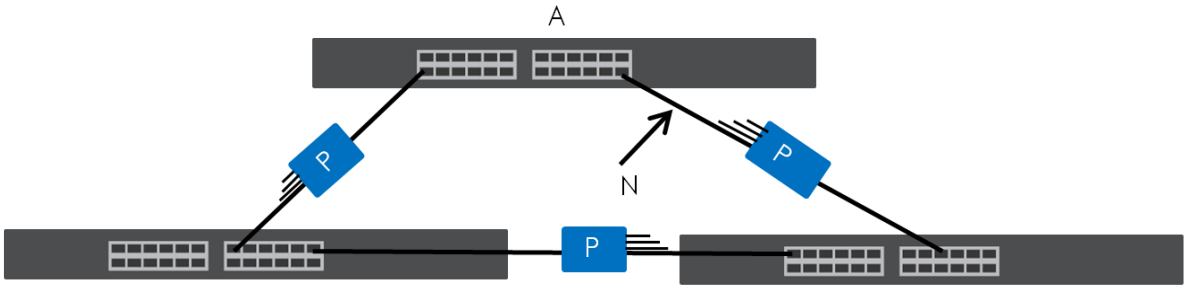
**Figure 272** Loop Guard – Probe Packet




The Switch also shuts down port **N** if the probe packet returns to switch **A** on any other port. In other words loop guard also protects against standard network loops.

The following figure illustrates three switches forming a loop. A sample path of the loop guard probe packet is also shown. In this example, the probe packet is sent from port **N** and returns on another port. As long as loop guard is enabled on port **N**. The Switch will shut down port **N** if it detects that the probe packet has returned to the Switch.

**Figure 273** Loop Guard – Network Loop




Note: After resolving the loop problem on your network you can re-activate the disabled port through the Web Configurator or through commands (See the CLI Reference Guide).

# 30.2 Loop Guard Setup

Click **Advanced Application** > **Loop Guard** in the navigation panel to display the screen as shown.

Note: The loop guard feature cannot be enabled on the ports that have Spanning Tree Protocol (RSTP, MRSTP or MSTP) enabled.

**Figure 274** Advanced Application > Loop Guard (Standalone Mode)

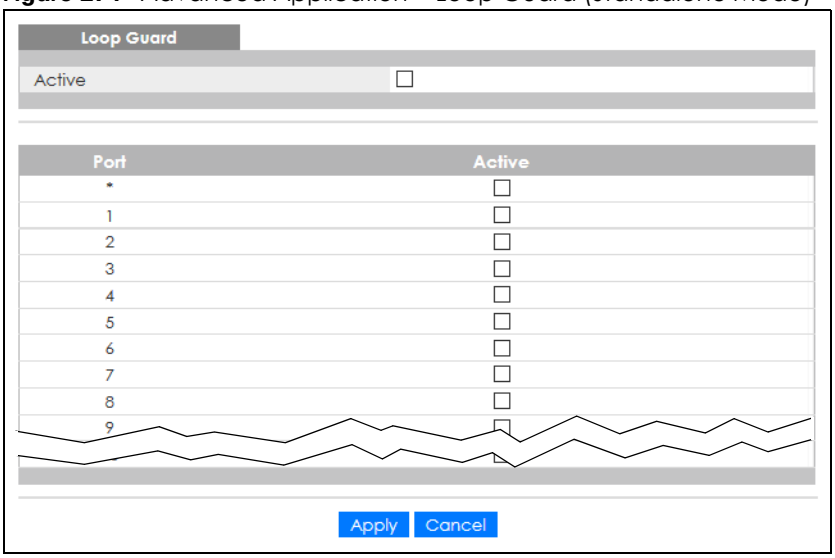
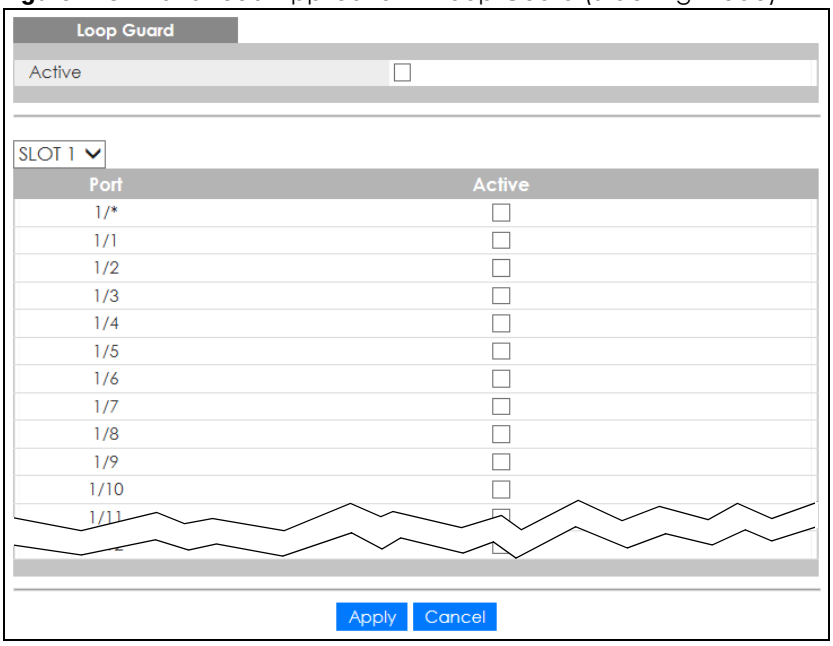



**Figure 275** Advanced Application > Loop Guard (Stacking Mode)



The following table describes the labels in this screen.

Table 155 Advanced Application > Loop Guard

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable loop guard on the Switch.<br><br>The Switch generates syslog, internal log messages as well as SNMP traps when it shuts down a port through the loop guard feature. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the loop guard feature on this port. The Switch sends broadcast and multicast probe packets from this port to check if the switch it is connected to is in loop state. If the switch that this port is connected is in loop state the Switch will shut down this port.<br><br>Clear this check box to disable the loop guard feature. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 31
# VLAN Mapping

This chapter shows you how to configure VLAN mapping on the Switch.

## 31.1 VLAN Mapping Overview

With VLAN mapping enabled, the Switch can map the VLAN ID and priority level of packets received from a private network to those used in the service provider's network.

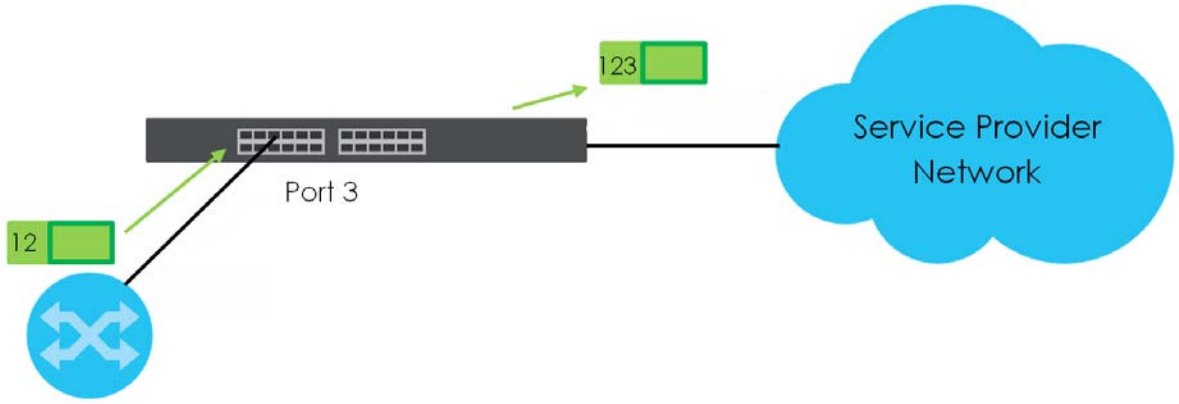
The Switch checks incoming traffic from the switch ports (non-management ports) against the VLAN mapping table first, the MAC learning table and then the VLAN table before forwarding them through the Gigabit uplink port. When VLAN mapping is enabled, the Switch discards the tagged packets that do not match an entry in the VLAN mapping table. If the incoming packets are untagged, the Switch adds a PVID based on the VLAN setting.

Note: You cannot enable VLAN mapping and VLAN stacking at the same time.

### 31.1.1 VLAN Mapping Example

In the following example figure, packets that carry VLAN ID 12 and are received on port 3 match a pre-configured VLAN mapping rule. The Switch translates the VLAN ID from 12 into 123 before forwarding the packets. Any packets carrying a VLAN tag other than 12 (such as 10) and received on port 3 will be dropped.

**Figure 276** VLAN Mapping Example




### 31.1.2 What You Can Do

- Use the **VLAN Mapping** screen (Section 31.2 on page 360) to enable VLAN mapping on the Switch and

ports.

- Use the **VLAN Mapping Configure** screen (Section 31.2.1 on page 361) to enable and edit the VLAN mapping rules.

# 31.2 Enable VLAN Mapping

Click **Advanced Application** and then **VLAN Mapping** in the navigation panel to display the screen as shown.

**Figure 277** Advanced Application > VLAN Mapping (Standalone Mode)

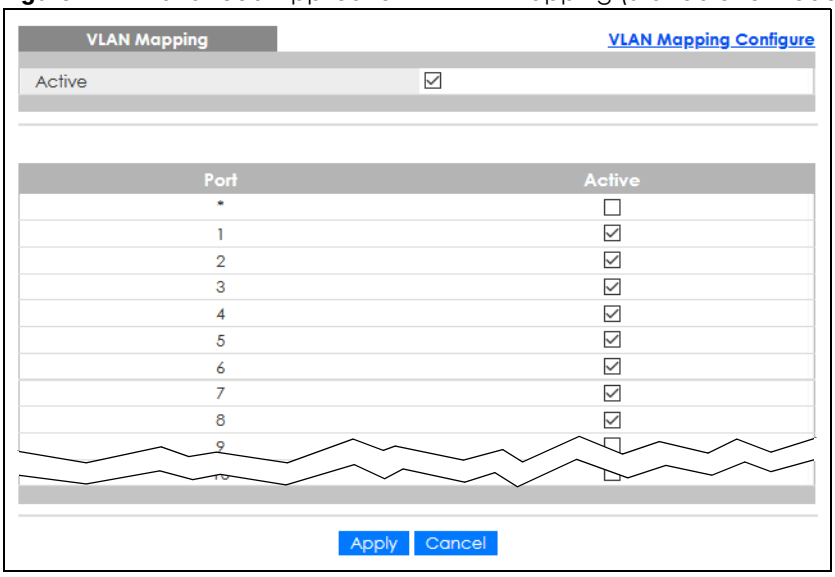
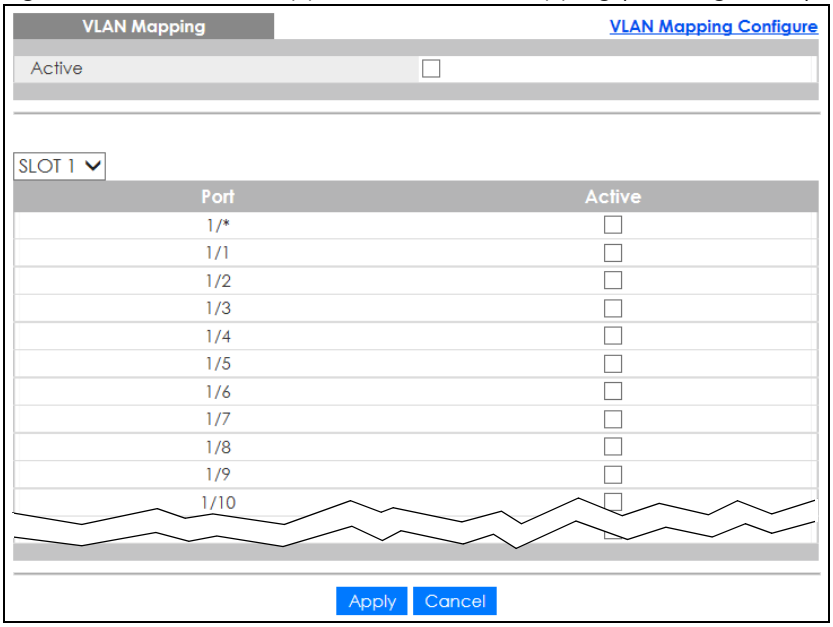



**Figure 278** Advanced Application > VLAN Mapping (Stacking Mode)



The following table describes the labels in this screen.

Table 156 Advanced Application > VLAN Mapping

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable VLAN mapping on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the VLAN mapping feature on this port. Clear this check box to disable the VLAN mapping feature. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 31.2.1 VLAN Mapping Configure

Click the **VLAN Mapping Configure** link in the **VLAN Mapping** screen to display the screen as shown. Use this screen to enable and edit the VLAN mapping rules.

**Figure 279** Advanced Application > VLAN Mapping > VLAN Mapping Configuration (Standalone Mode)

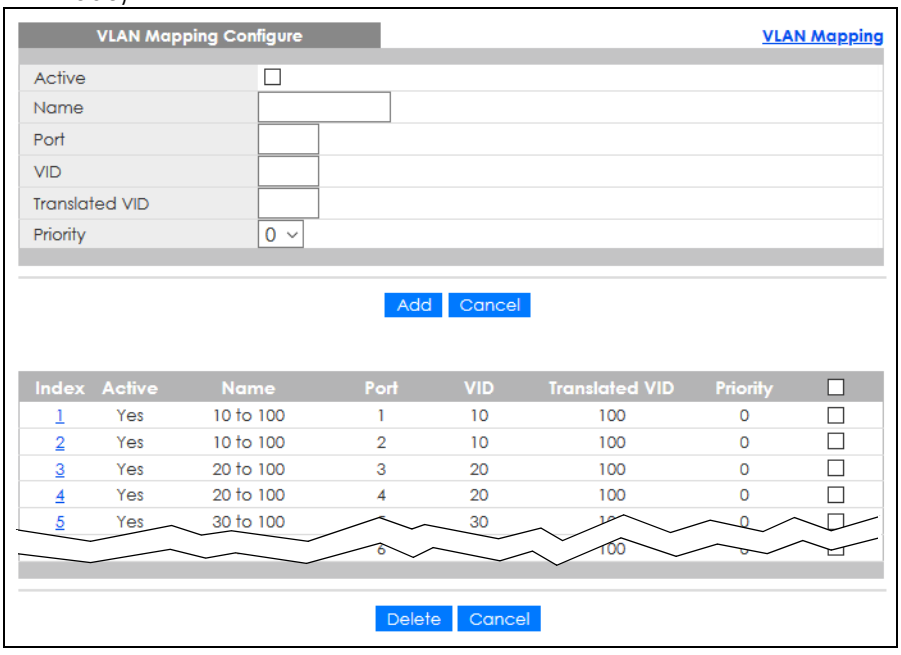
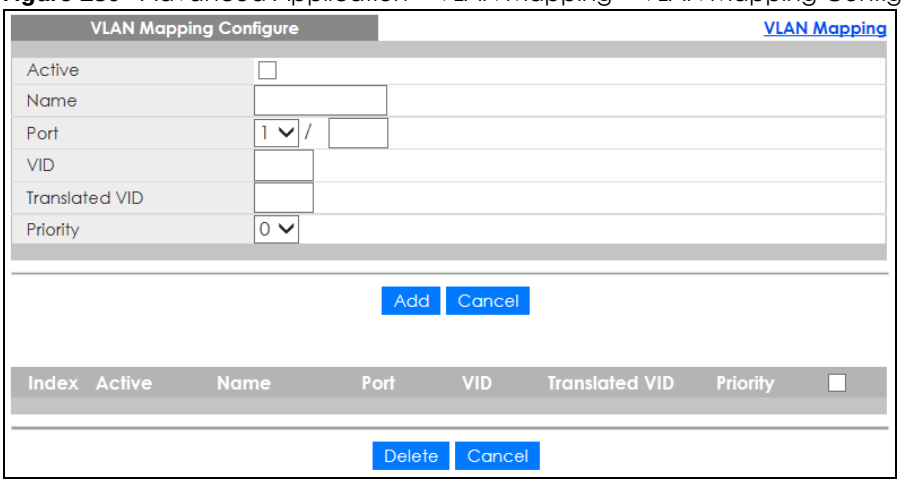


**Figure 280** Advanced Application > VLAN Mapping > VLAN Mapping Configuration (Stacking Mode)




The following table describes the labels in this screen.

Table 157 Advanced Application > VLAN Mapping > VLAN Mapping Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Check this box to activate this rule. |
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Port | Type a port to be included in this rule. In stacking mode, the first field is the slot ID and the second field is the port number. |
| VID | Enter a VLAN ID from 1 to 4094. This is the VLAN tag carried in the packets and will be translated into the VID you specified in the **Translated VID** field. |
| Translated VID | Enter a VLAN ID (from 1 to 4094) into which the customer VID carried in the packets will be translated. |
| Priority | Select a priority level (from 0 to 7). This is the priority level that replaces the customer priority level in the tagged packets or adds to the untagged packets. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Index | This is the number of the VLAN mapping entry in the table. Click on an index number to change the settings. |
| Active | This shows whether this entry is activated or not. |
| Name | This is the descriptive name for this rule. |
| Port | This is the port number to which this rule is applied. |
| VID | This is the customer VLAN ID in the incoming packets. |
| Translated VID | This is the VLAN ID that replaces the customer VLAN ID in the tagged packets. |
| Priority | This is the priority level that replaces the customer priority level in the tagged packets. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove in the **Delete** column and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the **Delete** check boxes. |

# CHAPTER 32
# Layer 2 Protocol Tunneling

## 32.1 Layer 2 Protocol Tunneling Overview

This chapter shows you how to configure layer 2 protocol tunneling on the Switch.

### 32.1.1 What You Can Do

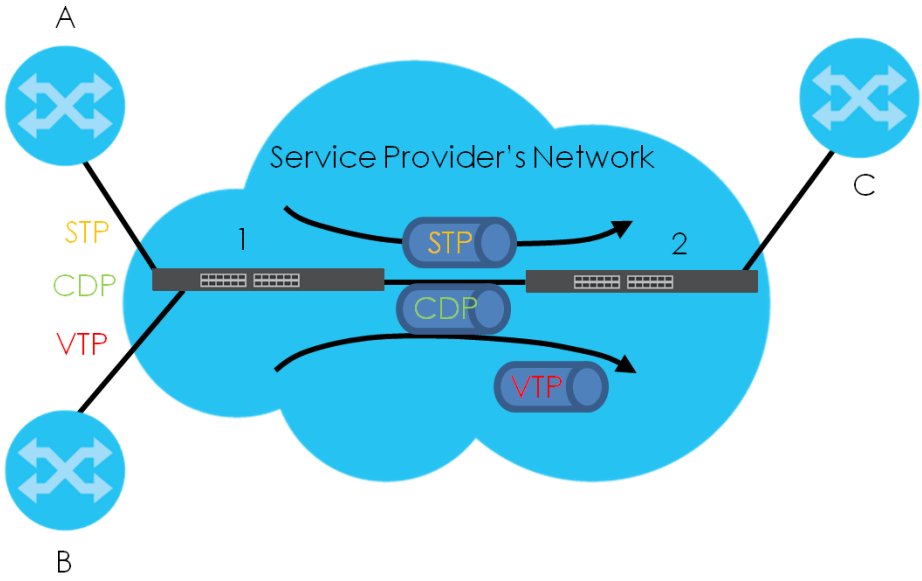
Use the **Layer 2 Protocol Tunnel** screen (Section 32.1 on page 363) to enable layer 2 protocol tunneling on the Switch and specify a MAC address with which the Switch uses to encapsulate the layer 2 protocol packets by replacing the destination MAC address in the packets.

### 32.1.2 What You Need to Know

Layer 2 protocol tunneling (L2PT) is used on the service provider's edge devices.

L2PT allows edge switches (**1** and **2** in the following figure) to tunnel layer 2 STP (Spanning Tree Protocol), CDP (Cisco Discovery Protocol) and VTP (VLAN Trunking Protocol) packets between customer switches (**A**, **B** and **C** in the following figure) connected through the service provider's network. The edge switch encapsulates layer 2 protocol packets with a specific MAC address before sending them across the service provider's network to other edge switches.

**Figure 281** Layer 2 Protocol Tunneling Network Scenario

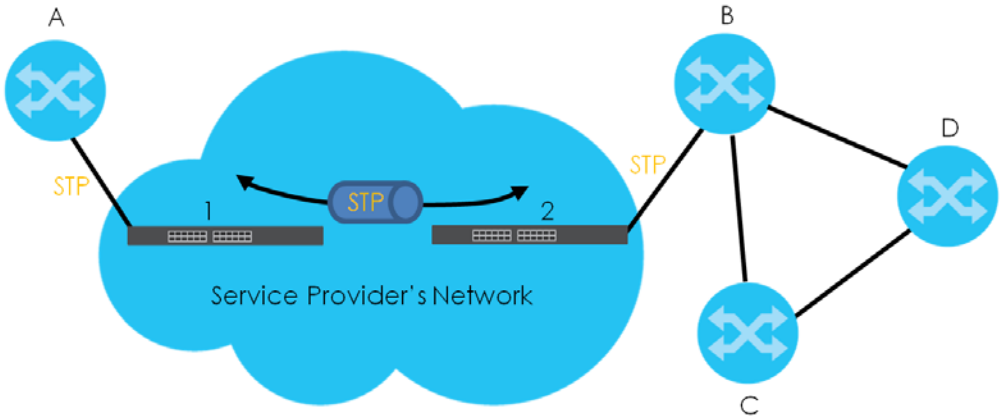



In the following example, if you enable L2PT for STP, you can have switches **A**, **B**, **C** and **D** in the same

spanning tree, even though switch **A** is not directly connected to switches **B**, **C** and **D**. Topology change information can be propagated throughout the service provider's network.

To emulate a point-to-point topology between two customer switches at different sites, such as **A** and **B**, you can enable protocol tunneling on edge switches **1** and **2** for PAgP (Port Aggregation Protocol), LACP or UDLD (Uni-Directional Link Detection).

**Figure 282** L2PT Network Example




### 32.1.2.1 Layer 2 Protocol Tunneling Mode

Each port can have two layer 2 protocol tunneling modes, **Access** and **Tunnel**.

- The **Access** port is an ingress port on the service provider's edge device (**1** or **2** in Figure 282 on page 364) and connected to a customer switch (**A** or **B**). Incoming layer 2 protocol packets received on an access port are encapsulated and forwarded to the tunnel ports.
- The **Tunnel** port is an egress port at the edge of the service provider's network and connected to another service provider's switch. Incoming encapsulated layer 2 protocol packets received on a tunnel port are decapsulated and sent to an access port.

## 32.2 Configuring Layer 2 Protocol Tunneling

Click **Advanced Application** > **Layer 2 Protocol Tunneling** in the navigation panel to display the screen as shown.

**Figure 283** Advanced Application > Layer 2 Protocol Tunneling (Standalone Mode)

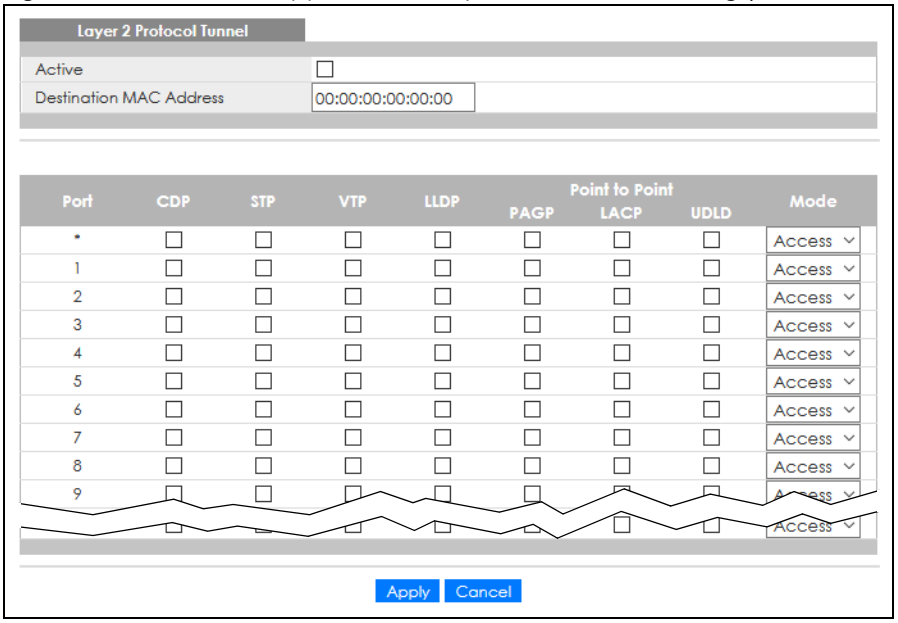
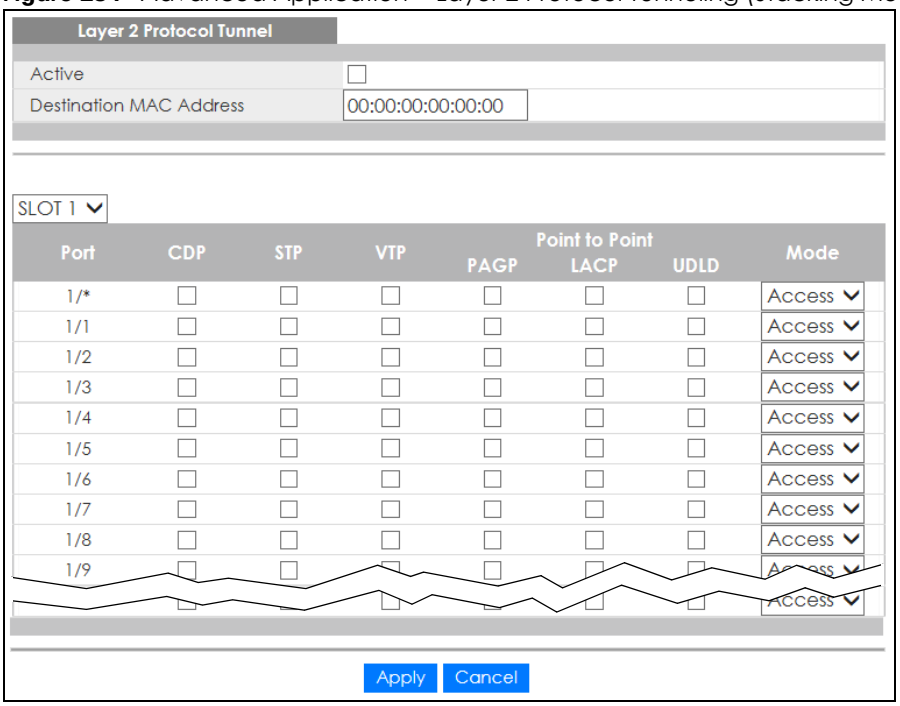



**Figure 284** Advanced Application > Layer 2 Protocol Tunneling (Stacking Mode)



The following table describes the labels in this screen.

Table 158 Advanced Application > Layer 2 Protocol Tunneling

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable layer 2 protocol tunneling on the Switch. |
| Destination MAC Address | Specify a MAC address with which the Switch uses to encapsulate the layer 2 protocol packets by replacing the destination MAC address in the packets.<br><br>Note: The MAC address can be either a unicast MAC address or multicast MAC address. If you use a unicast MAC address, make sure the MAC address does not exist in the address table of a switch on the service provider's network.<br><br>Note: All the edge switches in the service provider's network should be set to use the same MAC address for encapsulation. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| CDP | Select this option to have the Switch tunnel CDP (Cisco Discovery Protocol) packets so that other Cisco devices can be discovered through the service provider's network. |
| STP | Select this option to have the Switch tunnel STP (Spanning Tree Protocol) packets so that STP can run properly across the service provider's network and spanning trees can be set up based on bridge information from all (local and remote) networks. |
| VTP | Select this option to have the Switch tunnel VTP (VLAN Trunking Protocol) packets so that all customer switches can use consistent VLAN configuration through the service provider's network. |
| Point to Point | The Switch supports PAgP (Port Aggregation Protocol), LACP (Link Aggregation Control Protocol) and UDLD (UniDirectional Link Detection) tunneling for a point-to-point topology.<br><br>Both PAgP and UDLD are Cisco's proprietary data link layer protocols. PAgP is similar to LACP and used to set up a logical aggregation of Ethernet ports automatically. UDLD is to determine the link's physical status and detect a unidirectional link. |
| PAGP | Select this option to have the Switch send PAgP packets to a peer to automatically negotiate and build a logical port aggregation. |
| LACP | Select this option to have the Switch send LACP packets to a peer to dynamically create and manage trunk groups. |
| UDLD | Select this option to have the Switch send UDLD packets to a peer's port it connected to monitor the physical status of a link. |
| Mode | Select **Access** to have the Switch encapsulate the incoming layer 2 protocol packets and forward them to the tunnel ports. Select **Access** for ingress ports at the edge of the service provider's network.<br><br>Note: You can enable L2PT services for STP, LACP, VTP, CDP, UDLD, PAgP, and LLDP on the access ports only.<br><br>Select **Tunnel** for egress ports at the edge of the service provider's network. The Switch decapsulates the encapsulated layer 2 protocol packets received on a tunnel port by changing the destination MAC address to the original one, and then forward them to an access port. If the services is not enabled on an access port, the protocol packets are dropped. |

Table 158 Advanced Application > Layer 2 Protocol Tunneling (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 33
# sFlow

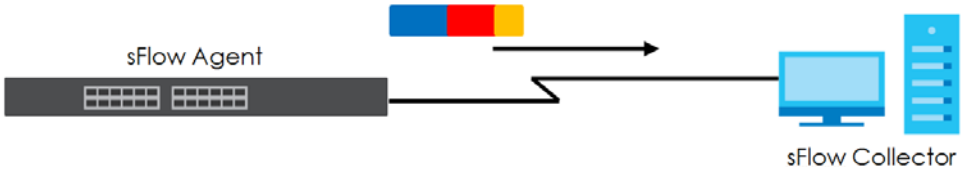
This chapter shows you how to configure sFlow to have the Switch monitor traffic in a network and send information to an sFlow collector for analysis.

## 33.1 sFlow Overview

sFlow (RFC 3176) is a standard technology for monitoring switched networks. An sFlow agent embedded on a switch or router gets sample data and packet statistics from traffic forwarded through its ports. The sFlow agent then creates sFlow data and sends it to an sFlow collector. The sFlow collector is a server that collects and analyzes sFlow datagram. An sFlow datagram includes packet header, input and output interface, sampling process parameters and forwarding information.

sFlow minimizes impact on CPU load of the Switch as it analyzes sample data only. sFlow can continuously monitor network traffic and create reports for network performance analysis and troubleshooting. For example, you can use it to know which IP address or which type of traffic caused network congestion.

**Figure 285** sFlow Application




## 33.2 sFlow Port Configuration

Click **Advanced Application** > **sFlow** in the navigation panel to display the screen as shown.

**Figure 286** Advanced Application > sFlow (Standalone Mode)

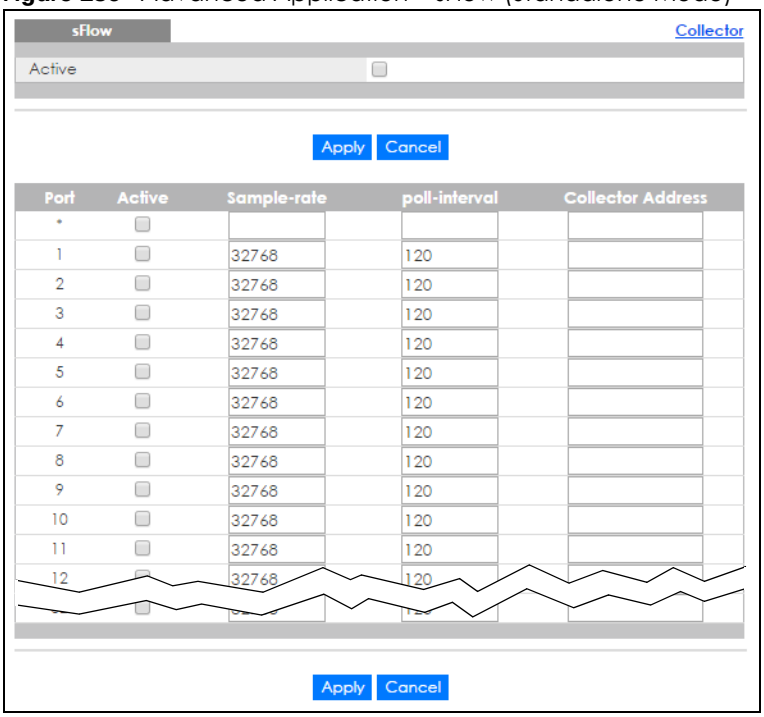
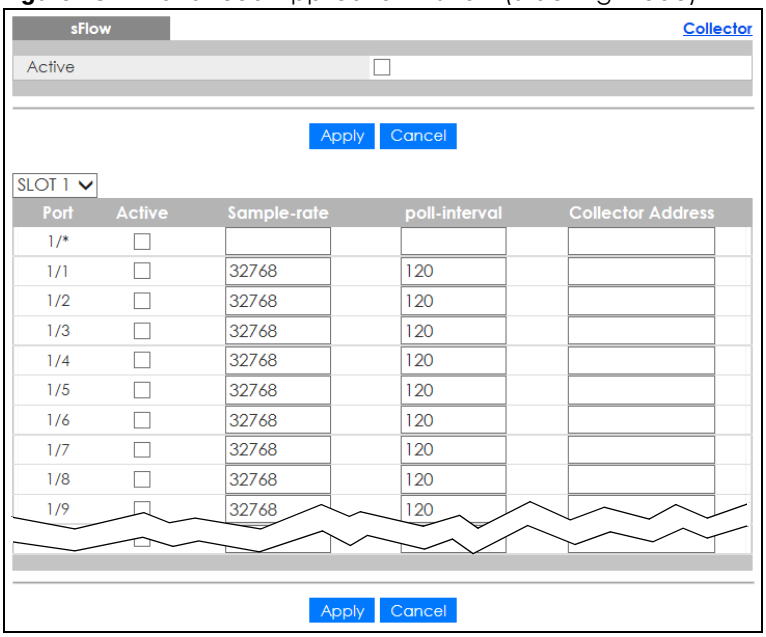



**Figure 287** Advanced Application > sFlow (Stacking Mode)




The following table describes the labels in this screen.

Table 159 Advanced Application > sFlow

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable the sFlow agent on the Switch. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

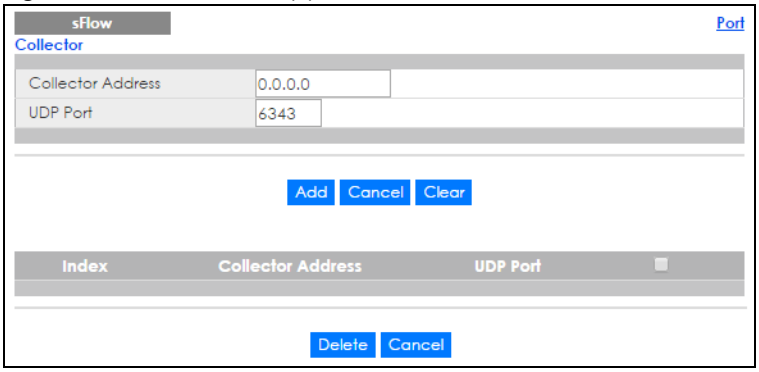
Table 159 Advanced Application > sFlow (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this to allow the Switch to monitor traffic on this port and generate and send sFlow datagram to the specified collector. |
| Sample-rate | Enter a number (N) from 256 to 65535. The Switch captures every one out of N packets for this port and creates sFlow datagram. |
| poll-interval | Specify a time interval (from 20 to 120 in seconds) the Switch waits before sending the sFlow datagram and packet counters for this port to the collector. |
| Collector Address | Enter the IP address of the sFlow collector.<br><br>Note: You must have the sFlow collector already configured in the **sFlow** > **Collector** screen. The sFlow collector does not need to be in the same subnet as the Switch, but it must be accessible from the Switch.<br><br>Note: Configure UDP port 6343 (the default) on a NAT router to allow port forwarding if the collector is behind a NAT router. Configure a firewall rule for UDP port 6343 (the default) to allow incoming traffic if the collector is behind a firewall. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 33.2.1 sFlow Collector Configuration

Click the **Collector** link in the **sFlow** screen to display the screen as shown. You can configure up to four sFlow collectors in this screen. You may want to configure more than one collector if the traffic load to be monitored is more than one collector can manage.

**Figure 288** Advanced Application > sFlow > Collector



The following table describes the labels in this screen.

Table 160 Advanced Application > sFlow > Collector

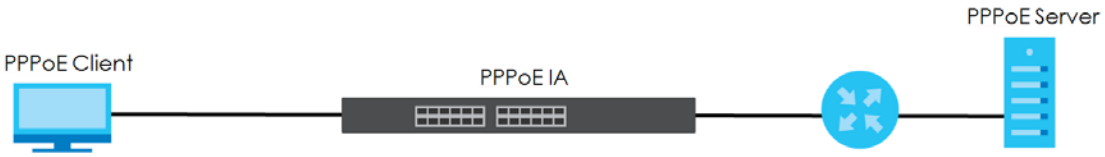
| LABEL | DESCRIPTION |
|---|---|
| Collector Address | Enter the IP address of the sFlow collector. |
| UDP Port | Enter a UDP port number the Switch uses to send sFlow datagram to the collector. If you change the port here, make sure you change it on the collector, too. The default port is 6343. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays the index number of this entry. Click on an index number to change the settings. |
| Collector Address | This field displays IP address of the sFlow collector. |
| UDP Port | This field displays port number the Switch uses to send sFlow datagram to the collector. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove in the **Delete** column and then click the **Delete** button. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 34
# PPPoE

## 34.1 PPPoE Intermediate Agent Overview

This chapter describes how the Switch gives a PPPoE termination server additional information that the server can use to identify and authenticate a PPPoE client.

A PPPoE Intermediate Agent (PPPoE IA) is deployed between a PPPoE server and PPPoE clients. It helps the PPPoE server identify and authenticate clients by adding subscriber line specific information to PPPoE discovery packets from clients on a per-port or per-port-per-VLAN basis before forwarding them to the PPPoE server.




### 34.1.1 What You Can Do

- Use the **PPPoE** screen (Section 34.2 on page 374) to display the main PPPoE screen.
- Use the **Intermediate Agent** screen (Section 34.3 on page 375) to enable the PPPoE Intermediate Agent on the Switch.
- Use the **PPPoE IA Per-Port** screen (Section 34.3.1 on page 376) to set the port state and configure PPPoE intermediate agent sub-options on a per-port basis.
- Use the **PPPoE IA Per-Port Per-VLAN** screen (Section 34.3.2 on page 378) to configure PPPoE IA settings that apply to a specific VLAN on a port.
- Use the **PPPoE IA for VLAN** (Section 34.3.3 on page 379) to enable the PPPoE Intermediate Agent on a VLAN.

### 34.1.2 What You Need to Know

Read on for concepts on ARP that can help you configure the screen in this chapter.

#### 34.1.2.1 PPPoE Intermediate Agent Tag Format

If the PPPoE Intermediate Agent is enabled, the Switch adds a vendor-specific tag to PADI (PPPoE Active Discovery Initialization) and PADR (PPPoE Active Discovery Request) packets from PPPoE clients.

This tag is defined in RFC 2516 and has the following format for this feature.

Table 161 PPPoE Intermediate Agent Vendor-specific Tag Format

| Tag_Type (0x0105) | Tag_Len | Value | i1 | i2 |
|---|---|---|---|---|

The Tag_Type is 0x0105 for vendor-specific tags, as defined in RFC 2516. The Tag_Len indicates the length of Value, i1 and i2. The Value is the 32-bit number 0x00000DE9, which stands for the "ADSL Forum" IANA entry. i1 and i2 are PPPoE intermediate agent sub-options, which contain additional information about the PPPoE client.

### 34.1.2.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 162 PPPoE IA Circuit ID Sub-option Format: User-defined String

| SubOpt | Length | Value |
|---|---|---|
| 0x01 (1 byte) | N (1 byte) | String (63 bytes) |

Table 163 PPPoE IA Remote ID Sub-option Format

| SubOpt | Length | Value |
|---|---|---|
| 0x02 (1 byte) | N (1 byte) | MAC Address or String (63 bytes) |

The 1 in the first field identifies this as an Agent Circuit ID sub-option and 2 identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field. The Switch takes the Circuit ID string you manually configure for a VLAN on a port as the highest priority and the Circuit ID string for a port as the second priority. In addition, the Switch puts the PPPoE client's MAC address into the Agent Remote ID Sub-option if you do not specify any user-defined string.

#### Flexible Circuit ID Syntax with Identifier String and Variables

If you do not configure a Circuit ID string for a VLAN on a specific port or for a specific port, the Switch adds the user-defined identifier string and variables into the Agent Circuit ID Sub-option. The variables can be the slot ID of the PPPoE client, the port number of the PPPoE client and/or the VLAN ID on the PPPoE packet.

The identifier-string, slot ID, port number and VLAN ID are separated from each other by a pound key (#), semi-colon (;), period (.), comma (,), forward slash (/) or space. An Agent Circuit ID Sub-option example is "Switch/07/0123" and indicates the PPPoE packets come from a PPPoE client which is connected to the Switch's port 7 and belong to VLAN 123.

Table 164 PPPoE IA Circuit ID Sub-option Format: Using Identifier String and Variables

| SubOpt | Length | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0x01 (1 byte) | N (1 byte) | Identifier String (53 byte) | delimiter (1 byte) | Slot ID (1 byte) | delimiter (1 byte) | Port No (2 byte) | delimiter (1 byte) | VLAN ID (4 bytes) |

### WT-101 Default Circuit ID Syntax

If you do not configure a Circuit ID string for a specific VLAN on a port or for a specific port, and disable the flexible Circuit ID syntax in the **PPPoE** > **Intermediate Agent** screen, the Switch automatically generates a Circuit ID string according to the default Circuit ID syntax which is defined in the DSL Forum Working Text (WT)-101. The default access node identifier is the host name of the PPPoE intermediate agent and the eth indicates "Ethernet".

Table 165 PPPoE IA Circuit ID Sub-option Format: Defined in WT-101

| SubOpt | Length | Value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0x01 (1 byte) | N (1 byte) | Access Node Identifier (20 byte) | Space (1 byte) | eth (3 byte) | Space (1 byte) | Slot ID (1 byte) | / (1 byte) | Port No (2 byte) | : (1 byte) | VLAN ID (4 bytes) |

#### 34.1.2.3 Port State

Every port is either a trusted port or an untrusted port for the PPPoE intermediate agent. This setting is independent of the trusted or untrusted setting for DHCP snooping or ARP inspection. You can also specify the agent sub-options (circuit ID and remote ID) that the Switch adds to PADI and PADR packets from PPPoE clients.

Trusted ports are connected to PPPoE servers.

- If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.
- If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted ports.

Note: The Switch will drop all PPPoE discovery packets if you enable the PPPoE intermediate agent and there are no trusted ports.

Untrusted ports are connected to subscribers.

- If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted ports.
- The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.

## 34.2 PPPoE

Use this screen to configure the PPPoE Intermediate Agent on the Switch.

Click **Advanced Application** > **PPPoE** in the navigation panel to display the screen as shown. Click **Click Here** to go to the **Intermediate Agent** screen.

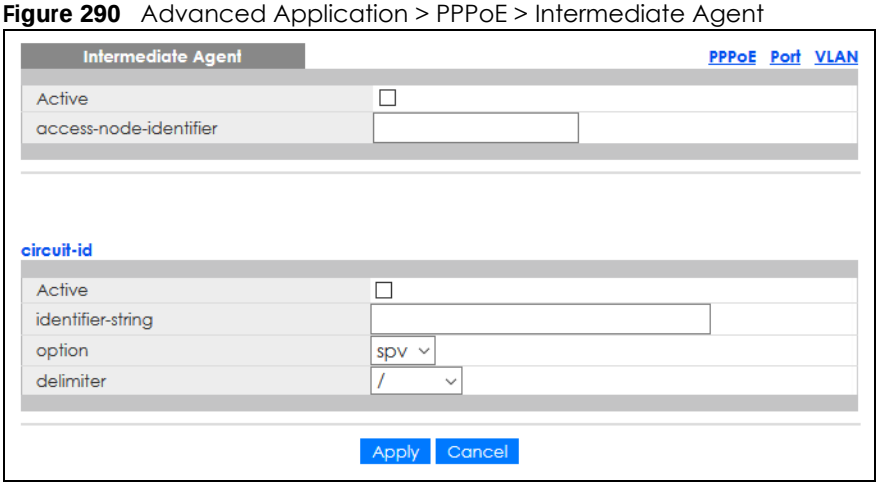
**Figure 289** Advanced Application > PPPoE > Intermediate Agent

# 34.3 PPPoE Intermediate Agent

Use this screen to configure the Switch to give a PPPoE termination server additional subscriber information that the server can use to identify and authenticate a PPPoE client.

Click **Advanced Application** > **PPPoE** > **Intermediate Agent** in the navigation panel to display the screen as shown.

**Figure 290** Advanced Application > PPPoE > Intermediate Agent




The following table describes the labels in this screen.

Table 166 Advanced Application > PPPoE > Intermediate Agent

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable the PPPoE intermediate agent globally on the Switch. |
| access-node-identifier | Enter up to 20 ASCII characters to identify the PPPoE intermediate agent. Hyphens (–) and spaces are also allowed. The default is the Switch's host name. |
| circuit-id | Use this section to configure the Circuit ID field in the PADI and PADR packets.<br>The Circuit ID you configure for a specific port or for a specific VLAN on a port has priority over this.<br>The Circuit ID you configure for a specific port (in the **Advanced Application** > **PPPoE** > **Intermediate Agent** > **Port** screen) or for a specific VLAN on a port (in the **Advanced Application** > **PPPoE** > **Intermediate Agent** > **Port** > **VLAN** screen) has priority over this. That means, if you also want to configure PPPoE IA Per-Port or Per-Port Per-VLAN setting, leave the fields here empty and configure circuit-id and remote-id in the Per-Port or Per-Port Per-VLAN screen. |
| Active | Select this option to have the Switch add the user-defined identifier string and variables (specified in the **option** field) to PADI or PADR packets from PPPoE clients.<br>If you leave this option unselected and do not configure any Circuit ID string (using CLI commands) on the Switch, the Switch will use the string specified in the **access-node-identifier** field. |
| identifier-string | Specify a string that the Switch adds in the Agent Circuit ID sub-option. You can enter up to 53 ASCII characters. Spaces are allowed. |
| option | Select the variables that you want the Switch to generate and add in the Agent Circuit ID sub-option. The variable options include **sp**, **sv**, **pv** and **spv** which indicate combinations of slot-port, slot-VLAN, port-VLAN and slot-port-VLAN respectively. The Switch enters a zero into the PADI and PADR packets for the slot value. |
| delimiter | Select a delimiter to separate the identifier-string, slot ID, port number and/or VLAN ID from each other. You can use a pound key (**#**), semi-colon (**;**), period (**.**), comma (**,**), forward slash (**/**) or space. |

Table 166 Advanced Application > PPPoE > Intermediate Agent (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 34.3.1 PPPoE IA Per-Port

Use this screen to specify whether individual ports are trusted or untrusted ports and have the Switch add extra information to PPPoE discovery packets from PPPoE clients on a per-port basis.

Note: The Switch will drop all PPPoE packets if you enable the PPPoE Intermediate Agent on the Switch and there are no trusted ports.

Click the **Port** link in the **Intermediate Agent** screen to display the screen as shown.

**Figure 291** Advanced Application > PPPoE > Intermediate Agent > Port (Standalone Mode)

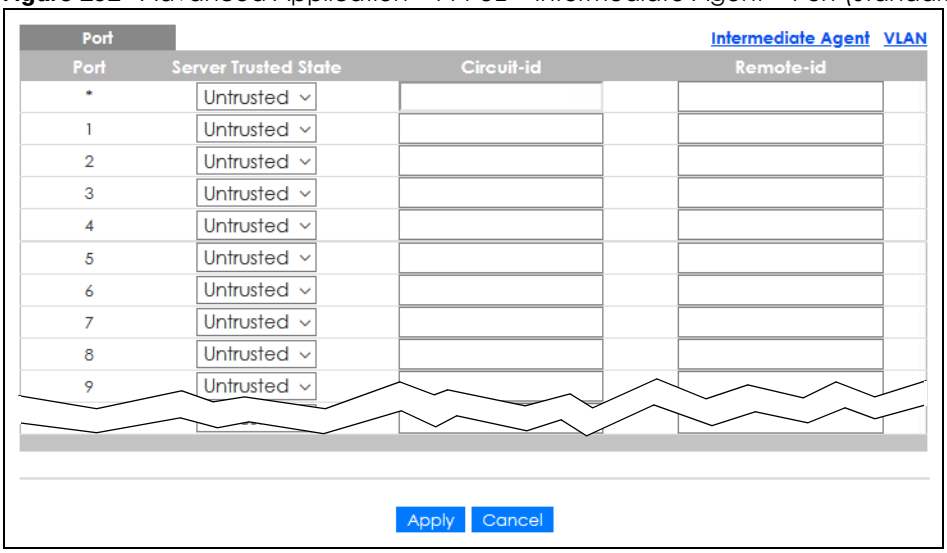
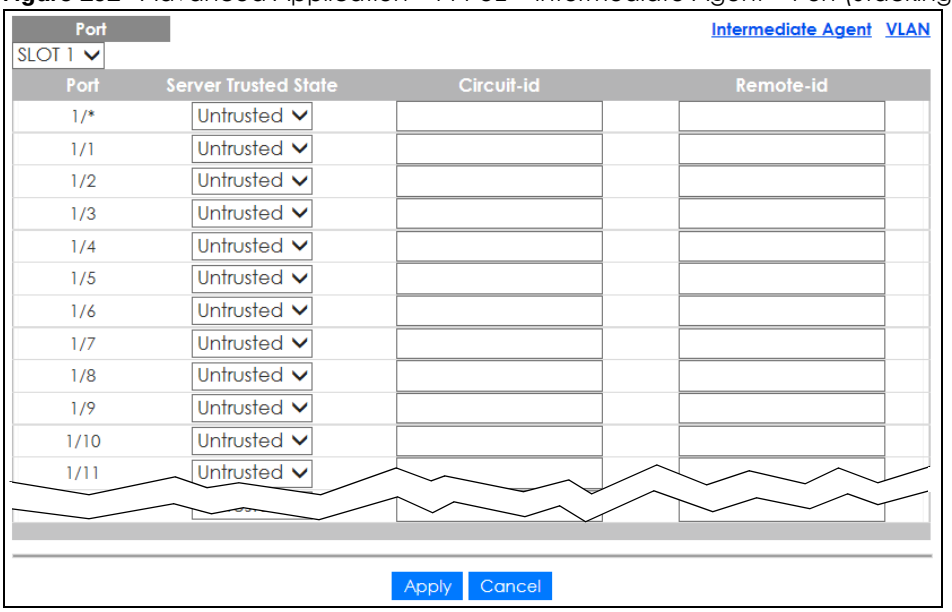


**Figure 292** Advanced Application > PPPoE > Intermediate Agent > Port (Stacking Mode)




The following table describes the labels in this screen.

Table 167 Advanced Application > PPPoE > Intermediate Agent > Port

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| Server Trusted State | Select whether this port is a trusted port (**Trusted**) or an untrusted port (**Untrusted**).<br><br>Trusted ports are uplink ports connected to PPPoE servers.<br><br>If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.<br><br>If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted ports.<br><br>Untrusted ports are downlink ports connected to subscribers.<br><br>If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted ports.<br><br>The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port. |
| Circuit-id | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed.<br><br>The Circuit ID you configure for a specific VLAN on a port (in the **Advanced Application** > **PPPoE** > **Intermediate Agent** > **Port** > **VLAN** screen) has the highest priority. |

Table 167 Advanced Application > PPPoE > Intermediate Agent > Port (continued)

| LABEL | DESCRIPTION |
|---|---|
| Remote-id | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed.<br><br>If you do not specify a string here or in the **Remote-id** field for a VLAN on a port, the Switch automatically uses the PPPoE client's MAC address.<br><br>The Remote ID you configure for a specific VLAN on a port (in the **Advanced Application** > **PPPoE** > **Intermediate Agent** > **Port** > **VLAN** screen) has the highest priority. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 34.3.2 PPPoE IA Per-Port Per-VLAN

Use this screen to configure PPPoE IA settings that apply to a specific VLAN on a port.

Click the **VLAN** link in the **Intermediate Agent** > **Port** screen to display the screen as shown.

**Figure 293** Advanced Application > PPPoE > Intermediate Agent > Port > VLAN (Standalone Mode)

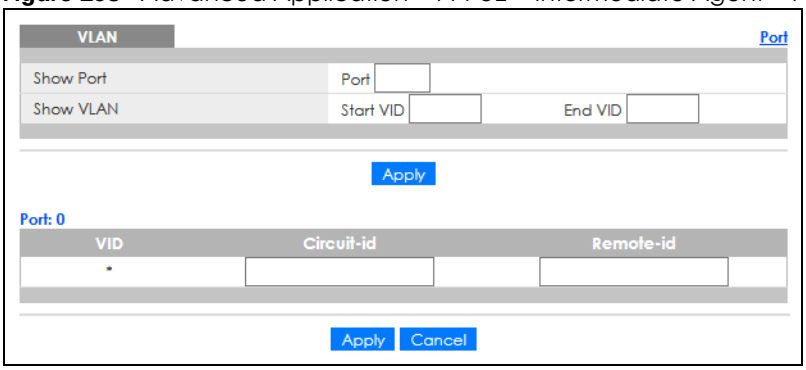
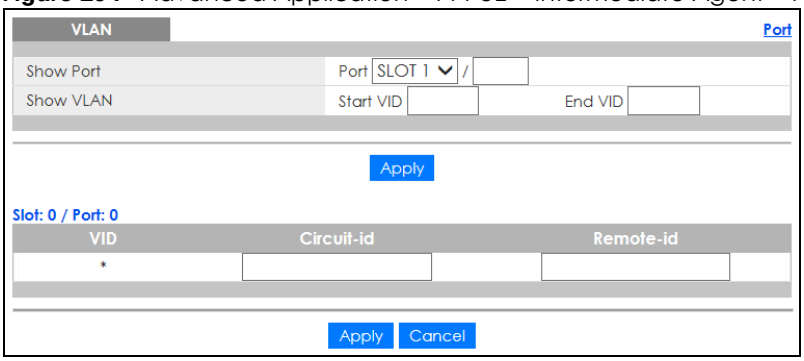



**Figure 294** Advanced Application > PPPoE > Intermediate Agent > Port > VLAN (Stacking Mode)



The following table describes the labels in this screen.

Table 168 Advanced Application > PPPoE > Intermediate Agent > Port > VLAN

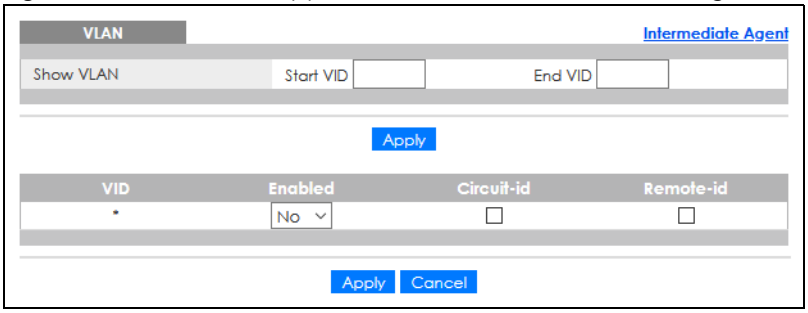
| LABEL | DESCRIPTION |
|---|---|
| Show Port | Enter a port number to show the PPPoE Intermediate Agent settings for the specified VLANs on the port.<br>In stacking mode, the first field is the slot ID and the second field is the port number. |
| Show VLAN | Use this section to specify the VLANs you want to configure in the section below. |
| Start VID | Enter the lowest VLAN ID you want to configure in the section below. |
| End VID | Enter the highest VLAN ID you want to configure in the section below. |
| Apply | Click **Apply** to display the specified range of VLANs in the section below. |
| Port<br>Slot / Port | This field displays the port number specified above.<br>In stacking mode, it displays the slot ID and port number specified above. |
| VID | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the * VLAN, the settings are applied to all VLANs. |
| * | Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis.<br>Changes in this row are copied to all the VLANs as soon as you make them. |
| Circuit-id | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Circuit ID sub-option for this VLAN on the specified port. Spaces are allowed.<br>The Circuit ID you configure here has the highest priority. |
| Remote-id | Enter a string of up to 63 ASCII characters that the Switch adds into the Agent Remote ID sub-option for this VLAN on the specified port. Spaces are allowed.<br>If you do not specify a string here or in the **Remote-id** field for a specific port, the Switch automatically uses the PPPoE client's MAC address.<br>The Remote ID you configure here has the highest priority. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 34.3.3 PPPoE IA for VLAN

Use this screen to set whether the PPPoE Intermediate Agent is enabled on a VLAN and whether the Switch appends the Circuit ID and/or Remote ID to PPPoE discovery packets from a specific VLAN.

Click the **VLAN** link in the **Intermediate Agent** screen to display the screen as shown.

**Figure 295** Advanced Application > PPPoE > Intermediate Agent > VLAN



The following table describes the labels in this screen.

Table 169 Advanced Application > PPPoE > Intermediate Agent > VLAN

| LABEL | DESCRIPTION |
|---|---|
| Show VLAN | Use this section to specify the VLANs you want to configure in the section below. |
| Start VID | Enter the lowest VLAN ID you want to configure in the section below. |
| End VID | Enter the highest VLAN ID you want to configure in the section below. |
| Apply | Click **Apply** to display the specified range of VLANs in the section below. |
| VID | This field displays the VLAN ID of each VLAN in the range specified above. If you configure the ***** VLAN, the settings are applied to all VLANs. |
| * | Use this row to make the setting the same for all VLANs. Use this row first and then make adjustments on a VLAN-by-VLAN basis.<br>Changes in this row are copied to all the VLANs as soon as you make them. |
| Enabled | Select this option to turn on the PPPoE Intermediate Agent on a VLAN. |
| Circuit-id | Select this option to make the Circuit ID settings for a specific VLAN take effect. |
| Remote-id | Select this option to make the Remote ID settings for a specific VLAN take effect. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 35
# Error-Disable

## 35.1 Error-Disable Overview

This chapter shows you how to configure the rate limit for control packets on a port, and set the Switch to take an action (such as to shut down a port or stop sending packets) on a port when the Switch detects a pre-configured error. It also shows you how to configure the Switch to automatically undo the action after the error is gone.

### 35.1.1 CPU Protection Overview

Switches exchange protocol control packets in a network to get the latest networking information. If a switch receives large numbers of control packets, such as ARP, BPDU or IGMP packets, which are to be processed by the CPU, the CPU may become overloaded and be unable to handle regular tasks properly.

The CPU protection feature allows you to limit the rate of ARP, BPDU and IGMP packets to be delivered to the CPU on a port. This enhances the CPU efficiency and protects against potential DoS attacks or errors from other networks. You then can choose to drop control packets that exceed the specified rate limit or disable a port on which the packets are received.

### 35.1.2 Error-Disable Recovery Overview

Some features, such as loop guard or CPU protection, allow the Switch to shut down a port or discard specific packets on a port when an error is detected on the port. For example, if the Switch detects that packets sent out the ports loop back to the Switch, the Switch can shut down the ports automatically. After that, you need to enable the ports or allow the packets on a port manually through the Web Configurator or the commands. With error-disable recovery, you can set the disabled ports to become active or start receiving the packets again after the time interval you specify.

### 35.1.3 What You Can Do

- Use the **Errdisable Status** screen (Section 35.3 on page 382) to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information.
- Use the **CPU Protection** screen (Section 35.4 on page 384) to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port.
- Use the **Errdisable Detect** screen (Section 35.5 on page 386) to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded.
- Use the **Errdisable Recovery** screen (Section 35.6 on page 387) to set the Switch to automatically undo an action after the error is gone.

# 35.2 Error-Disable Settings

Use this screen to go to the screens where you can configure error disable related settings. Click **Advanced Application** > **Errdisable** in the navigation panel to open the following screen.

**Figure 296** Advanced Application > Errdisable

The following table describes the labels in this screen.

Table 170 Advanced Application > Errdisable

| LABEL | DESCRIPTION |
|---|---|
| Errdisable Status | Click this link to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information. |
| CPU protection | Click this link to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port. |
| Errdisable Detect | Click this link to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded. |
| Errdisable Recovery | Click this link to set the Switch to automatically undo an action after the error is gone. |

# 35.3 Error-Disable Status

Use this screen to view whether the Switch detected that control packets exceeded the rate limit configured for a port or a port is disabled according to the feature requirements and what action you configure, and related information. Click the **Click here** link next to **Errdisable Status** in the **Advanced Application** > **Errdisable** screen to display the screen as shown.

**Figure 297** Advanced Application > Errdisable > Errdisable Status (Standalone Mode)

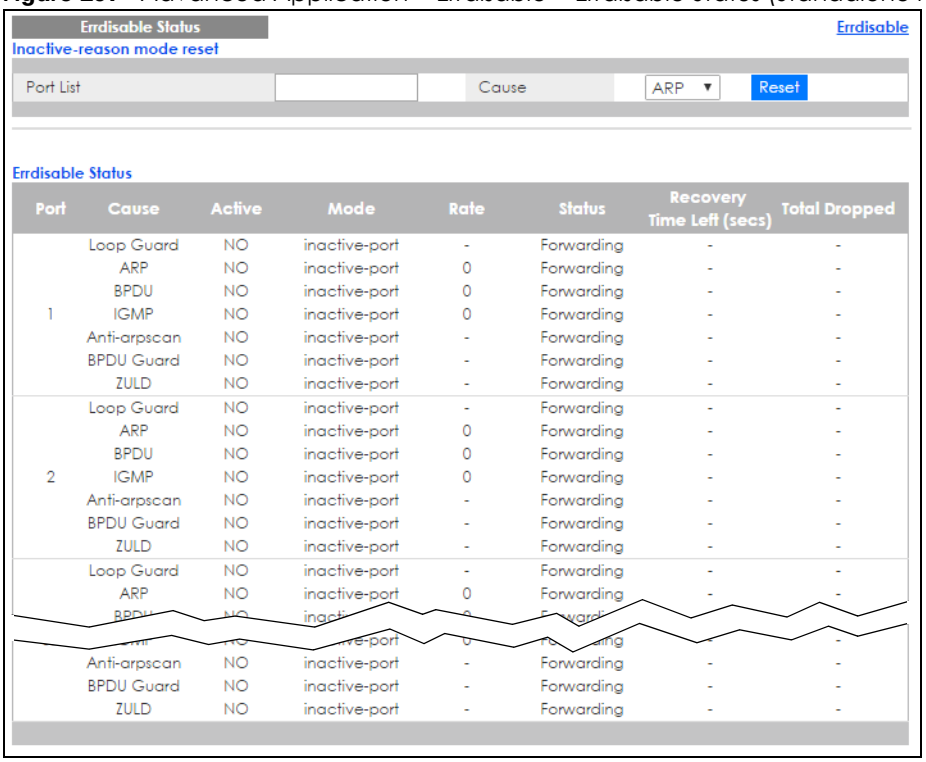
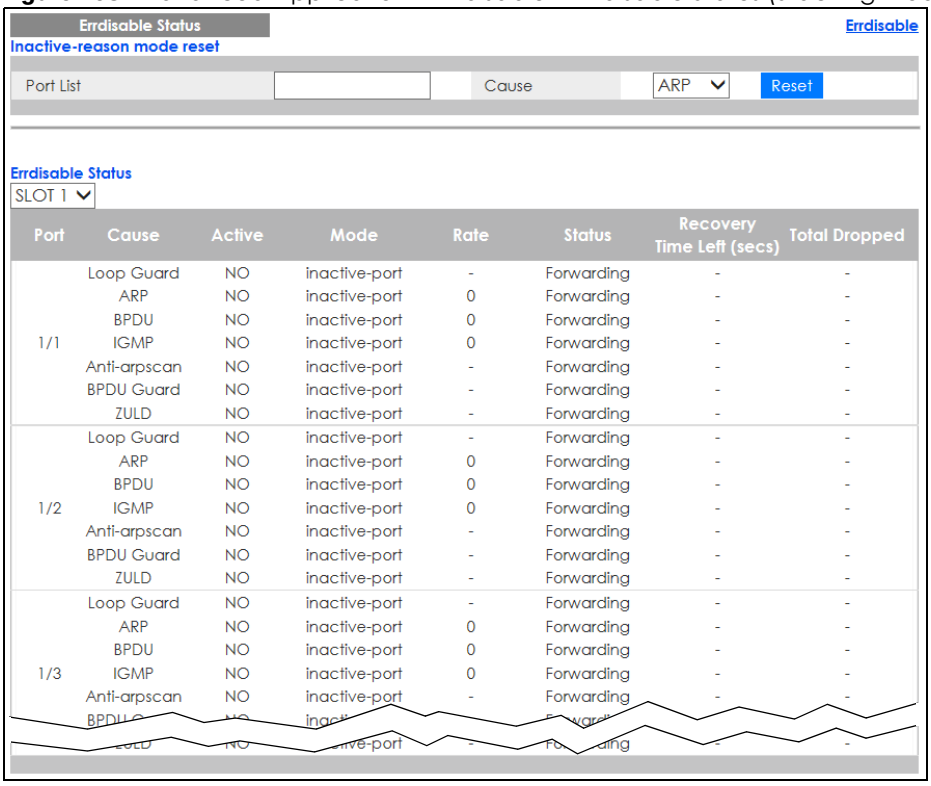



**Figure 298** Advanced Application > Errdisable > Errdisable Status (Stacking Mode)



The following table describes the labels in this screen.

Table 171 Advanced Application > Errdisable > Errdisable Status

| LABEL | DESCRIPTION |
|---|---|
| Inactive-reason mode reset | |
| Port List | Enter the number of the ports (separated by a comma) on which you want to reset inactive-reason status. In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Cause | Select the cause of inactive-reason mode you want to reset here. |
| Reset | Press to reset the specified ports to handle ARP, BPDU or IGMP packets instead of ignoring them, if the ports is in inactive-reason mode. |
| Errdisable Status | |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Cause | This displays the type of the control packet received on the port or the feature enabled on the port and causing the Switch to take the specified action. |
| Active | This field displays whether the control packets (ARP, BPDU, and/or IGMP) on the port is being detected or not. It also shows whether loop guard, anti-arp scanning, BPDU guard or ZULD is enabled on the port. |
| Mode | This field shows the action that the Switch takes for the cause.<br>• **inactive-port** – The Switch disables the port.<br>• **inactive-reason** – The Switch drops all the specified control packets (such as BPDU) on the port.<br>• **rate-limitation** – The Switch drops the additional control packets the ports has to handle in every one second. |
| Rate | This field displays how many control packets this port can receive or transmit per second. It can be adjusted in **CPU Protection**. **0** means no rate limit. |
| Status | This field displays the errdisable status<br>• **Forwarding**: The Switch is forwarding packets. Rate-limitation mode is always in **Forwarding** status.<br>• **Err-disable**: The Switch disables the port on which the control packets are received (**inactive-port**) or drops specified control packets on the port (**inactive-reason**). |
| Recovery Time Left (secs) | This field displays the time (seconds) left before the ports becomes active of Errdisable Recovery. |
| Total Dropped | This field displays the total packet number dropped by this port where the packet rate exceeds the rate of mode rate-limitation. |

# 35.4 CPU Protection Configuration

Use this screen to limit the maximum number of control packets (ARP, BPDU and/or IGMP) that the Switch can receive or transmit on a port. Click the **Click Here** link next to **CPU protection** in the **Advanced Application** > **Errdisable** screen to display the screen as shown.

Note: After you configure this screen, make sure you also enable error detection for the specific control packets in the **Advanced Application** > **Errdisable** > **Errdisable Detect**

screen.

**Figure 299** Advanced Application > Errdisable > CPU protection (Standalone Mode)

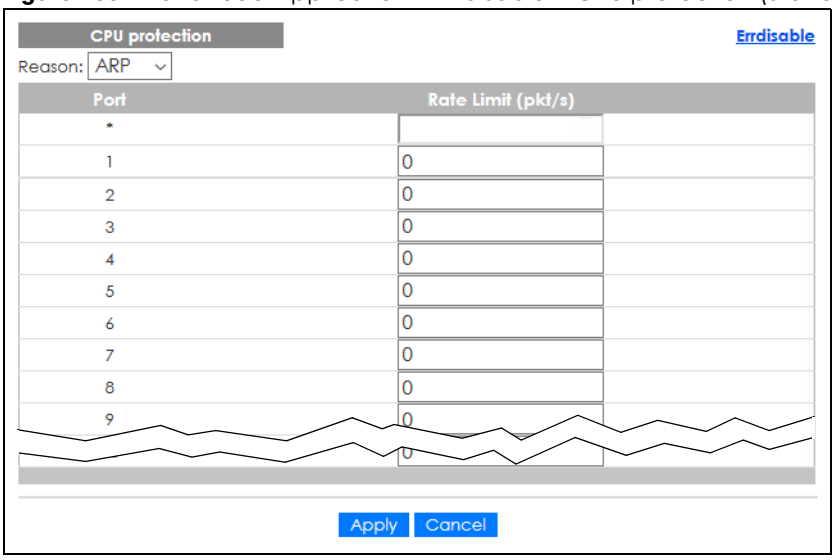
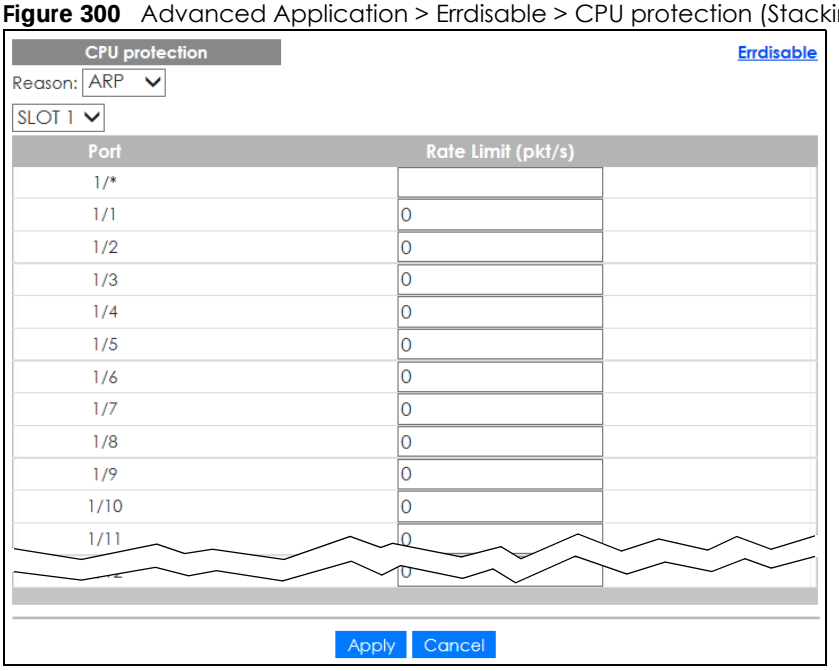



**Figure 300** Advanced Application > Errdisable > CPU protection (Stacking Mode)




The following table describes the labels in this screen.

Table 172 Advanced Application > Errdisable > CPU protection

| LABEL | DESCRIPTION |
|---|---|
| Reason | Select the type of control packet you want to configure here. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

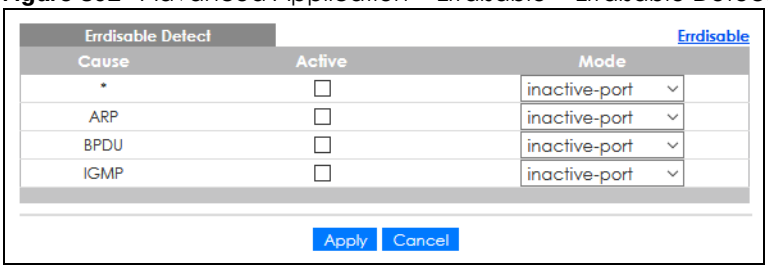
Table 172 Advanced Application > Errdisable > CPU protection (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| Rate Limit (pkt/s) | Enter a number from 0 to 256 to specify how many control packets this port can receive or transmit per second.<br><br>**0** means no rate limit.<br><br>You can configure the action that the Switch takes when the limit is exceeded. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 35.5 Error-Disable Detect Configuration

Use this screen to have the Switch detect whether the control packets exceed the rate limit configured for a port and configure the action to take once the limit is exceeded. Click the **Click Here** link next to **Errdisable Detect** link in the **Advanced Application** > **Errdisable** screen to display the screen as shown.

**Figure 301** Advanced Application > Errdisable > Errdisable Detect




The following table describes the labels in this screen.

Table 173 Advanced Application > Errdisable > Errdisable Detect

| LABEL | DESCRIPTION |
|---|---|
| Cause | This field displays the types of control packet that may cause CPU overload. |
| * | Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary.<br><br>Changes in this row are copied to all the entries as soon as you make them. |
| Active | Select this option to have the Switch detect if the configured rate limit for a specific control packet is exceeded and take the action selected below. |
| Mode | Select the action that the Switch takes when the number of control packets exceed the rate limit on a port, set in the **Advanced Application** > **Errdisable** > **CPU protection** screen.<br><br>• **inactive-port** – The Switch disables the port on which the control packets are received.<br>• **inactive-reason** – The Switch drops all the specified control packets (such as BPDU) on the port.<br>• **rate-limitation** – The Switch drops the additional control packets the ports has to handle in every one second. |

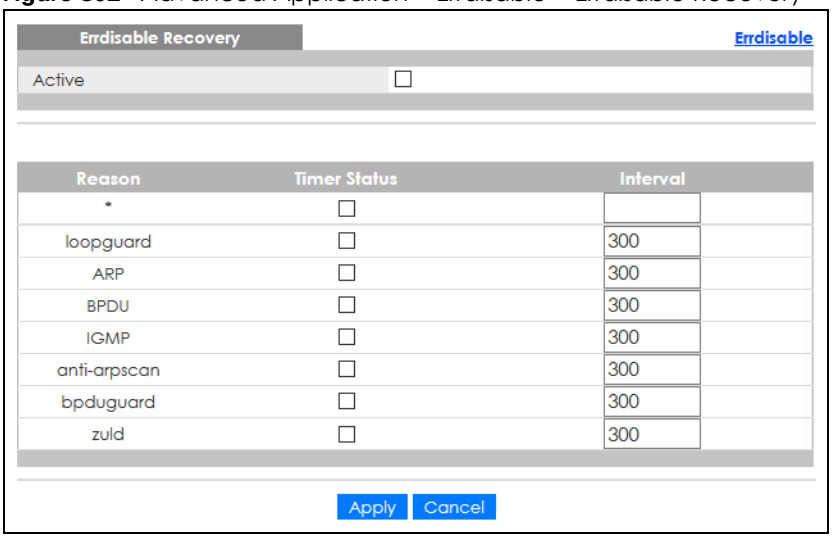
Table 173 Advanced Application > Errdisable > Errdisable Detect (continued)

| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 35.6 Error-Disable Recovery Configuration

Use this screen to configure the Switch to automatically undo an action after the error is gone. Click the **Click Here** link next to **Errdisable Recovery** in the **Advanced Application** > **Errdisable** screen to display the screen as shown.

**Figure 302** Advanced Application > Errdisable > Errdisable Recovery




The following table describes the labels in this screen.

Table 174 Advanced Application > Errdisable > Errdisable Recovery

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to turn on the error-disable recovery function on the Switch. |
| Reason | This field displays the supported features that allow the Switch to shut down a port or discard packets on a port according to the feature requirements and what action you configure. |
| * | Use this row to make the setting the same for all entries. Use this row first and then make adjustments to each entry if necessary.<br><br>Changes in this row are copied to all the entries as soon as you make them. |
| Timer Status | Select this check box to allow the Switch to wait for the specified time interval to activate a port or allow specific packets on a port, after the error was gone. Clear the check box to turn off this rule. |
| Interval | Enter the number of seconds (from 30 to 2592000) for the time interval. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 36
# VLAN Isolation

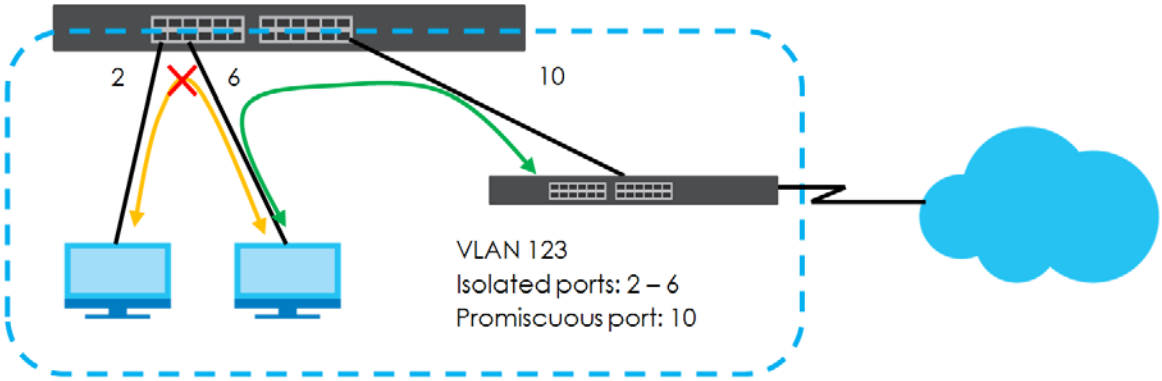
This chapter shows you how to configure the Switch to prevent communications between ports in a VLAN.

## 36.1 VLAN Isolation Overview

Vlan Isolation allows you to do port isolation within a VLAN in a simple way. You specify which ports in a VLAN is not isolated by adding it to the promiscuous port list. The Switch automatically adds other ports in this VLAN to the isolated port list and blocks traffic between the isolated ports. A promiscuous port can communicate with any port in the same VLAN. An isolated port can communicate with the promiscuous ports only.

Note: You can have up to one VLAN Isolation rule for each VLAN.

**Figure 303** VLAN Isolation Example

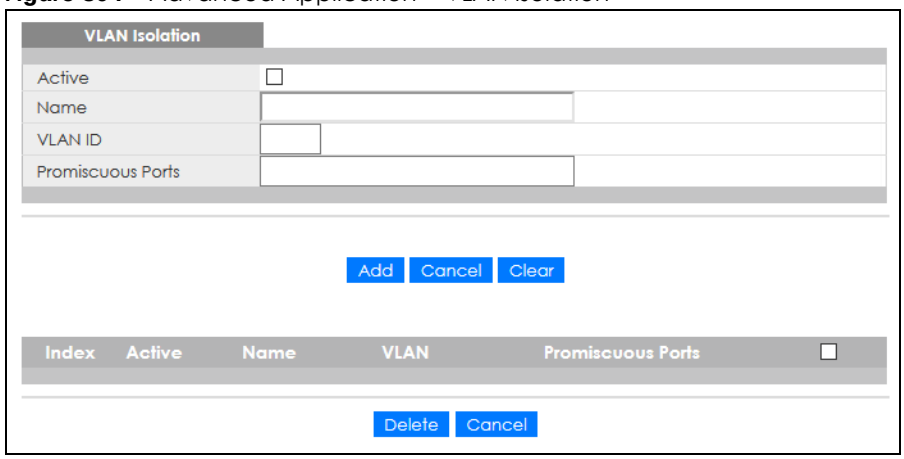



Note: Make sure you keep at least one port in the promiscuous port list for a VLAN with VLAN Isolation enabled. Otherwise, this VLAN is blocked from the whole network.

## 36.2 Configuring VLAN Isolation

Click **Advanced Application** > **Vlan Isolation** in the navigation panel to display the screen as shown.

**Figure 304** Advanced Application > VLAN Isolation




The following table describes the labels in this screen.

Table 175 Advanced Application > VLAN Isolation

| LABEL | DESCRIPTION |
|---|---|
| Active | Check this box to enable VLAN Isolation in a VLAN. |
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| VLAN ID | Enter a VLAN ID from 1 to 4094. This is the VLAN to which this rule applies. |
| Promiscuous Ports | Enter the number of the ports that can communicate with any ports in the same VLAN. Other ports belonging to this VLAN will be added to the isolation list and can only send and receive traffic from the ports you specify here. |
| Add | Click **Add** to insert the entry in the summary table below and save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to clear the fields to the factory defaults. |
| Index | This is the index number of the rule. |
| Active | This shows whether this rule is activated or not. |
| Name | This is the descriptive name for this rule. |
| VLAN | This is the VLAN to which this rule is applied. |
| Promiscuous Ports | This shows the ports that can communicate with any ports in the same VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 37
# MAC Pinning

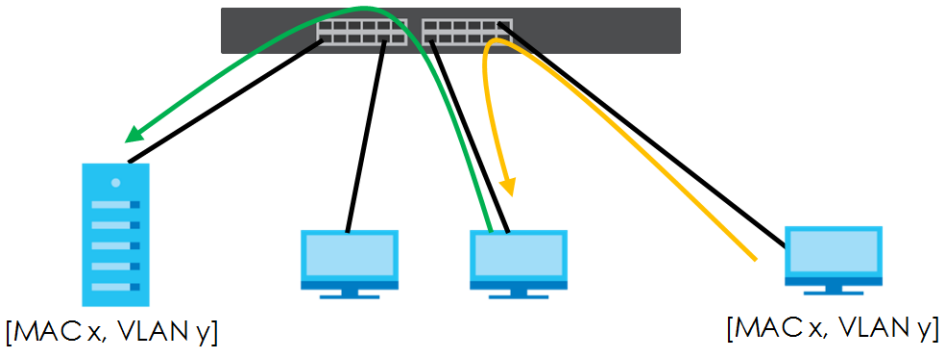
This chapter shows you how to configure MAC pinning on the Switch.

## 37.1 MAC Pinning Overview

When the Switch obtains a connected device's MAC address, it adds an entry in the MAC address forwarding table and uses the table to determine how to forward frames. In addition to the source MAC address of a received frame, the Switch also learns the VLAN to which the device belongs and the port on which the frame is received. If the Switch learns the same MAC address and same VLAN ID on another port, it updates the MAC address table immediately.

MAC pinning allows you to set a port or multiple ports to have priority over other ports in MAC address learning. That means when a MAC address (and VLAN ID) is learned on a MAC-pinning-enabled port, the MAC address will not be learned on any other port until the aging time for the dynamically learned MAC address in the table expires.

This helps enhance security. For example, when an attacker (**A**) sends packets to all connected clients by spoofing the source MAC address of a server (**B**) connected to one of the Switch's ports, on which MAC pinning is enabled, the responses from clients will still be forwarded to the server according to the Switch's MAC forwarding table.




## 37.2 MAC Pinning Configuration

Use this screen to enable MAC pinning on the Switch and on specific ports. Click **Advanced Application** > **MAC Pinning** in the navigation panel to open the following screen.

**Figure 305** Advanced Application > MAC Pinning (Standalone Mode)

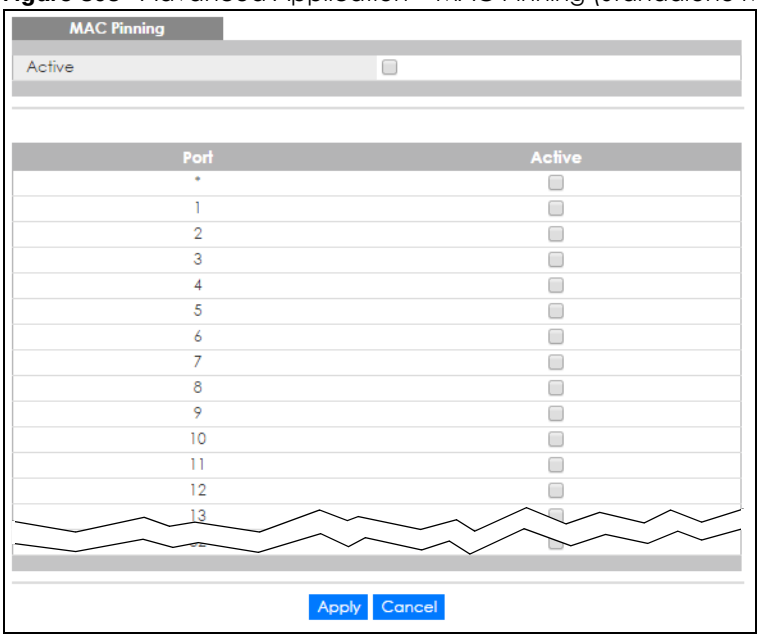
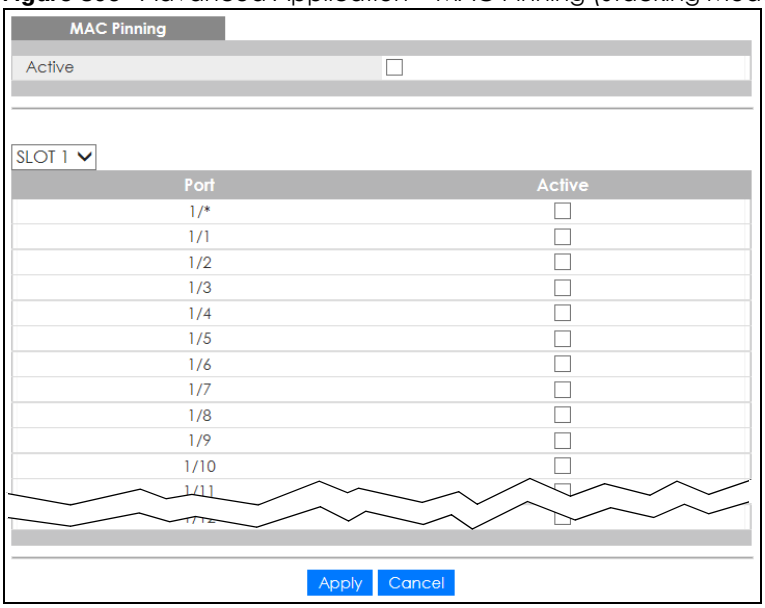



**Figure 306** Advanced Application > MAC Pinning (Stacking Mode)




The following table describes the labels in this screen.

Table 176 Advanced Application > MAC Pinning

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to turn on the MAC pinning function on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 176 Advanced Application > MAC Pinning (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable MAC pinning on this port. The port then has priority over other ports in MAC address learning.<br>Clear this check box to disable MAC pinning. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 38
# Private VLAN

## 38.1 Private VLAN Overview

Use private VLAN if you want you to block traffic between ports in the same VLAN. **Community** and **Isolated** VLANs are secondary private VLANs that must be associated with a **Primary** private VLAN.

- **Primary**: Ports in a **Primary** VLAN are promiscuous and they can communicate with all promiscuous ports in the same primary VLAN, and all ports in associated community and isolated VLANs. They cannot communicate with ports in different primary VLANs.
- **Community**: Ports in a **Community** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN and other community ports in the same **Community** VLAN. They cannot communicate with ports in **Isolated** VLANs, non-associated **Primary** VLAN promiscuous ports nor community ports in different **Community** VLANs.
- **Isolated**: Ports in an **Isolated** VLAN can communicate with promiscuous ports in an associated **Primary** VLAN only. They cannot communicate with other isolated ports in the same **Isolated** VLAN, non-associated **Primary** VLAN promiscuous ports nor any community ports.

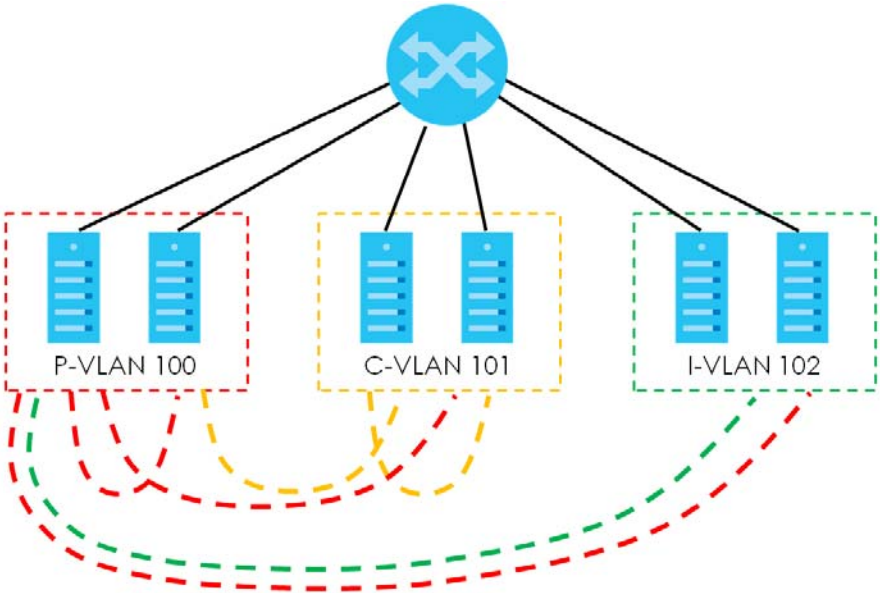



Table 177 PVLAN Graphic Key

| LABEL | DESCRIPTION |
|---|---|
| P-VLAN 100 | Primary private VLAN |
| C-VLAN 101 | Community private VLAN |
| I-VLAN 102 | Isolated private VLAN |

Tagged Private VLANs can span switches but trunking ports must be VLAN-trunking ports – see

**Advanced** > **VLAN** > **VLAN Port Setting**.

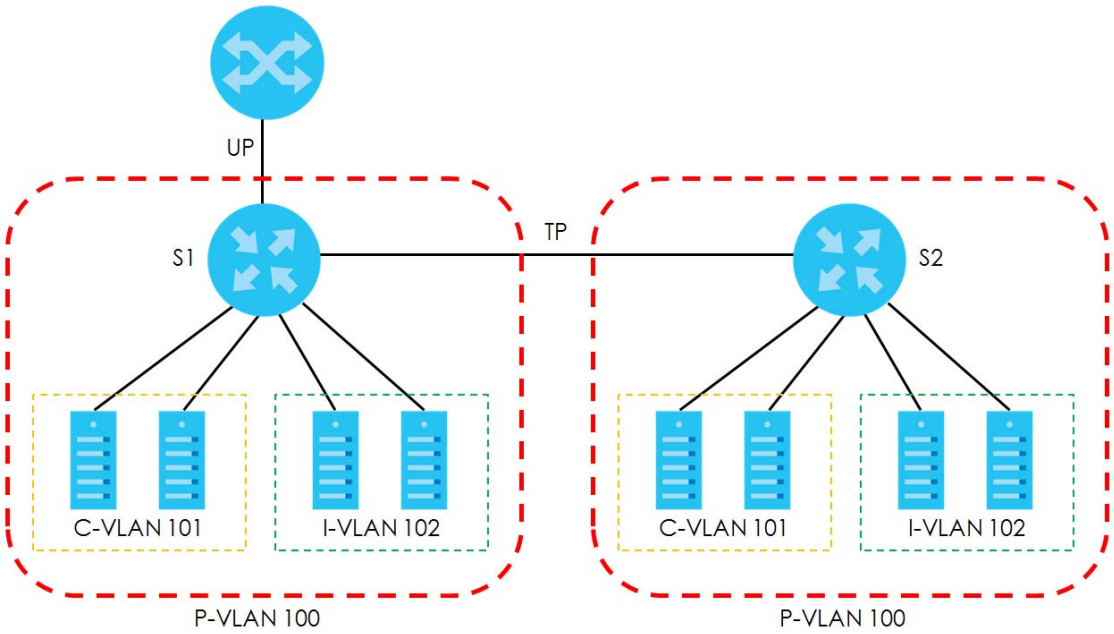



Table 178 Spanning PVLAN Graphic Key

| LABEL | DESCRIPTION |
|---|---|
| UP | Uplink promiscuous port |
| TP | VLAN-trunking ports |
| S1, S2 | Switch 1, Switch 2 |
| P-VLAN 100 | Primary private VLAN with VLAN ID tag of 100 |
| C-VLAN 101 | Community private VLAN with VLAN ID tag of 101 |
| I-VLAN 102 | Isolated private VLAN with VLAN ID tag of 102 |

This is the communication process if primary VLAN **P-VLAN 100** is associated with community VLAN **C-VLAN 101** and isolated VLAN **I-VLAN 102**.

- Promiscuous ports in **P-VLAN 100** can communicate with all ports in **P-VLAN 100** including community ports in **C-VLAN 101** and isolated ports in **I-VLAN 102**.
- Community ports in **C-VLAN 101** can communicate with promiscuous ports in **P-VLAN 100** and other community ports in **C-VLAN 101**. They cannot communicate with isolated ports in **I-VLAN 102**.
- Isolated ports can communicate with promiscuous ports in **P-VLAN 100**. They cannot communicate with other isolated ports in **I-VLAN 102** nor community ports in **C-VLAN 101**.

Note: **Isolation** in **VLAN** > **VLAN Port Setting** has a higher priority than private VLAN settings, so promiscuous ports with **Isolation** in **VLAN** > **VLAN Port Setting** enabled will not be able to communicate with each other.

## 38.1.1 Configuration

You must go to the **Static VLAN** screen first to create VLAN IDs for **Primary**, **Isolated** or **Community** VLANs.

Click **Advanced Application** > **Private VLAN** to display the following screen.

**Figure 307** Advanced Application > Private VLAN (Standalone Mode)

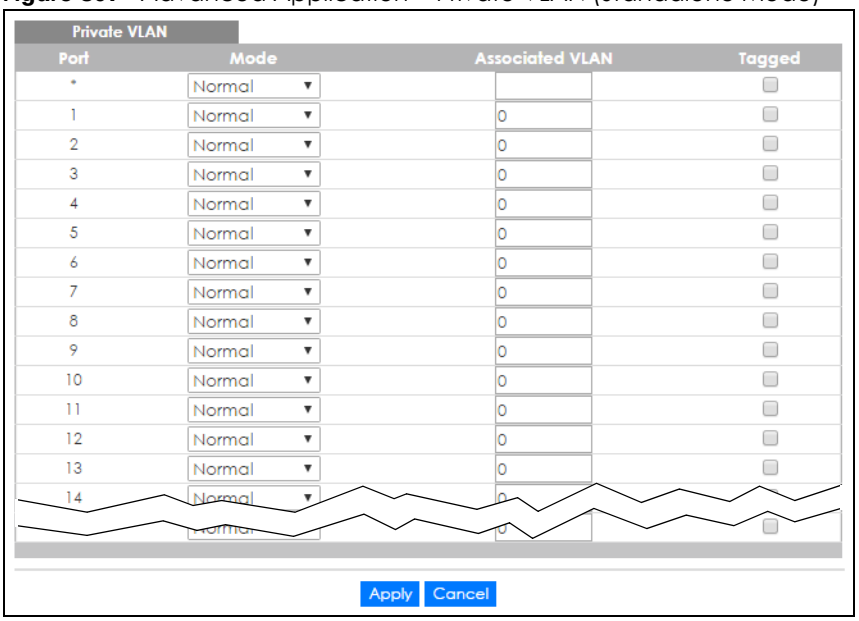
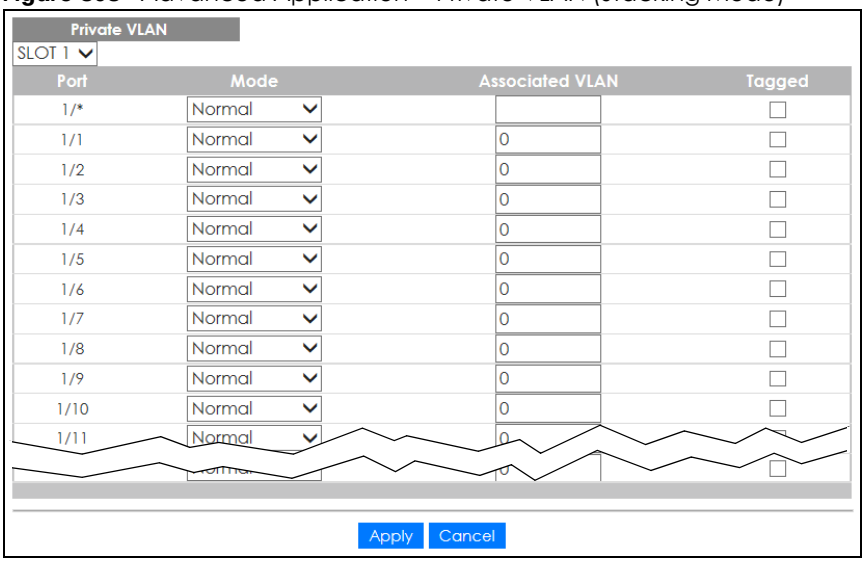



**Figure 308** Advanced Application > Private VLAN (Stacking Mode)




The following table describes the labels in this screen.

Table 179 Advanced Application > Private VLAN

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |

Table 179 Advanced Application > Private VLAN (continued)

| LABEL | DESCRIPTION |
|---|---|
| Mode | This is the type of VLAN mapped to this port.<br>• **Normal**: These are ports in a static VLAN. This is not a private VLAN.<br>• **Promiscuous**: Ports in a **Primary** VLAN are **Promiscuous**. They can communicate with all ports in the **Primary** VLAN and associated **Community** and **Isolated** VLANs. They cannot communicate with **Promiscuous** ports in different primary VLANs.<br>• **Community**: Ports in a **Community** VLAN can communicate with **Promiscuous** ports in an associated Primary VLAN and other community ports in the same **Community** VLAN. They cannot communicate with ports in an **Isolated** VLAN, non-associated **Primary** VLAN **Promiscuous** ports nor **Community** ports in different **Community** VLANs.<br>• **Isolated:** Ports in an **Isolated** VLAN can communicate with **Promiscuous** ports in an associated **Primary** VLAN only. They cannot communicate with other **Isolated** ports in the same **Isolated** VLAN, non-associated **Primary** VLAN **Promiscuous** ports nor any **Community** ports. |
| Associated VLAN | Enter the VLAN ID of a previously created VLAN here.<br>Note: The VLAN ID and **Mode** selected here must be the same as the VLAN ID and **VLAN Type** created in **Advanced Application** > **VLAN** > **Static VLAN**. |
| Tagged | A VLAN ID tag identifies VLAN membership of a frame across switches.<br>Select this if the VLAN includes ports on multiple switches. The Switch forwards tagged frames through this port; it adds the PVID to untagged frames before sending them out.<br>Clear this if the VLAN includes ports on this Switch only. The Switch forwards untagged frames through this port; it removes the VLAN ID from tagged frames before sending them out. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 39
# Green Ethernet

This chapter shows you how to configure the Switch to reduce the power consumed by switch ports.

## 39.1 Green Ethernet Overview

Green Ethernet reduces switch port power consumption in the following ways.

### IEEE 802.3az Energy Efficient Ethernet (EEE)

If EEE is enabled, both sides of a link support EEE and there is no traffic, the port enters Low Power Idle (LPI) mode. LPI mode turns off some functions of the physical layer (becomes quiet) to save power. Periodically the port transmits a REFRESH signal to allow the link partner to keep the link alive. When there is traffic to be sent, a WAKE signal is sent to the link partner to return the link to active mode.

### Auto Power Down

**Auto Power Down** turns off almost all functions of the port's physical layer functions when the link is down, so the port only uses power to check for a link up pulse from the link partner. After the link up pulse is detected, the port wakes up from **Auto Power Down** and operates normally.

### Short Reach

Traditional Ethernet transmits all data with enough power to reach the maximum cable length. Shorter cables lose less power, so **Short Reach** saves power by adjusting the transmit power of each port according to the length of cable attached to that port.

## 39.2 Configuring Green Ethernet

Click **Advanced Application** > **Green Ethernet** in the navigation panel to display the screen as shown.

Note: EEE, Auto Power Down and Short Reach are NOT supported on an uplink port.

**Figure 309** Advanced Application > Green Ethernet (Standalone Mode)

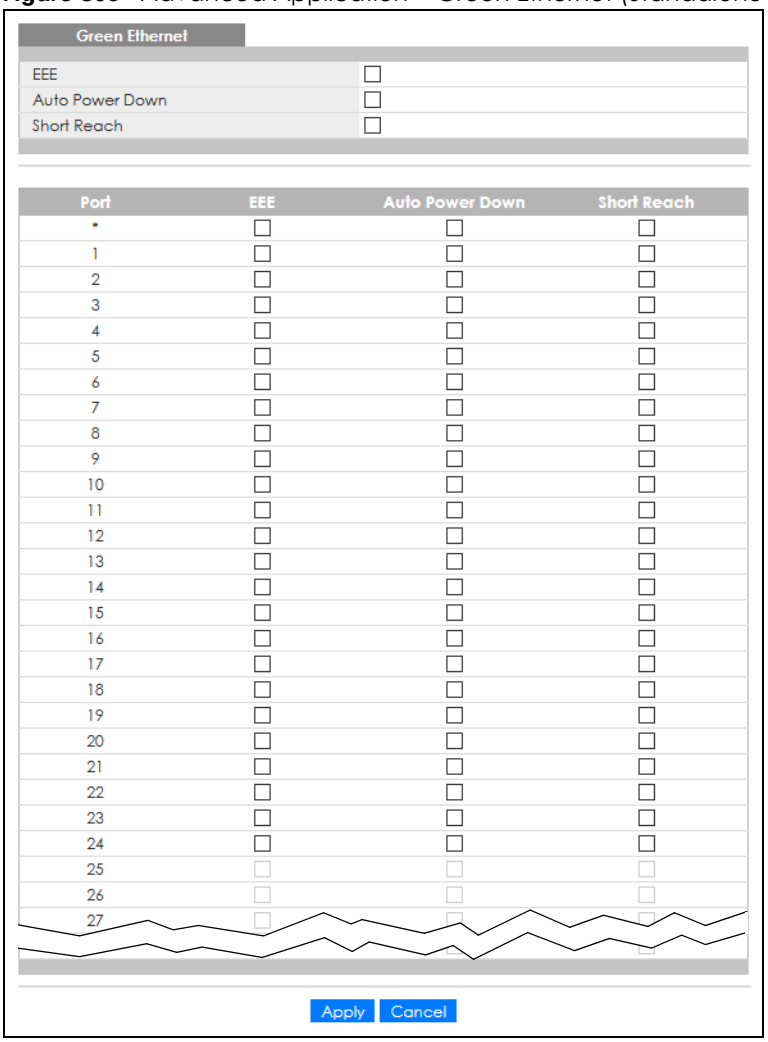
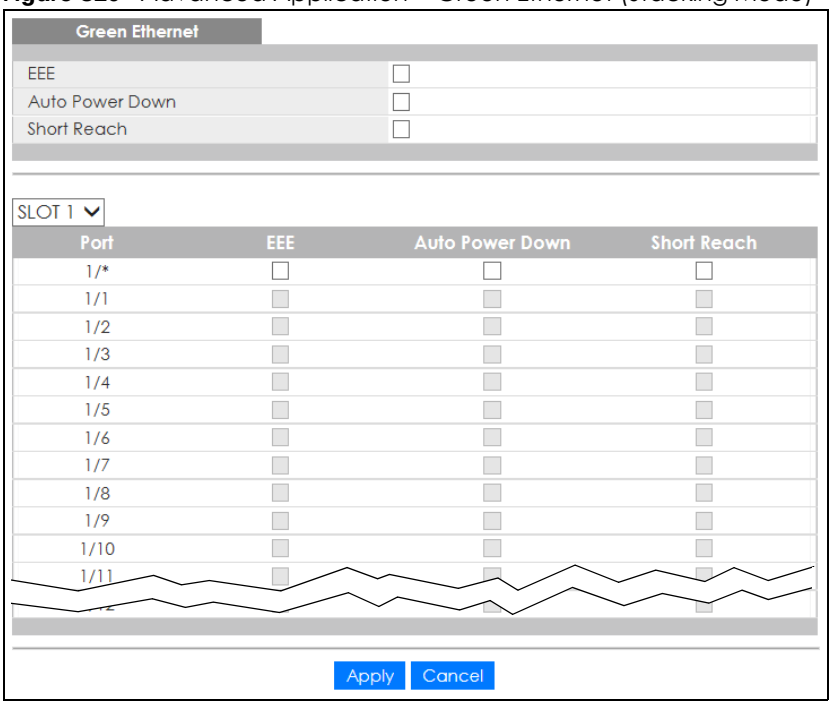


**Figure 310** Advanced Application > Green Ethernet (Stacking Mode)




The following table describes the labels in this screen.

Table 180 Advanced Application > Green Ethernet

| LABEL | DESCRIPTION |
|---|---|
| EEE | Select this to activate Energy Efficient Ethernet globally. |
| Auto Power Down | Select this to activate Auto Power Down globally. |
| Short Reach | Select this to activate Short Reach globally. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| EEE | Select this to activate Energy Efficient Ethernet on this port. |
| Auto Power Down | Select this to activate Auto Power Down on this port. |
| Short Reach | Select this to activate Short Reach on this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 40
# Link Layer Discovery Protocol (LLDP)

## 40.1 LLDP Overview

The LLDP (Link Layer Discovery Protocol) is a layer 2 protocol. It allows a network device to advertise its identity and capabilities on the local network. It also allows the device to maintain and store information from adjacent devices which are directly connected to the network device. This helps an administrator discover network changes and perform necessary network reconfiguration and management. The device information is encapsulated in the LLDPDUs (LLDP data units) in the form of TLV (Type, Length, Value). Device information carried in the received LLDPDUs is stored in the standard MIB.

The Switch supports these basic management TLVs.

- End of LLDPDU (mandatory)
- Chassis ID (mandatory)
- Port ID (mandatory)
- Time to Live (mandatory)
- Port Description (optional)
- System Name (optional)
- System Description (optional)
- System Capabilities (optional)
- Management Address (optional)

The Switch also supports the IEEE 802.1 and IEEE 802.3 organizationally-specific TLVs.

IEEE 802.1 specific TLVs:

- Port VLAN ID TLV (optional)
- Port and Protocol VLAN ID TLV (optional)

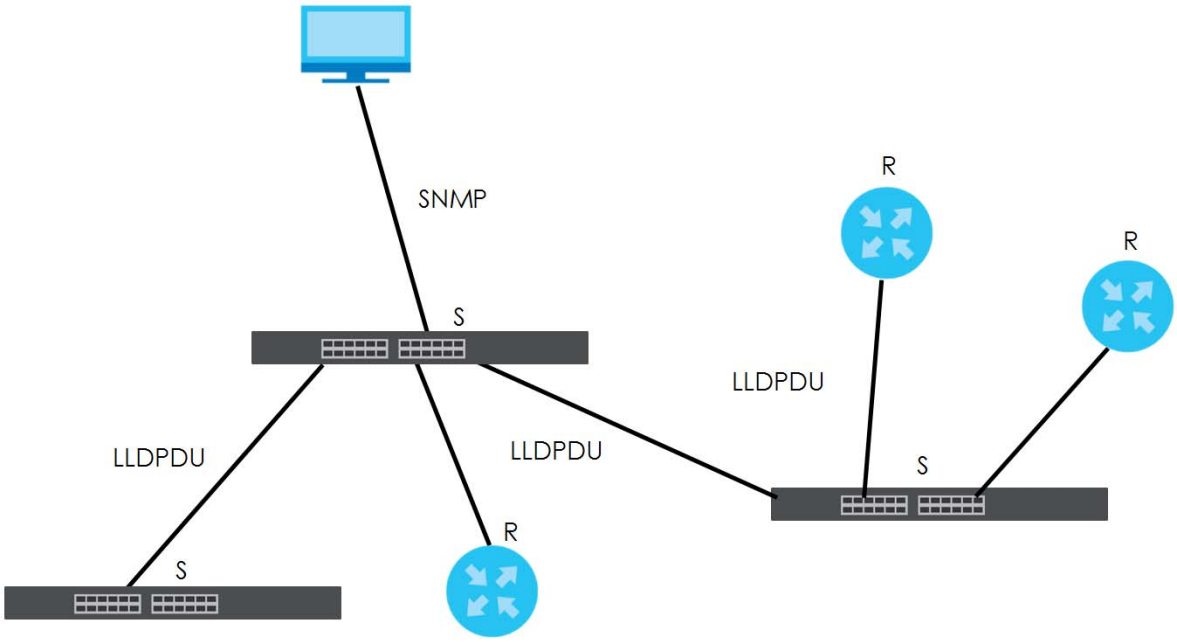
IEEE 802.3 specific TLVs:

- MAC/PHY Configuration/Status TLV (optional)
- Link Aggregation TLV (optional)
- Maximum Frame Size TLV (optional)

The optional TLVs are inserted between the Time To Live TLV and the End of LLDPDU TLV.

The next figure demonstrates that the network devices Switches and Routers (S and R) transmit and receive device information through LLDPDU and the network manager can query the information using Simple Network Management Protocol (SNMP).

**Figure 311** LLDP Overview




# 40.2 LLDP-MED Overview

LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) is an extension to the standard LLDP developed by the Telecommunications Industry Association (TIA) TR-41.4 subcommittee which defines the enhanced discovery capabilities, such as VoIP applications, to enable network administrators manage their network topology application more efficiently. Unlike the traditional LLDP, which has some limitations when handling multiple application devices, the LLDP-MED offers display of accurate physical topology, interoperability of devices, and easy trouble shooting for mis-configured IP addresses. There are three classes of endpoint devices that the LLDP-MED supports:

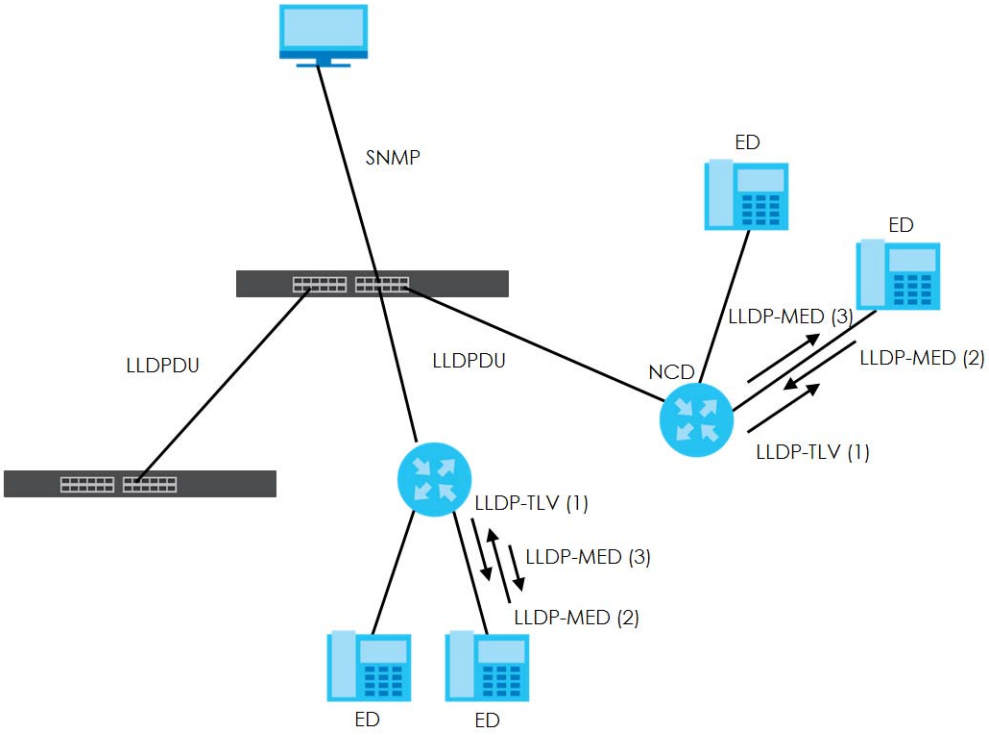
Class I: IP Communications Controllers or other communication related servers

Class II: Voice Gateways, Conference Bridges or Media Servers

Class III: IP-Phones, PC-based Softphones, End user Communication Appliances supporting IP Media

The following figure shows that with the LLDP-MED, network connectivity devices (NCD) like Switches and Routers will transmit LLDP TLV to endpoint device (ED) like IP Phone first (1), to get its device type and capabilities information, then it will receive that information in LLDP-MED TLV back from endpoint devices (2), after that the network connectivity devices will transmit LLDP-MED TLV (3) to provision the endpoint device to such that the endpoint device's network policy and location identification information is updated. Since LLDPDU updates status and configuration information periodically, network managers may check the result of provision through remote status. The remote status is updated by receiving LLDP-MED TLVs from endpoint devices.

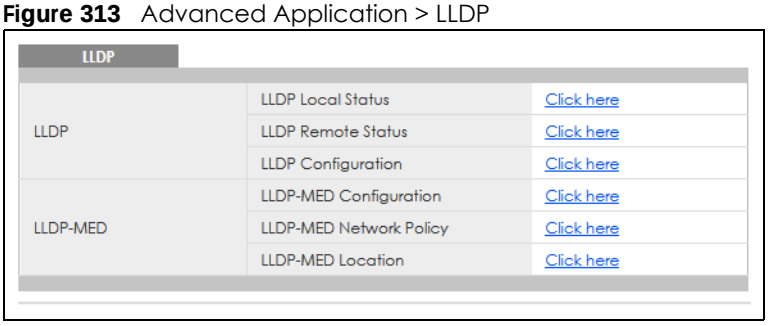
**Figure 312** LLDP-MED Overview




# 40.3 LLDP Settings

Click **Advanced Application** > **LLDP** in the navigation panel to display the screen as shown next.

**Figure 313** Advanced Application > LLDP




The following table describes the labels in this screen.

Table 181 Advanced Application > LLDP

| LABEL | DESCRIPTION |
|---|---|
| LLDP | |
| LLDP Local Status | Click here to show a screen with the Switch's LLDP information. |
| LLDP Remote Status | Click here to show a screen with LLDP information from the neighboring devices. |
| LLDP Configuration | Click here to show a screen to configure LLDP parameters. |

Table 181 Advanced Application > LLDP (continued)

| LABEL | DESCRIPTION |
|---|---|
| LLDP-MED | |
| LLDP-MED Configuration | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) parameters. |
| LLDP-MED Network Policy | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) network policy parameters. |
| LLDP-MED Location | Click here to show a screen to configure LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) location parameters. |

# 40.4 LLDP Local Status

This screen displays a summary of LLDP status on this Switch. Click **Advanced Application** > **LLDP** > **LLDP Local Status** to display the screen as shown next.

**Figure 314** Advanced Application > LLDP > LLDP Local Status (Standalone Mode)

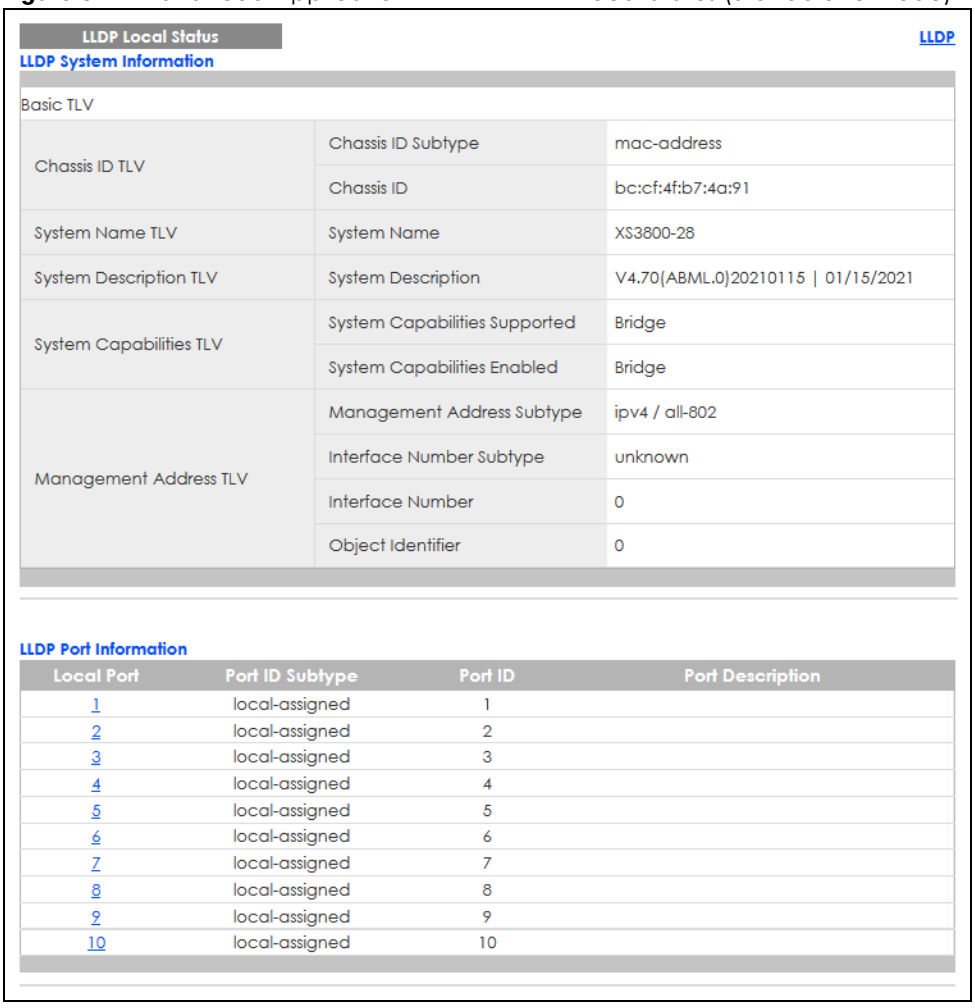
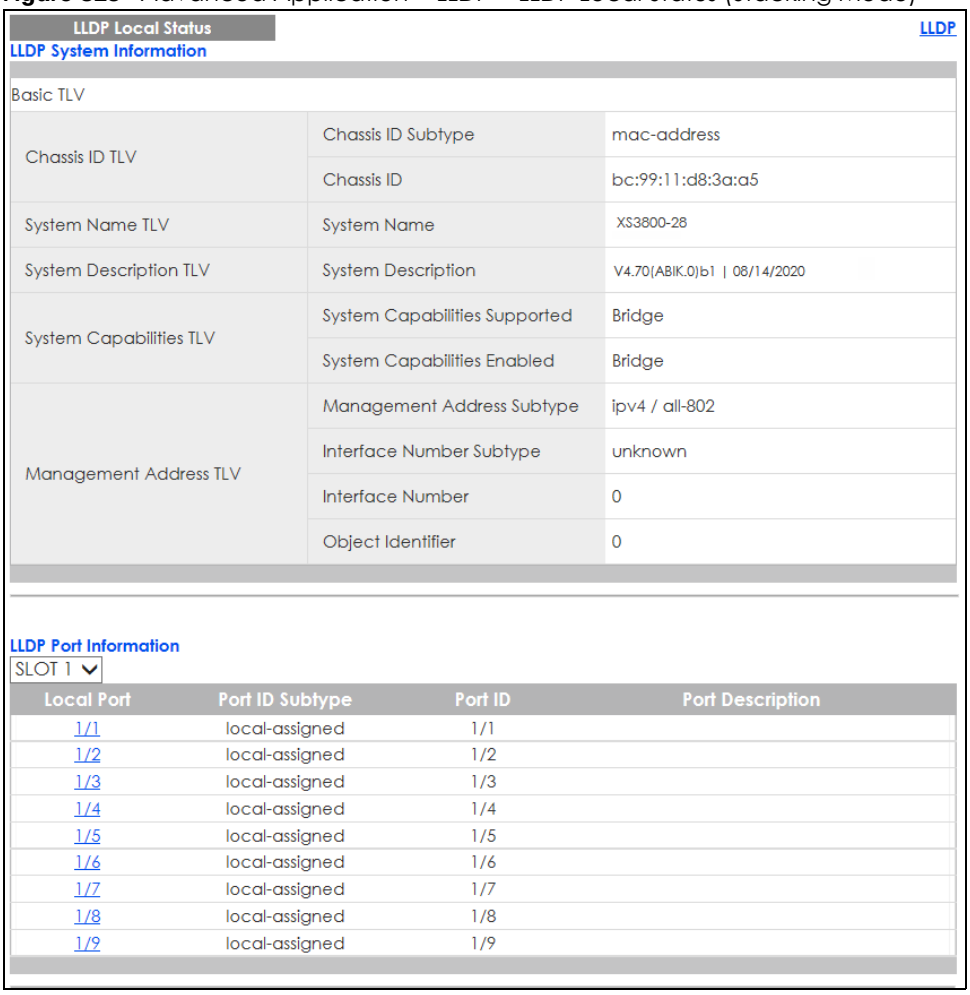


**Figure 315** Advanced Application > LLDP > LLDP Local Status (Stacking Mode)




The following table describes the labels in this screen.

Table 182 Advanced Application > LLDP > LLDP Local Status

| LABEL | DESCRIPTION |
|---|---|
| Basic TLV | |
| Chassis ID TLV | This displays the chassis ID of the local Switch, that is the Switch you are configuring. The chassis ID is identified by the chassis ID subtype.<br>**Chassis ID Subtype** – this displays how the chassis of the Switch is identified.<br>**Chassis ID** – This displays the chassis ID of the local Switch. |
| System Name TLV | This shows the host name of the Switch. |
| System Description TLV | This shows the firmware version of the Switch. |
| System Capabilities TLV | This shows the System Capabilities enabled and supported on the local Switch.<br>• **System Capabilities Supported** – Bridge<br>• **System Capabilities Enabled** – Bridge |

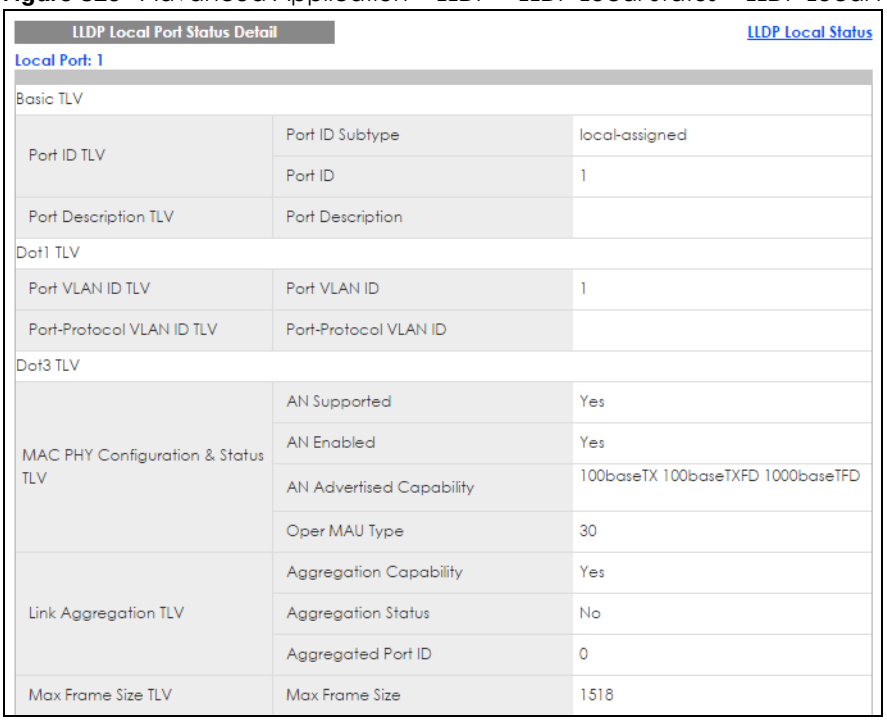
Table 182 Advanced Application > LLDP > LLDP Local Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Management Address TLV | The Management Address TLV identifies an address associated with the local LLDP agent that may be used to reach higher layer entities to assist discovery by network management. The TLV may also include the system interface number and an object identifier (OID) that are associated with this management address.<br>This field displays the Management Address settings on the specified ports.<br>• **Management Address Subtype** – ipv4 or all-802<br>• **Interface Number Subtype** – unknown<br>• **Interface Number** – 0 (not supported)<br>• **Object Identifier** – 0 (not supported) |
| LLDP Port Information | This displays the local port information. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Local Port | This displays the number of the Switch port which receives the LLDPDU from the remote device. Click a port number to view the detailed LLDP status on this port at **LLDP Local Port Status Detail** screen.<br>In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Port ID Subtype | This indicates how the port ID field is identified. |
| Port ID | This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted. |
| Port Description | This shows the port description that the Switch will advertise from this port. |

## 40.4.1 LLDP Local Port Status Detail

This screen displays detailed LLDP status for each port on this Switch. Click **Advanced Application** > **LLDP** > **LLDP Local Status** and then, click a port number, for example 1 in the local port column to display the screen as shown next.

**Figure 316** Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (Basic TLV)



LLDP Local Port Status Detail

LLDP Local Status

Local Port: 1

| | | |
|---|---|---|
| Basic TLV | | |
| Port ID TLV | Port ID Subtype | local-assigned |
| | Port ID | 1 |
| Port Description TLV | Port Description | |
| Dot1 TLV | | |
| Port VLAN ID TLV | Port VLAN ID | 1 |
| Port-Protocol VLAN ID TLV | Port-Protocol VLAN ID | |
| Dot3 TLV | | |
| MAC PHY Configuration & Status TLV | AN Supported | Yes |
| | AN Enabled | Yes |
| | AN Advertised Capability | 100baseTX 100baseTXFD 1000baseTFD |
| | Oper MAU Type | 30 |
| Link Aggregation TLV | Aggregation Capability | Yes |
| | Aggregation Status | No |
| | Aggregated Port ID | 0 |
| Max Frame Size TLV | Max Frame Size | 1518 |

**Figure 317** Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (MED TLV)

| | | |
|---|---|---|
| MED TLV | | |
| Capabilities TLV | Network Policy | Yes |
| | Location | Yes |
| | Extend Power via MDI PSE | No |
| | Extend Power via MDI PD | No |
| | Inventory Management | No |
| Device Type TLV | Device Type | Network Connectivity |
| Network Policy TLV | Voice | |
| | Voice-Signaling | |
| | Guest-Voice | |
| | Guest-Voice-Signaling | |
| | Softphone-Voice | |
| | Video-Conferencing | |
| | Streaming-Video | |
| | Video-Signaling | |
| Location Identification TLV | Coordinate-base LCI | |
| | Civic LCI | |
| | ELIN | |

The following table describes the labels in this screen.

Table 183 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail

| LABEL | DESCRIPTION |
|---|---|
| Local Port | This displays the number of the Switch's port. |
| Basic TLV | These are the Basic TLV flags |
| Port ID TLV | The port ID TLV identifies the specific port that transmitted the LLDP frame.<br>• **Port ID Subtype**: This shows how the port is identified.<br>• **Port ID**: This is the ID of the port. In stacking mode, the first number represents the slot and the second the port number. |
| Port Description TLV | This displays the local port description. |
| Dot1 TLV | |
| Port VLAN ID TLV | This displays the VLAN ID sent by the IEEE 802.1 Port VLAN ID TLV. |
| Port Protocol VLAN ID TLV | This displays the IEEE 802.1 Port Protocol VLAN ID TLVs, which indicates whether the VLAN is enabled and supported. |
| Dot3 TLV | |
| MAC PHY Configuration & Status TLV | The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override.<br>• **AN Supported** – Displays if the port supports or does not support auto-negotiation.<br>• **AN Enabled** – The current auto-negotiation status of the port.<br>• **AN Advertised Capability** – The auto-negotiation capabilities of the port.<br>• **Oper MAU Type** – The current Medium Attachment Unit (MAU) type of the port. |
| Link Aggregation TLV | The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation.<br>• **Aggregation Capability** – The current aggregation capability of the port.<br>• **Aggregation Status** – The current aggregation status of the port.<br>• **Aggregation Port ID** – The aggregation ID of the current port. |
| Max Frame Size TLV | This displays the maximum supported frame size in octets. |
| MED TLV | LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting. |
| Capabilities TLV | This field displays which LLDP-MED TLV are capable to transmit on the Switch.<br>• **Network Policy**<br>• **Location**<br>• **Extend Power via MDI PSE**<br>• **Extend Power via MDI PD**<br>• **Inventory Management** |
| Device Type TLV | This is the LLDP-MED device class. The Zyxel Switch device type is:<br>• Network Connectivity |

Table 183 Advanced Application > LLDP > LLDP Local Status > LLDP Local Port Status Detail (continued)

| LABEL | DESCRIPTION |
|---|---|
| Network Policy TLV | This displays a network policy for the specified application.<br>• **Voice**<br>• **Voice-Signaling**<br>• **Guest-Voice**<br>• **Guest-Voice-Signaling**<br>• **Softphone-Voice**<br>• **Video-Conferencing**<br>• **Streaming-Video**<br>• **Video-Signaling** |
| Location Identification TLV | This shows the location information of a caller by its ELIN (Emergency Location Identifier Number) or the IETF Geopriv Civic Address based Location Configuration Information (Civic Address LCI).<br>• **Coordinate-based LCI** – latitude, longitude and altitude coordinates of the location Configuration Information (LCI)<br>• **Civic LCI** – IETF Geopriv Civic Address based Location Configuration Information<br>• **ELIN** – (Emergency Location Identifier Number) |

# 40.5 LLDP Remote Status

This screen displays a summary of LLDP status for each LLDP connection to a neighboring Switch. Click **Advanced Application** > **LLDP** > **LLDP Remote Status (Click Here)** to display the screen as shown next.

**Figure 318** Advanced Application > LLDP > LLDP Remote Status (Standalone Mode)

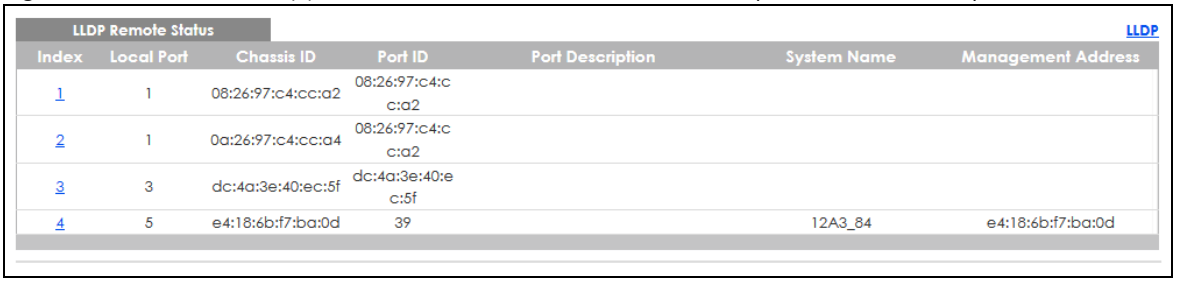
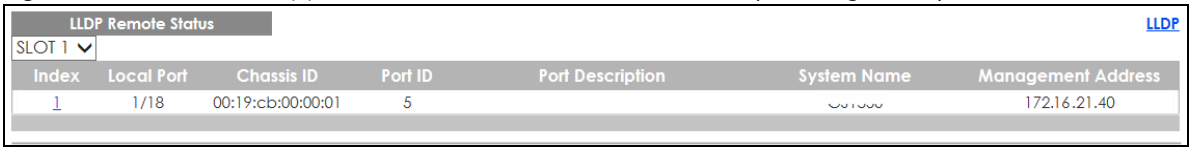



**Figure 319** Advanced Application > LLDP > LLDP Remote Status (Stacking Mode)




The following table describes the labels in this screen.

Table 184 Advanced Application > LLDP > LLDP Remote Status

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Index | The index number shows the number of remote devices that are connected to the Switch. Click on an index number to view the detailed LLDP status for this remote device in the **LLDP Remote Port Status Detail** screen. |

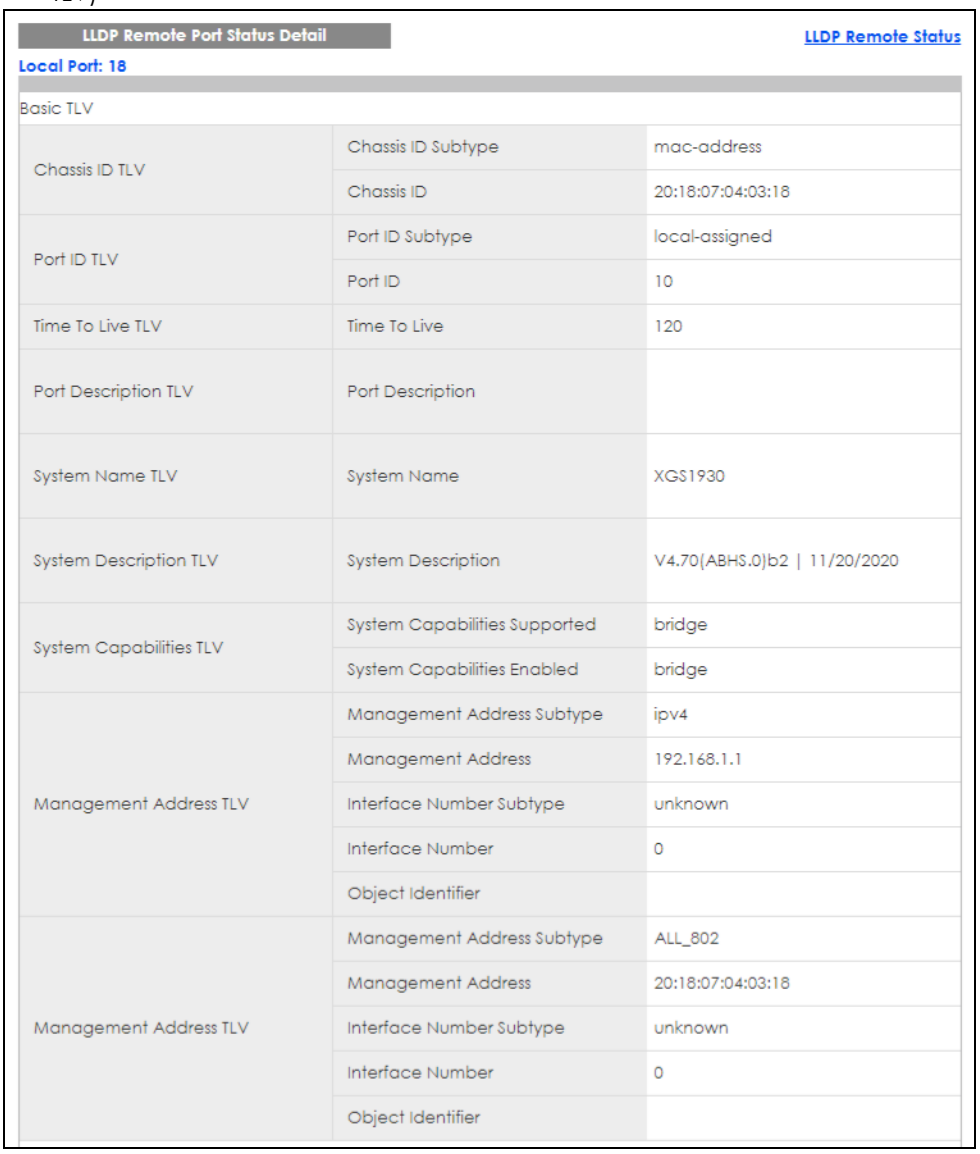
Table 184 Advanced Application > LLDP > LLDP Remote Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Local Port | This is the number of the Switch's port that received LLDPDU from the remote device. In stacking mode, the first number represents the slot and the second the port number. |
| Chassis ID | This displays the chassis ID of the remote device associated with the transmitting LLDP agent. The chassis ID is identified by the chassis ID subtype. For example, the MAC address of the remote device. |
| Port ID | This is an alpha-numeric string that contains the specific identifier for the port from which this LLDPDU was transmitted. The port ID is identified by the port ID subtype. |
| Port Description | This displays a description for the port from which this LLDPDU was transmitted. |
| System Name | This displays the system name of the remote device. |
| Management Address | This displays the management address of the remote device. It could be the MAC address or IP address. |

## 40.5.1 LLDP Remote Port Status Detail

This screen displays detailed LLDP status of the remote device connected to the Switch. Click **Advanced Application** > **LLDP** > **LLDP Remote Status (Click Here)** and then click an index number, for example 1, in the **Index** column in the **LLDP Remote Status** screen to display the screen as shown next.

**Figure 320** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)



LLDP Remote Port Status Detail — LLDP Remote Status

Local Port: 18

| Basic TLV | | |
|---|---|---|
| Chassis ID TLV | Chassis ID Subtype | mac-address |
| | Chassis ID | 20:18:07:04:03:18 |
| Port ID TLV | Port ID Subtype | local-assigned |
| | Port ID | 10 |
| Time To Live TLV | Time To Live | 120 |
| Port Description TLV | Port Description | |
| System Name TLV | System Name | XGS1930 |
| System Description TLV | System Description | V4.70(ABHS.0)b2 \| 11/20/2020 |
| System Capabilities TLV | System Capabilities Supported | bridge |
| | System Capabilities Enabled | bridge |
| Management Address TLV | Management Address Subtype | ipv4 |
| | Management Address | 192.168.1.1 |
| | Interface Number Subtype | unknown |
| | Interface Number | 0 |
| | Object Identifier | |
| Management Address TLV | Management Address Subtype | ALL_802 |
| | Management Address | 20:18:07:04:03:18 |
| | Interface Number Subtype | unknown |
| | Interface Number | 0 |
| | Object Identifier | |

The following table describes the labels in Basic TLV part of the screen.

Table 185 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV)

| LABEL | DESCRIPTION |
|---|---|
| Local Port | This displays the number of the Switch's port to which the remote device is connected. In stacking mode, the first number represents the slot and the second the port number. |
| Basic TLV | |
| Chassis ID TLV | • **Chassis ID Subtype** – this displays how the chassis of the remote device is identified.<br>• **Chassis ID** – this displays the chassis ID of the remote device. The chassis ID is identified by the chassis ID subtype. |
| Port ID TLV | • **Port ID Subtype** – this displays how the port of the remote device is identified.<br>• **Port ID** – this displays the port ID of the remote device. The port ID is identified by the port ID subtype. |

Table 185 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Basic TLV) (continued)

| LABEL | DESCRIPTION |
|---|---|
| Time To Live TLV | This displays the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP frames transmitting interval. |
| Port Description TLV | This displays the remote port description. |
| System Name TLV | This displays the system name of the remote device. |
| System Description TLV | This displays the system description of the remote device. |
| System Capabilities TLV | This displays whether the system capabilities are enabled and supported on the remote device.<br>• **System Capabilities Supported**<br>• **System Capabilities Enabled** |
| Management Address TLV | This displays the management address (IPv4 and IPv6) of the remote device.<br>• **Management Address Subtype**<br>• **Management Address**<br>• **Interface Number Subtype**<br>• **Interface Number**<br>• **Object Identifier** |

**Figure 321** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot1 and Dot3 TLV)

| | | |
|---|---|---|
| Dot1 TLV | | |
| Port VLAN ID TLV | Port VLAN ID | |
| Port-Protocol VLAN ID TLV | Port-Protocol VLAN ID | |
| | Port-Protocol VLAN ID Supported | |
| | Port-Protocol VLAN ID Enabled | |
| Vlan Name TLV | VLAN ID | |
| | VLAN Name | |
| Protocol Identity TLV | Protocol ID | |
| Dot3 TLV | | |
| MAC PHY Configuration & Status TLV | AN Supported | No |
| | AN Enabled | No |
| | AN Advertised Capability | |
| | Oper MAU type | 0 |
| Link Aggregation TLV | Aggregation Capability | Yes |
| | Aggregation Status | No |
| | Aggregated Port ID | 0 |
| Power Via MDI TLV | Port Class | |
| | MDI Supported | |
| | MDI Enabled | |
| | Pair Controlable | |
| | PSE Power Pairs | |
| | Power Class | |
| Max Frame Size TLV | Max Frame Size | |

The following table describes the labels in the Dot1 and Dot3 parts of the screen.

Table 186 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot1 and Dot3 TLV)

| LABEL | DESCRIPTION |
|---|---|
| Dot1 TLV | |
| Port VLAN ID TLV | This displays the VLAN ID of this port on the remote device. |
| Port-Protocol VLAN ID TLV | This displays the IEEE 802.1 Port Protocol VLAN ID TLV, which indicates whether the VLAN ID and whether it is enabled and supported on the port of remote Switch which sent the LLDPDU.<br>• **Port-Protocol VLAN ID**<br>• **Port-Protocol VLAN ID Supported**<br>• **Port-Protocol VLAN ID Enabled** |

Table 186 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (Dot1 and Dot3 TLV) (continued)

| LABEL | DESCRIPTION |
|---|---|
| Vlan Name TLV | This shows the VLAN ID and name for remote device port.<br>• **VLAN ID**<br>• **VLAN Name** |
| Protocol Identity TLV | The Protocol Identity TLV allows the Switch to advertise the particular protocols that are accessible through its port. |
| Dot3 TLV | |
| MAC PHY Configuration & Status TLV | The MAC/PHY Configuration/Status TLV advertises the bit-rate and duplex capability of the sending 802.3 node. It also advertises the current duplex and bit-rating of the sending node. Lastly, it advertises whether these setting were the result of auto-negotiation during link initiation or manual override.<br>• **AN Supported** – Displays if the port supports or does not support auto-negotiation.<br>• **AN Enabled** – The current auto-negotiation status of the port.<br>• **AN Advertised Capability** – The auto-negotiation capabilities of the port.<br>• **Oper MAU Type** – The current Medium Attachment Unit (MAU) type of the port. |
| Link Aggregation TLV | The Link Aggregation TLV indicates whether the link is capable of being aggregated, whether the link is currently in an aggregation, and if in an aggregation, the port identification of the aggregation.<br>• **Aggregation Capability** – The current aggregation capability of the port.<br>• **Aggregation Status** – The current aggregation status of the port.<br>• **Aggregation Port ID** – The aggregation ID of the current port. |
| Power Via MDI TLV | The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending port on the remote device.<br>• **Port Class**<br>• **MDI Supported**<br>• **MDI Enabled**<br>• **Pair Controllable**<br>• **PSE Power Pairs**<br>• **Power Class** |
| Max Frame Size TLV | This displays the maximum supported frame size in octets. |

**Figure 322** Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

| MED TLV | | |
|---|---|---|
| Capabilities TLV | Network Policy | |
| | Location | |
| | Extend Power via MDI PSE | |
| | Extend Power via MDI PD | |
| | Inventory Management | |
| Device Type TLV | Device Type | |
| Network Policy TLV | Voice | |
| | Voice-Signaling | |
| | Guest-Voice | |
| | Guest-Voice-Signaling | |
| | Softphone-Voice | |
| | Video-Conferencing | |
| | Streaming-Video | |
| | Video-Signaling | |
| Location Identification TLV | Coordinate-base LCI | |
| | Civic LCI | |
| | ELIN | |
| Inventory TLV | Hardware Revision | |
| | Software Revision | |
| | Firmware Revision | |
| | Model Name | |
| | Manufacturer | |
| | Serial Number | |
| | Asset ID | |
| Extended Power via MDI TLV | Power Type | |
| | Power Source | |
| | Power Priority | |
| | Power Value | |

The following table describes the labels in the MED TLV part of the screen.

Table 187 Advanced Application > LLDP > LLDP Remote Status > LLDP Remote Port Status Detail (MED TLV)

| LABEL | DESCRIPTION |
|---|---|
| MED TLV | LLDP Media Endpoint Discovery (MED) is an extension of LLDP that provides additional capabilities to support media endpoint devices. MED enables advertisement and discovery of network policies, device location discovery to allow creation of location databases, and information for troubleshooting. |
| Capabilities TLV | This displays the MED capabilities the remote port supports.<br>• **Network Policy**<br>• **Location**<br>• **Extend Power via MDI PSE**<br>• **Extend Power via MDI PD**<br>• **Inventory Management** |
| Device Type TLV | LLDP-MED endpoint device classes:<br>• Endpoint Class I<br>• Endpoint Class II<br>• Endpoint Class III<br>• Network Connectivity |
| Network Policy TLV | This displays a network policy for the specified application.<br>• **Voice**<br>• **Voice-Signaling**<br>• **Guest-Voice**<br>• **Guest-Voice-Signaling**<br>• **Softphone-Voice**<br>• **Video-Conferencing**<br>• **Streaming-Video**<br>• **Video-Signaling** |
| Location Identification TLV | This shows the location information of a caller by its:<br>• **Coordinate-base LCI** – latitude and longitude coordinates of the Location Configuration Information (LCI)<br>• **Civic LCI** – IETF Geopriv Civic Address based Location Configuration Information<br>• **ELIN** – (Emergency Location Identifier Number) |
| Inventory TLV | The majority of IP Phones lack support of management protocols such as SNMP, so LLDP-MED inventory TLVs are used to provide their inventory information to the Network Connectivity Devices such as the Switch. The Inventory TLV may contain the following information.<br>• **Hardware Revision**<br>• **Software Revision**<br>• **Firmware Revision**<br>• **Model Name**<br>• **Manufacturer**<br>• **Serial Number**<br>• **Asset ID** |
| Extended Power via MDI TLV | Extended Power Via MDI Discovery enables detailed power information to be advertised by Media Endpoints, such as IP phones and Network Connectivity Devices such as the Switch.<br>• **Power Type** – whether it is currently operating from primary power or is on backup power (backup power may indicate to the Endpoint Device that it should move to a power conservation mode).<br>• **Power Source** – whether or not the Endpoint is currently operating from an external power source.<br>• **Power Priority** – the Endpoint Device's power priority (which the Network Connectivity Device may use to prioritize which devices will remain in service during power shortages).<br>• **Power Value** – power requirement, in fractions of Watts, in current configuration. |

# 40.6 LLDP Configuration

Use this screen to configure global LLDP settings on the Switch. Click **Advanced Application** > **LLDP** > **LLDP Configuration (Click Here)** to display the screen as shown next.

**Figure 323** Advanced Application > LLDP > LLDP Configuration (Standalone Mode)

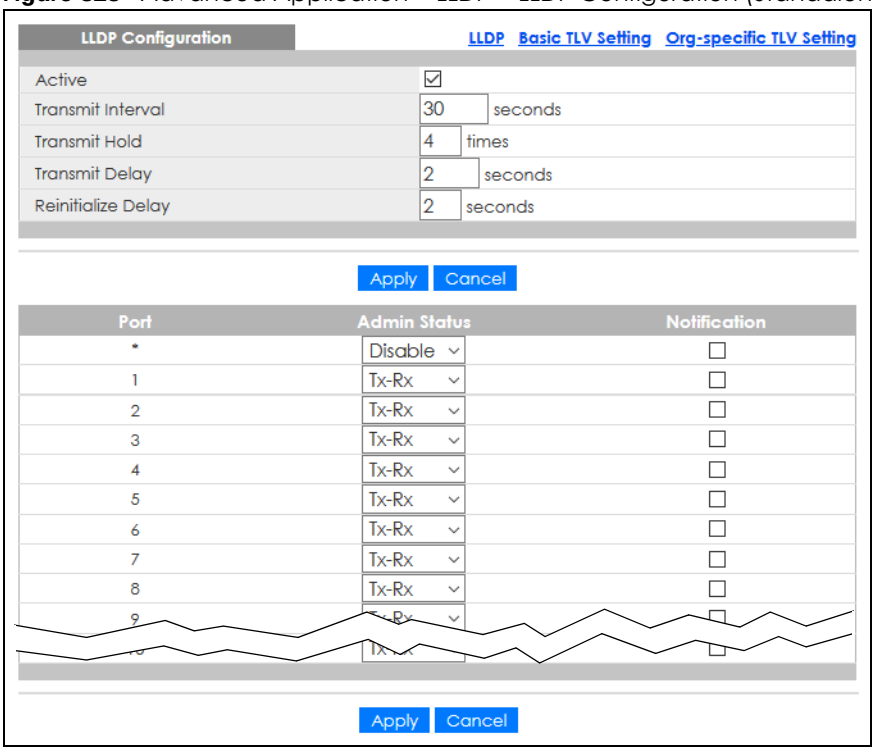
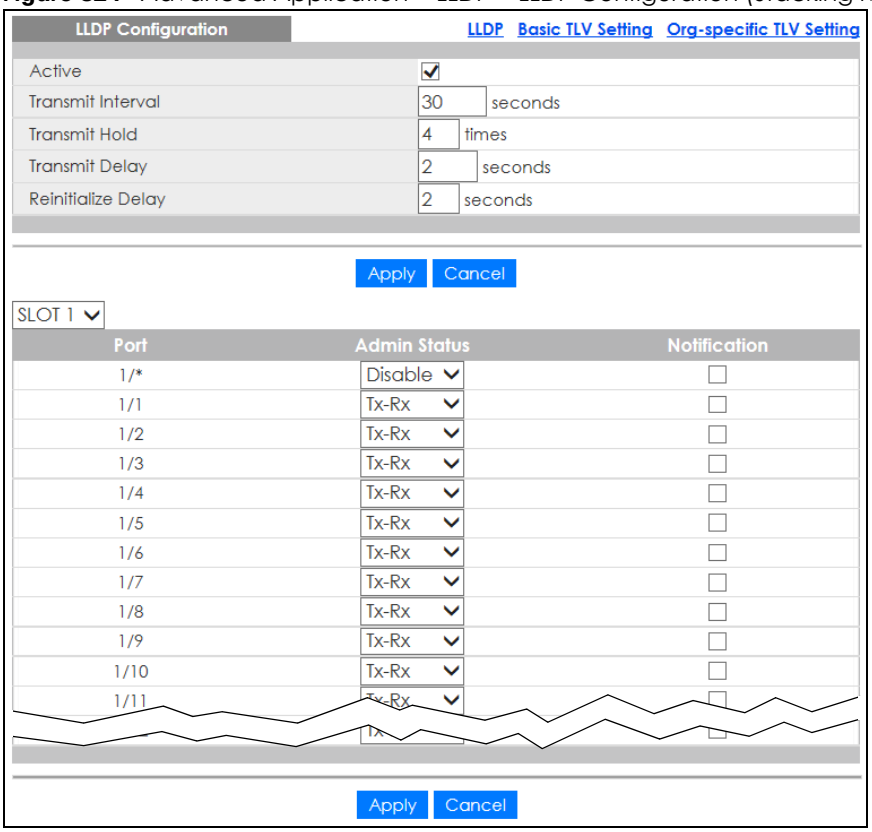


**Figure 324** Advanced Application > LLDP > LLDP Configuration (Stacking Mode)




The following table describes the labels in this screen.

Table 188 Advanced Application > LLDP > LLDP Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select to enable LLDP on the Switch. It is enabled by default. |
| Transmit Interval | Enter how many seconds the Switch waits before sending LLDP packets. |
| Transmit Hold | Enter the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP packets transmitting interval. |
| Transmit Delay | Enter the delay (in seconds) between successive LLDPDU transmissions initiated by value or status changes in the Switch MIB. |
| Reinitialize Delay | Enter the number of seconds for LLDP to wait before initializing on a port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Changes in this row are copied to all the ports as soon as you make them. |

Table 188 Advanced Application > LLDP > LLDP Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Admin Status | Select whether LLDP transmission and/or reception is allowed on this port.<br>• **Disable** – not allowed<br>• **Tx-Only** – transmit only<br>• **Rx-Only** – receive only<br>• **Tx-Rx** – transmit and receive |
| Notification | Select whether LLDP notification is enabled on this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 40.6.1 LLDP Configuration Basic TLV Setting

Use this screen to configure Basic TLV settings. Click **Advanced Application** > **LLDP** > **LLDP Configuration (Click Here)** > **Basic TLV Setting** to display the screen as shown next.

**Figure 325** Advanced Application > LLDP > LLDP Configuration> Basic TLV Setting (Standalone Mode)

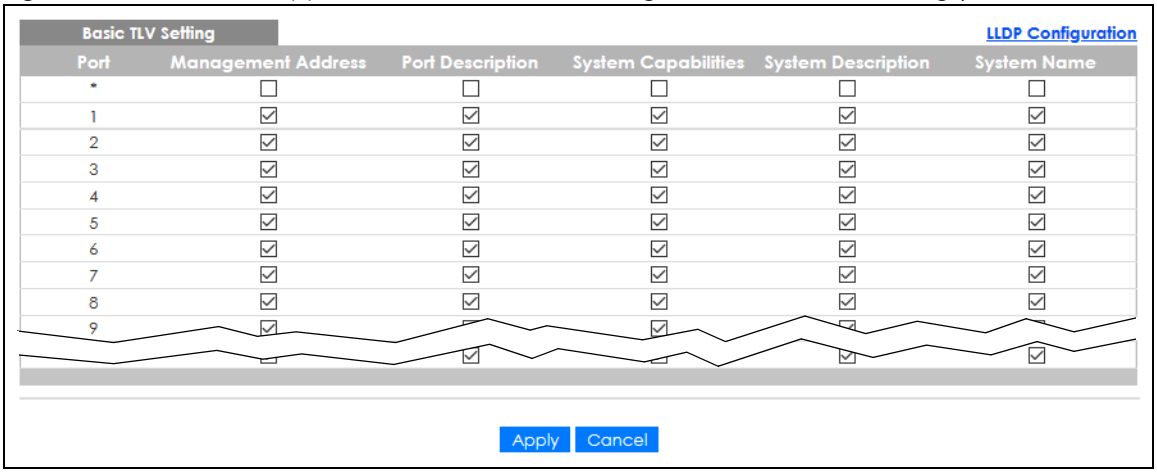
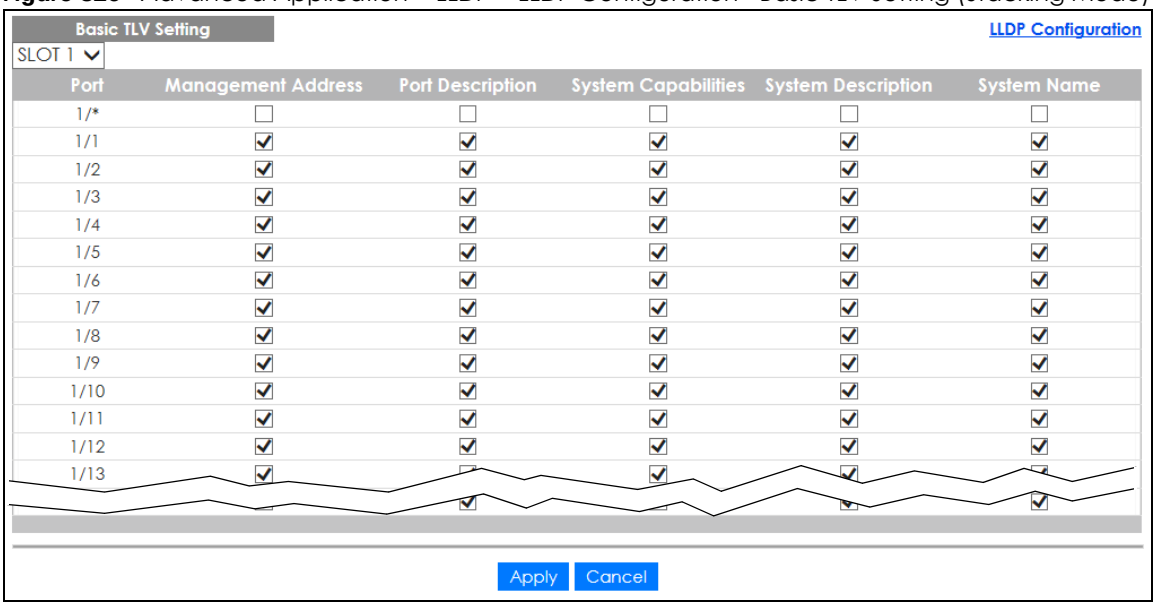


**Figure 326** Advanced Application > LLDP > LLDP Configuration> Basic TLV Setting (Stacking Mode)




The following table describes the labels in this screen.

Table 189 Advanced Application > LLDP > LLDP Configuration > Basic TLV Setting

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Management Address | Select the check boxes to enable or disable the sending of Management Address TLVs on the ports. |
| Port Description | Select the check boxes to enable or disable the sending of Port Description TLVs on the ports. |
| System Capabilities | Select the check boxes to enable or to disable the sending of System Capabilities TLVs on the ports. |
| System Description | Select the check boxes to enable or to disable the sending of System Description TLVs on the ports. |
| System Name | Select the check boxes to enable or to disable the sending of System Name TLVs on the ports. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 40.6.2 LLDP Configuration Org-specific TLV Setting

Use this screen to configure organization-specific TLV settings. Click **Advanced Application** > **LLDP** > **LLDP Configuration (Click Here)** > **Org-specific TLV Setting** to display the screen as shown next.

**Figure 327** Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting (Standalone Mode)

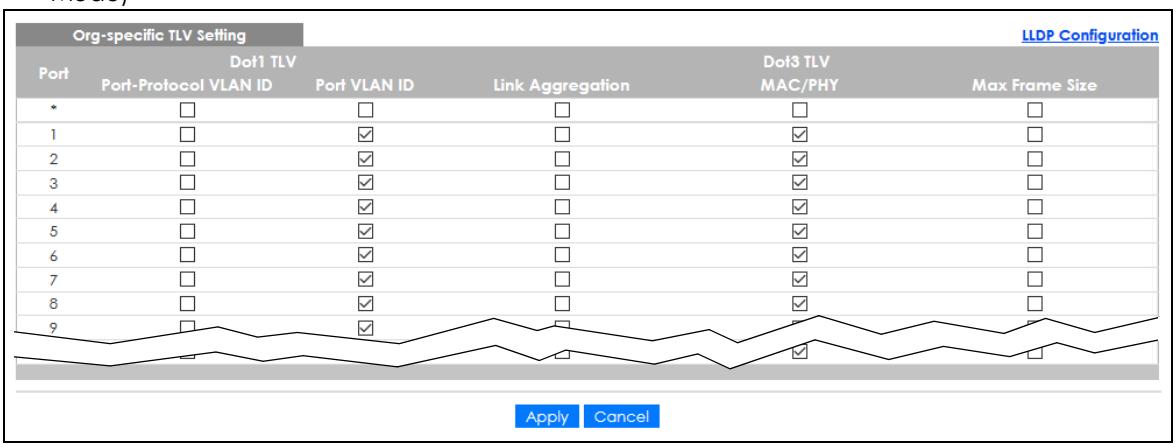
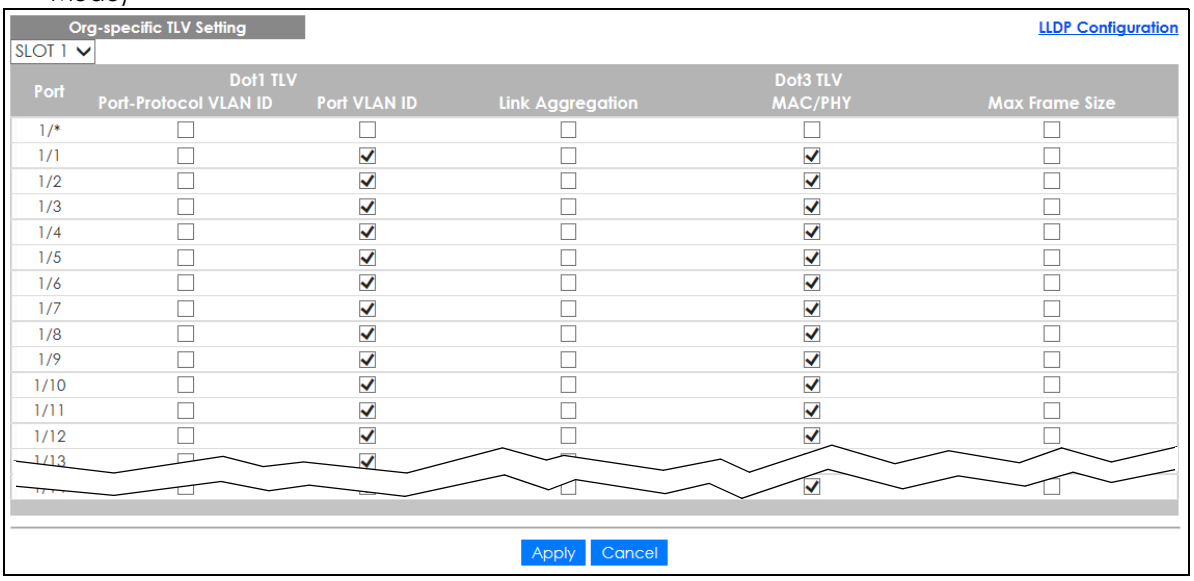



**Figure 328** Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting (Stacking Mode)




The following table describes the labels in this screen.

Table 190 Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| Dot1 TLV | |
| Port-Protocol VLAN ID | Select the check boxes to enable or disable the sending of IEEE 802.1 Port and Protocol VLAN ID TLVs on the ports. |
| Port VLAN ID | Select the check boxes to enable or disable the sending of IEEE 802.1 Port VLAN ID TLVs on the ports. All check boxes in this column are enabled by default. |

Table 190 Advanced Application > LLDP > LLDP Configuration > Org-specific TLV Setting (continued)

| LABEL | DESCRIPTION |
|---|---|
| Dot3 TLV | |
| Link Aggregation | Select the check boxes to enable or disable the sending of IEEE 802.3 Link Aggregation TLVs on the ports. |
| MAC/PHY | Select the check boxes to enable or disable the sending of IEEE 802.3 MAC/PHY Configuration/Status TLVs on the ports. All check boxes in this column are enabled by default. |
| Max Frame Size | Select the check boxes to enable or disable the sending of IEEE 802.3 Max Frame Size TLVs on the ports. |
| Power Via MDI | Note: For PoE models only.<br><br>The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending port on the remote device.<br>• Port Class<br>• MDI Supported<br>• MDI Enabled<br>• Pair Controllable<br>• PSE Power Pairs<br>• Power Class |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 40.7 LLDP-MED Configuration

Click **Advanced Application** > **LLDP** > **LLDP-MED Configuration** to display the screen as shown next.

**Figure 329** Advanced Application > LLDP > LLDP-MED Configuration (Standalone Mode)

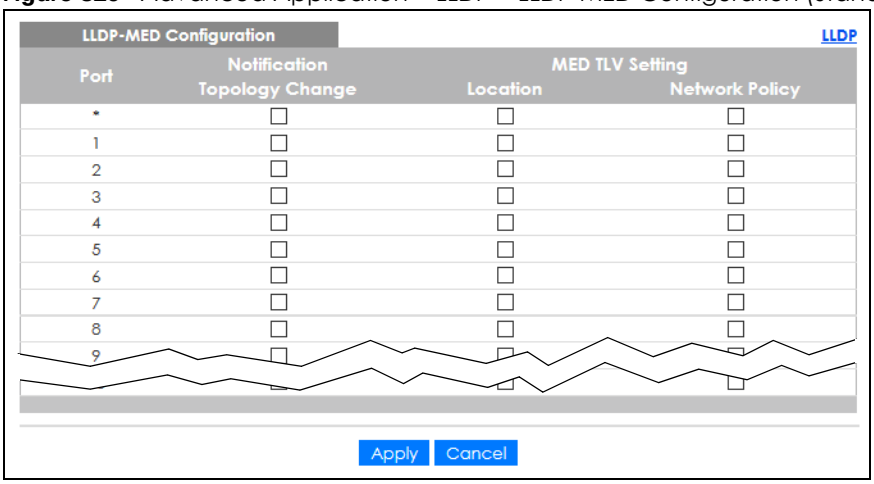
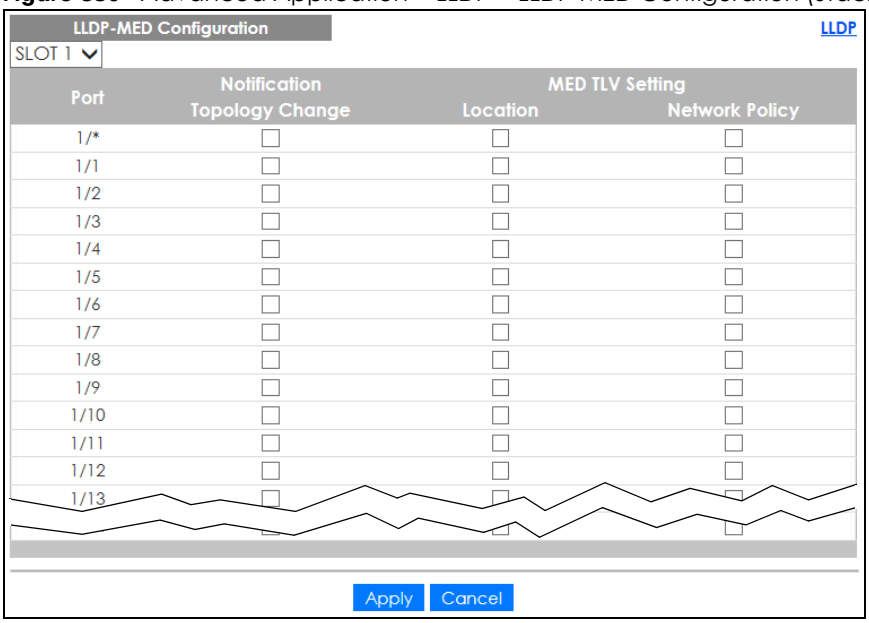


**Figure 330** Advanced Application > LLDP > LLDP-MED Configuration (Stacking Mode)




The following table describes the labels in this screen.

Table 191 Advanced Application > LLDP > LLDP-MED Configuration

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Use this row to make the setting the same for all ports. Use this row first and then make adjustments to each port if necessary.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| Notification | |
| Topology Change | Select to enable LLDP-MED topology change traps on this port. |
| MED TLV Setting | |
| Location | Select to enable transmitting LLDP-MED location TLV. |
| Network Policy | Select to enable transmitting LLDP-MED Network Policy TLV. |
| Apply | Click **Apply** to save the changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the Save link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 40.8 LLDP-MED Network Policy

Click **Advanced Application** > **LLDP** > **LLDP-MED Network Policy (Click Here)** to display the screen as shown next.

**Figure 331** Advanced Application > LLDP > LLDP-MED Network Policy (Standalone Mode)

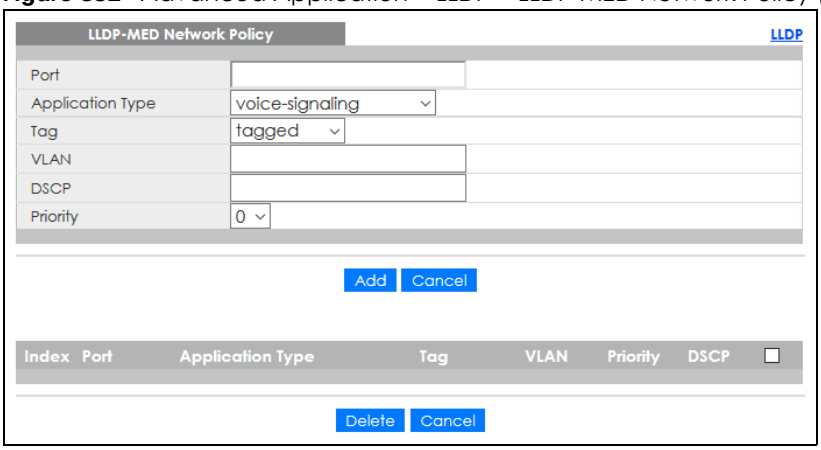
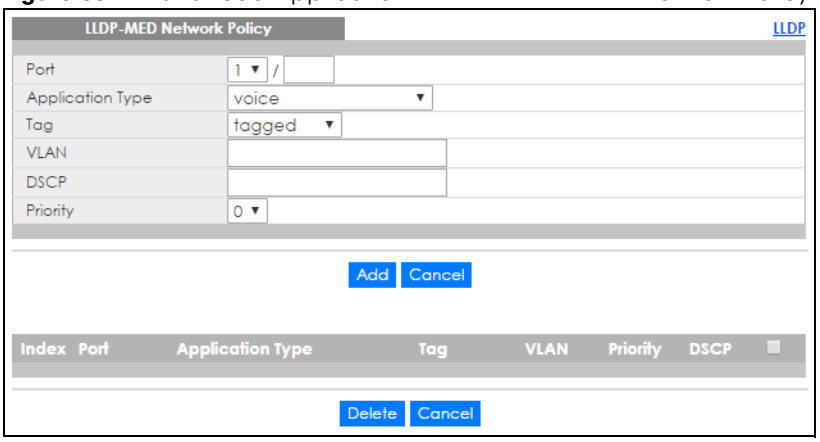



**Figure 332** Advanced Application > LLDP > LLDP-MED Network Policy (Stacking Mode)




The following table describes the labels in this screen.

Table 192 Advanced Application > LLDP > LLDP-MED Network Policy

| LABEL | DESCRIPTION |
|---|---|
| Port | Enter the port number to set up the LLDP-MED network policy. You can enter multiple ports separated by (no space) comma (,) or hyphen for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br><br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Application Type | Select the type of application used in the network policy.<br><br>• **voice**<br>• **voice-signaling**<br>• **guest-voice**<br>• **guest-voice-signaling**<br>• **softphone-voice**<br>• **video-conferencing**<br>• **streaming-video**<br>• **video-signaling** |
| Tag | Select to tag or untag in the network policy.<br><br>• tagged<br>• untagged |
| VLAN | Enter the VLAN ID number. It should be from 1 to 4094. For priority tagged frames, enter "0". |

Table 192 Advanced Application > LLDP > LLDP-MED Network Policy (continued)

| LABEL | DESCRIPTION |
|---|---|
| DSCP | Enter the DSCP value of the network policy. The value is defined from 0 through 63 with the 0 representing use of the default DSCP value. |
| Priority | Enter the priority value for the network policy. |
| Add | Click **Add** after finish entering the network policy information. A summary table will list all the Switch you have added. |
| Cancel | Click **Cancel** to begin entering the information afresh. |
| Index | This field displays the of index number of the network policy. Click an index number to edit the rule. |
| Port | This field displays the port number of the network policy. In stacking mode, the first number represents the slot and the second the port number. |
| Application Type | This field displays the application type of the network policy. |
| Tag | This field displays the Tag Status of the network policy. |
| VLAN | This field displays the VLAN ID of the network policy. |
| Priority | This field displays the priority value of the network policy. |
| DSCP | This field displays the DSCP value of the network policy. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove, then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# 40.9 LLDP-MED Location

Click **Advanced Application** > **LLDP** > **LLDP-MED Location (Click Here)** to display the screen as shown next.

**Figure 333** Advanced Application > LLDP > LLDP-MED Location (Standalone Mode)

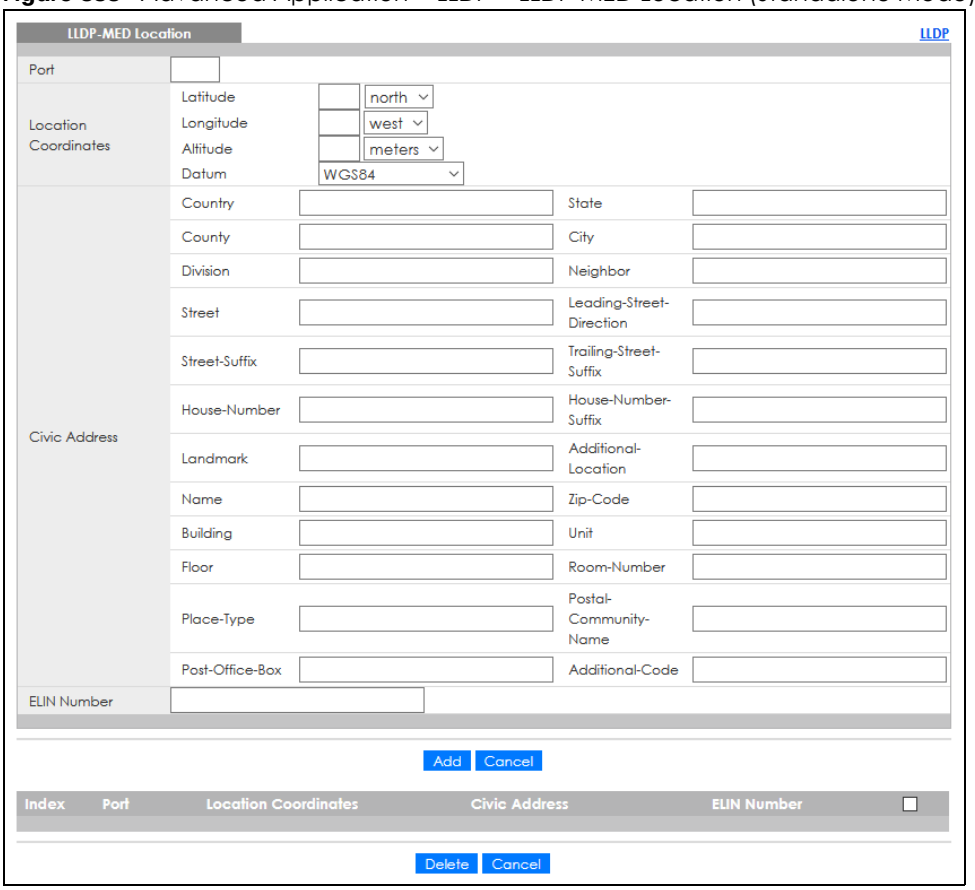
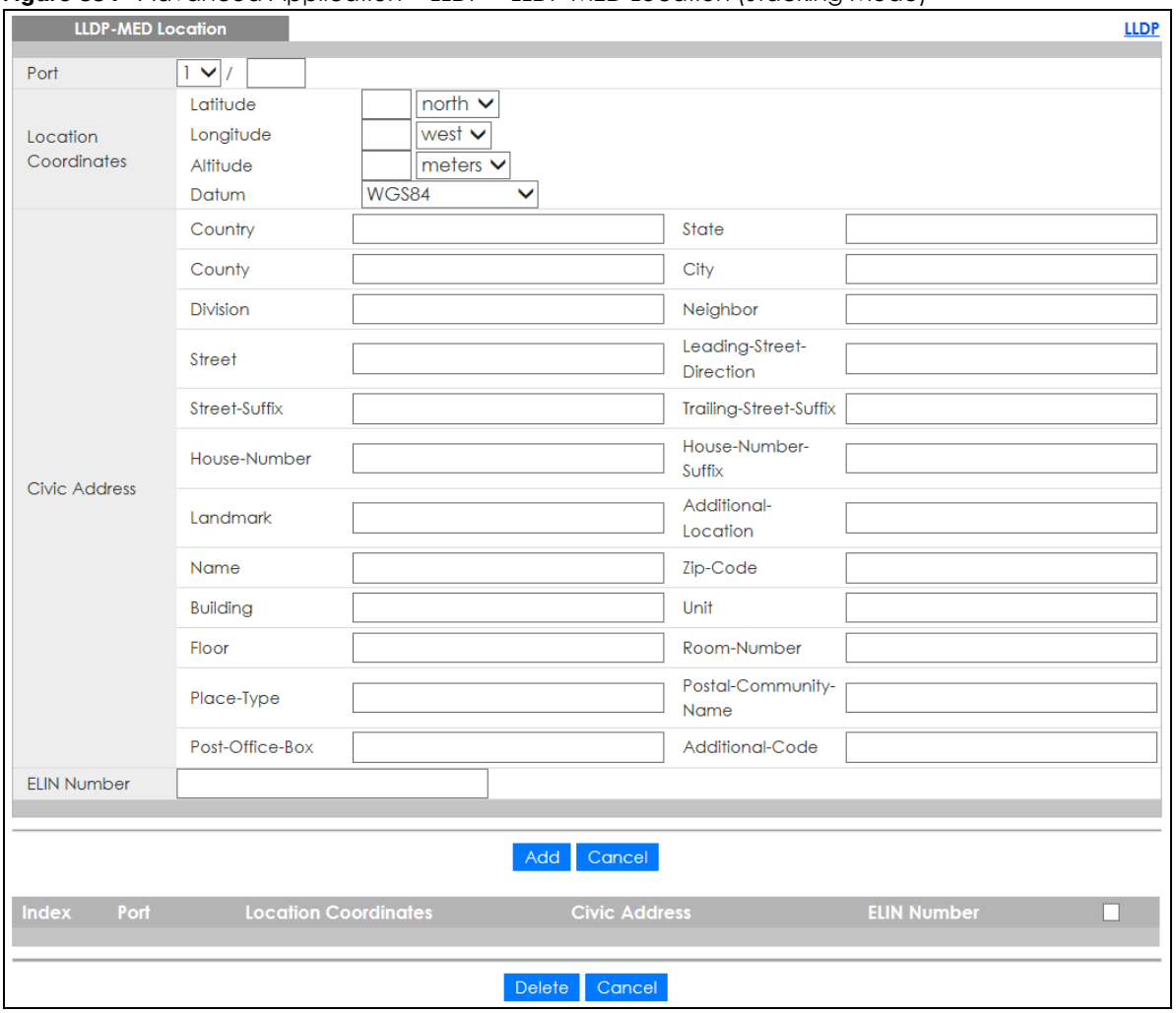


**Figure 334** Advanced Application > LLDP > LLDP-MED Location (Stacking Mode)




The following table describes the labels in this screen.

Table 193 Advanced Application > LLDP > LLDP-MED Location

| LABEL | DESCRIPTION |
|---|---|
| Port | Enter the port number you want to set up the location within the LLDP-MED network. In stacking mode, the first field is the slot ID and the second field is the port number. |
| Location Coordinates | The LLDP-MED uses geographical coordinates and Civic Address to set the location information of the remote device. Geographical based coordinates includes latitude, longitude, altitude and datum. Civic Address includes Country, State, County, City, Street and other related information. |
| Latitude | Enter the latitude information. The value should be from 0° to 90°.<br>• **north**<br>• **south** |
| Longitude | Enter the longitude information. The value should be from 0° to 180°.<br>• **west**<br>• **east** |

Table 193 Advanced Application > LLDP > LLDP-MED Location (continued)

| LABEL | DESCRIPTION |
|---|---|
| Altitude | Enter the altitude information. The value should be from –2097151 to 2097151 in meters or in floors.<br>• **meters**<br>• **floor** |
| Datum | Select the appropriate geodetic datum used by GPS.<br>• **WGS84**<br>• **NAD83-NAVD88**<br>• **NAD83-MLLW** |
| Civic Address | Enter the Civic Address by providing information such as Country, State, County, City, Street, Number, ZIP code and other additional information. Enter at least 2 fields in this configuration including the Country. The valid length of the Country field is 2 characters and all other fields are up to 32 characters.<br>• **Country**<br>• **State**<br>• **County**<br>• **City**<br>• **Division**<br>• **Neighbor**<br>• **Street**<br>• **Leading-Street-Direction**<br>• **Street-Suffix**<br>• **Trailing-Street-Suffix**<br>• **House-Number**<br>• **House-Number-Suffix**<br>• **Landmark**<br>• **Additional-Location**<br>• **Name**<br>• **Zip-Code**<br>• **Building**<br>• **Unit**<br>• **Floor**<br>• **Room-Number**<br>• **Place-Type**<br>• **Postal-Community-Name**<br>• **Post-Office-Box**<br>• **Additional-Code** |
| ELIN Number | Enter a numerical digit string, corresponding to the ELIN identifier which is used during emergency call setup to a traditional CAMA or ISDN trunk-based PSAP. The valid length is from 10 to 25 characters. |
| Add | Click **Add** after finish entering the location information. |
| Cancel | Click **Cancel** to begin entering the location information afresh. |
| Index | This lists the index number of the location configuration. Click an index number to view or edit the location. |
| Port | This lists the port number of the location configuration. In stacking mode, the first number represents the slot and the second the port number. |
| Location Coordinates | This field displays the location configuration information based on geographical coordinates that includes longitude, latitude, altitude and datum. |
| Civic Address | This field displays the Civic Address for the remote device using information such as Country, State, County, City, Street, Number, ZIP code and additional information. |

Table 193 Advanced Application > LLDP > LLDP-MED Location (continued)

| LABEL | DESCRIPTION |
|---|---|
| ELIN Number | This field shows the Emergency Location Identification Number (ELIN), which is used to identify endpoint devices when they issue emergency call services. The valid length is form 10 to 25 characters. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the locations that you want to remove, then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# CHAPTER 41
# Anti-Arpscan

## 41.1 Anti-Arpscan Overview

Address Resolution Protocol (ARP), RFC 826, is a protocol used to convert a network-layer IP address to a link-layer MAC address. ARP scan is used to scan the network of a certain interface for alive hosts. It shows the IP address and MAC addresses of all hosts found. Hackers could use ARP scan to find targets in your network. **Anti-arpscan** is used to detect unusual ARP scan activity and block suspicious hosts or ports.

Unusual ARP scan activity is determined by port and host thresholds that you set. A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an **Err-Disable** state. You can recover the normal state of the port manually if this happens and after you identify the cause of the problem.

A host threshold is determined by the number of ARP-request packets received per second. There is a global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.

Note: A port-based threshold must be larger than the host-based threshold or the host-based threshold will not work.

### 41.1.1 What You Can Do

- Use the **Anti-Arpscan Status** screen (Section 41.1 on page 429) to see what ports are trusted and are forwarding traffic or are disabled.
- Use the **Anti-Arpscan Host Status** screen (Section 41.3 on page 431) to view blocked hosts and clear selected ones.
- Use the **Anti-Arpscan Trust Host** screen (Section 41.4 on page 431) to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts.
- Use this **Anti-Arpscan Configure** screen (Section 41.5 on page 432) to enable anti-arpscan, set port and host thresholds as well as configure ports to be trusted or untrusted.

### 41.1.2 What You Need to Know

- You should set an uplink port as a trusted port before enabling **Anti-arpscan** so as to prevent the port from being shutdown due to receiving too many ARP messages.
- When a port is configured as a trusted port, **Anti-arpscan** is not performed on the port. Both host and port thresholds are ignored for trusted ports. If the received ARP packet rate on a port or the received ARP-requests from a host exceed the thresholds, the trusted port will not be closed.
- If a port on the Switch is closed by **Anti-arpscan**, and you want to recover it, then do one of the following:

- Go to **Basic Setting** > **Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
- Go to **Application** > **Errdisable** > **Errdisable Recovery** and set the interval for **Anti-arpscan**. After the interval expires, the closed ports will become active and start receiving packets again.
- Use the command `port no inactive`.

- Refer to the port logs to see when a port was closed.

# 41.2 Anti-Arpscan Status

Use this screen to see what ports are trusted and are forwarding traffic or are disabled. To open this screen, click **Advanced Application** > **Anti-Arpscan**.

**Figure 335** Advanced Application > Anti-Arpscan Status (Standalone Mode)

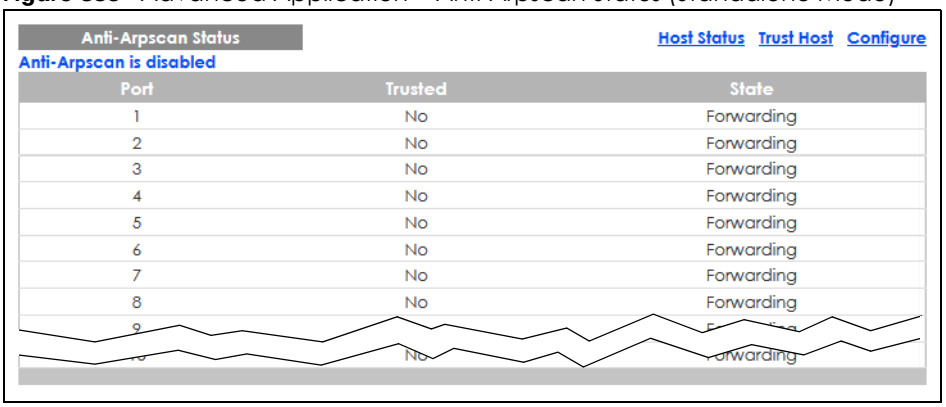
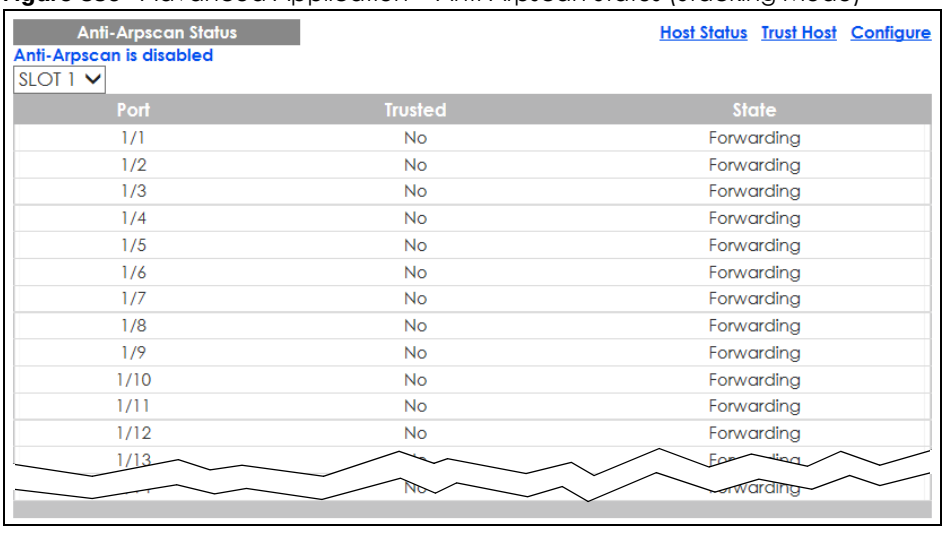



**Figure 336** Advanced Application > Anti-Arpscan Status (Stacking Mode)




The following table describes the fields in the above screen.

Table 194 Advanced Application > Anti-Arpscan Status

| LABEL | DESCRIPTION |
|---|---|
| Anti-Arpscan is.... | This shows whether **Anti-arpscan** is enabled or disabled on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

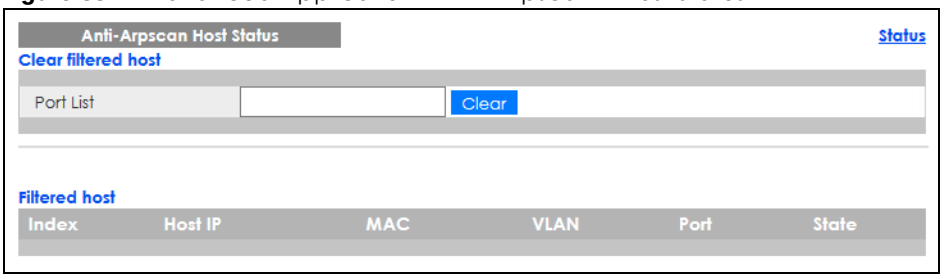
Table 194 Advanced Application > Anti-Arpscan Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number of the Switch. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Trusted | This field displays whether the port is trusted or untrusted. **Anti-arpscan** is not performed on a trusted port. |
| State | This field displays whether the port can forward traffic normally (**Forwarding**) or is disabled (**Err-Disable**). |

# 41.3 Anti-Arpscan Host Status

Use this screen to view blocked hosts and unblock ones connected to certain ports. To open this screen, click **Advanced Application** > **Anti-Arpscan** > **Host Status**.

**Figure 337** Advanced Application > Anti-Arpscan > Host Status




The following table describes the fields in the above screen.

Table 195 Advanced Application > Anti-Arpscan > Host Status

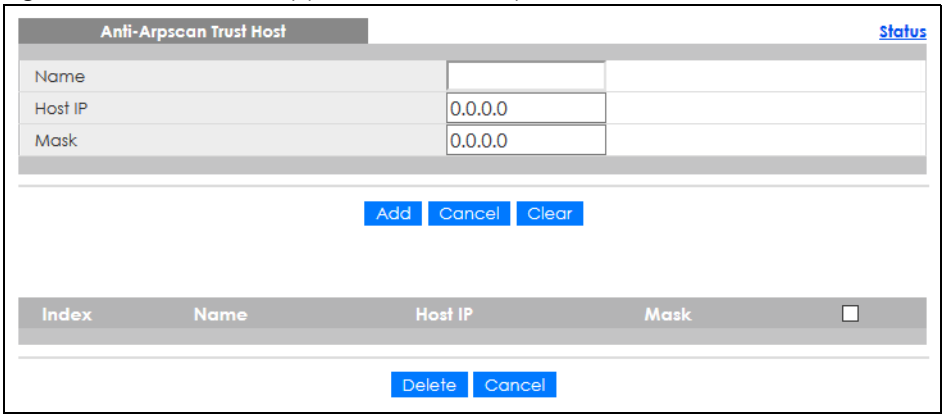
| LABEL | DESCRIPTION |
|---|---|
| Clear Filtered host | A filtered host is a blocked IP address. |
| Port List | Type a port number or a series of port numbers separated by commas and spaces, and then click **Clear** to unblock all hosts connected to these ports. |
| Filtered host | This table lists information on blocked hosts. |
| Index | This displays the index number of an IP address (a host) that has been blocked. |
| Host IP | This displays the IP address of the blocked host. |
| MAC | This displays the MAC address of the blocked host. |
| VLAN | This displays the VLAN ID that shows which VLAN the blocked host is in. |
| Port | This displays the port number to which the blocked host is connected. |
| State | This shows **Err-Disable** if the ARP-request rate from this host is over the threshold. Forwarding hosts are not displayed. |

# 41.4 Anti-Arpscan Trust Host

Use this screen to create or remove trusted hosts identified by IP address and subnet mask. **Anti-arpscan** is not performed on trusted hosts. To open this screen, click **Advanced Application** > **Anti-Arpscan** > **Trust**

**Host**.

**Figure 338** Advanced Application > Anti-Arpscan > Trust Host




The following table describes the fields in the above screen.

Table 196 Advanced Application > Anti-Arpscan > Trust Host

| LABEL | DESCRIPTION |
|---|---|
| Name | Type a descriptive name of up to 32 printable ASCII characters to identify this host. |
| Host IP | Type the IP address of the host. |
| Mask | A trusted host may consist of a subnet of IP addresses. Type a subnet mask to create a single host or a subnet of hosts. |
| Add | Click this to create the trusted host. |
| Cancel | Click this to reset the values above based or, if not applicable, to clear the fields above. |
| Clear | Click this to clear the fields above. |
| Index | This field displays a sequential number for each trusted host. |
| Name | This field displays the name of the trusted host. |
| Host IP | This field displays the IP address of the trusted host. |
| Mask | This field displays the subnet mask of the trusted host. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select an entry check box and click **Delete** to remove the specified entry. |
| Cancel | Click this to clear the check boxes above. |

# 41.5 Anti-Arpscan Configure

Use this screen to enable **Anti-Arpscan**, set port and host thresholds as well as configure ports to be trusted or untrusted. To open this screen, click **Advanced Application** > **Anti-Arpscan** > **Configure**.

**Figure 339** Advanced Application > Anti-Arpscan > Configure (Standalone Mode)

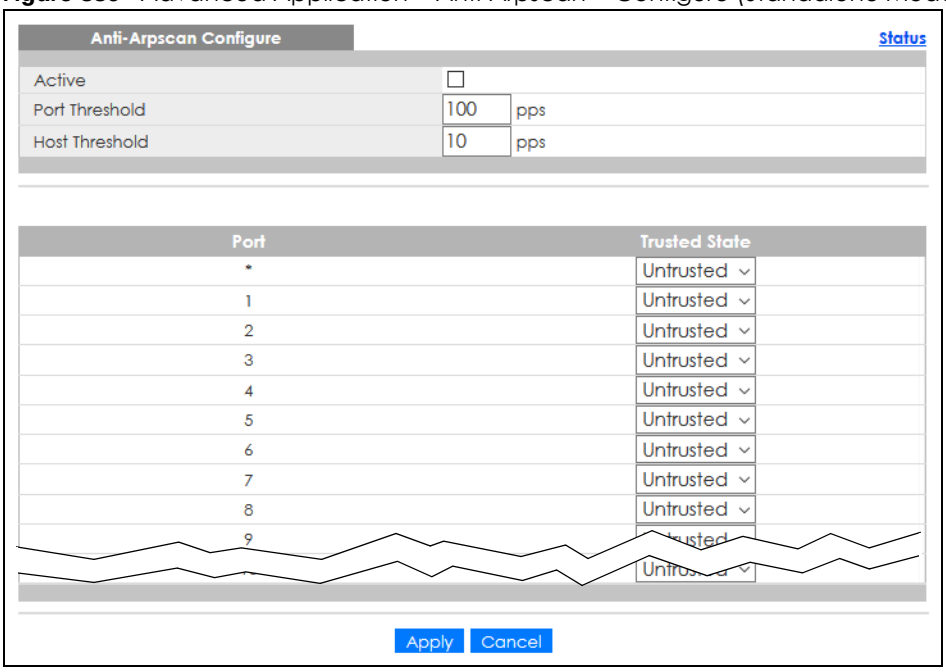
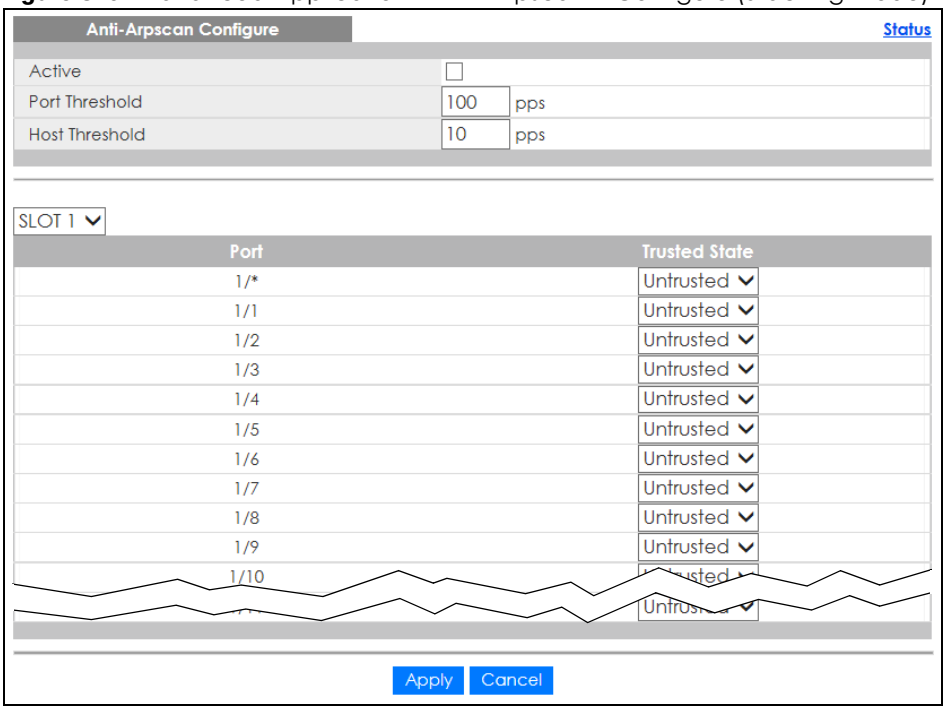



**Figure 340** Advanced Application > Anti-Arpscan > Configure (Stacking Mode)



The following table describes the fields in the above screen.

Table 197 Advanced Application > Anti-Arpscan > Configure

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable **Anti-arpscan** on the Switch. |
| Port Threshold | A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an **Err-Disable** state. Type the maximum number of packets per second allowed on the port before it is blocked.<br><br>Note: The allowed range is 2 to 255 packets received per second. |
| Host Threshold | A host threshold is determined by the number of ARP-request packets received per second. This is the global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.<br><br>Type the maximum number of ARP-request packets allowed by a host before it is blocked.<br><br>Note: The allowed range is 2 to 100 ARP-request packets per second.<br><br>Note: The port-based threshold must be larger than the host-based threshold or the host-based threshold will not be applied. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Trusted State | Select **Untrusted** or **Trusted** for the associated port. **Anti-arpscan** is not performed on trusted hosts. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

# CHAPTER 42
# BPDU Guard

## 42.1 BPDU Guard Overview

A BPDU (Bridge Protocol Data Units) is a data frame that contains information about STP. STP-aware switches exchange BPDUs periodically.

The BPDU guard feature allows you to prevent any new STP-aware switch from connecting to an existing network and causing STP topology changes in the network. If there is any BPDU detected on the ports on which BPDU guard is enabled, the Switch disables the ports automatically. You can then enable the ports manually in the **Basic Setting** > **Port Setup** screen, or use the **Errdisable Recovery** screen (see Section 35.6 on page 387) to have the ports become active after a certain time interval.

### 42.1.1 What You Can Do

- Use the **BPDU Guard Status** screen (Section 42.2 on page 435) to view the BPDU guard status.
- Use the **BPDU Guard Configuration** screen (Section 42.3 on page 436) to enable BPDU guard on the Switch.

## 42.2 BPDU Guard Status

Use this screen to view whether BPDU guard is enabled on the Switch and the port status. Click **Advanced Application** > **BPDU Guard** in the navigation panel.

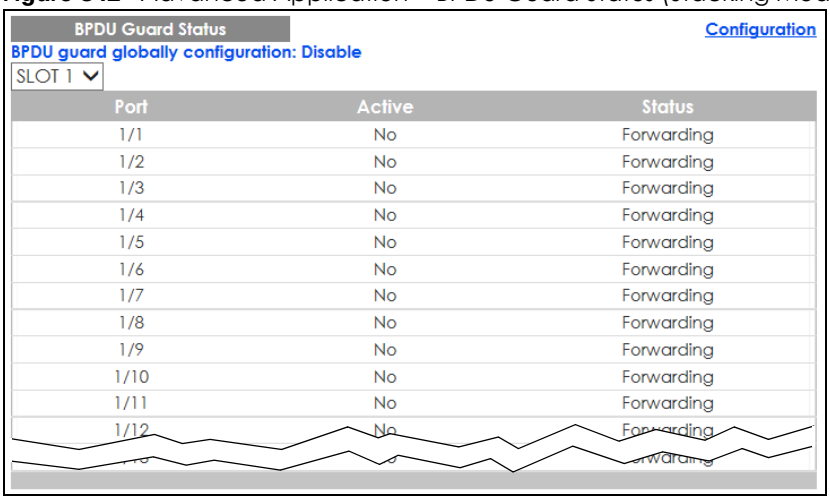
**Figure 341** Advanced Application > BPDU Guard Status (Standalone Mode)

BPDU Guard Status — Configuration

BPDU guard globally configuration: Disable

| Port | Active | Status |
|---|---|---|
| 1 | No | Forwarding |
| 2 | No | Forwarding |
| 3 | No | Forwarding |
| 4 | No | Forwarding |
| 5 | No | Forwarding |
| 6 | No | Forwarding |
| 7 | No | Forwarding |
| 8 | No | Forwarding |
| 9 | No | Forwarding |

**Figure 342** Advanced Application > BPDU Guard Status (Stacking Mode)




The following table describes the fields in the above screen.

Table 198 Advanced Application > BPDU Guard Status

| LABEL | DESCRIPTION |
|---|---|
| BPDU guard globally configuration | This field displays whether BPDU guard is activated on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Active | This shows whether BPDU guard is activated on the port. |
| Status | This shows whether the port is shut down (**Err-disable**) or able to transmit packets (**Forwarding**). |

# 42.3 BPDU Guard Configuration

Use this screen to turn on the BPDU guard feature on the Switch and ports.

In the **BPDU Guard Status** screen, click **Configuration** to display the configuration screen as shown.

**Figure 343** Advanced Application > BPDU Guard > BPDU Guard Configuration (Standalone Mode)

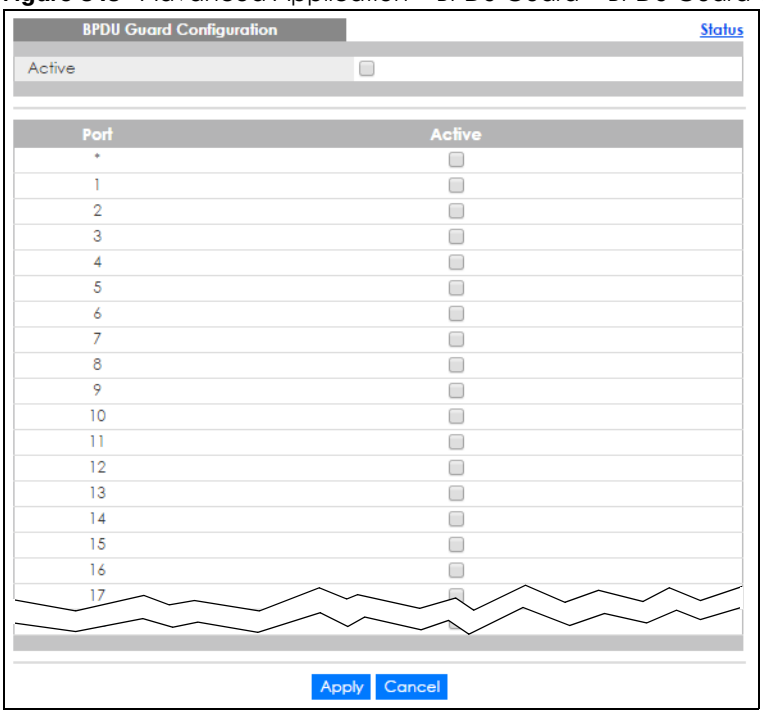
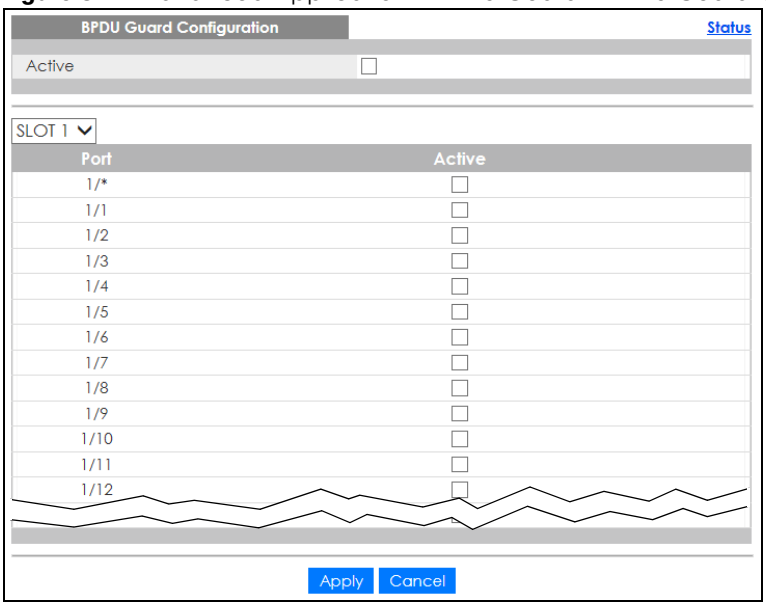



**Figure 344** Advanced Application > BPDU Guard > BPDU Guard Configuration (Stacking Mode)




The following table describes the fields in the above screen.

Table 199 Advanced Application > BPDU Guard > BPDU Guard Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable BPDU guard on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

Table 199 Advanced Application > BPDU Guard > BPDU Guard Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the BPDU guard feature on this port. The Switch shuts down this port if there is any BPDU received on the port.<br>Clear this check box to disable the BPDU guard feature. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 43
# OAM

## 43.1 OAM Overview

Link layer Ethernet OAM (Operations, Administration and Maintenance) as described in IEEE 802.3ah is a link monitoring protocol. It utilizes OAM Protocol Data Units or OAM PDUs to transmit link status information between directly connected Ethernet devices. Both devices must support IEEE 802.3ah. Because link layer Ethernet OAM operates at layer two of the OSI (Open Systems Interconnection Basic Reference) model, neither IP or SNMP are necessary to monitor or troubleshoot network connection problems.

The Switch supports the following IEEE 802.3ah features:

- Discovery – this identifies the devices on each end of the Ethernet link and their OAM configuration.
- Remote Loopback – this can initiate a loopback test between Ethernet devices.

### 43.1.1 What You Can Do

- Use the **OAM Status** screen (Section 43.2 on page 439) to view the configuration of ports on which Ethernet OAM is enabled.
- Use the **OAM Configuration** screen (Section 43.3 on page 444) to enable Ethernet OAM on the Switch.
- Use the **OAM Remote Loopback** screen (Section 43.4 on page 446) to perform remote-loopback tests.

## 43.2 OAM Status

Use this screen to view the configuration of ports on which Ethernet OAM is enabled. Click **Advanced Application** > **OAM** in the navigation panel.

**Figure 345** Advanced Application > OAM Status (Standalone Mode)

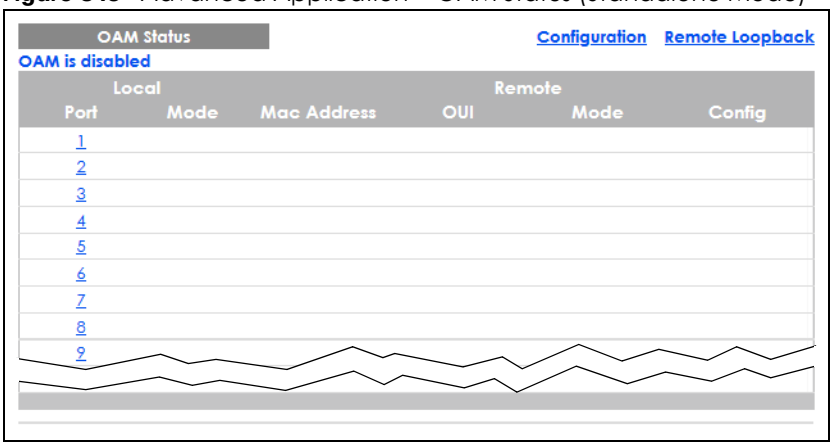
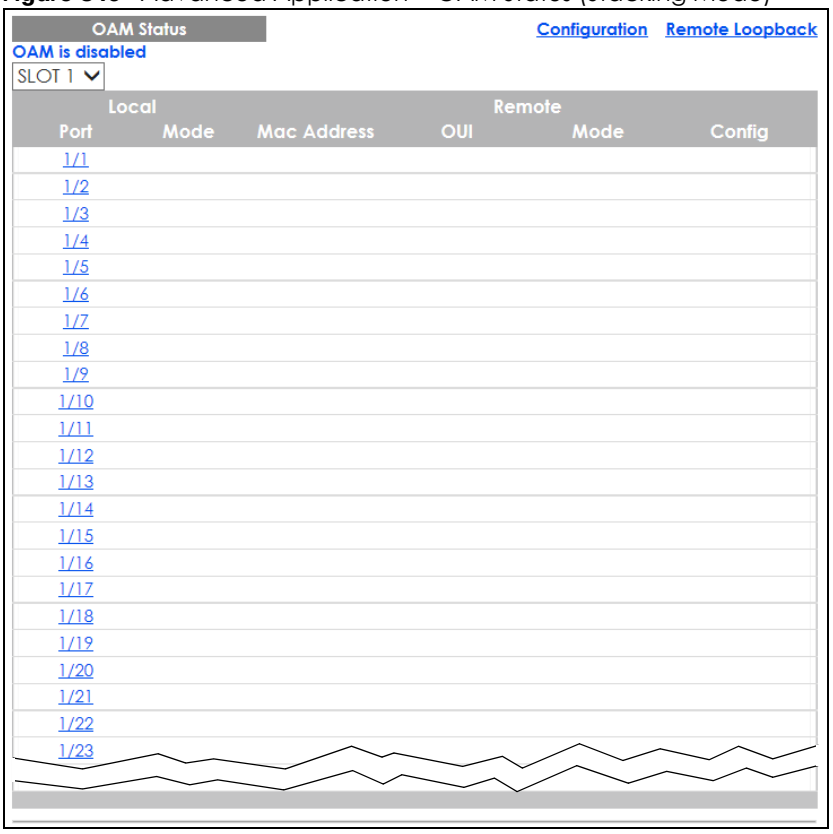



**Figure 346** Advanced Application > OAM Status (Stacking Mode)




The following table describes the fields in the above screen.

Table 200 Advanced Application > OAM Status

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Local<br><br>This section displays information about the ports on the Switch. | |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |

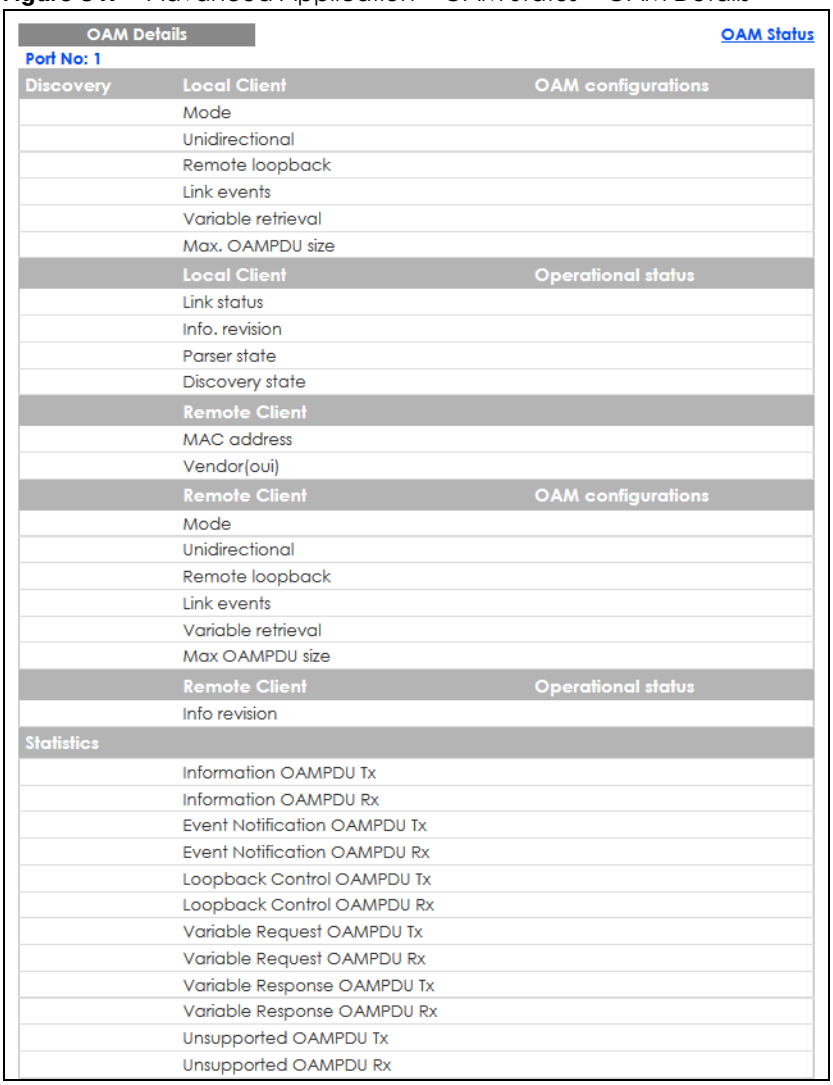
Table 200 Advanced Application > OAM Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Mode | This field displays the operational state of the port when OAM is enabled on the port.<br>**Active** – Allows the port to issue and respond to Ethernet OAM commands.<br>**Passive** – Allows the port to respond to Ethernet OAM commands. |
| Remote<br>This section displays information about the remote device. | |
| Mac Address | This field displays the MAC address of the remote device. |
| OUI | This field displays the OUI (first 3 bytes of the MAC address) of the remote device. |
| Mode | This field displays the operational state of the port when OAM is enabled on the port.<br>**Active** – Allows the port to issue and respond to Ethernet OAM commands.<br>**Passive** – Allows the port to respond to Ethernet OAM commands. |
| Config | This field displays the capabilities of the Switch and remote device. |

## 43.2.1 OAM Details

Use this screen to view OAM configuration details and operational status of a specific port. Click a number in the **Port** column in the **OAM Status** screen to display the screen as shown next.

**Figure 347** Advanced Application > OAM Status > OAM Details



OAM Details — OAM Status

Port No: 1

| Discovery | Local Client | OAM configurations |
|---|---|---|
| | Mode | |
| | Unidirectional | |
| | Remote loopback | |
| | Link events | |
| | Variable retrieval | |
| | Max. OAMPDU size | |
| | **Local Client** | **Operational status** |
| | Link status | |
| | Info. revision | |
| | Parser state | |
| | Discovery state | |
| | **Remote Client** | |
| | MAC address | |
| | Vendor(oui) | |
| | **Remote Client** | **OAM configurations** |
| | Mode | |
| | Unidirectional | |
| | Remote loopback | |
| | Link events | |
| | Variable retrieval | |
| | Max OAMPDU size | |
| | **Remote Client** | **Operational status** |
| | Info revision | |
| **Statistics** | | |
| | Information OAMPDU Tx | |
| | Information OAMPDU Rx | |
| | Event Notification OAMPDU Tx | |
| | Event Notification OAMPDU Rx | |
| | Loopback Control OAMPDU Tx | |
| | Loopback Control OAMPDU Rx | |
| | Variable Request OAMPDU Tx | |
| | Variable Request OAMPDU Rx | |
| | Variable Response OAMPDU Tx | |
| | Variable Response OAMPDU Rx | |
| | Unsupported OAMPDU Tx | |
| | Unsupported OAMPDU Rx | |

The following table describes the fields in the above screen.

Table 201 Advanced Application > OAM Status > OAM Details

| LABEL | DESCRIPTION |
|---|---|
| Discovery | This section displays OAM configuration details and operational status of the port on the Switch and/or the remote device. |
| Local Client/Remote Client<br><br>OAM configurations | |
| Mode | This field displays the OAM mode. The device in active mode (typically the service provider's device) controls the device in passive mode (typically the subscriber's device).<br><br>**Active**: The port initiates OAM discovery; sends information PDUs; and may send event notification PDUs, variable request/response PDUs, or loopback control PDUs.<br><br>**Passive**: The port waits for the remote device to initiate OAM discovery; sends information PDUs; may send event notification PDUs; and may respond to variable request PDUs or loopback control PDUs.<br><br>The Switch might not support some types of PDUs, as indicated in the fields below. |

Table 201 Advanced Application > OAM Status > OAM Details (continued)

| LABEL | DESCRIPTION |
|---|---|
| Unidirectional | This field indicates whether or not the port can send information PDUs to transmit fault information when the receive path is non-operational. |
| Remote loopback | This field indicates whether or not the port can use loopback control PDUs to put the remote device into loopback mode. |
| Link events | This field indicates whether or not the port can interpret link events, such as link fault and dying gasp. Link events are sent in event notification PDUs and indicate when the number of errors in a given interval (time, number of frames, number of symbols, or number of error frame seconds) exceeds a specified threshold. Organizations may create organization-specific link event TLVs as well. |
| Variable retrieval | This field indicates whether or not the port can respond to requests for more information, such as requests for Ethernet counters and statistics, about link events. |
| Max. OAMPDU size | This field displays the maximum size of PDU for receipt and delivery. |
| Local Client/Remote Client<br>Operational status | |
| Link status | This field indicates that the link between the Switch port and a connected IEEE 802.3ah-enabled remote Ethernet device is up or down. |
| Info. revision | This field displays the current version of local state and configuration. This two-octet value starts at zero and increments every time the local state or configuration changes. |
| Parser state | This field indicates the current state of the parser.<br>**Forward**: The port is forwarding packets normally.<br>**Loopback**: The port is in loopback mode.<br>**Discard**: The port is discarding non-OAM PDUs because it is trying to or has put the remote device into loopback mode. |
| Discovery state | This field indicates the state in the OAM discovery process. OAM-enabled devices use this process to detect each other and to exchange information about their OAM configuration and capabilities. OAM discovery is a handshake protocol.<br>**Fault**: One of the devices is transmitting OAM PDUs with link fault information, or the interface is not operational.<br>**Active Send Local**: The port is in active mode and is trying to see if the remote device supports OAM.<br>**Passive Wait**: The port is in passive mode and is waiting for the remote device to begin OAM discovery.<br>**Send Local Remote**: This state occurs in the following circumstances.<br>• The port has discovered the remote device but has not accepted or rejected the connection yet.<br>• The port has discovered the remote device and rejected the connection.<br>**Send Local Remote OK**: The port has discovered the remote device and has accepted the connection. In addition, the remote device has not accepted or rejected the connection yet, or the remote device has rejected the connected.<br>**Send Any**: The port and the remote device have accepted the connection. This is the operating state for OAM links that are fully operational. |
| Remote Client | |
| MAC Address | This field displays the MAC address of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch. |
| Vendor(oui) | This field displays the Organizationally Unique Identifiers (OUI) representing the vendor of the IEEE 802.3ah-enabled remote Ethernet device that is connected to the Switch. |

Table 201 Advanced Application > OAM Status > OAM Details (continued)

| LABEL | DESCRIPTION |
|---|---|
| Statistics<br>This section displays the number of OAM packets transferred on the port of the Switch. | |
| Information OAMPDU Tx | This field displays the number of OAM PDUs sent on the port. |
| Information OAMPDU Rx | This field displays the number of OAM PDUs received on the port. |
| Event Notification OAMPDU Tx | This field displays the number of unique or duplicate OAM event notification PDUs sent on the port. |
| Event Notification OAMPDU Rx | This field displays the number of unique or duplicate OAM event notification PDUs received on the port. |
| Loopback Control OAMPDU Tx | This field displays the number of loopback control OAM PDUs sent on the port. |
| Loopback Control OAMPDU Rx | This field displays the number of loopback control OAM PDUs received on the port. |
| Variable Request OAMPDU Tx | This field displays the number of OAM PDUs sent to request MIB objects on the remote device. |
| Variable Request OAMPDU Rx | This field displays the number of OAM PDUs received requesting MIB objects on the Switch. |
| Variable Response OAMPDU Tx | This field displays the number of OAM PDUs sent by the Switch in response to requests. |
| Variable Response OAMPDU Rx | This field displays the number of OAM PDUs sent by the remote device in response to requests. |
| Unsupported OAMPDU Tx | This field displays the number of unsupported OAM PDUs sent on the port. |
| Unsupported OAMPDU Rx | This field displays the number of unsupported OAM PDUs received on the port. |

# 43.3 OAM Configuration

Use this screen to turn on Ethernet OAM on the Switch and ports and configure the related settings.

In the **OAM Status** screen click **Configuration** to display the configuration screen as shown.

**Figure 348** Advanced Application > OAM > OAM Configuration (Standalone Mode)

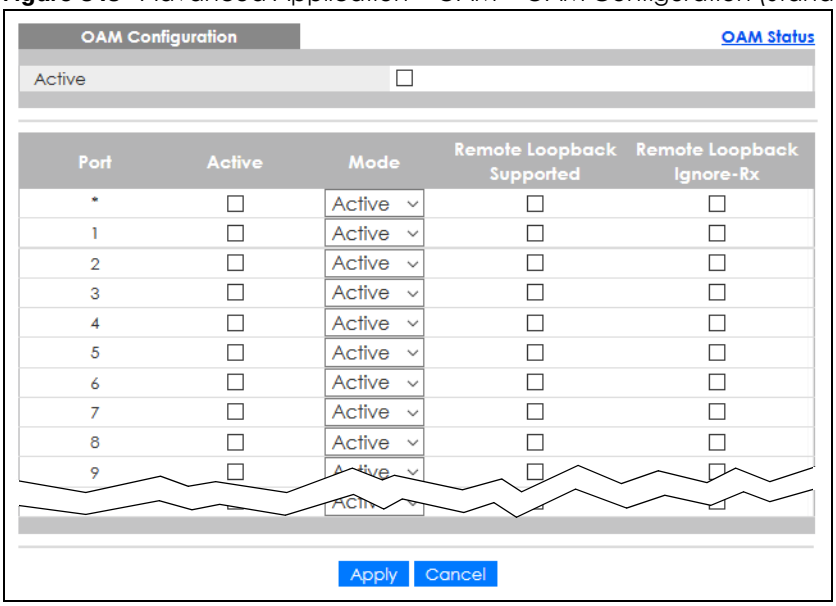
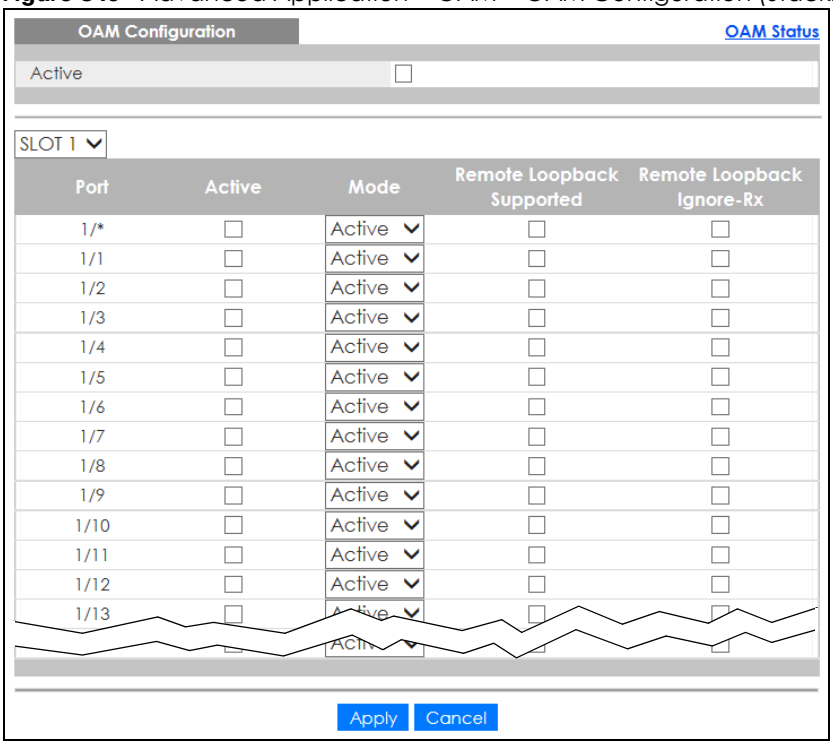



**Figure 349** Advanced Application > OAM > OAM Configuration (Stacking Mode)




The following table describes the fields in the above screen.

Table 202 Advanced Application > OAM > OAM Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable Ethernet OAM on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |

Table 202 Advanced Application > OAM > OAM Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable Ethernet OAM on this port.<br>Clear this check box to disable Ethernet OAM on the port. |
| Mode | Specify the OAM mode on the port.<br>Select **Active** to allow the port to issue and respond to Ethernet OAM commands.<br>Select **Passive** to allow the port to respond to Ethernet OAM commands. |
| Remote Loopback Supported | Select this check box to enable the remote loopback feature on the port. Otherwise, clear the check box to disable it. |
| Remote Loopback Ignore-Rx | Select this check box to set the Switch to process loopback commands received on the port. Otherwise, clear the check box to have the Switch ignore loopback commands received on the port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 43.4 OAM Remote Loopback

Use this screen to perform a remote loopback test. In the **OAM Status** screen click **Remote Loopback** to display the screen as shown.

**Figure 350** Advanced Application > OAM > OAM Remote Loopback (Standalone Mode)

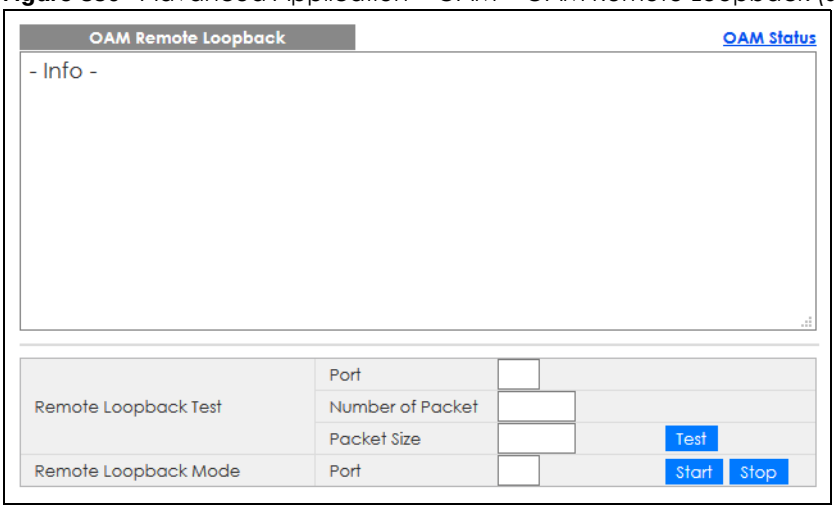
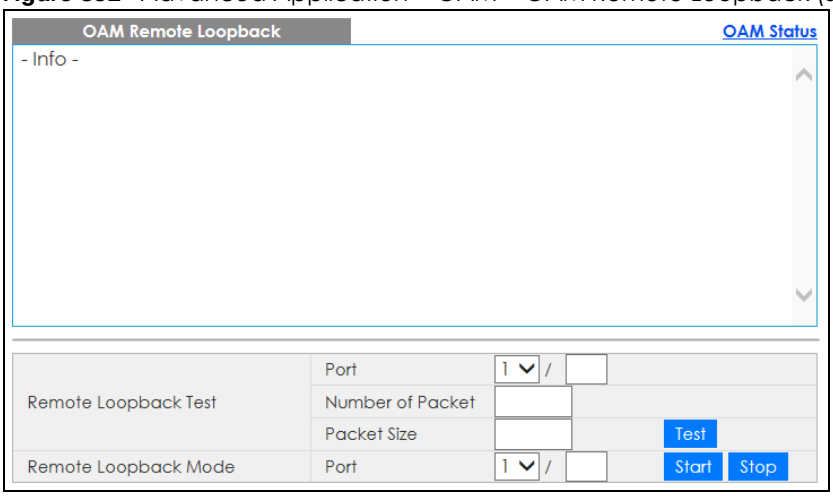


**Figure 351** Advanced Application > OAM > OAM Remote Loopback (Stacking Mode)




The following table describes the fields in the above screen.

Table 203 Advanced Application > OAM > OAM Remote Loopback

| LABEL | DESCRIPTION |
|---|---|
| Remote Loopback Test | |
| Port | Enter the number of the port from which the Switch performs a remote-loopback test.<br>In stacking mode, the first field is the slot ID and the second field is the port number. |
| Number of Packet | Define the allowable packet number of the loopback test frames. |
| Packet Size | Define the allowable packet size of the loopback test frames. |
| Test | Click **Test** to begin the test. |
| Remote Loopback Mode | |
| Port | Enter the number of the port from which the Switch sends loopback control PDUs to initiate or terminate a remote-loopback test.<br>In stacking mode, the first field is the slot ID and the second field is the port number. |
| Start | Click **Start** to initiate a remote-loopback test from the specified port by sending Enable Loopback Control PDUs to the remote device. |
| Stop | Click **Stop** to terminate a remote-loopback test from the specified port by sending Disable Loopback Control PDUs to the remote device. |

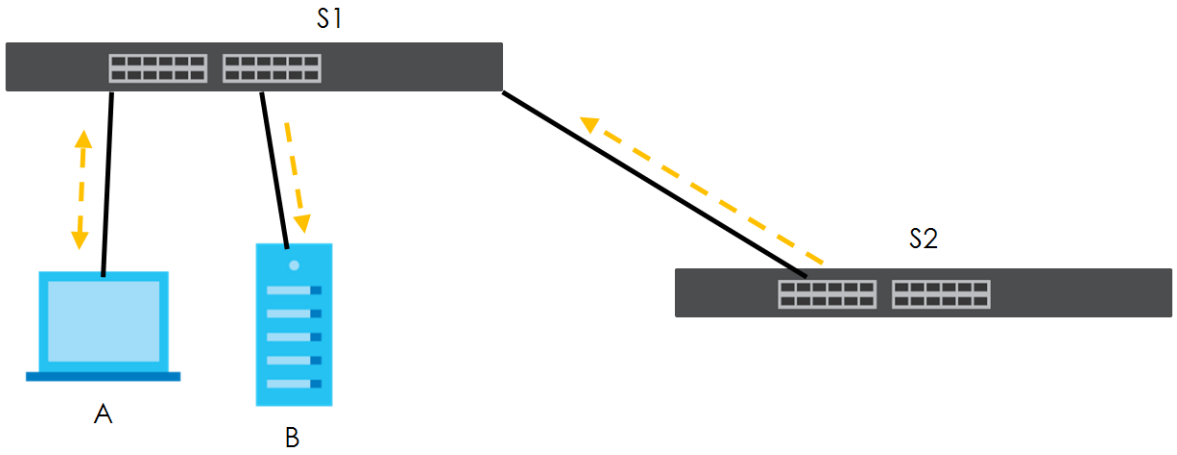
# CHAPTER 44
# ZULD

## 44.1 ZULD Overview

A unidirectional link is a connection where the link is up on both ends, but only one end can receive packets. This may happen if OAM was initially enabled but then disabled, there are mis-configured transmitting or receiving lines or the hardware is malfunctioning. Zyxel Unidirectional Link Detection (**ZULD**) is a layer-2 protocol that can detect and disable these physical one-way links before they cause loops or communication malfunction.

In the figure below, S1–A is a bidirectional link as both ends can send packets to each other. S1–B is unidirectional as B cannot send packets to S1 (although the S1–B link is up). Similarly, S2–S1 is unidirectional as S1 cannot send packets to S2 (although the S1–S2 link is up).

**Figure 352** ZULD Overview




### 44.1.1 What You Can Do

- Use the **ZULD Status** screen (Section 44.2 on page 449) to see details on ZULD.
- Use the **ZULD Configuration** screen (Section 44.3 on page 451) to enable ZULD on a port, configure a mode and set the probe time.

### 44.1.2 What You Need to Know

- ZULD must be enabled on the Switch and the ports in order to detect unidirectional links by monitoring OAMPDUs.
- Ports advertise their unidirectional link detection capability using OAMPDUs, so all connected devices must support **OAM** as well as **ZULD**. You need to enable OAM on the Switch by going to **Advanced Application** > **OAM** > **Configuration** and selecting **Active**. OAM must be enabled on other connected

devices too. If OAM is not enabled initially, **ZULD** will not work.

- If OAM is enabled initially and later disabled on one end of a link, the link will be unidirectional as that end cannot send OAMPDUs.
- OAM discovery, the sending of OAMPDUs to other ports, is initiated by an active port.
- When **ZULD** detects a unidirectional link, it sends a syslog and SNMP trap and may shut down the affected port (**Aggressive Mode**).
- If a port on the Switch is shut down by **ZULD**, and you want to recover it, then do one of the following:
  - Go to **Basic Setting** > **Port Setup**. Clear **Active** and click **Apply**. Then select **Active** and click **Apply** again.
  - Go to **Advanced Application** > **Errdisable** > **Errdisable Recovery** and set the interval for **ZULD**. After the interval expires, the closed ports will become active and start receiving packets again.
  - Use the command `port no inactive`.
- Refer to the ZULD logs to see when a unidirectional link is detected and when it is recovered to a bidirectional link.

# 44.2 ZULD Status

Use this screen to see details of unidirectional and bidirectional links discovered by **ZULD**. To open this screen, click **Advanced Application** > **ZULD**.

**Figure 353** Advanced Application > ZULD Status (Standalone Mode)

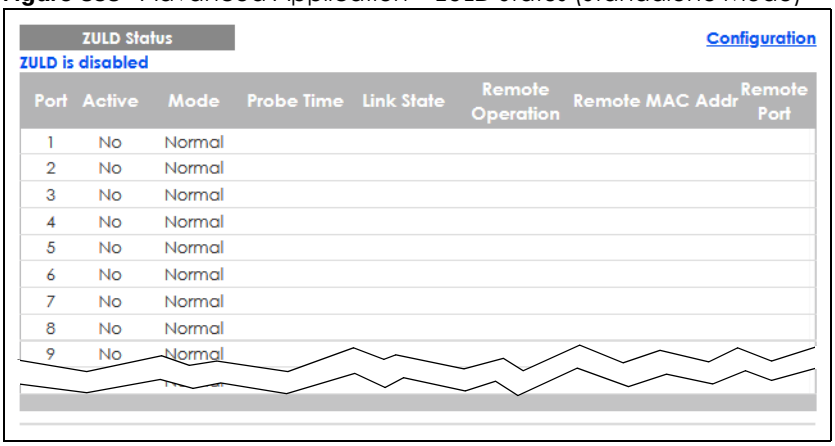
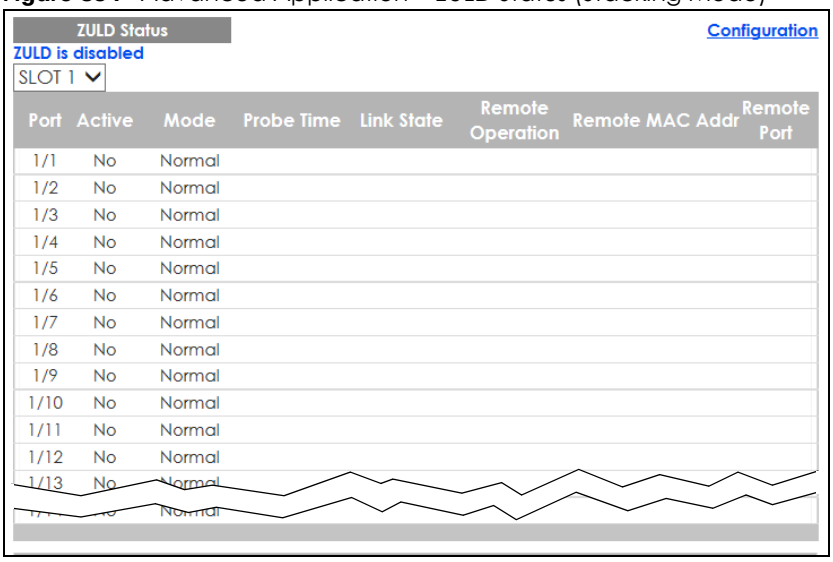


**Figure 354** Advanced Application > ZULD Status (Stacking Mode)




The following table describes the fields in the above screen.

Table 204 Advanced Application > ZULD Status

| LABEL | DESCRIPTION |
|---|---|
| ZULD is.... | This shows whether **ZULD** is enabled or disabled on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Active | This field displays whether ZULD is enabled on the port or not. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs. |
| Mode | This field indicates what **ZULD** will do when a unidirectional link is detected. In **Normal** mode, **ZULD** only sends a syslog and trap when it detects a unidirectional link. In **Aggressive** mode, **ZULD** shuts down the port (puts it into an **ErrDisable** state) as well as sends a syslog and trap when it detects a unidirectional link. |
| Probe Time | Probe time is the length of time that **ZULD** waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then **ZULD** declares that the link is unidirectional. |
| Link State | This field shows the following link states:<br>• **Linkdown**: This is an initialization state, where the port is not yet up.<br>• **Probe**: This indicates that **ZULD** is discovering the connected device on this link.<br>• **Bidirectional**: Traffic sent by the Switch is received by the connected device on this link, and traffic from the connected device on this link is received by the Switch.<br>• **Unidirectional**: The state of the link between the port and its connected port cannot be determined either because no ZULD message was received, or one port is not capable of sending traffic.<br>• **Shutdown**: The port has been shut down because its link with the connected device is unidirectional and **ZULD** is in **Aggressive** mode. |
| Remote Operation | This field displays whether ZULD is enabled or disabled on the connected device on this link. ZULD must be enabled on the connected device and on the port that is connecting to the Switch. |

Table 204 Advanced Application > ZULD Status (continued)

| LABEL | DESCRIPTION |
|---|---|
| Remote MAC Addr | This is the MAC address of the port on the connected device to which the port of the Switch is connected. |
| Remote Port | This is the port number of the port on the connected device to which the port of the Switch is connected. |

# 44.3 ZULD Configuration

Use this screen to enable ZULD on a port, configure a mode and set the probe time. To open this screen, click **Advanced Application** > **ZULD** > **Configuration**.

**Figure 355** Advanced Application > ZULD > Configuration (Standalone Mode)

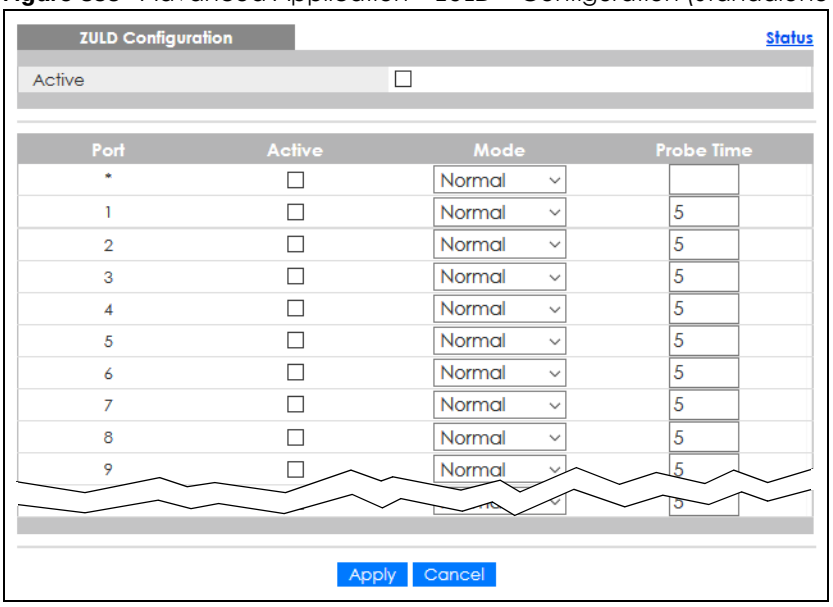
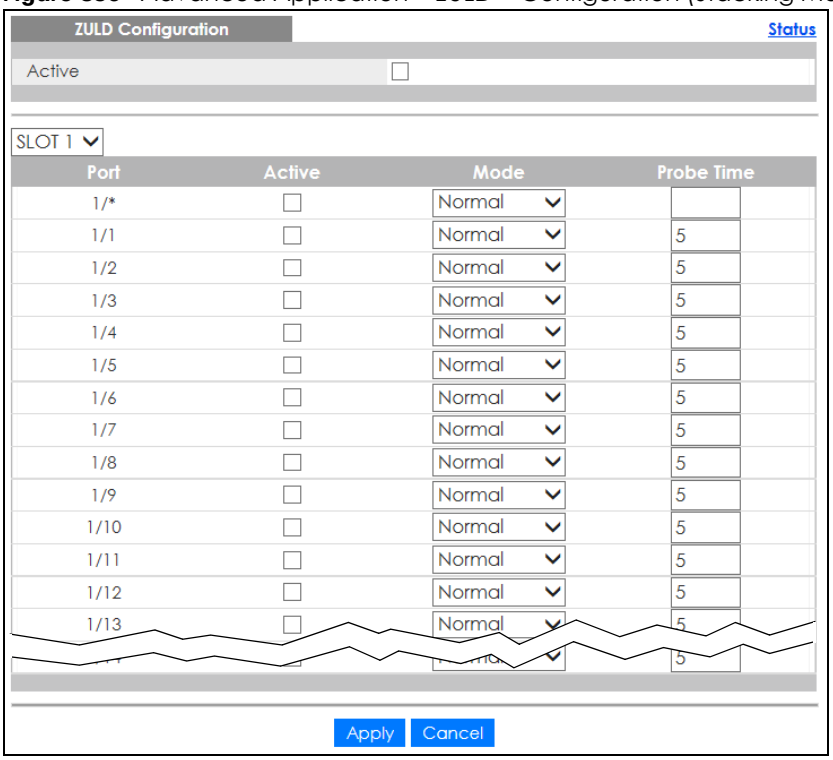


**Figure 356** Advanced Application > ZULD > Configuration (Stacking Mode)




The following table describes the fields in the above screen.

Table 205 Advanced Application > ZULD > Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this to enable **ZULD** on the Switch. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this to enable **ZULD** on the port. ZULD must be enabled to detect an unidirectional link by monitoring OAMPDUs. |
| Mode | Select **Normal** or **Aggressive**. In **Normal** mode, ZULD only sends a syslog and trap when it detects a unidirectional link. In **Aggressive** mode, ZULD shuts down the port (puts it into an **ErrDisable** state) as well as sends a syslog and trap when it detects a unidirectional link. |
| Probe Time | Type the length of time that **ZULD** waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then **ZULD** declares that the link is unidirectional.<br><br>The allowed time range is from 5 – 65535 seconds. |

Table 205 Advanced Application > ZULD > Configuration (continued)

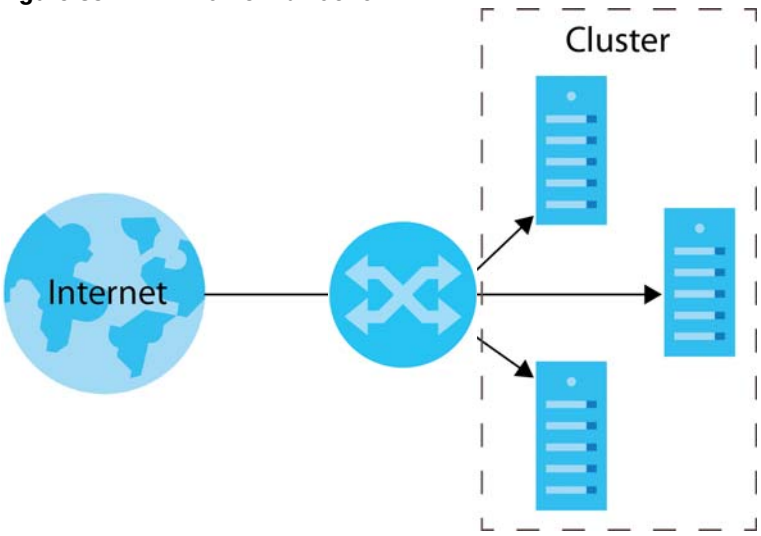
| LABEL | DESCRIPTION |
|---|---|
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values in this screen to their last-saved values. |

# CHAPTER 45
# NLB

## 45.1 NLB Overview

The Switch supports NLB (Network Load Balancing) traffic distribution. The Switch will copy and forward the incoming traffic to a cluster. Each server in a cluster tackles a separate copy of traffic.

**Figure 357** NLB Traffic Distribution




The Switch only supports up to two clusters for NLB traffic distribution.

Note: NLB settings are configured on the servers.

See Section 45.1.2 on page 455 for more information about NLB.

### 45.1.1 What You Can Do

- Use the **MAC Forwarding** screen (Section 45.2 on page 455) to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.
- Use the **IP Configuration** screen (Section 45.3 on page 457) to map the IP address to the MAC address of a cluster for layer-3 forwarding.

## 45.1.2 What You Need to Know

### NLB

Network Load Balancing (NLB) is a feature developed by Microsoft. NLB enhances the performance reliability for critical applications by sharing traffic with multiple servers in a cluster using TCP/IP protocol. Each server of a cluster tackles a copy of a traffic. You can create a cluster by grouping up to 32 servers together.

If a server in a cluster fails, traffic will be redistributed to the other operating servers. When the server is back in service, it will join the cluster automatically and share the traffic.

### Unicast Mode

NLB replaces the real MAC addresses of the servers in a cluster with a unicast MAC address. Each server uses the same unicast MAC address, and a switch cannot map the unicast MAC address to a port. This forces a switch to flood traffic meant for the cluster to all ports of the switch to make sure the traffic is forwarded to the right destination.

The servers in a cluster cannot communicate with each other, because they use the same unicast MAC address.

### Multicast Mode

NLB assigns a multicast MAC address to the servers in a cluster. Therefore, each server has two MAC addresses, the real MAC address and the multicast MAC address.

Create static ARP entries on a switch for the servers, so the switch will only forward traffic to the servers of the cluster.

The servers in a cluster can communicate with each other, because they keep their real MAC address and already have their own IP addresses.

# 45.2 MAC Forwarding

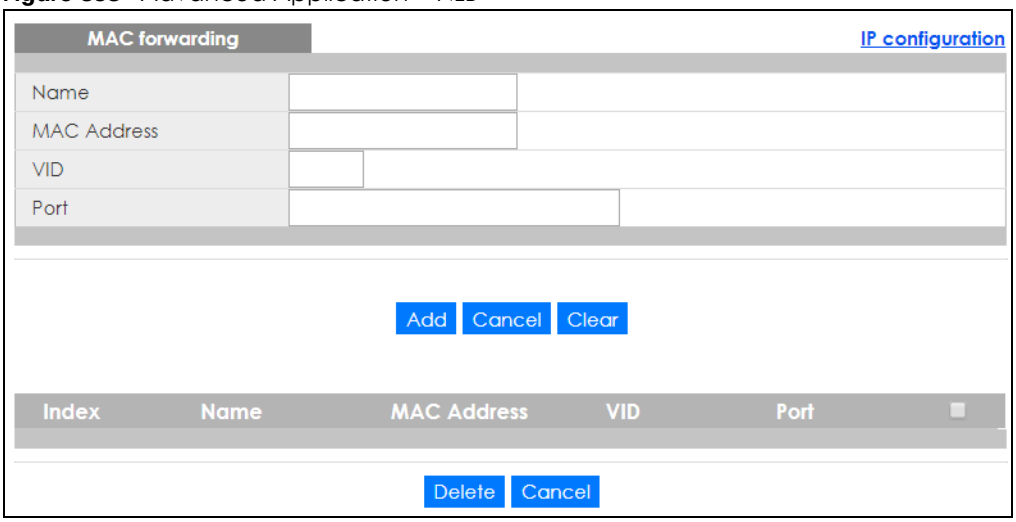
Use this screen to configure to which MAC addresses and ports the Switch should forward the incoming NLB traffic.

Click **Advanced Application** > **NLB** in the navigation panel to display the screen as shown.

Note: The following screens cannot have duplicate settings as the **Advanced Application** > **NLB** screen.

- **Advanced Application** > **Static MAC Forwarding**
- **Advanced Application** > **Static Multicast Forwarding**
- **Advanced Application** > **Filtering**

**Figure 358** Advanced Application > NLB




The following table describes the labels in this screen.

Table 206 Advanced Application > NLB

| LABEL | DESCRIPTION |
|---|---|
| MAC forwarding | |
| Name | Enter a descriptive name for identification purposes for this rule. |
| MAC Address | Enter a multicast or unicast MAC address of a cluster.<br>The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.<br>The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses. |
| VID | Enter the VLAN identification number. If you do not have a specific target VLAN, enter 1.<br>The Switch will forward traffic to ports in this VLAN group. |
| Port | Enter the ports to which you want the Switch to forward the incoming NLB traffic.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (–). For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1-1/24,2/23 for ports 1 to 24 for the Switch in slot 1 and port 23 for the Switch in slot 2, for example. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click Cancel to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays the index number of the rule. |
| Name | This field displays the descriptive name of the rule. |
| MAC Address | This field displays the multicast or unicast MAC address of this rule. |
| VID | This field displays the VLAN group identification number. |
| Port | This field displays the ports to which the Switch will forward the incoming NLB traffic. |

Table 206 Advanced Application > NLB (continued)

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

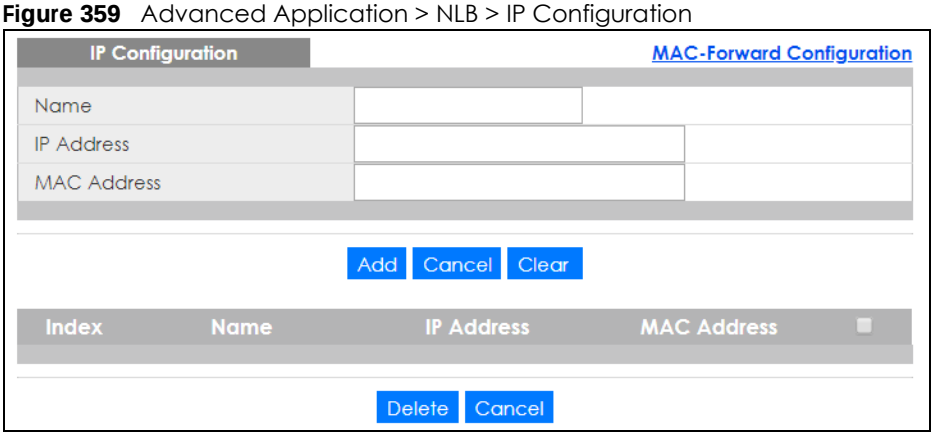
# 45.3 IP Configuration

Use this screen to map the IP address to the MAC address of a cluster for layer-3 forwarding. Use the MAC address added in the **Advanced Application** > **NLB** screen.

Click **Advanced Application** > **NLB** > **IP configuration** in the navigation panel to display the screen as shown.

Note: The settings configured in the **Advanced Application** > **NLB** > **IP configuration** and **IP Application** > **ARP Setup** > **Static ARP** screens cannot duplicate.

**Figure 359** Advanced Application > NLB > IP Configuration




The following table describes the labels in this screen.

Table 207 Advanced Application > NLB > IP Configuration

| LABEL | DESCRIPTION |
|---|---|
| IP Configuration | |
| Name | Enter a descriptive name for identification purposes for this rule. |
| IP Address | Enter an IPv4 or IPv6 address for a cluster. |
| MAC Address | Enter a multicast or unicast MAC address added in the **Advanced Application** > **NLB** screen.<br><br>The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses.<br><br>The last binary bit of the first octet pair in a unicast MAC address must be 0. For example, the first octet pair 00000000 is 00 and 00000010 is 02 in hexadecimal, so 00:00:5e:00:00:0A and 02:00:5e:00:00:27 are valid unicast MAC addresses. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |

Table 207 Advanced Application > NLB > IP Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Cancel | Click Cancel to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays the index number of the rule. |
| Name | This field displays the descriptive name of the rule. |
| IP Address | This field displays the IP address of the cluster. |
| MAC Address | This field displays the multicast or unicast MAC address of this rule. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 46
# Wol Relay

## 46.1 Wol Relay Overview

Wake On LAN is a feature to remotely turn on a device on the LAN network. A device is turned on by receiving a magic packet. To use this feature the remote hardware (for example the network adapter on a computer) must support Wake On LAN using the "Magic Packet" method.

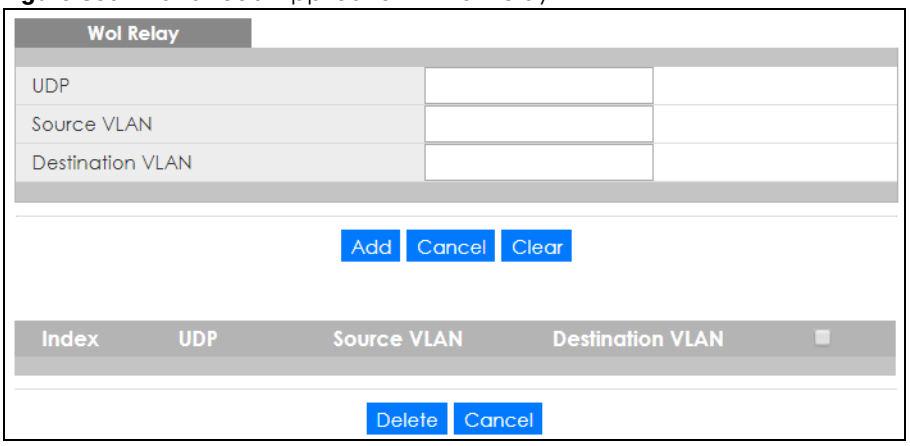
A magic packet is a UDP broadcast packet. The device that you want to turn on is off, so it cannot respond to a TCP packet. Therefore, It has to be a UDP broadcast packet to turn on a device.

Broadcast packets are generally not routed. A magic packet cannot be routed. This prevents DDoS attacks, but also prohibits you from sending magic packets to other devices in different subnets. The Switch's Wake On LAN relay feature allows you to send magic packets to devices across different subnets.

## 46.2 Wol Relay

Use this screen to configure settings on Wake On LAN relay. Click **Advanced Application** > **Wol Relay** to open the following screen.

**Figure 360** Advanced Application > Wol Relay



The following table describes the labels in this screen.

Table 208 Advanced Application > Wol Relay

| LABEL | DESCRIPTION |
|---|---|
| Wol Relay | |
| UDP | Enter a UDP port number that magic packets are sent through.<br>The most common port for transmission is UDP port 9. |
| Source VLAN | Enter the source VLAN ID where the magic packet originates from. |
| Destination VLAN | Enter the destination VLAN ID where the magic packet will be sent to. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click Cancel to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays the index number of the rule. |
| UDP | This field displays the UDP port of the rule. |
| Source VLAN | This field displays the source VLAN ID of the rule. |
| Destination VLAN | This field displays the destination VLAN ID of the rule. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 47
# Static Route

## 47.1 Static Routing Overview

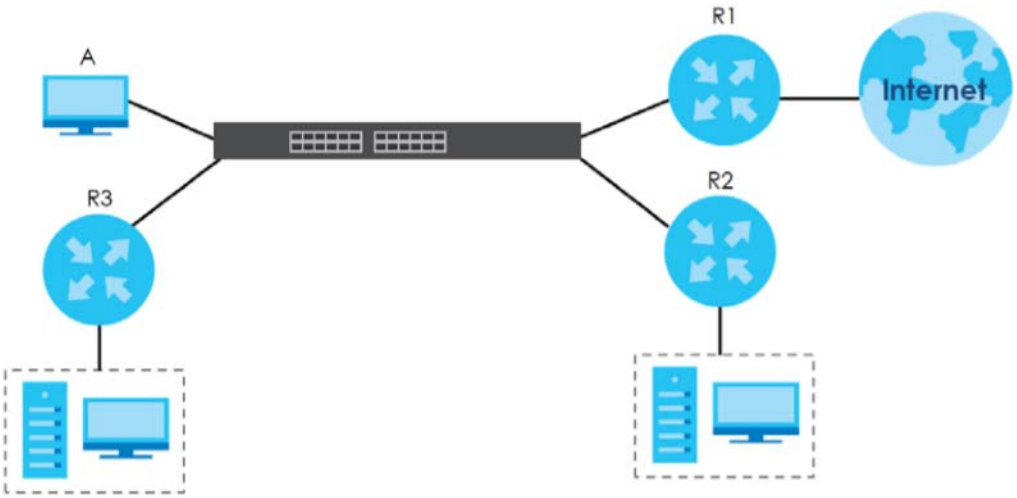
This chapter shows you how to configure static routes.

The Switch uses IP for communication with management computers, for example using HTTP, Telnet, SSH, or SNMP. Use IP static routes to have the Switch respond to remote management stations that are not reachable through the default gateway. The Switch can also use static routes to send data to a server or device that is not reachable through the default gateway, for example when sending SNMP traps or using ping to test IP connectivity.

The Switch usually uses the default gateway to route outbound traffic from computers on the LAN to the Internet. To have the Switch send data to devices not reachable through the default gateway, use static routes.

For example, the next figure shows a computer (**A**) connected to the Switch. The Switch routes most traffic from **A** to the Internet through the Switch's default gateway (**R1**). You create one static route to connect to services offered by your ISP behind router **R2**. You create another static route to communicate with a separate network behind a router **R3** connected to the Switch.

**Figure 361** Example of Static Routing Topology




### 47.1.1 What You Can Do

- Use the **Static Routing** screen (Section 47.2 on page 462) to display the link to the **IPv4 Static Route** screen.
- Use the **IPv4 Static Route** screen (Section 47.3 on page 462) to configure and enable an IPv4 static route.
- Use the **IPv6 Static Route** screen (Section 47.4 on page 463) to configure and enable an IPv6 static route.

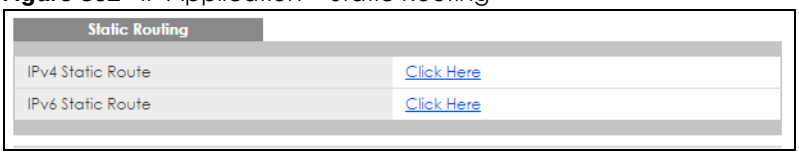
# 47.2 Static Routing

Click **IP Application** > **Static Routing** in the navigation panel to display the screen as shown.

Click the link next to **IPv4 Static Route** to open a screen where you can create IPv4 static routing rules.

Click the link next to **IPv6 Static Route** to open a screen where you can create IPv6 static routing rules.

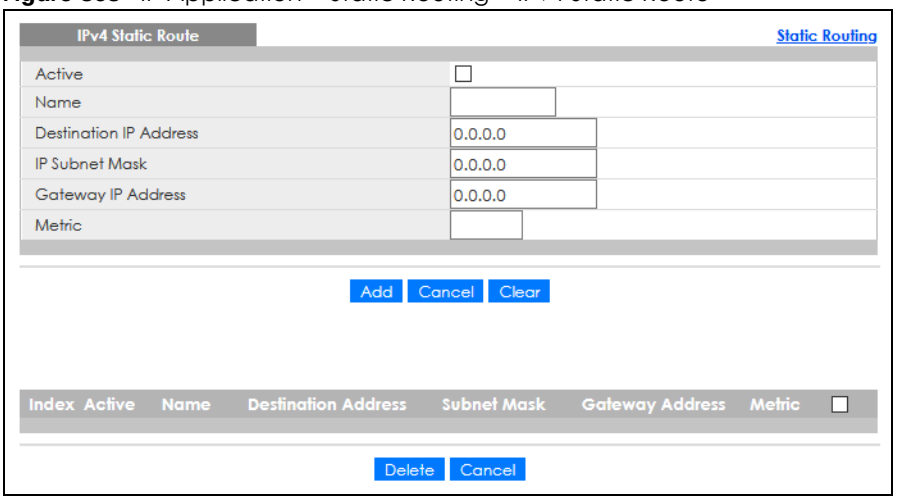
**Figure 362** IP Application > Static Routing




# 47.3 IPv4 Static Route

Click the link next to **IPv4 Static Route** in the **IP Application** > **Static Routing** screen to display the screen as shown.

**Figure 363** IP Application > Static Routing > IPv4 Static Route




The following table describes the related labels you use to create a static route.

Table 209 IP Application > Static Routing > IPv4 Static Route

| LABEL | DESCRIPTION |
|---|---|
| Active | This field allows you to activate or deactivate this static route. |
| Name | Enter a descriptive name (up to 10 printable ASCII characters) for identification purposes. |
| Destination IP Address | This parameter specifies the IP network address of the final destination. |
| IP Subnet Mask | Enter the subnet mask for this destination. Routing is always based on network number. If you need to specify a route to a single host, use a subnet mask of 255.255.255.255 in the subnet mask field to force the network number to be identical to the host ID. |
| Gateway IP Address | Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination. The gateway must be a router on the same segment as your Switch. |

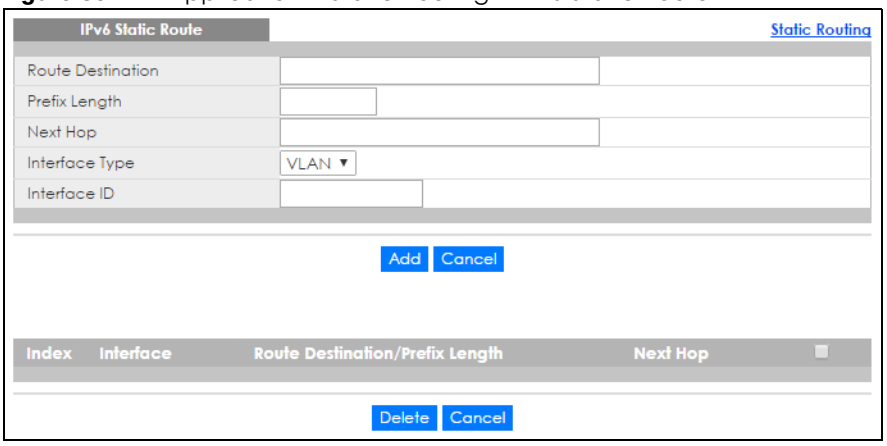
Table 209 IP Application > Static Routing > IPv4 Static Route (continued)

| LABEL | DESCRIPTION |
|---|---|
| Metric | The metric represents the "cost" of transmission for routing purposes. IP routing uses hop count as the measurement of cost, with a minimum of 1 for directly connected networks. Enter a number that approximates the cost for this link. The number need not be precise, but it must be between 1 and 15. In practice, 2 or 3 is usually a good number. |
| Add | Click **Add** to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the above fields to your previous configuration. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays the index number of the route. Click a number to edit the static route entry. |
| Active | This field displays **Yes** when the static route is activated and **NO** when it is deactivated. |
| Name | This field displays the descriptive name for this route. This is for identification purposes only. |
| Destination Address | This field displays the IP network address of the final destination. |
| Subnet Mask | This field displays the subnet mask for this destination. |
| Gateway Address | This field displays the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination. |
| Metric | This field displays the cost of transmission for routing purposes. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 47.4 IPv6 Static Route

Click the link next to **IPv6 Static Route** in the **IP Application** > **Static Routing** screen to display the screen as shown.

**Figure 364** IP Application > Static Routing > IPv6 Static Route



The following table describes the related labels you use to create a static route.

Table 210 IP Application > Static Routing > IPv6 Static Route

| LABEL | DESCRIPTION |
|---|---|
| Route Destination | Enter the IPv6 address of the final destination. |
| Prefix Length | Enter the prefix length number of up to 64 for this destination. |
| Next Hop | Enter the IPv6 address of the next-hop router. |
| Interface Type | Select the type of the IPv6 interface through which the IPv6 packets are forwarded.<br>The Switch supports only the VLAN interface type at the time of writing. |
| Interface ID | Enter the ID number of the IPv6 interface through which the IPv6 packets are forwarded. |
| Add | Click **Add** to insert a new static route to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Index | This field displays the index number of the route. Click a number to edit the static route entry. |
| Interface | This field displays the descriptive name of the interface that is used to forward the packets to the destination. |
| Route Destination/Prefix Length | This field displays the IPv6 subnet prefix and prefix length of the final destination. |
| Next Hop | This field displays the IPv6 address of the gateway that helps forward the packet to the destination. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 48
# Policy Routing

This chapter shows you how to configure policy routing rules.

## 48.1 Policy Route Overview

Traditionally, routing is based on the destination address only and the Switch takes the shortest path to forward a packet. Policy routing provides a mechanism to override the default routing behavior and alter the packet forwarding based on the policy defined by the network administrator. Policy-based routing is applied to incoming packets prior to the normal routing.

Individual routing policies are used as part of the overall policy routing process. A routing policy defines the action to take when a packet meets the criteria in a specified classifier. The action is taken only when all the criteria are met.

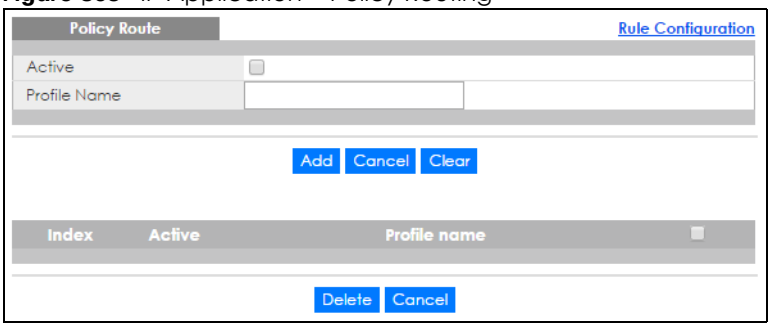
### 48.1.1 Benefits

- Source-Based Routing – Network administrators can use policy-based routing to direct traffic from different users through different connections.
- Cost Savings – Policy routing allows organizations to distribute interactive traffic on high-bandwidth, high-cost paths while using low-cost paths for batch traffic.
- Load Sharing – Network administrators can use policy routing to distribute traffic among multiple paths.

## 48.2 Configuring Policy Routing Profile

Click **IP Application** > **Policy Routing** in the navigation panel to display the screen as shown. Use this screen to configure a policy routing profile, which can consist of multiple policy routing rules.

**Figure 365** IP Application > Policy Routing



The following table describes the labels in this screen.

Table 211 IP Application > Policy Routing

| LABEL | DESCRIPTION |
|---|---|
| Active | This field allows you to activate or deactivate this policy routing profile and rules in the profile. |
| Profile Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. Spaces are allowed. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays the index number of the policy routing profile. Click a number to edit the policy routing profile entry. |
| Active | This field displays **Yes** when the policy routing profile is activated and **No** when it is deactivated. |
| Profile Name | This field displays the descriptive name for this profile. This is for identification purposes only. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

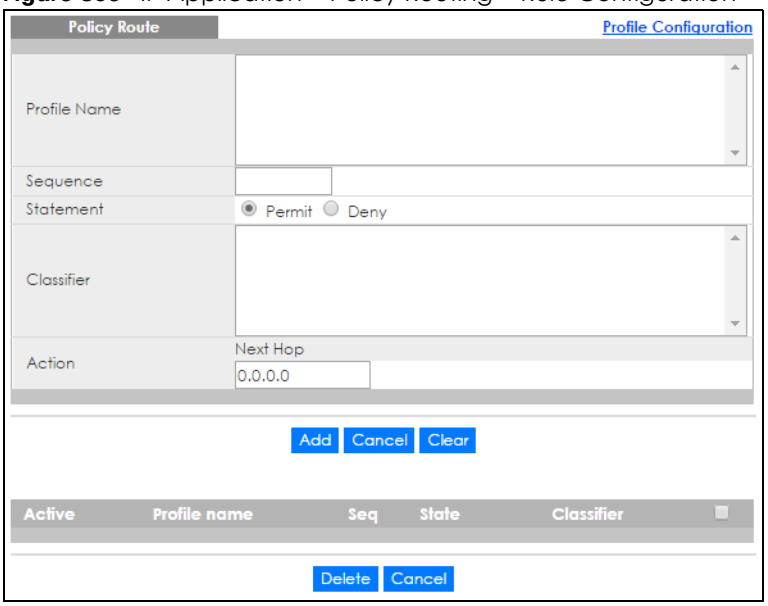
## 48.2.1 Policy Routing Rule Configuration

You must first configure a layer-3 classifier in the **Classifier** screen and a policy routing profile in the **Policy Routing** screen.

Use this screen to configure a policy route to override the default (shortest path) routing behavior and forward packets based on the classifier and action you specify. A policy route rule defines the matching classifier and the action to take when a packet meets the criteria in the classifier. The action is taken only when all the criteria are met. Policy-based routing is applied to incoming packets on a per interface basis before normal routing. The Switch does not perform normal routing on packets that match any of the policy routes.

Click **Rule Configuration** in the **IP Application** > **Policy Routing** screen to display the screen as shown.

**Figure 366** IP Application > Policy Routing > Rule Configuration




The following table describes the labels in this screen.

Table 212 IP Application > Policy Routing > Rule Configuration

| LABEL | DESCRIPTION |
|---|---|
| Profile Name | This field displays the policy routing profiles you configure in the **IP Application** > **Policy Routing** screen.<br><br>Select a profile for which you want to configure a policy routing rule. |
| Sequence | Enter the rule number from 1 to 64. The ordering of your rules is important as rules are applied in turn.<br><br>You can not specify a number already in use by another rule. |
| Statement | Select **Permit** to forward traffic that matches this rule to the gateway specified in the rule.<br><br>Select **Deny** to disable the rule action and forward traffic that matches this rule according to the routing table on the Switch. |
| Classifier | This field displays the available active classifiers you configure in the **Classifier** screen, which are not used by any policy rule or policy routing rule.<br><br>Select a classifier to which this policy routing rule applies. |
| Action | Enter the IP address of the gateway. The gateway is an immediate neighbor of your Switch that will forward the packet to the destination. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Active | This field displays whether the policy route profile is enabled or not. |
| Profile Name | This field displays the name of the policy route profile with which the rule is associated. |
| Seq | This field displays the rule index number that you configure in the **Sequence** field. Click an index number to change the rule's **Statement**. |
| State | This field displays **permit** when the rule action is activated and **deny** when is it deactivated. |

Table 212 IP Application > Policy Routing > Rule Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Classifier | This field displays the name of the classifier to which this policy applies. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entries from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 49
# RIP

This chapter shows you how to configure RIP (Routing Information Protocol).

## 49.1 RIP Overview

RIP (Routing Information Protocol) allows a routing device to exchange routing information with other routers. The **Direction** field controls the sending and receiving of RIP packets. When set to:

- **Both** – the Switch will broadcast its routing table periodically and incorporate the RIP information that it receives.
- **Incoming** – the Switch will not send any RIP packets but will accept all RIP packets received.
- **Outgoing** – the Switch will send out RIP packets but will not accept any RIP packets received.
- **None** – the Switch will not send any RIP packets and will ignore any RIP packets received.

The **Version** field controls the format and the broadcasting method of the RIP packets that the Switch sends (it recognizes both formats when receiving). **RIP-1** is universally supported; but RIP-2 carries more information. **RIP-1** is probably adequate for most networks, unless you have an unusual network topology.

Both **RIP-2B** and **RIP-2M** send the routing data in RIP-2 format; the difference being that **RIP-2B** uses subnet broadcasting while **RIP-2M** uses multicasting.

RIPv2 uses UDP port 520 and the multicast address 224.0.0.9.

### 49.1.1 Administrative Distance

When two or more than two different routing protocols, such as RIP and OSPF provide multiple routes to the same destination, the Switch can use the administrative distance of the route to determine which routing protocol to use and add the route to the routing table.

The lower the administrative distance value is, the more preferable the routing protocol is. If two routes have the same administrative distance value, the Switch uses the route that has the lowest metric value. The following table lists the default administrative distance value of the route sources supported on the Switch.

Table 213 Default Distance Value

| ROUTE SOURCE | ADMINISTRATIVE DISTANCE |
|---|---|
| Local | 0 |
| Static | 1 |

Table 213 Default Distance Value (continued)

| ROUTE SOURCE | ADMINISTRATIVE DISTANCE |
|---|---|
| OSPF | 110 |
| RIP | 120 |

# 49.2 RIP Configuration

Click **IP Application** > **RIP** in the navigation panel to display the screen as shown.

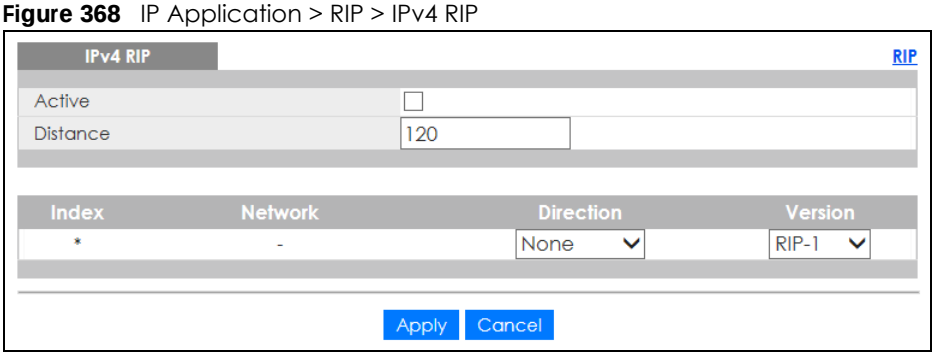
Click the link next to **IPv4 RIP** to open a screen where you can enable RIP for IPv4 and configure the RIP version and direction for an IP interface.

**Figure 367** IP Application > RIP

# 49.3 Configuring IPv4 RIP

Click **IP Application** > **RIP** > **IPv4 RIP** in the navigation panel to display the screen as shown. You cannot manually configure a new entry. Each entry in the table is automatically created when you configure a new IP domain in the **IP Setup** screen.

**Figure 368** IP Application > RIP > IPv4 RIP




The following table describes the labels in this screen.

Table 214 IP Application > RIP > IPv4 RIP

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable IPv4 RIP on the Switch. |
| Distance | Enter a number from 10 to 255 to specify the administrative distance that is assigned to routes learned by RIP.<br>The lower the administrative distance value is, the more preferable the routing protocol is.<br>Note: You cannot set two routing protocols to have the same administrative distance. |
| Index | This field displays the index number of an IP interface. |

Table 214 IP Application > RIP > IPv4 RIP (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all entries.<br>Use this row only if you want to make some settings the same for all entries. Use this row first to set the common settings and then make adjustments on a per entry basis.<br>Note: Changes in this row are copied to all the entries as soon as you make them. |
| Network | This field displays the IP interface configured on the Switch.<br>Refer to the section on IP Setup for more information on configuring IP domains. |
| Direction | Select the RIP direction from the drop-down list box. Choices are **Outgoing**, **Incoming**, **Both** and **None**. |
| Version | Select the RIP version from the drop-down list box. Choices are **RIP-1**, **RIP-2B** and **RIP-2M**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 50
# OSPF

This chapter describes the OSPF (Open Shortest Path First) routing protocol and shows you how to configure OSPF.

## 50.1 OSPF Overview

OSPF (Open Shortest Path First) is a link-state protocol designed to distribute routing information within an autonomous system (AS). An autonomous system is a collection of networks using a common routing protocol to exchange routing information.

OSPF offers some advantages over traditional vector-space routing protocols (such as RIP). The following table summarizes some of the major differences between OSPF and RIP.

Table 215 OSPF vs. RIP

| | OSPF | RIP |
|---|---|---|
| Network Size | Large | Small (with up to 15 routers) |
| Metrics | Bandwidth, hop count, throughput, round trip time and reliability. | Hop count |
| Convergence | Fast | Slow |

The Switch uses OSPFv2 for IPv4. OSPFv2 uses plain text or MD5 authentication.

### 50.1.1 OSPF Autonomous Systems and Areas

An OSPF autonomous system (AS) can be divided into logical areas. Each area represents a group of adjacent networks. All areas are connected to a backbone (also known as area 0). The backbone is the transit area to route packets between two areas. A stub area, at the edge of an AS is not a transit area since there is only one connection to the stub area.

The following table describes the four classes of OSPF routers.

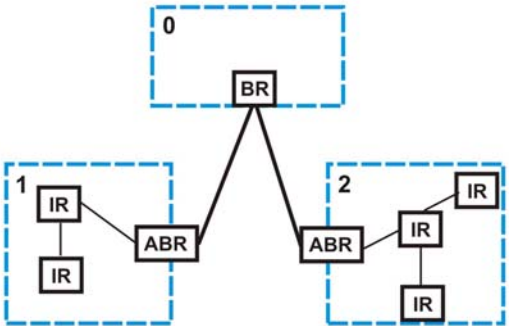
Table 216 OSPF: Router Types

| TYPE | DESCRIPTION |
|---|---|
| Internal Router (IR) | An Internal or intra-area router is a router in an area. |
| Area Border Router (ABR) | An Area Border Router connects two or more areas. |
| Backbone Router (BR) | A backbone router has an interface to the backbone. |
| AS Boundary Router | An AS boundary router exchanges routing information with routers in other ASs. |

The following figure depicts an OSPF network example. The backbone is area 0 with a backbone router.

The internal routers are in area 1 and 2. The area border routers connect area 1 and 2 to the backbone.

**Figure 369** OSPF Network Example




## 50.1.2 How OSPF Works

Layer-3 devices exchange routing information to build a synchronized link state database within the same AS or area. The link state database contains records of router IDs, their associated links and path costs. Each device can then use the link state database and Dijkstra algorithm to compute the least cost paths to network destinations.

Layer-3 devices build a synchronized link state database by exchanging Hello messages to confirm which neighbor (layer-3) devices exist and then they exchange database descriptions (DDs) to create the link state database. The link state database is constantly updated through LSAs (Link State Advertisements).

## 50.1.3 Interfaces and Virtual Links

An OSPF interface is a link between a layer-3 device and an OSPF network. An interface has state information, an IP address and subnet mask associated with it. When you configure an OSPF interface, you first set an interface to transmit OSPF traffic and add the interface to an area.

You can configure a virtual link to establish/maintain connectivity between a non-backbone area and the backbone. The virtual link must be configured on both layer-3 devices in the non-backbone area and the backbone.

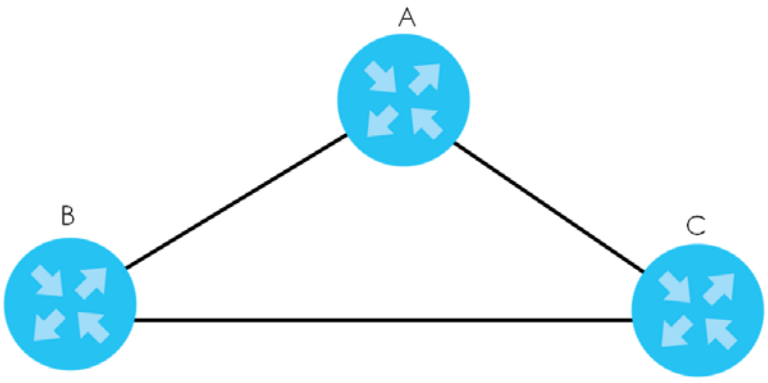
## 50.1.4 OSPF and Router Elections

The OSPF protocol provides for automatic election of Designated Router (DR) and Backup Designated Router (BDR) on network segments. The DR and BDR keep track of link state updates in their area and make sure LSAs are sent to the rest of the network.

In most cases the default DR/BDR election is fine, but in some situations it must be controlled. In the following figure only router **A** has direct connectivity with all the other routers on the network segment. Routers **B** and **C** do not have a direct connection with each other. Therefore they should not be allowed

to become DR or BDR. Only router A should become the DR.

**Figure 370** OSPF Router Election Example




You can assign a priority to an interface which determines whether this router will be elected to be a DR or BDR. The router with the highest priority becomes the DR, while a router with a priority of 0 does not participate in router elections. In Figure 370 on page 474 you can assign a priority of 0 to routers **B** and **C**, thereby ensuring they do not become DR or BDR and assign a priority of 1 to router **A** to make sure that it does become the DR.

### 50.1.5 Configuring OSPF

To configure OSPF on the Switch, do the following tasks:

1. Enable OSPF.
2. Create OSPF areas.
3. Create and associate interfaces to an area.
4. Create virtual links to maintain backbone connectivity.

## 50.2 OSPF Screen

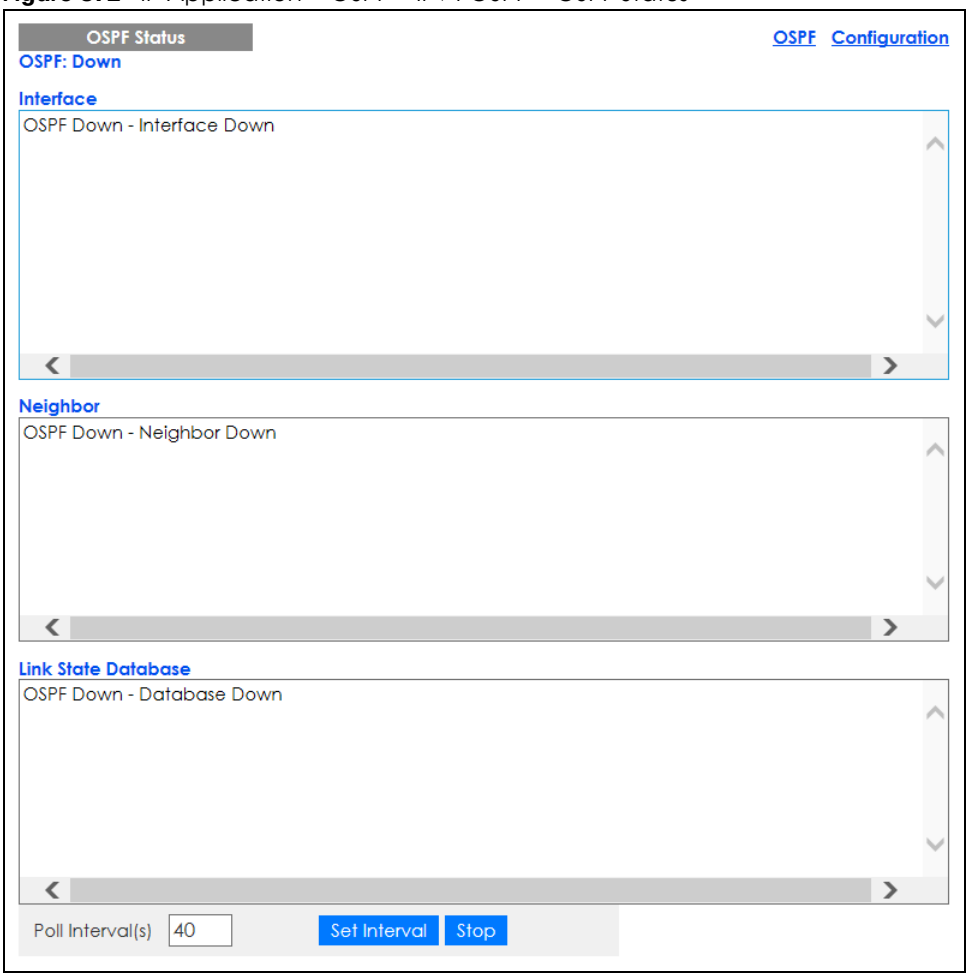
Click **IP Application** > **OSPF** in the navigation panel to display the screen as shown. Click the link next to **IPv4 OSPF** to open screens where you can view IPv4 OSPF status and configure OSPF for IPv4. Click the link next to **IPv6 OSPF** to open screens where you can view IPv6 OSPF status and configure OSPF for IPv6.

**Figure 371** IP Application > OSPF

# 50.3 IPv4 OSPF Status

Use this screen to view current IPv4 OSPF status. Click **IP Application** > **OSPF** > **IPv4 OSPF** the navigation panel to display the screen as shown next. See Section 50.1 on page 472 for more information on OSPF.

**Figure 372** IP Application > OSPF > IPv4 OSPF > OSPF Status




The following table describes the labels in this screen.

Table 217 IP Application > OSPF > IPv4 OSPF > OSPF Status

| LABEL | DESCRIPTION |
|---|---|
| OSPF | This field displays whether OSPF is activated (**Running**) or not (**Down**). |
| Interface | The text box displays the OSPF status of the interfaces on the Switch. |
| Neighbor | The text box displays the status of the neighboring router participating in the OSPF network. |
| Link State Database | The text box displays information in the link state database which contains data in the LSAs. |
| Poll Interval(s) | The text box displays how often (in seconds) this screen refreshes. You may change the refresh interval by typing a new number in the text box and then clicking **Set Interval**. |
| Stop | Click **Stop** to end OSPF status polling. |

The following table describes some common output fields.

Table 218 IP Application > IPv4 OSPF > OSPF Status: Common Output Fields

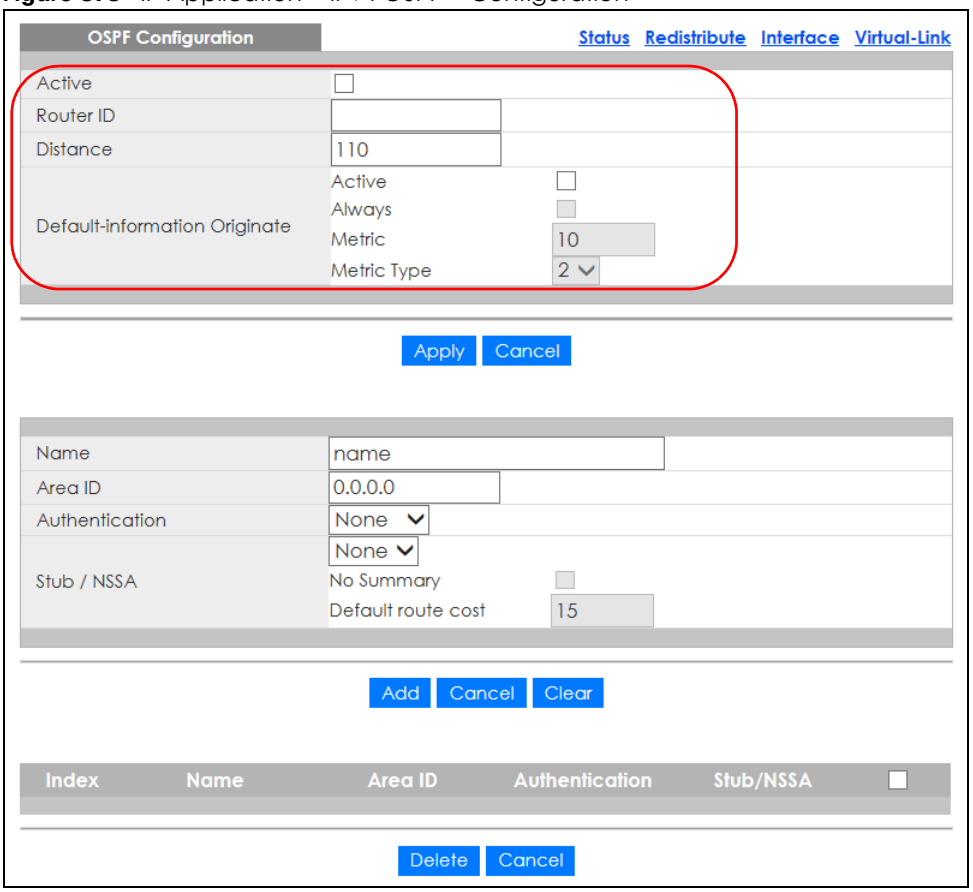
| FIELD | DESCRIPTION |
|---|---|
| Interface | |
| Internet Address | This field displays the IP address and subnet bits of an IP routing domain. |
| Area | This field displays the area ID. |
| Router ID | This field displays the unique ID of the Switch. |
| Transmit Delay | This field displays the transmission delay in seconds. |
| State | This field displays the state of the Switch (**backup** or **DR** (designated router)). |
| Priority | This field displays the priority of the Switch. This number is used in the designated router election. |
| Designated Router | This field displays the router ID of the designated router. |
| Backup Designated Router | This field displays the router ID of a backup designated router. |
| Time Intervals Configured | This field displays the time intervals (in seconds) configured. |
| Neighbor Count | This field displays the number of neighbor routers. |
| Adjacent Neighbor Count | This field displays the number of neighbor routers that is adjacent to the Switch. |
| Neighbor | |
| Neighbor ID | This field displays the router ID of the neighbor. |
| Pri | This field displays the priority of the neighbor. This number is used in the designated router election. |
| State | This field displays the state of the neighbor (**backup** or **DR** (designated router)). |
| Dead Time | This field displays the dead time in seconds. |
| Address | This field displays the IP address of a neighbor. |
| Interface | This field displays the MAC address of a device. |
| Link State Database | |
| Link ID | This field displays the ID of a router or subnet. |
| ADV Router | This field displays the IP address of the layer-3 device that sends the LSAs. |
| Age | This field displays the time (in seconds) since the last LSA was sent. |
| Seq # | This field displays the link sequence number of the LSA. |
| Checksum | This field displays the checksum value of the LSA. |
| Link Count | This field displays the number of links in the LSA. |

# 50.4 IPv4 OSPF Configuration

Use this screen to activate OSPF for IPv4 and set general settings. Click **IP Application** > **OSPF** > **IPv4 OSPF** > **Configuration** to display the **IPv4 OSPF Configuration** screen. See Section 50.1 on page 472 for more

information on OSPF.

**Figure 373** IP Application > IPv4 OSPF > Configuration




The follow table describes the related labels in this screen.

Table 219 IP Application > IPv4 OSPF > Configuration

| LABEL | DESCRIPTION |
|---|---|
| Active | OSPF for IPv4 is disabled by default. Select this option to enable it. |
| Router ID | Router ID uniquely identifies the Switch in an OSPF. Enter a unique ID (that uses the format of an IP address in dotted decimal notation) for the Switch. |
| Distance | Enter a number from 10 to 255 to specify the administrative distance that is assigned to routes learned by OSPF.<br>The lower the administrative distance value is, the more preferable the routing protocol is.<br>Note: You cannot set two routing protocols to have the same administrative distance. |
| Default-information Originate | Select **Active** to advertise a default route in your OSPF network if there is one in the routing table. When no matching route is found in the routing table, the default route will be used to forward traffic. |
| Always | Select the check box to have the Switch advertise a default route to neighboring OSPF routers even if the Switch does not have one in its routing table. |
| Metric | Enter a route cost (between 0 and 16777215) for the default route. |

Table 219 IP Application > IPv4 OSPF > Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Metric Type | Select **1** to configure the default route as type 1, which has a default cost (metric) of 20 and adds up the cost toward the destination. Its external metrics are directly comparable to the internal OSPF cost. When selecting a path, the internal OSPF cost is added to the AB boundary router to the external metrics.<br>Select **2** to configure the default route as type 2. The route has a default cost of 20 and the metric will never change along a traffic path. Its external metrics are not comparable to the OSPF cost. In this case, the external cost of the AB boundary router is used in path decision to a destination. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

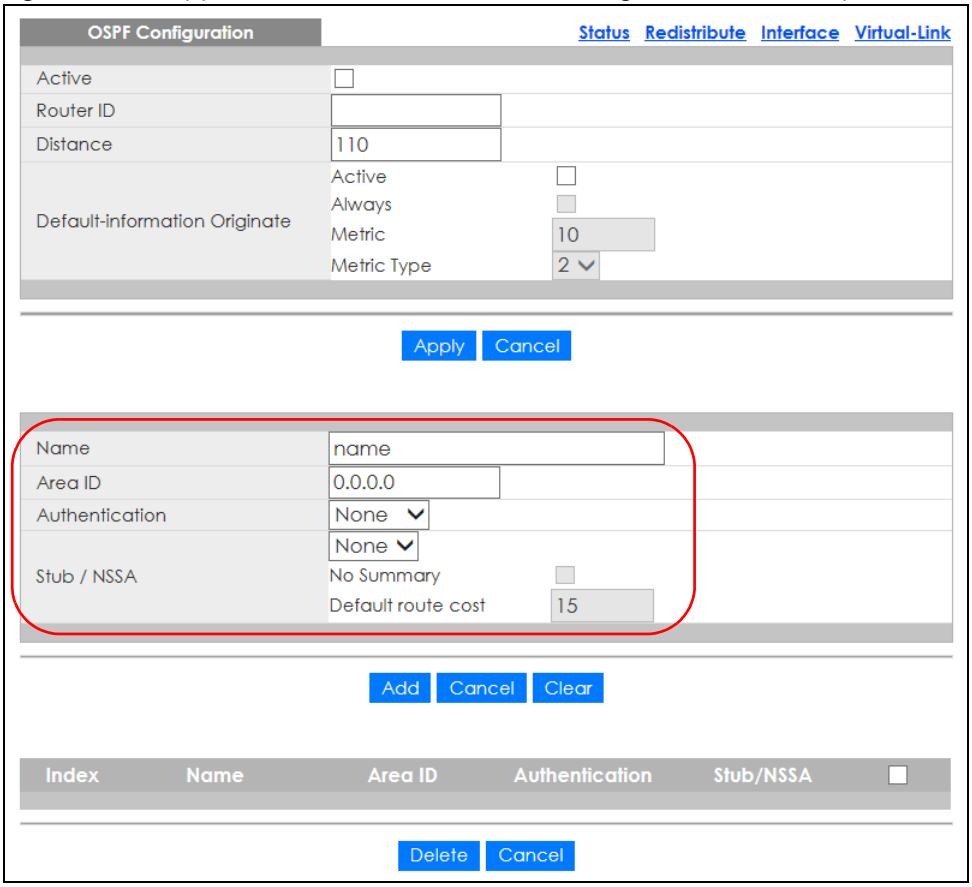
# 50.5 Configure IPv4 OSPF Areas

To ensure that the Switch receives only routing information from a trusted layer-3 devices, activate authentication. The OSPF supports three levels of authentication:

- **None** – no authentication is used.
- **Simple** – authenticate link state updates using an 8 printable ASCII character password.
- **MD5** – authenticate link state updates using a 16 printable ASCII character password.

To configure an area, set the related fields in the **IPv4 OSPF Configuration** screen.

**Figure 374** IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup




The following table describes the related labels in this screen.

Table 220 IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Area ID | Enter a 32-bit ID (that uses the format of an IP address in dotted decimal notation) that uniquely identifies an area.<br><br>A value of **0.0.0.0** indicates that this is a backbone (also known as Area 0). You can create only one backbone area on the Switch. |
| Authentication | Select an authentication method (**Simple** or **MD5**) to activate authentication. Select **None** (default) to disable authentication.<br><br>Usually interfaces and virtual interfaces should use the same authentication method as the associated area. If interfaces and virtual interfaces use different authentication methods than the associated area, the authentication methods are based on the interfaces and virtual interfaces settings. |
| Stub / NSSA | Select this option to set the area as a stub area or a not-so-stubby area.<br><br>If you enter **0.0.0.0** in the **Area ID** field, the settings in the stub area fields are ignored. |
| No Summary | Select this option to set the Switch to not send or receive LSAs. |
| Default route cost | Specify a cost (between 0 and 16777215) used to add a default route into a stub area for routes which are external to an OSPF domain. If you do not set a route cost, no default route is added. |

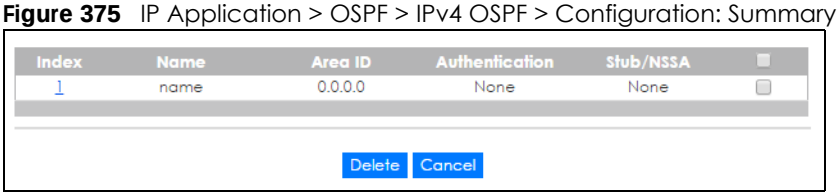
Table 220 IP Application > OSPF > IPv4 OSPF > Configuration: Area Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to default settings. |

## 50.5.1 View OSPF Area Information Table

The bottom of the **IPv4 OSPF Configuration** screen displays a summary table of all the OSPF areas you have configured.

**Figure 375** IP Application > OSPF > IPv4 OSPF > Configuration: Summary Table




The following table describes the related labels in this screen.

Table 221 IP Application > OSPF > IPv4 OSPF > Configuration: Summary Table

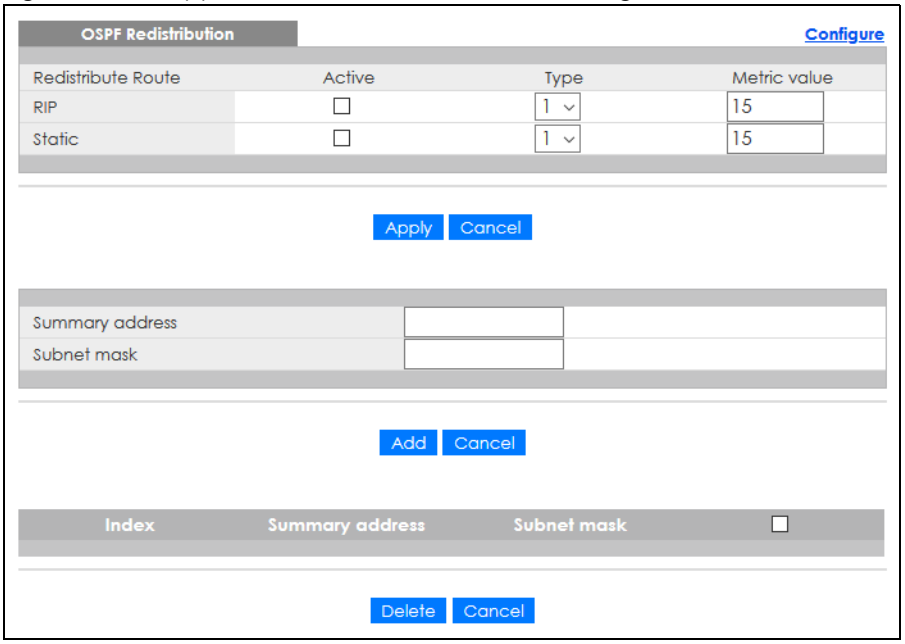
| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of an area. |
| Name | This field displays the descriptive name of an area. |
| Area ID | This field displays the area ID (that uses the format of an IP address in dotted decimal notation) that uniquely identifies an area.<br>An area ID of **0.0.0.0** indicates the backbone. |
| Authentication | This field displays the authentication method used (**None**, **Simple** or **MD5**). |
| Stub / NSSA | This field displays the area defined (**Stub**, **NSSA** or **None**). |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 50.6 Configuring IPv4 OSPF Redistribution

Use this screen to configure route redistribution and summary addresses. Route redistribution is used when other routers which use RIP routing protocol and/or static routes need to exchange routing information with the Switch using OSPF routing protocol. A summary address is used to cover more than one routing entries in order to reduce the routing table size.

In the **IPv4 OSPF Configuration** screen, click **Redistribute** to display the **OSPF Redistribution** screen.

**Figure 376** IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute




The following table describes the labels in this screen.

Table 222 IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute

| LABEL | DESCRIPTION |
|---|---|
| Redistribute Route | Route redistribution allows your Switch to import and translate external routes learned through **RIP** routing protocol or configured manually (**Static**) into the OSPF network transparently. |
| Active | Select this option to activate route redistribution for routes learned through the selected protocol. |
| Type | Select **1** for routing protocols (such as RIP) whose external metrics are directly comparable to the internal OSPF cost. When selecting a path, the internal OSPF cost is added to the AB boundary router to the external metrics.<br><br>Select **2** for routing protocols whose external metrics are not comparable to the OSPF cost. In this case, the external cost of the AB boundary router is used in path decision to a destination. |
| Metric Value | Enter a route cost (between 0 and 16777215). The default metric value is 15. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Summary address | Enter a network IP address which can cover more than one network in order to reduce the routing table size. For example, you can use 192.168.8.0/22 instead of using 192.168.8.0/24, 192.168.9.0/24, 192.168.10.0/24, and 192.168.11.0/24.<br><br>The third octet of these four network IP addresses is 00001000, 00001001, 00001010, 00001011 respectively. The first 6 digits (000010) are the common part among these IP addresses. So 192.168.8.0/22 can represent all of these networks. |
| Subnet mask | Enter the subnet mask for this summary IP address which can cover multiple networks. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

Table 222 IP Application > OSPF > IPv4 OSPF > Configuration > Redistribute (continued)

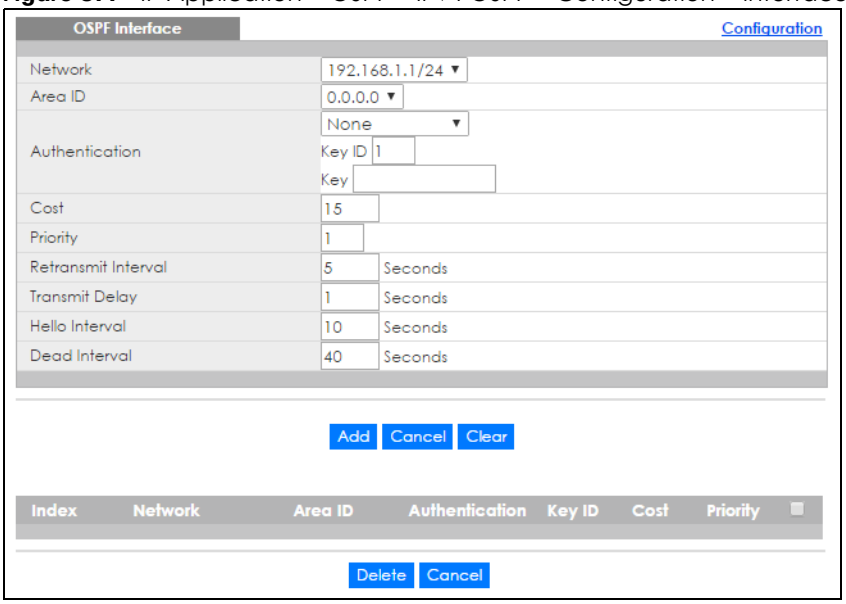
| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of the summary address. |
| Summary address | This field displays the summary IP address. |
| Subnet mask | This field displays the subnet mask for the summary IP address. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the rules that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the check boxes. |

# 50.7 Configuring IPv4 OSPF Interfaces

To configure an OSPF interface, first create an IP routing domain in the **IP Setup** screen. Once you create an IP routing domain, an OSPF interface entry is automatically created. See Section 50.1 on page 472 for more information on OSPF.

In the **IPv4 OSPF Configuration** screen, click **Interface** to display the **OSPF Interface** screen.

**Figure 377** IP Application > OSPF > IPv4 OSPF > Configuration > Interface




The following table describes the labels in this screen.

Table 223 IP Application > OSPF > IPv4 OSPF > Configuration > Interface

| LABEL | DESCRIPTION |
|---|---|
| Network | Select an IP interface. |
| Area ID | Select the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area. |

Table 223 IP Application > OSPF > IPv4 OSPF > Configuration > Interface (continued)

| LABEL | DESCRIPTION |
|---|---|
| Authentication | Note: OSPF Interfaces must use the same authentication method within the same area.<br><br>Select an authentication method. The choices are **Same-as-Area**, **None** (default), **Simple** and **MD5**.<br><br>To participate in an OSPF network, you must make the authentication method and/or password settings the same as the associated area.<br><br>Select **Same-as-Area** to use the same authentication method within the area and set the related fields when necessary.<br><br>Select **None** to disable authentication. This is the default setting.<br><br>Select **Simple** and set the **Key** field to authenticate OSPF packets transmitted through this interface using simple password authentication.<br><br>Select **MD5** and set the **Key ID** and **Key** fields to authenticate OSPF packets transmitted through this interface using MD5 authentication. |
| Key ID | When you select **MD5** in the **Authentication** field, specify the identification number of the authentication you want to use. |
| Key | When you select **Simple** in the **Authentication** field, enter a password eight-character long. Characters after the eighth character will be ignored.<br><br>When you select **MD5** in the **Authentication** field, enter a password 16-character long. |
| Cost | The interface cost is used for calculating the routing table. Enter a number between 1 and 65535. The default interface cost is 15. |
| Priority | The priority you assign to the interface is used in router elections to decide which router is going to be the Designated Router (DR) or the Backup Designated Router (BDR). You can assign a number between 0 and 255. A priority of 0 means that the router will not participate in router elections. |
| Retransmit Interval | Specify how long (in seconds) the Switch should wait for an acknowledgment packet from the interface's neighbor device before retransmitting link-state advertisements (LSAs) on the interface. The valid range for retransmitting is between 1 and 65535. The default value is 5 seconds. |
| Transmit Delay | Set the estimated time (in seconds) that is required to transmit a link-state update packet on the interface. The valid range for transmitting delay is between 1 and 65535. The default value is 1 second. |
| Hello Interval | Specify how often (in seconds) the Switch sends hello packets on the interface to check if the interface's neighbor devices still exist. The valid range for hello interval is between 1 and 65535. The default value is 10 seconds. |
| Dead Interval | Specify how long (in seconds) the Switch should wait for a hello packet from the interface's neighbor device before declaring that the neighbor device is not available. The valid range for dead interval is between 1 and 65535. The default value is 40 seconds. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays the index number for an interface. |
| Network | This field displays the IP interface information. |
| Area ID | This field displays the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area. |
| Authentication | This field displays the authentication method used (**Same-as-Area**, **None**, **Simple** or **MD5**). |

Table 223 IP Application > OSPF > IPv4 OSPF > Configuration > Interface (continued)

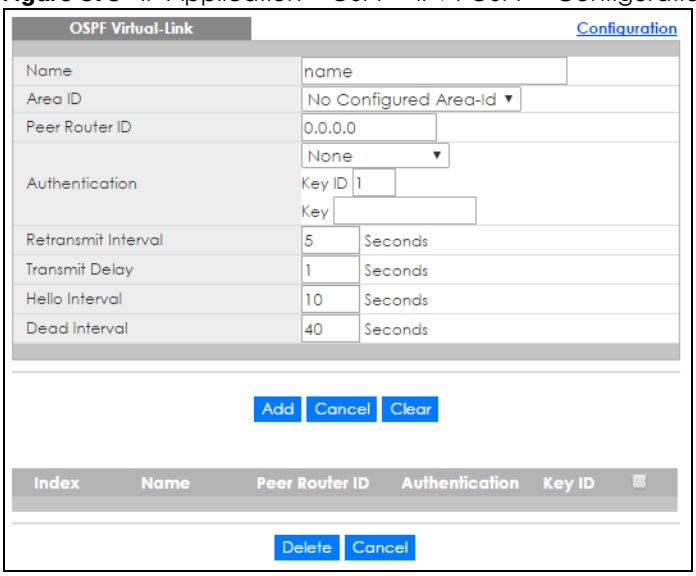
| LABEL | DESCRIPTION |
|---|---|
| Key ID | When the **Authentication** field displays **MD5**, this field displays the identification number of the key used. |
| Cost | This field displays the interface cost used for calculating the routing table. |
| Priority | This field displays the priority for this OSPF interface. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 50.8 IPv4 OSPF Virtual-Links

Configure and view virtual link settings in this screen. See Section 50.1 on page 472 for more information on OSPF.

In the **IPv4 OSPF Configuration** screen, click **Virtual-Link** to display the screen as shown next.

**Figure 378** IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link



The following table describes the related labels in this screen.

Table 224 IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Area ID | Select the area ID (in an IP address format with dotted decimal notation) of an area to associate the interface to that area. |
| Peer Router ID | Enter the ID of a peer border router. |
| Authentication | Note: Virtual interfaces must use the same authentication method within the same area.<br>Select an authentication method. The choices are **Same-as-Area**, **None** (default), **Simple** and **MD5**.<br>To exchange OSPF packets with a peer border router, you must make the authentication method and/or password settings the same as the peer border router.<br>Select **Same-as-Area** to use the same authentication method within the area and set the related fields when necessary.<br>Select **None** to disable authentication. This is the default setting.<br>Select **Simple** to authenticate OSPF packets transmitted through this interface using a simple password.<br>Select **MD5** to authenticate OSPF packets transmitted through this interface using MD5 authentication. |
| Key ID | When you select **MD5** in the **Authentication** field, specify the identification number of the authentication you want to use. |
| Key | When you select **Simple** in the **Authentication** field, enter a password eight-character long.<br>When you select **MD5** in the **Authentication** field, enter a password 16-character long. |
| Retransmit Interval | Specify how long (in seconds) the Switch should wait for an acknowledgment packet from the interface's neighbor device before retransmitting link-state advertisements (LSAs) on the interface. The valid range for retransmitting is between 1 and 65535. The default value is 5 seconds. |
| Transmit Delay | Set the estimated time (in seconds) that is required to transmit a link-state update packet on the interface. The valid range for transmitting delay is between 1 and 65535. The default value is 1 second. |
| Hello Interval | Specify how often (in seconds) the Switch sends hello packets on the interface to check if the interface's neighbor devices still exist. The valid range for hello interval is between 1 and 65535. The default value is 10 seconds. |
| Dead Interval | Specify how long (in seconds) the Switch should wait for a hello packet from the interface's neighbor device before declaring that the neighbor device is not available. The valid range for dead interval is between 1 and 65535. The default value is 40 seconds. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays an index number of an entry. |
| Name | This field displays a descriptive name of a virtual link. |
| Peer Router ID | This field displays the ID (that uses the format of an IP address in dotted decimal notation) of a peer border router. |
| Authentication | This field displays the authentication method used (**Same-as-Area**, **None**, **Simple** or **MD5**). |

Table 224 IP Application > OSPF > IPv4 OSPF > Configuration > Virtual-Link (continued)

| LABEL | DESCRIPTION |
|---|---|
| Key ID | When the **Authentication** field displays **MD5**, this field displays the identification number of the key used. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the **Delete** check boxes. |

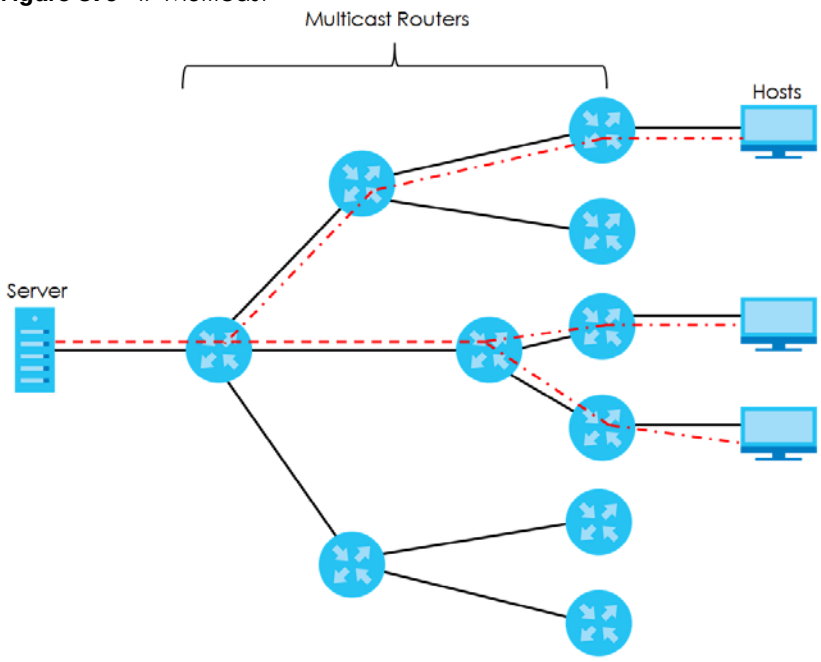
# CHAPTER 51
# IGMP

This chapter shows you how to configure the Switch as a multicast router.

## 51.1 IGMP Overview

IP multicast is an IETF standard for distributing data to multiple recipients. The following figure shows a multicast session and the relationship between a multicast server, multicast routers and multicast hosts. A multicast server transmits multicast packets and multicast routers forward multicast packets to multicast hosts.

**Figure 379** IP Multicast




A host can decide to join or leave a multicast group at any time. A host can also be a member of more than one multicast group. Multicast groups are identified by IP addresses in the Class D range (224.0.0.0 to 239.255.255.255). A multicast server sends packets addressed to a particular multicast group (multicast IP address).

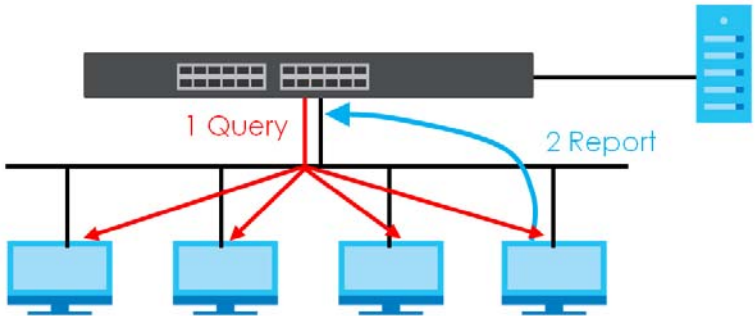
IGMP (Internet Group Management Protocol) is used by multicast hosts to indicate their multicast group membership to multicast routers. Multicast routers can also use IGMP to periodically check if multicast hosts still want to receive transmission from a multicast server. In other words, multicast routers check if any hosts on their network are still members of a specific multicast group.

The Switch supports IGMP version 1 (**IGMP-v1**), version 2 (**IGMP-v2**) and IGMP version 3 (**IGMP-v3**). Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively. At start up, the Switch queries all directly connected networks to gather group membership. After that, the Switch periodically updates this information.

## 51.1.1 How IGMP Works

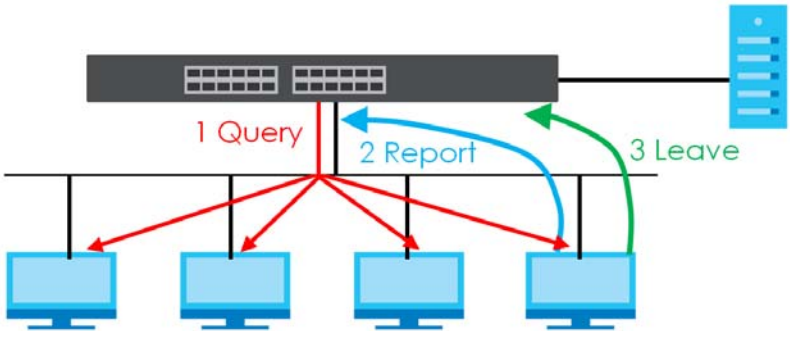
This section describes how IGMP works and the changes it has gone through from version 1 to version 3. IGMP version 1 defines how a multicast router checks to see if any multicast hosts are part of a multicast group. It checks for group membership by sending out an IGMP Query packet. Hosts that are members of a multicast group reply with an IGMP Report packet. This is also referred to as a join group request. The multicast router then keeps a list of all networks that have members of this multicast group and forwards multicast traffic to that network.

**Figure 380** IGMP Version 1 Example




The main difference in IGMP version 2 is that it provides a mechanism for a multicast group member to notify a multicast router that it is leaving a multicast group. The multicast router then sends a group-specific IGMP query to check if there are any members remaining in that group. If the multicast router does not receive an IGMP report from any members, it stops sending multicast traffic to that group. This change helps shorten the leave convergence time, in other words, the amount of time that a multicast router believes that there are group members on a particular network. This in turn helps reduce the amount of multicast traffic going through the multicast router.

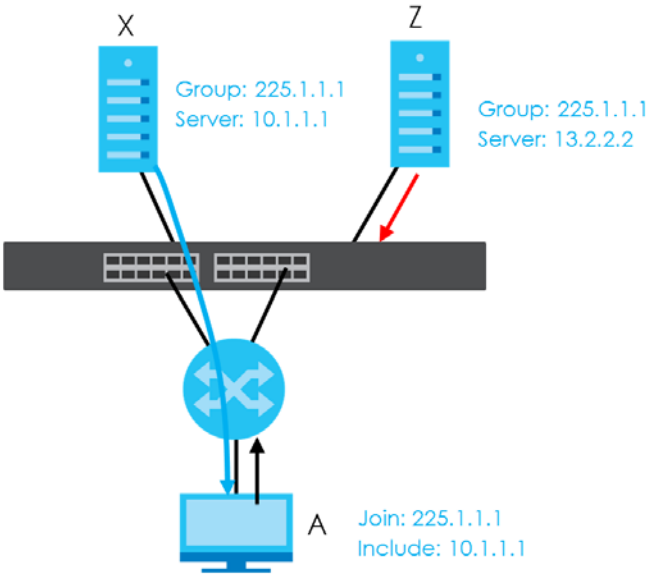
**Figure 381** IGMP Version 2 Example




IGMP version 3 allows a multicast host to join a multicast group and specify from which source (multicast server) it wants to receive multicast packets. Alternatively, a multicast host can specify from which multicast servers it does not want to receive multicast packets. In the following figure multicast server **X** (IP address **10.1.1.1**) and multicast server **Z** (IP address **13.2.2.2**) both send multicast traffic to the same multicast group identified by the multicast IP address **225.1.1.1**. In IGMP version 3 multicast host **A** can

join multicast group **225.1.1.1** and specify that it only wants to receive multicast packets from server **X**.

**Figure 382** IGMP Version 3 Example



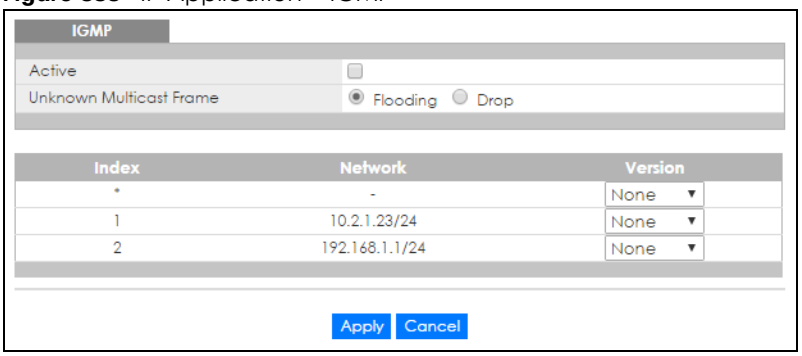

# 51.2 Port-based IGMP

The Switch sends IGMP Query packets to all ports. The Switch then listens for IGMP Report packets, and it records which port the messages came from. It then delivers multicast traffic to only those ports from which it received a request to join a multicast group.

# 51.3 Configuring IGMP

Click **IP Application** > **IGMP** in the navigation panel to display the screen as shown next. Each entry in the table is automatically created when you configure a new IP domain in the **IP Setup** screen.

**Figure 383** IP Application > IGMP



The following table describes the labels in this screen.

Table 225 IP Application > IGMP

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable IGMP on the Switch.<br><br>Note: You cannot enable both IGMP snooping and IGMP at the same time. |
| Unknown Multicast Frame | Specify the action to perform when the Switch receives an unknown multicast frame. Unknown multicast frames are addressed to multicast groups for which the Switch has not recorded any group members. Select **Drop** to discard the frames. Select **Flooding** to send the frames to all ports. |
| Index | This field displays an index number of an entry. |
| Network | This field displays the IP domain configured on the Switch. |
| Version | Select an IGMP version from the drop-down list box. The choices are **IGMP-v1**, **IGMP-v2**, **IGMP-v3** and **None**.<br><br>Generally, if you want to enable IGMP on the Switch, you should choose **IGMP-v3** as it is compatible with older versions. Choose an earlier version of IGMP (**IGMP-v2** or **IGMP-v1**) if the multicast hosts on your network can not recognize IGMP version 3 or version 2 Query messages. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 52
# DVMRP

This chapter introduces DVMRP and tells you how to configure it.

## 52.1 DVMRP Overview

DVMRP (Distance Vector Multicast Routing Protocol) is a protocol used for routing multicast data within an autonomous system (AS). This DVMRP implementation is based on draft-ietf-idmr-dvmrp-v3-10. DVMRP provides multicast forwarding capability to a layer-3 switch that runs both the IPv4 protocol (with IP Multicast support) and the IGMP protocol. The DVMRP metric is a hop count of 32.

IGMP is a protocol used for joining or leaving a multicast group. You must have IGMP enabled when you enable DVMRP; otherwise you see the screen as in Figure 386 on page 493.

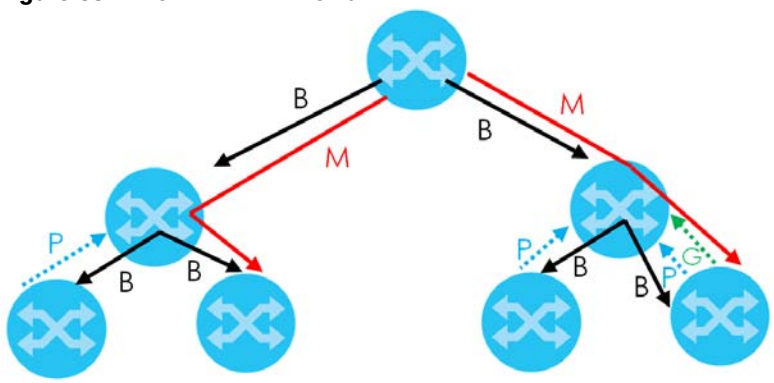
## 52.2 How DVMRP Works

DVMRP uses the Reverse Path Multicasting (RPM) algorithm to generate an IP Multicast delivery tree. Multicast packets are forwarded along these multicast tree branches. DVMRP dynamically learns host membership information using Internet Group Management Protocol (IGMP). The trees are updated dynamically to track the membership of individual groups.

1. Initially an advertisement multicast packet is broadcast ("**B**" in the following figure).
2. DVMRP-enabled Layer-3 devices that do not have any hosts in their networks that belong to this multicast group send back a prune message ("**P**").
3. If hosts later join the multicast group, a graft message ("**G**") to undo the prune is sent to the parent.

4 The final multicast ("**M**") after pruning and grafting is shown in the next figure.

**Figure 384** How DVMRP Works




## 52.2.1 DVMRP Terminology

DVMRP probes are used to discover other DVMRP Neighbors on a network.

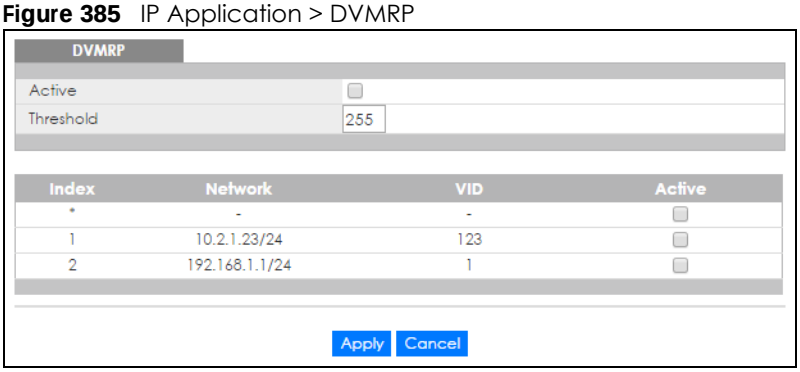
DVMRP reports are used to exchange DVMRP source routing information. These packets are used to build the DVMRP multicast routing table that is used to build source trees and also perform Reverse Path Forwarding (RPF) checks on incoming multicast packets. RPF checks prevent duplicate packets being filtered when loops exist in the network topology.

DVMRP prunes trim the multicast delivery trees. DVMRP grafts attach a branch back onto the multicast delivery tree.

# 52.3 Configuring DVMRP

Configure DVMRP on the Switch when you wish it to act as a multicast router ("mrouter"). Click **IP Application** > **DVMRP** in the navigation panel to display the screen as shown.

**Figure 385** IP Application > DVMRP



The following table describes the labels in this screen.

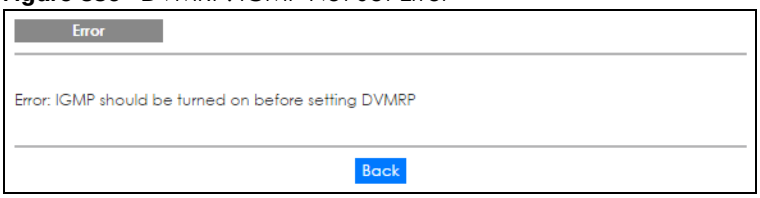
Table 226 IP Application > DVMRP

| LABEL | DESCRIPTION |
|---|---|
| Active | Select **Active** to enable DVMRP on the Switch. You should do this if you want the Switch to act as a multicast router. |
| Threshold | Threshold is the maximum time to live (TTL) value. TTL is used to limit the scope of multicasting. You should reduce this value if you do not wish to flood Layer-3 devices many hops away with multicast traffic. This applies only to multicast traffic this Switch sends out. |
| Index | Index is the DVMRP configuration for the IP routing domain defined under **Network**. The maximum number of DVMRP configurations allowed is the maximum number of IP routing domains allowed on the Switch. |
| Network | This is the IP routing domain IP address and subnet mask you set up in **IP Setup.** |
| VID | DVMRP cannot be enabled on the same VLAN group across different IP routing domains, that is, you cannot have duplicate VIDs for different DVMRP configurations. |
| Active | Select **Active** to enable DVMRP on this IP routing domain. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 52.3.1 DVMRP Configuration Error Messages

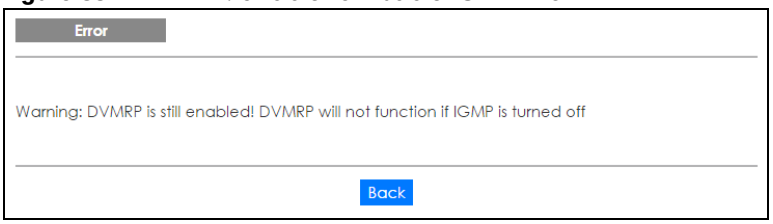
You must have IGMP enabled when you enable DVMRP; otherwise you see the screen as in the next figure.

**Figure 386** DVMRP: IGMP Not Set Error




When you disable IGMP, but DVMRP is still active you also see another warning screen.

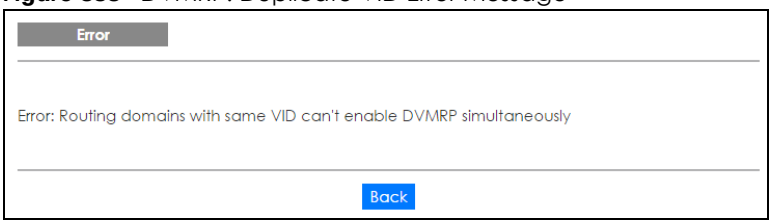
**Figure 387** DVMRP: Unable to Disable IGMP Error




Each IP routing domain DVMRP configuration must be in a different VLAN group; otherwise you see the

following screen.

**Figure 388** DVMRP: Duplicate VID Error Message




# 52.4 Default DVMRP Timer Values

The following are some default DVMRP timer values.

Table 227 DVMRP: Default Timer Values

| DVMRP FIELD | DEFAULT VALUE |
|---|---|
| Probe interval | 10 sec |
| Report interval | 35 sec |
| Route expiration time | 140 sec |
| Prune lifetime | Variable (less than 2 hours) |
| Prune retransmission time | 3 sec with exponential back off |
| Graft retransmission time | 5 sec with exponential back off |

# CHAPTER 53
# Differentiated Services

## 53.1 DiffServ Overview

This chapter shows you how to configure Differentiated Services (DiffServ) on the Switch.

Quality of Service (QoS) is used to prioritize source-to-destination traffic flows. All packets in the flow are given the same priority. You can use CoS (class of service) to give different priorities to different packet types.

DiffServ is a class of service (CoS) model that marks packets so that they receive specific per-hop treatment at DiffServ-compliant network devices along the route based on the application types and traffic flow. Packets are marked with DiffServ Code Points (DSCPs) indicating the level of service desired. This allows the intermediary DiffServ-compliant network devices to handle the packets differently depending on the code points without the need to negotiate paths or remember state information for every flow. In addition, applications do not have to request a particular service or give advanced notice of where the traffic is going.

### 53.1.1 What You Can Do

- Use the **DiffServ** screen (Section 53.2 on page 496) to activate DiffServ to apply marking rules or IEEE 802.1p priority mapping on the Switch.
- Use the **DSCP Setting** screen (Section 53.3.1 on page 498) to change the DSCP-IEEE 802.1p mapping.

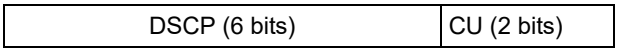
### 53.1.2 What You Need to Know

Read on for concepts on Differentiated Services that can help you configure the screens in this chapter.

#### DSCP and Per-Hop Behavior

DiffServ defines a new DS (Differentiated Services) field to replace the Type of Service (ToS) field in the IP header. The DS field contains a 6-bit DSCP field which can define up to 64 service levels and the remaining 2 bits are defined as currently unused (CU). The following figure illustrates the DS field.

**Figure 389** DiffServ: Differentiated Service Field




DSCP is backward compatible with the three precedence bits in the ToS octet so that non-DiffServ compliant, ToS-enabled network device will not conflict with the DSCP mapping.

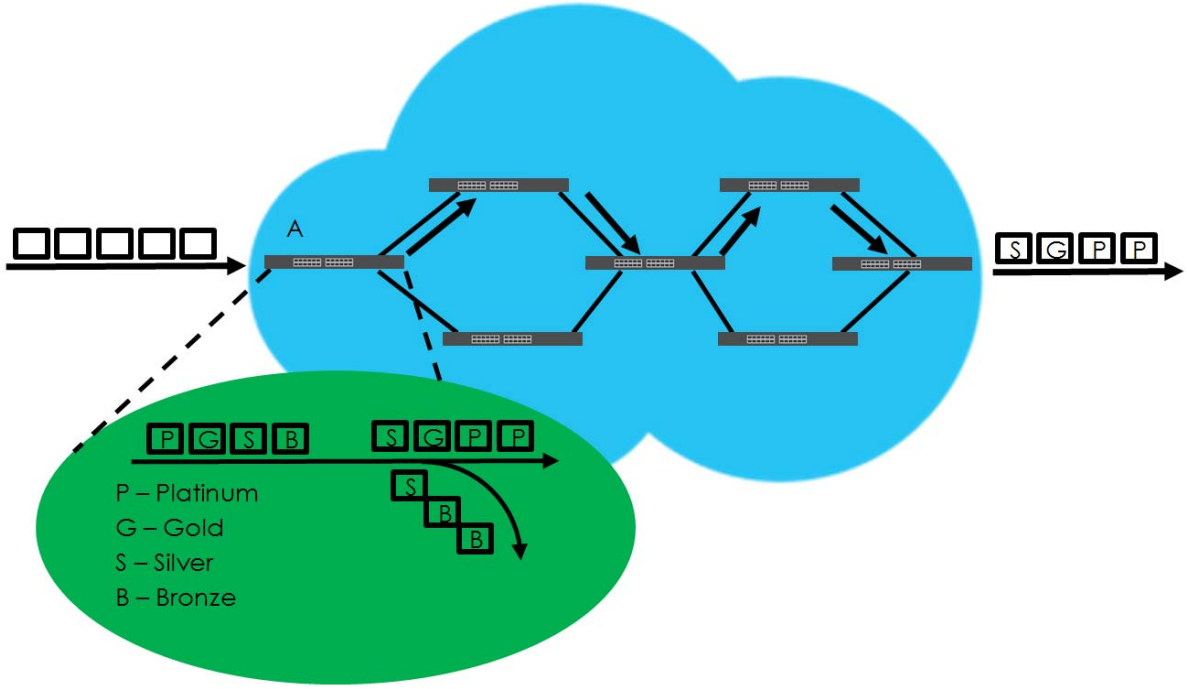
The DSCP value determines the PHB (Per-Hop Behavior), that each packet gets as it is forwarded across the DiffServ network. Based on the marking rule different kinds of traffic can be marked for different

priorities of forwarding. Resources can then be allocated according to the DSCP values and the configured policies.

### DiffServ Network Example

The following figure depicts a DiffServ network consisting of a group of directly connected DiffServ-compliant network devices. The boundary node (**A** in Figure 390) in a DiffServ network classifies (marks with a DSCP value) the incoming packets into different traffic flows (**Platinum**, **Gold**, **Silver**, **Bronze**) based on the configured marking rules. A network administrator can then apply various traffic policies to the traffic flows. An example traffic policy, is to give higher drop precedence to one traffic flow over others. In our example, packets in the **Bronze** traffic flow are more likely to be dropped when congestion occurs than the packets in the **Platinum** traffic flow as they move across the DiffServ network.

**Figure 390** DiffServ Network




## 53.2 Activating DiffServ

Activate DiffServ to apply marking rules or IEEE 802.1p priority mapping on the selected ports.

Click **IP Application** > **DiffServ** in the navigation panel to display the screen as shown.

**Figure 391** IP Application > DiffServ (Standalone Mode)

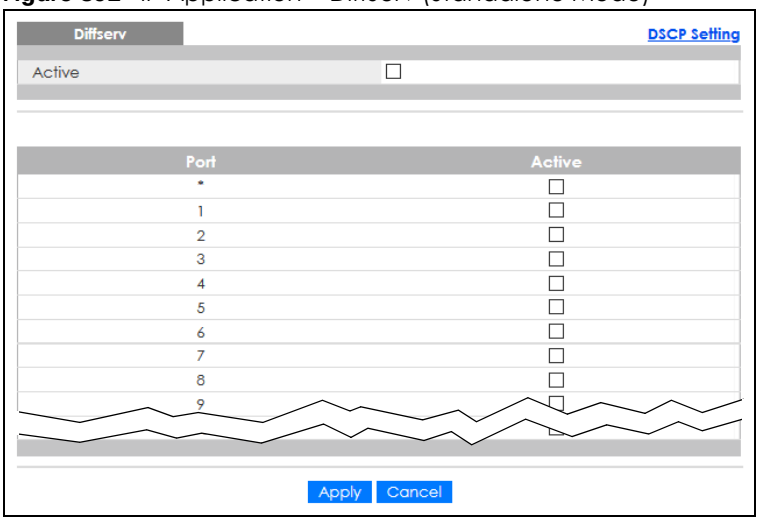
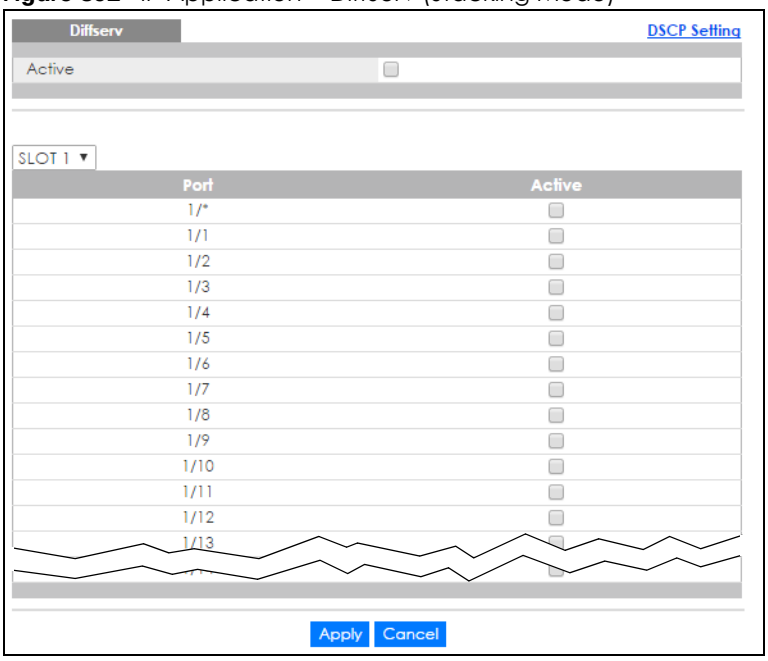



**Figure 392** IP Application > DiffServ (Stacking Mode)




The following table describes the labels in this screen.

Table 228 IP Application > DiffServ

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable DiffServ on the Switch. |
| Slot | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the index number of a port on the Switch. In stacking mode, the first number represents the slot and the second the port number. * means all ports (on the same Switch). |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them. |

Table 228 IP Application > DiffServ (continued)

| LABEL | DESCRIPTION |
|---|---|
| Active | Select **Active** to enable Diffserv on the port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 53.3 DSCP-to-IEEE 802.1p Priority Settings

You can configure the DSCP to IEEE 802.1p mapping to allow the Switch to prioritize all traffic based on the incoming DSCP value according to the DiffServ to IEEE 802.1p mapping table.

The following table shows the default DSCP-to-IEEE802.1p mapping.

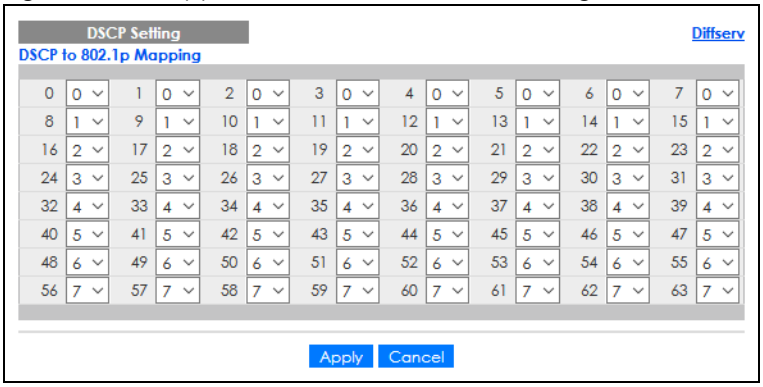
Table 229 Default DSCP-IEEE 802.1p Mapping

| DSCP VALUE | 0 – 7 | 8 – 15 | 16 – 23 | 24 – 31 | 32 – 39 | 40 – 47 | 48 – 55 | 56 – 63 |
|---|---|---|---|---|---|---|---|---|
| IEEE 802.1p | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

## 53.3.1 Configuring DSCP Settings

To change the DSCP-IEEE 802.1p mapping click the **DSCP Setting** link in the **DiffServ** screen to display the screen as shown next.

**Figure 393** IP Application > DiffServ > DSCP Setting




The following table describes the labels in this screen.

Table 230 IP Application > DiffServ > DSCP Setting

| LABEL | DESCRIPTION |
|---|---|
| 0 … 63 | This is the DSCP classification identification number.<br><br>To set the IEEE 802.1p priority mapping, select the priority level from the drop-down list box. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 54
# DHCP

## 54.1 DHCP Overview

This chapter shows you how to configure the DHCP feature.

DHCP (Dynamic Host Configuration Protocol RFC 2131 and RFC 2132) allows individual computers to obtain TCP/IP configuration at start-up from a server. You can configure the Switch as a DHCP server or a DHCP relay agent. When configured as a server, the Switch provides the TCP/IP configuration for the clients. If you configure the Switch as a relay agent, then the Switch forwards DHCP requests to DHCP server on your network. If you do not configure the Switch as a DHCP server or relay agent then you must have a DHCP server in the broadcast domain of the client computers or else the client computers must be configured manually.

### 54.1.1 What You Can Do

- Use the **DHCPv4 Status** screen (Section 54.3 on page 500) to display the server status and relay mode.
- Use the **DHCPv4 Server Status Detail** screen (Section 54.3.1 on page 501) to view details regarding DHCP server settings configured on the Switch.
- Use the **DHCPv4 Option 82 Profile** screen (Section 54.4.2 on page 503) to create DHCPv4 option 82 profiles.
- Use the **DHCPv4 Global Relay** screen (Section 54.4.3 on page 505) to configure global DHCPv4 relay.
- Use the **DHCPv4 Global Relay Port** screen (Section 54.4.4 on page 505) to apply a different DHCP option 82 profile to certain ports on the Switch.
- Use the **VLAN Setting** screen (Section 54.4.6 on page 507) to configure your DHCPv4 settings based on the VLAN domain of the DHCPv4 clients.
- Use the **DHCPv4 VLAN Port** screen (Section 54.4.7 on page 509) to apply a different DHCP option 82 profile to certain ports in a VLAN.
- Use the **DHCPv6 Status** screen (Section 54.5 on page 511) to see information on the DHCPv6 server.
- Use the **DHCPv6 Information** screen (Section 54.6 on page 512) to configure DHCPv6 and DNS server settings on the Switch.
- Use the **DHCPv6 Prefix Delegation** screen (Section 54.7 on page 513) to configure DHCPv6 client and IPv6 prefix settings for a specific VLAN on the Switch.
- Use the **DHCPv6 Relay** screen (Section 54.8 on page 515) to enable and configure DHCPv6 relay.
- Use the **DHCP Server Guard** screen (Section 54.9 on page 516) to specify whether ports are trusted or untrusted ports for DHCP packets.

### 54.1.2 What You Need to Know

Read on for concepts on DHCP that can help you configure the screens in this chapter.

### DHCP Modes

The Switch can be configured as a DHCP server or DHCP relay agent.

- If you configure the Switch as a DHCP server, it will maintain the pool of IP addresses along with subnet masks or prefixes, DNS server and default gateway information and distribute them to your LAN computers.
- If there is already a DHCP server on your network, then you can configure the Switch as a DHCP relay agent. When the Switch receives a request from a computer on your network, it contacts the DHCP server for the necessary IP information, and then relays the assigned information back to the computer.

### DHCPv4 Configuration Options

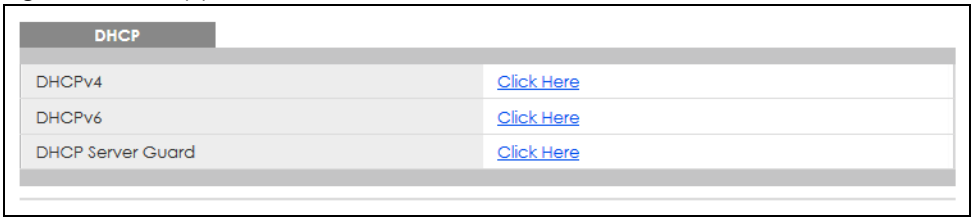
The DHCPv4 configuration on the Switch is divided into **Global** and **VLAN** screens. The screen you should use for configuration depends on the DHCP services you want to offer the DHCP clients on your network. Choose the configuration screen based on the following criteria:

- **Global** – The Switch forwards all DHCP requests to the same DHCP server.
- **VLAN** – The Switch is configured on a VLAN by VLAN basis. The Switch can be configured as a DHCP server for one VLAN and at the same time the Switch can be configured to relay DHCPv4 requests for clients in another VLAN.

## 54.2 DHCP Configuration

Click **IP Application** > **DHCP** in the navigation panel to display the screen as shown. Click the link next to **DHCPv4** to open screens where you can enable and configure DHCPv4 relay settings and create option 82 profiles. Click the link next to **DHCPv6** to open a screen where you can configure DHCPv6 relay settings. Click the link next to **DHCP Server Guard** to open a screen where you can specify whether ports are trusted or untrusted ports for DHCP packets.

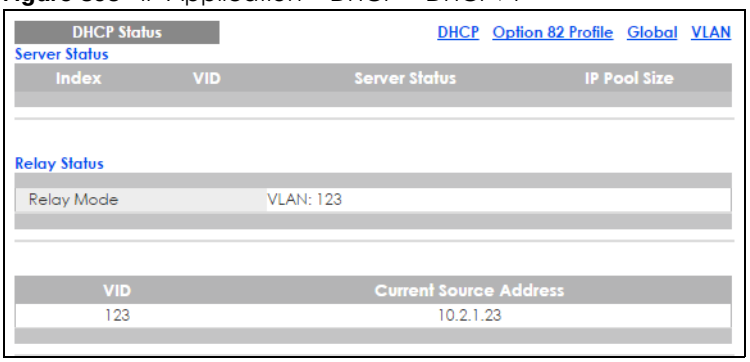
**Figure 394** IP Application > DHCP




## 54.3 DHCPv4 Status

Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel. The **DHCP Status** screen displays.

**Figure 395** IP Application > DHCP > DHCPv4




The following table describes the labels in this screen.

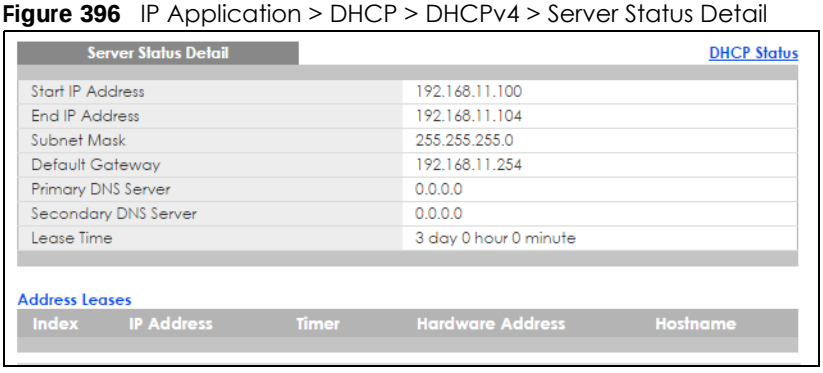
Table 231 IP Application > DHCP > DHCPv4

| LABEL | DESCRIPTION |
|---|---|
| Server Status | This section displays configuration settings related to the Switch's DHCP server mode. |
| Index | This is the index number. Click an index number to change the settings. |
| VID | This field displays the VLAN ID for which the Switch is a DHCP server. |
| Server Status | This field displays the starting DHCP client IP address. |
| IP Pool Size | This field displays the number of IP addresses that can be assigned to clients. |
| Relay Status | This section displays configuration settings related to the Switch's DHCP relay mode. |
| Relay Mode | This field displays:<br>**None** – if the Switch is not configured as a DHCP relay agent.<br>**Global** – if the Switch is configured as a DHCP relay agent only.<br>**VLAN** – followed by a VLAN ID or multiple VLAN IDs if it is configured as a relay agent for specific VLANs. |
| VID | This field displays the ID number of the VLAN for which the Switch acts as a DHCP relay agent. |
| Current Source Address | This field displays the source IP address of the DHCP requests that the Switch forwards to a DHCP server. |

## 54.3.1 DHCPv4 Server Status Detail

Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel and then click an existing index number of a DHCP server configuration to view the screen as shown. Use this screen to view details regarding DHCP server settings configured on the Switch.

**Figure 396** IP Application > DHCP > DHCPv4 > Server Status Detail



The following table describes the labels in this screen.

Table 232 IP Application > DHCP > DHCPv4 > Server Status Detail

| LABEL | DESCRIPTION |
|---|---|
| Start IP Address | This field displays the starting IP address of the IP address pool configured for this DHCP server instance. |
| End IP Address | This field displays the last IP address of the IP address pool configured for this DHCP server instance. |
| Subnet Mask | This field displays the subnet mask value sent to clients from this DHCP server instance. |
| Default Gateway | This field displays the default gateway value sent to clients from this DHCP server instance. |
| Primary DNS Server | This field displays the primary DNS server value sent to clients from this DHCP server instance. |
| Secondary DNS Server | This field displays the secondary DNS server value sent to clients from this DHCP server instance. |
| Lease Time | This field displays the amount of time that the IP address is valid. |
| Address Leases | This section displays information about the IP addresses this DHCP server issued to clients. |
| Index | This field displays a sequential number for each DHCP request handled by the Switch. |
| IP Address | This is the IP address issued to a DHCP client. |
| Timer | This field displays the time remaining before the DHCP client has to renew its IP address. |
| Hardware Address | This field displays the MAC address of the DHCP client.<br>It may also display **SELF OCCUPIED ADDRESS** if the IP address cannot be used for DHCP because it is already assigned to the Switch itself. |
| Hostname | This field displays the system name of the client. |

# 54.4 DHCPv4 Relay

Configure DHCP relay on the Switch if the DHCP clients and the DHCP server are not in the same broadcast domain. During the initial IP address leasing, the Switch helps to relay network information (such as the IP address and subnet mask) between a DHCP client and a DHCP server. Once the DHCP client obtains an IP address and can connect to the network, network information renewal is done between the DHCP client and the DHCP server without the help of the Switch.

The Switch can be configured as a global DHCP relay. This means that the Switch forwards all DHCP requests from all domains to the same DHCP server. You can also configure the Switch to relay DHCP information based on the VLAN membership of the DHCP clients.

## 54.4.1 DHCPv4 Relay Agent Information

The Switch can add information about the source of client DHCP requests that it relays to a DHCP server by adding **Relay Agent Information**. This helps provide authentication about the source of the requests. The DHCP server can then provide an IP address based on this information. Please refer to RFC 3046 for more details.

The DHCP **Relay Agent Information** feature adds an Agent Information field (also known as the **Option 82** field) to DHCP requests. The **Option 82** field is in the DHCP headers of client DHCP request frames that the Switch relays to a DHCP server.

**Relay Agent Information** can include the **System Name** of the Switch if you select this option. You can change the **System Name** in **Basic Setting** > **General Setup**.

The following describes the DHCP relay agent information that the Switch sends to the DHCP server:

Table 233 Relay Agent Information

| FIELD LABELS | DESCRIPTION |
|---|---|
| Slot ID | (1 byte) This value is always 0 for stand-alone switches. |
| Port ID | (1 byte) This is the port that the DHCP client is connected to. |
| VLAN ID | (2 bytes) This is the VLAN that the port belongs to. |
| Information | (up to 64 bytes) This optional, read-only field is set according to system name set in **Basic Setting** > **General Setup**. |

#### 54.4.1.1 DHCPv4 Relay Agent Information Format

A DHCP Relay Agent Information option has the following format.

Table 234 DHCP Relay Agent Information Option Format

| Code (82) | Length (N) | i1 | i2 | ... | iN |
|---|---|---|---|---|---|

i1, i2 and iN are DHCP relay agent sub-options, which contain additional information about the DHCP client. You need to define at least one sub-option.

#### 54.4.1.2 Sub-Option Format

There are two types of sub-option: "Agent Circuit ID Sub-option" and "Agent Remote ID Sub-option". They have the following formats.

Table 235 DHCP Relay Agent Circuit ID Sub-option Format

| SubOpt Code | Length | Value |
|---|---|---|
| 1 (1 byte) | N (1 byte) | Slot ID, Port ID, VLAN ID, System Name or String |

Table 236 DHCP Relay Agent Remote ID Sub-option Format

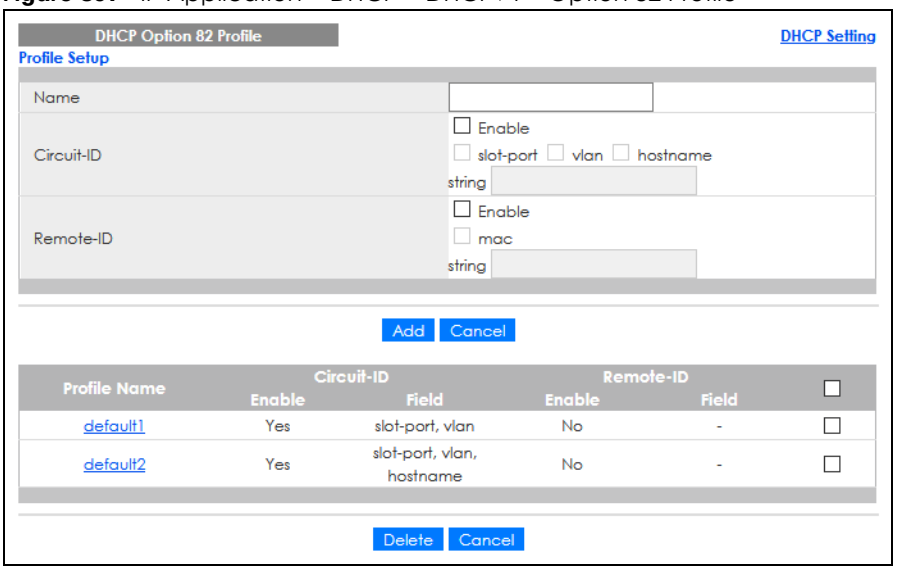
| SubOpt Code | Length | Value |
|---|---|---|
| 2 (1 byte) | N (1 byte) | MAC Address or String |

The 1 in the first field identifies this as an Agent Circuit ID sub-option and two identifies this as an Agent Remote ID sub-option. The next field specifies the length of the field.

### 54.4.2 DHCPv4 Option 82 Profile

Use this screen to create DHCPv4 option 82 profiles. Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel and click the **Option 82 Profile** link to display the screen as shown.

**Figure 397** IP Application > DHCP > DHCPv4 > Option 82 Profile




The following table describes the labels in this screen.

Table 237 IP Application > DHCP > DHCPv4 > Option 82 Profile

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter a descriptive name for the profile for identification purposes. You can use up to 32 ASCII characters. Spaces are allowed. |
| Circuit-ID | Use this section to configure the Circuit ID sub-option to include information that is specific to the relay agent (the Switch). |
| Enable | Select this option to have the Switch add the Circuit ID sub-option to client DHCP requests that it relays to a DHCP server. |
| slot-port | Select this option to have the Switch add the number of port that the DHCP client is connected to. |
| vlan | Select this option to have the Switch add the ID of VLAN which the port belongs to. |
| hostname | This is the system name you configure in the **Basic Setting** > **General Setup** screen.<br>Select this option for the Switch to add the system name to the client DHCP requests that it relays to a DHCP server. |
| string | Enter a string of up to 64 ASCII characters that the Switch adds into the client DHCP requests. Spaces are allowed. |
| Remote-ID | Use this section to configure the Remote ID sub-option to include information that identifies the relay agent (the Switch). |
| Enable | Select this option to have the Switch append the Remote ID sub-option to the option 82 field of DHCP requests. |
| mac | Select this option to have the Switch add its MAC address to the client DHCP requests that it relays to a DHCP server. |
| string | Enter a string of up to 64 ASCII characters for the remote ID information in this field. Spaces are allowed. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Profile Name | This field displays the descriptive name of the profile. Click the name to change the settings. |

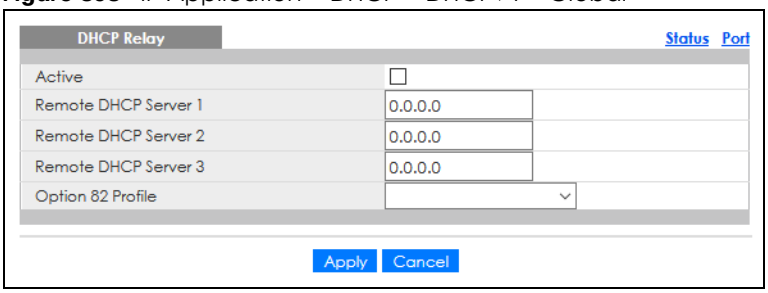
Table 237 IP Application > DHCP > DHCPv4 > Option 82 Profile (continued)

| LABEL | DESCRIPTION |
|---|---|
| Circuit-ID | This section displays the Circuit ID sub-option including information that is specific to the relay agent (the Switch). |
| Enable | This field displays whether the Circuit ID sub-option is added to client DHCP requests. |
| Field | This field displays the information that is included in the Circuit ID sub-option. |
| Remote-ID | This section displays the Remote ID sub-option including information that identifies the relay agent (the Switch). |
| Enable | This field displays whether the Remote ID sub-option is added to client DHCP requests. |
| Field | This field displays the information that is included in the Remote ID sub-option. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

## 54.4.3 Configuring DHCPv4 Global Relay

Use this screen to configure global DHCPv4 relay. Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel and click the **Global** link to display the screen as shown.

**Figure 398** IP Application > DHCP > DHCPv4 > Global




The following table describes the labels in this screen.

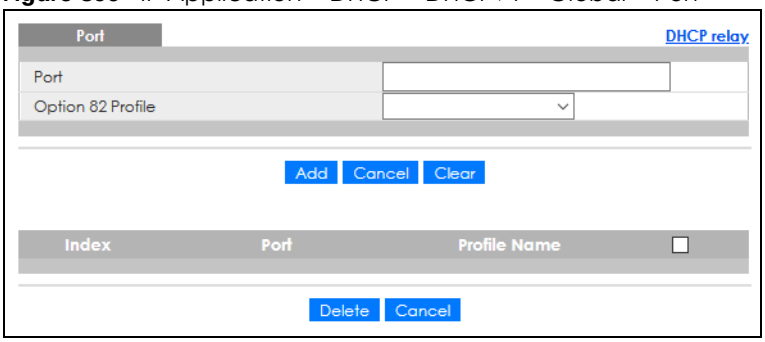
Table 238 IP Application > DHCP > DHCPv4 > Global

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable DHCPv4 relay. |
| Remote DHCP Server 1 .. 3 | Enter the IP address of a DHCPv4 server in dotted decimal notation. |
| Option 82 Profile | Select a pre-defined DHCPv4 option 82 profile that the Switch applies to all ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 54.4.4 Configure DHCPv4 Global Relay Port

Use this screen to apply a different DHCP option 82 profile to certain ports on the Switch. To open this screen, click **IP Application** > **DHCP** > **DHCPv4** > **Global** > **Port**.

**Figure 399** IP Application > DHCP > DHCPv4 > Global > Port




The following table describes the labels in this screen.

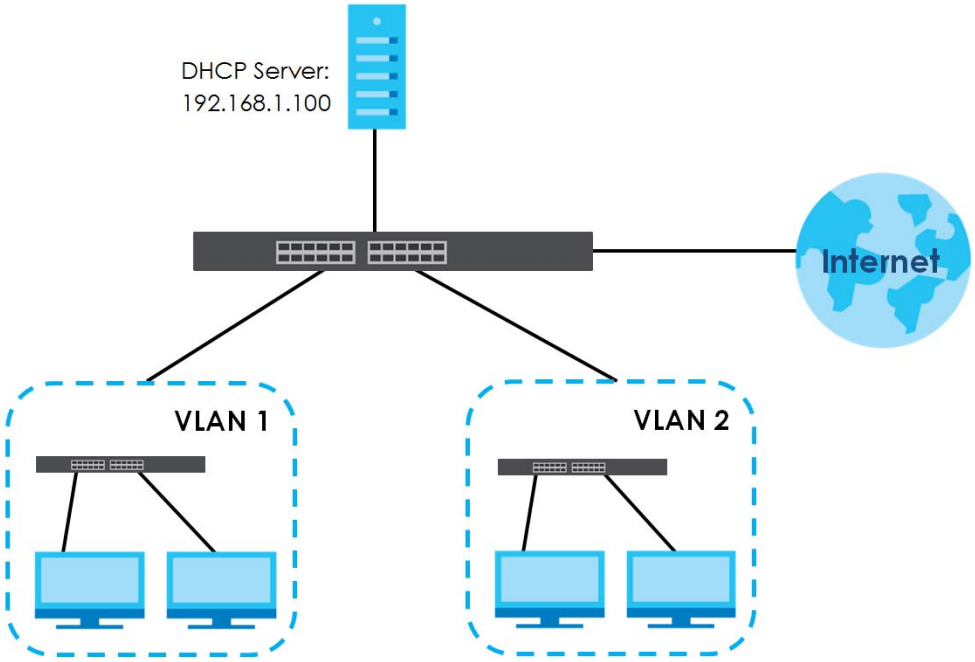
Table 239 IP Application > DHCP > DHCPv4 > Global > Port

| LABEL | DESCRIPTION |
|---|---|
| Port | Enter the number of ports to which you want to apply the specified DHCP option 82 profile.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/28 for ports 1 to 24 for the Switch in slot 1 and port 28 for the Switch in slot 2, for example. |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.<br>The profile you select here has priority over the one you select in the **DHCP** > **DHCPv4** > **Global** screen. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each entry. Click an index number to change the settings. |
| Port | This field displays the port(s) to which the Switch applies the settings. In stacking mode, the first number represents the slot and the second the port number. |
| Profile Name | This field displays the DHCP option 82 profile that the Switch applies to the ports. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select the entries that you want to remove, then click the **Delete** button to remove the selected entries from the table. |
| Cancel | Click this to clear the check boxes above. |

## 54.4.5 Global DHCP Relay Configuration Example

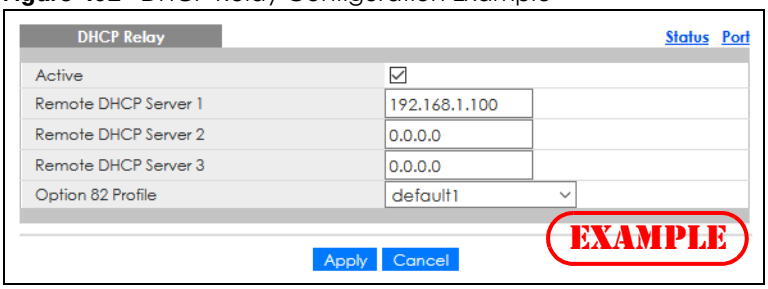
The follow figure shows a network example where the Switch is used to relay DHCP requests for the **VLAN1** and **VLAN2** domains. There is only one DHCP server that services the DHCP clients in both domains.

**Figure 400** Global DHCP Relay Network Example




Configure the **DHCP Relay** screen as shown. Make sure you select a DHCP option 82 profile (**default1** in this example) to set the Switch to send additional information (such as the VLAN ID) together with the DHCP requests to the DHCP server. This allows the DHCP server to assign the appropriate IP address according to the VLAN ID.

**Figure 401** DHCP Relay Configuration Example

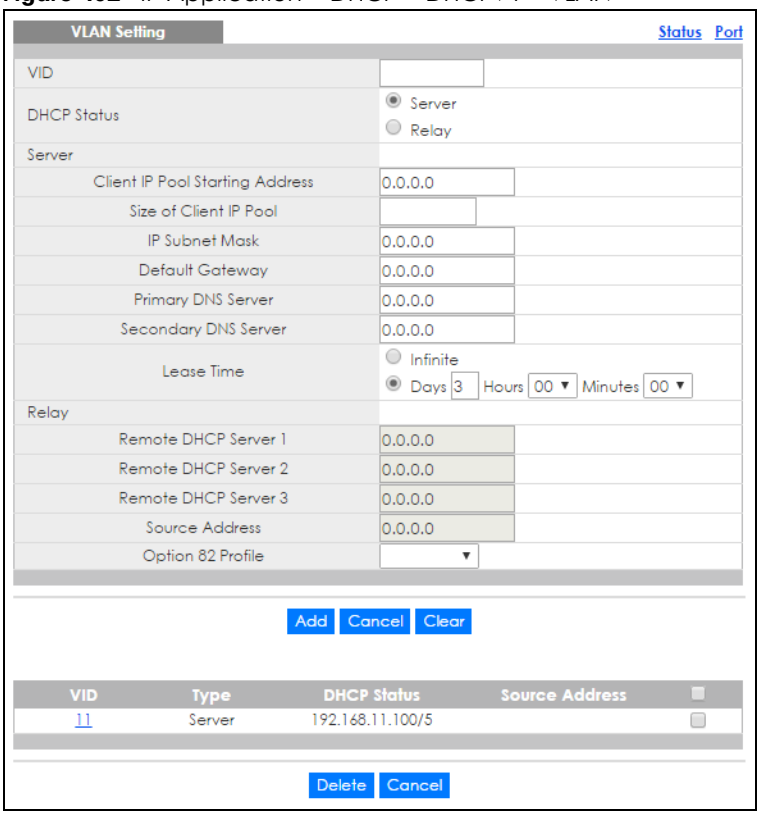



## 54.4.6 DHCPv4 VLAN Setting

Use this screen to configure your DHCP settings based on the VLAN domain of the DHCP clients. Click **IP Application** > **DHCP** > **DHCPv4** in the navigation panel, then click the **VLAN** link In the **DHCP Status** screen that displays.

Note: You must set up a management IP address for each VLAN that you want to configure DHCP settings for on the Switch.

**Figure 402** IP Application > DHCP > DHCPv4 > VLAN




The following table describes the labels in this screen.

Table 240 IP Application > DHCP > DHCPv4 > VLAN

| LABEL | DESCRIPTION |
|---|---|
| VID | Enter the ID number of the VLAN to which these DHCP settings apply. |
| DHCP Status | Select whether the Switch should function as a DHCP **Server** or **Relay** for the specified VID. If you select **Server** then fields related to DHCP relay configuration are grayed out and vice versa. |
| Server | Use this section if you want to configure the Switch to function as a DHCP server for this VLAN. |
| Client IP Pool Starting Address | Specify the first of the contiguous addresses in the IP address pool. |
| Size of Client IP Pool | Specify the size, or count of the IP address pool. The Switch can issue from 1 to 253 IP addresses to DHCP clients. |
| IP Subnet Mask | Enter the subnet mask for the client IP pool. |
| Default Gateway | Enter the IP address of the default gateway device. |
| Primary/ Secondary DNS Server | Enter the IP addresses of the DNS servers. The DNS servers are passed to the DHCP clients along with the IP address and the subnet mask. |
| Lease Time | Select **Infinite** to have the binding always valid. Select the second radio button to set up the binding's valid days, hours and minutes. |
| Relay | Use this section if you want to configure the Switch to function as a DHCP relay for this VLAN. |
| Remote DHCP Server 1 .. 3 | Enter the IP address of a DHCP server in dotted decimal notation. |

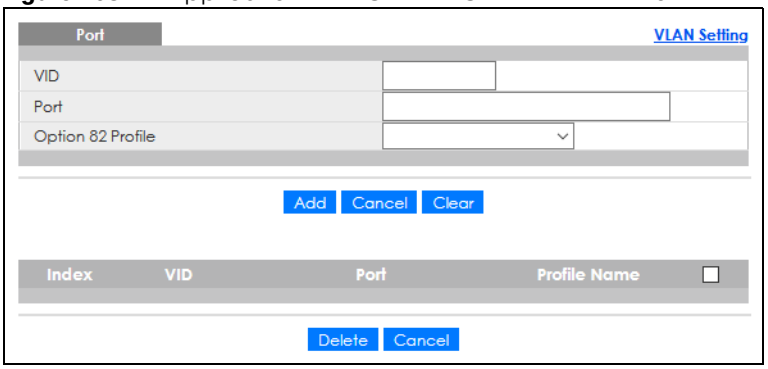
Table 240 IP Application > DHCP > DHCPv4 > VLAN (continued)

| LABEL | DESCRIPTION |
|---|---|
| Source Address | Enter the source IP address that the Switch adds to DHCP requests from clients on this VLAN before forwarding them. If you leave this field set to **0.0.0.0**, the Switch automatically sets the source IP address of the DHCP requests to the IP address of the interface on which the packet is received.<br>The source IP address helps DHCP clients obtain an appropriate IP address when you configure multiple routing domains on a VLAN. |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to all ports in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| VID | This field displays the ID number of the VLAN group to which this DHCP settings apply. |
| Type | This field displays **Server** or **Relay** for the DHCP mode. |
| DHCP Status | For DHCP server configuration, this field displays the starting IP address and the size of the IP address pool.<br>For DHCP relay configuration, this field displays the first remote DHCP server IP address. |
| Source Address | This field displays the source IP address you configured for DHCP requests from clients on this VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select the configuration entries you want to remove and click **Delete** to remove them. |
| Cancel | Click **Cancel** to clear the check boxes. |

## 54.4.7 Configure DHCPv4 VLAN Port

Use this screen to apply a different DHCP option 82 profile to certain ports in a VLAN. To open this screen, click **IP Application** > **DHCP** > **DHCPv4** > **VLAN** > **Port**.

**Figure 403** IP Application > DHCP > DHCPv4 > VLAN > Port



The following table describes the labels in this screen.

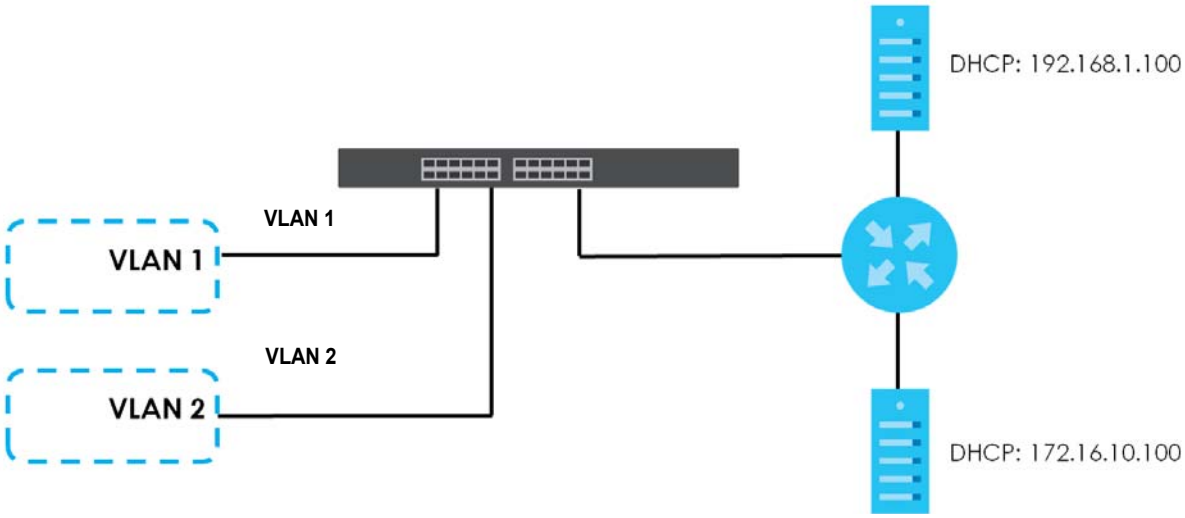
Table 241 IP Application > DHCP > DHCPv4 > VLAN > Port

| LABEL | DESCRIPTION |
|---|---|
| VID | Enter the ID number of the VLAN you want to configure here. |
| Port | Enter the number of ports to which you want to apply the specified DHCP option 82 profile.<br>You can enter multiple ports separated by (no space) comma (,) or hyphen (–) for a range. For example, enter "3–5" for ports 3, 4, and 5. Enter "3,5,7" for ports 3, 5, and 7.<br>In stacking mode, the first number represents the slot and the second the port number. Enter 1/1–1/24,2/28 for ports 1 to 24 for the Switch in slot 1 and port 28 for the Switch in slot 2, for example. |
| Option 82 Profile | Select a pre-defined DHCP option 82 profile that the Switch applies to the specified ports in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server.<br>The profile you select here has priority over the one you select in the **DHCP** > **DHCPv4** > **VLAN** screen. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click this to reset the values above based on the last selected entry or, if not applicable, to clear the fields above. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each entry. Click an index number to change the settings. |
| VID | This field displays the VLAN to which the ports belongs. |
| Port | This field displays the ports to which the Switch applies the settings. |
| Profile Name | This field displays the DHCP option 82 profile that the Switch applies to the ports in this VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Select the entries that you want to remove, then click the **Delete** button to remove the selected entries from the table. |
| Cancel | Click this to clear the check boxes above. |

## 54.4.8 Example: DHCP Relay for Two VLANs

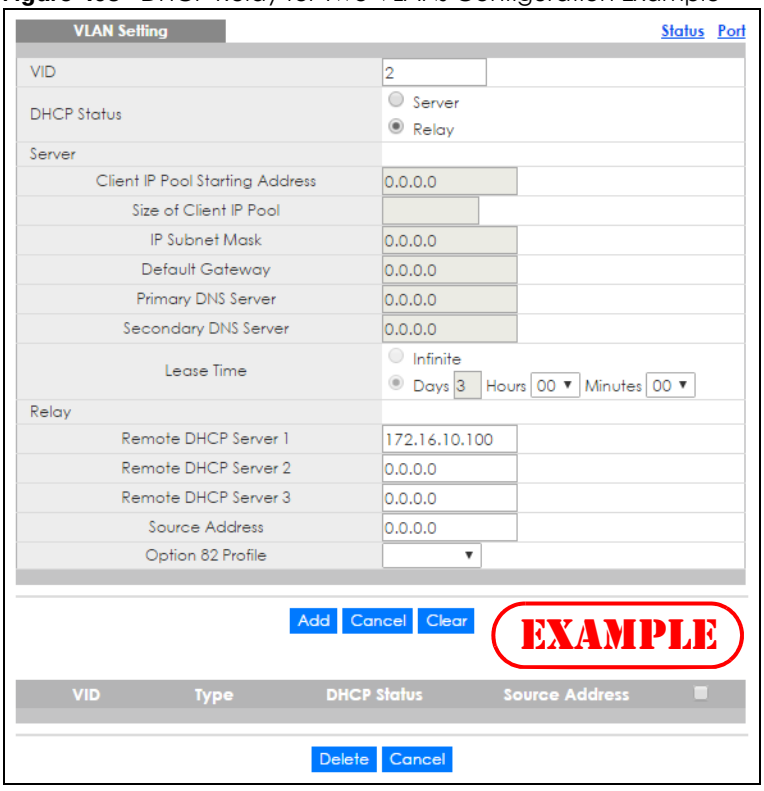
The following example displays two VLANs (VIDs 1 and 2) for a campus network. Two DHCP servers are installed to serve each VLAN. The system is set up to forward DHCP requests from the dormitory rooms (VLAN 1) to the DHCP server with an IP address of 192.168.1.100. Requests from the academic buildings (VLAN 2) are sent to the other DHCP server with an IP address of 172.16.10.100.

**Figure 404** DHCP Relay for Two VLANs




For the example network, configure the **VLAN Setting** screen as shown.

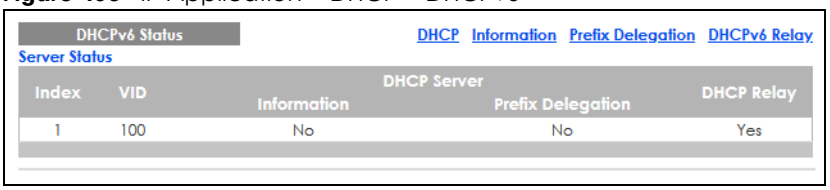
**Figure 405** DHCP Relay for Two VLANs Configuration Example




# 54.5 DHCPv6 Status

Click **IP Application** > **DHCP** > **DHCPv6** in the navigation panel to see information on the DHCPv6 server. The **DHCPv6 Status** screen displays.

**Figure 406** IP Application > DHCP > DHCPv6




The following table describes the labels in this screen.

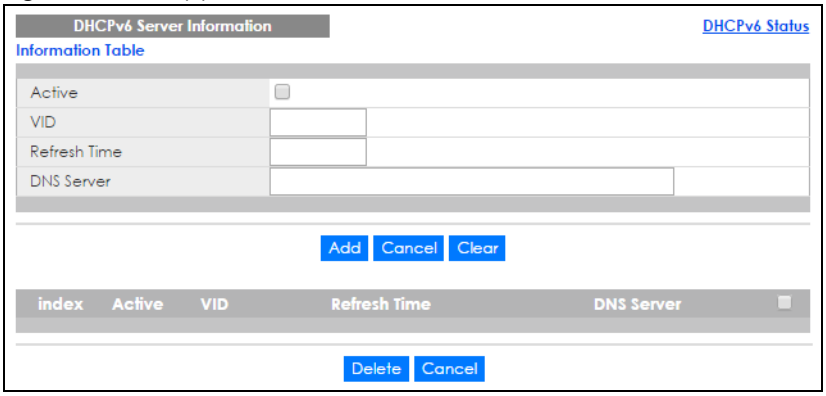
Table 242 IP Application > DHCP > DHCPv6

| LABEL | DESCRIPTION |
|---|---|
| Server Status | This section displays configuration settings related to the Switch's DHCP server mode. |
| Index | This is the index number of a DHCPv6 server information. |
| VID | This field displays the VLAN ID to which the DHCP server belongs. |
| DHCP Server | A DHCPv6 server can assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. |
| Information | This field displays **Yes** when the entry supports display of the refresh time and DNS server; it shows **No** when it does not. |
| Prefix Delegation | This field displays **Yes** when the entry supports the prefix delegation; it shows **No** when it does not. The prefix delegation is used by an IPv6 device to generate its IP address. |
| DHCP Relay | A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that's in another network) and the DHCPv6 clients.<br>This field displays **Yes** when the Switch supports DHCPv6 Relay and **No** when it does not. **Yes** means the Switch forwards all DHCP requests to the same DHCP server. **No** means the Switch does not forward DHCP requests to a DHCP server. |

# 54.6 DHCPv6 Information

Use this screen to configure DHCPv6 and DNS server settings on the Switch. Click **IP Application** > **DHCP** > **DHCPv6** > **Information** in the navigation panel to display the screen as shown.

**Figure 407** IP Application > DHCP > DHCPv6 > Information



The following table describes the labels in this screen.

Table 243 IP Application > DHCP > DHCPv6 > Information

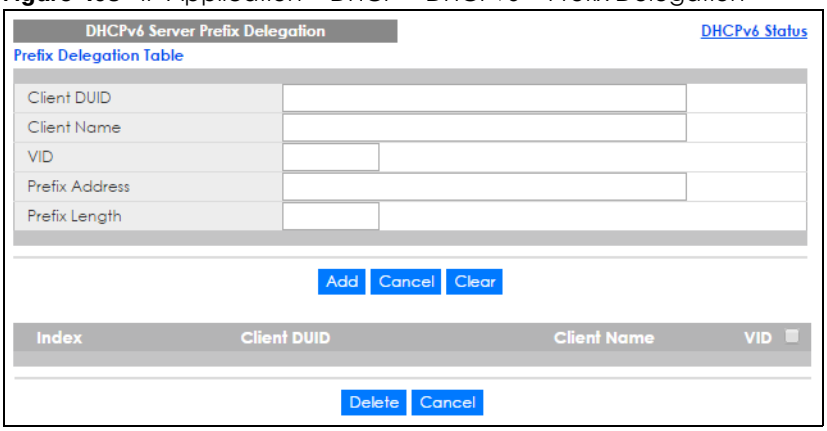
| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable the entry. |
| VID | Enter the ID number of the VLAN to which the DHCPv6 server belongs here. |
| Refresh Time | Enter the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. The allowed range is 600 to 4294967295 seconds. |
| DNS Server | Specify the IPv6 address of the DNS server for the DHCP clients to use here.<br>An 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address '2001:0db8:1a2b:0015:0000:0000:1a2f:0000'.<br>IPv6 addresses can be abbreviated in two ways:<br>• Leading zeros in a block can be omitted. So '2001:0db8:1a2b:0015:0000:0000:1a2f:0000' can be written as '2001:db8:1a2b:15:0:0:1a2f:0'.<br>• Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So '2001:0db8:0000:0000:1a2f:0000:0000:0015' can be written as '2001:0db8::1a2f:0000:0000:0015', '2001:0db8:0000:0000:1a2f::0015', '2001:db8::1a2f:0:0:15' or '2001:db8:0:0:1a2f::15'. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each entry. Click an index number to change its settings. |
| Active | This field displays whether the entry is activated or not. |
| VID | This field displays the ID number of the VLAN to which the DHCPv6 server belongs. |
| Refresh Time | This field displays the number of seconds a DHCPv6 client should wait before refreshing information retrieved from a DHCPv6 server. It displays **disable** if **Refresh Time** is not configured. |
| DNS Server | This field displays the IPv6 address of the DNS server that the DHCP clients will use. It displays **disable** when it is not configured. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# 54.7 DHCPv6 Prefix Delegation

Prefix delegation enables an IPv6 device to use the received IPv6 prefix (for example, '2001:db2::/48') to generate its IP address. The Switch passes the IPv6 prefix information to its connected hosts (according to VLAN) so that they can generate their IPv6 addresses.

Use this screen to configure DHCPv6 client and IPv6 prefix settings for a specific VLAN on the Switch. Click **IP Application** > **DHCP** > **DHCPv6** > **Prefix Delegation** in the navigation panel to display the screen as shown.

**Figure 408** IP Application > DHCP > DHCPv6 > Prefix Delegation




The following table describes the labels in this screen.

Table 244 IP Application > DHCP > DHCPv6 > Prefix Delegation

| LABEL | DESCRIPTION |
|---|---|
| Client DUID | Each DHCP client and server has a unique DHCP Unique IDentifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. Type the client DUID for the devices connected to the Switch in this field. |
| Client Name | Type a name to identify the DHCPv6 client in this field. |
| VID | Type the ID number of the VLAN to which the DHCPv6 client belongs here. |
| Prefix Address | IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example, '2001:db8:1a2b:15::1a2f:0/32' is a prefix address with prefix length.<br><br>/32 means that the first 32 bits ('2001:db8') from the left is the network prefix.<br><br>Type the prefix address in this field. For example, type '2001:db8:1a2b:15::1a2f:0' |
| Prefix Length | Type the prefix length in this field. For example, type 32. |
| Add | Click this to create a new entry or to update an existing one.<br><br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This field displays a sequential number for each entry. Click an index number to change its settings. |
| Client DUID | This field displays the client DHCP Unique IDentifier (DUID) which uniquely identifies the client. |
| Client Name | This field displays a name to identify the DHCPv6 client. |
| VID | This field displays the ID number of the VLAN to which the DHCPv6 client belongs. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

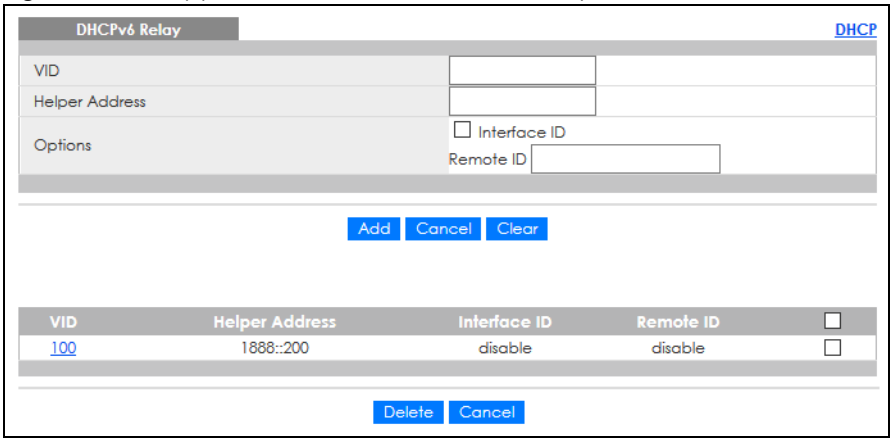
# 54.8 DHCPv6 Relay

A DHCPv6 relay agent is on the same network as the DHCPv6 clients and helps forward messages between the DHCPv6 server (that is in another network) and the DHCPv6 clients.

The DHCPv6 relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCPv6 server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

Use this screen to configure DHCPv6 relay settings for a specific VLAN on the Switch. Click **IP Application** > **DHCP** > **DHCPv6** > **DHCPv6 Relay** in the navigation panel to display the screen as shown.

**Figure 409** IP Application > DHCP > DHCPv6 Relay




The following table describes the labels in this screen.

Table 245 IP Application > DHCP > DHCPv6 Relay

| LABEL | DESCRIPTION |
|---|---|
| VID | Enter the ID number of the VLAN to which the DHCPv6 server that will assign IP information belongs here. |
| Helper Address | Enter the IPv6 address of the DHCPv6 server that will assign IP information here.<br><br>An 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address '2001:0db8:1a2b:0015:0000:0000:1a2f:0000'.<br><br>IPv6 addresses can be abbreviated in two ways:<br><br>• Leading zeros in a block can be omitted. So '2001:0db8:1a2b:0015:0000:0000:1a2f:0000' can be written as '2001:db8:1a2b:15:0:0:1a2f:0'.<br>• Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So '2001:0db8:0000:0000:1a2f:0000:0000:0015' can be written as '2001:0db8::1a2f:0000:0000:0015', '2001:0db8:0000:0000:1a2f::0015', '2001:db8::1a2f:0:0:15' or '2001:db8:0:0:1a2f::15'. |
| Options | |
| Interface ID | Select this option to have the Switch add the interface-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server. |

Table 245 IP Application > DHCP > DHCPv6 Relay (continued)

| LABEL | DESCRIPTION |
|---|---|
| Remote ID | Enter a string of up to 64 printable characters to be carried in the remote-ID option. The Switch adds the remote-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCPv6 server. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| VID | This field displays the VLAN ID number. Click the VLAN ID to change the settings. |
| Helper Address | This field displays the IPv6 address of the remote DHCPv6 server for this VLAN. |
| Interface ID | This field displays whether the interface-ID option is added to DHCPv6 requests from clients in this VLAN. |
| Remote ID | This field displays whether the remote-ID option is added to DHCPv6 requests from clients in this VLAN. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Check the entries that you want to remove and then click the **Delete** button. |
| Cancel | Click **Cancel** to clear the selected check boxes. |

# 54.9 DHCP Server Guard

Use this screen to specify whether ports are trusted or untrusted ports for DHCP packets. Click **IP Application** > **DHCP** > **DHCP Server Guard** in the navigation panel to display the screen as shown.

**Figure 410** IP Application > DHCP > DHCP Server Guard (Standalone Mode)

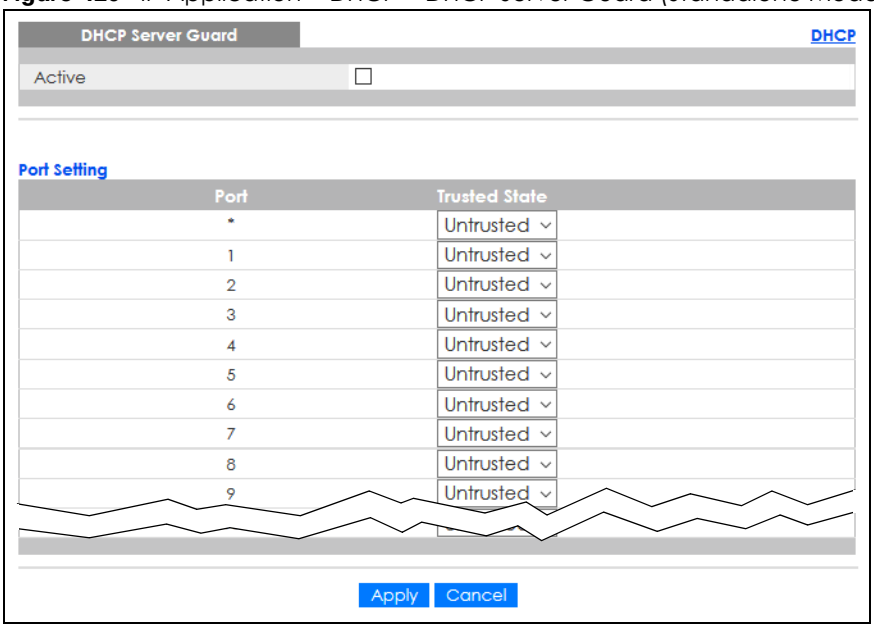
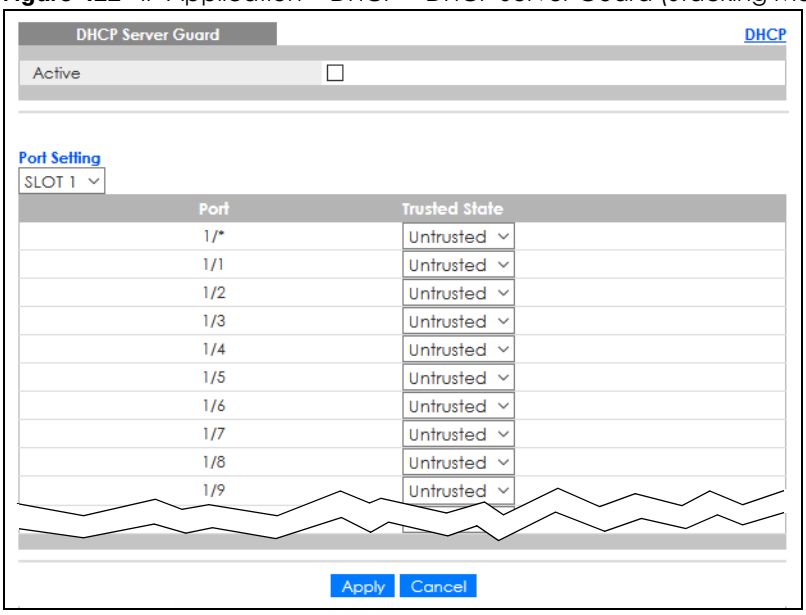


**Figure 411** IP Application > DHCP > DHCP Server Guard (Stacking Mode)




The following table describes the labels in this screen.

Table 246 IP Application > DHCP > DHCP Server Guard

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable DHCP Server Guard. |
| Port Setting | |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last two ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Trusted State | Select whether this port is a trusted port (**Trusted**) or an untrusted port (**Untrusted**). The Switch does not discard DHCP packets on trusted ports for any reason.<br>The Switch discards DHCP packets from untrusted ports when the packet is a DHCP server packet (for example, OFFER, ACK, or NACK). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to their last saved values. |

# CHAPTER 55
# VRRP

This chapter shows you how to configure and monitor the Virtual Router Redundancy Protocol (VRRP) on the Switch.

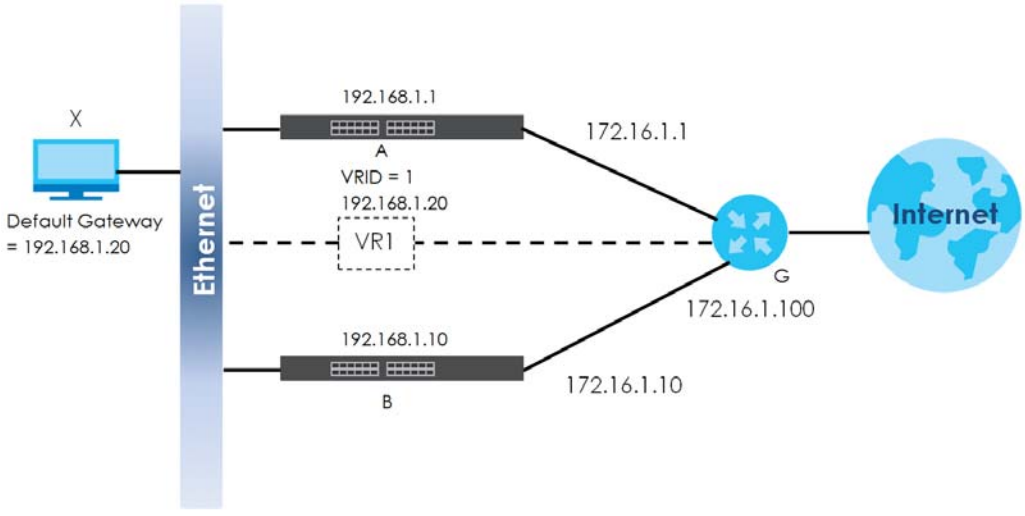
## 55.1 VRRP Overview

Each host on a network is configured to send packets to a statically configured default gateway (this Switch). The default gateway can become a single point of failure. Virtual Router Redundancy Protocol (VRRP), defined in RFC 2338, allows you to create redundant backup gateways to ensure that the default gateway of a host is always available.

In VRRP, a virtual router (VR) represents a number of physical layer-3 devices. An IP address is associated with the virtual router. A layer-3 device having the same IP address is the preferred master router while the other Layer-3 devices are the backup routers. The master router forwards traffic for the virtual router. When the master router becomes unavailable, a backup router assumes the role of the master router until the master router comes back up and takes over.

The following figure shows a VRRP network example with the switches (**A** and **B**) implementing one virtual router **VR1** to ensure the link between the host **X** and the uplink gateway **G**. Host **X** is configured to use **VR1** (192.168.1.20) as the default gateway. If switch **A** has a higher priority, it is the master router. Switch **B**, having a lower priority, is the backup router.

**Figure 412** Example 1

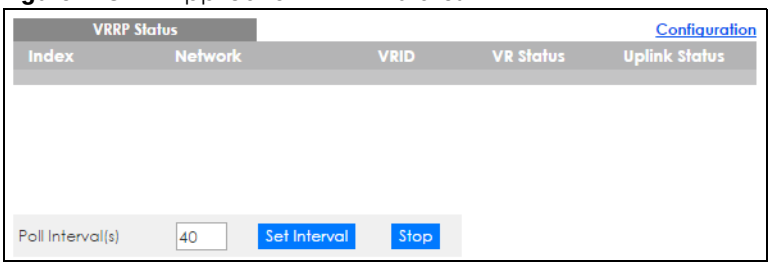



If switch **A** (the master router) is unavailable, switch **B** takes over. Traffic is then processed by switch **B**.

# 55.2 VRRP Status

Click **IP Application** > **VRRP** in the navigation panel to display the **VRRP Status** screen as shown next.

**Figure 413** IP Application > VRRP Status




The following table describes the labels in this screen.

Table 247 IP Application > VRRP Status

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of a rule. |
| Network | This field displays the IP address and the subnet mask bits of an IP routing domain that is associated to a virtual router. |
| VRID | This field displays the ID number of the virtual router. |
| VR Status | This field displays the status of the virtual router.<br>This field is **Master** indicating that this Switch functions as the master router.<br>This field is **Backup** indicating that this Switch functions as a backup router.<br>This field displays **Init** when this Switch is initiating the VRRP protocol or when the **Uplink Status** field displays **Dead**. |
| Uplink Status | This field displays the status of the link between this Switch and the uplink gateway.<br>This field is **Alive** indicating that the link between this Switch and the uplink gateway is up. Otherwise, this field is **Dead**.<br>This field displays **Probe** when this Switch is check for the link state. |
| Poll Interval(s) | The text box displays how often (in seconds) this screen refreshes. You may change the refresh interval by typing a new number in the text box and then clicking **Set Interval**. |
| Stop | Click **Stop** to halt system statistic polling. |

# 55.3 VRRP Configuration

The following sections describe the different parts of the **VRRP Configuration** screen.

## 55.3.1 IP Interface Setup

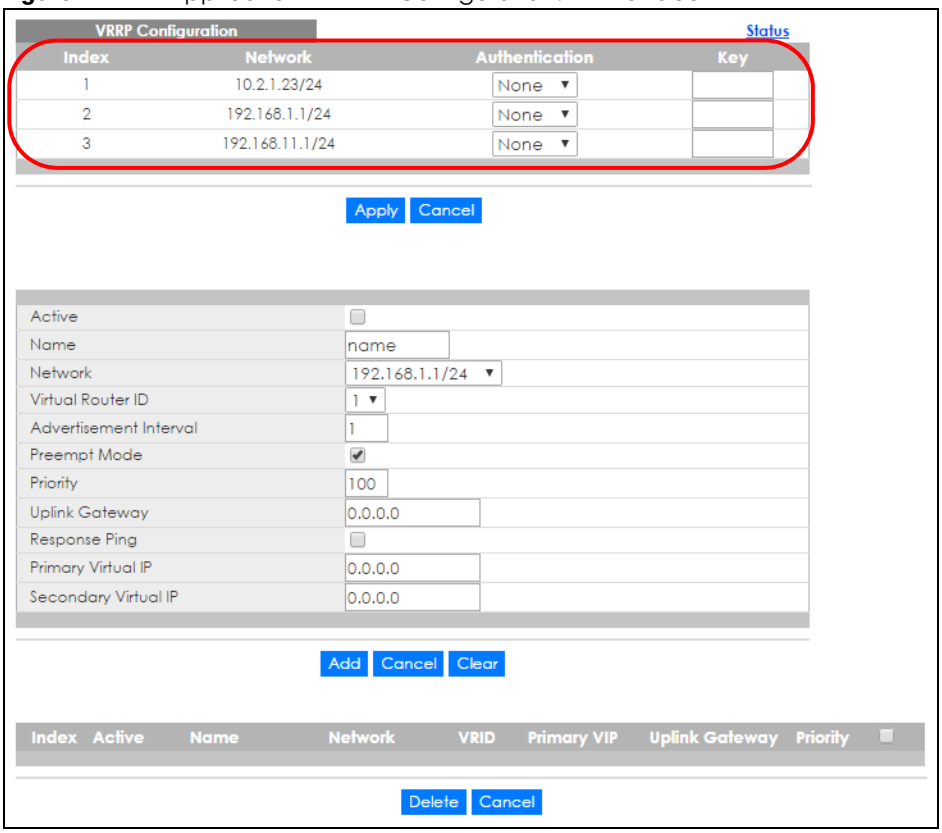
Before configuring VRRP, first create an IP interface (or routing domain) in the **IP Setup** screen.

Click **IP Application**, **VRRP** and click the **Configuration** link to display the **VRRP Configuration** screen as shown next.

Note: You can only configure VRRP on interfaces with unique VLAN IDs.

Note: Routing domains with the same VLAN ID are not displayed in the table indicated.

**Figure 414** IP Application > VRRP Configuration: IP Interface




The following table describes the labels in this screen.

Table 248 IP Application > VRRP Configuration: IP Interface

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of an entry. |
| Network | This field displays the IP address and number of subnet mask bit of an IP domain. |
| Authentication | Select **None** to disable authentication. This is the default setting.<br>Select **Simple** to use a simple password to authenticate VRRP packet exchanges on this interface. |
| Key | When you select **Simple** in the **Authentication** field, enter a password key (up to eight printable ASCII character long) in this field. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to discard all changes made in this table. |

## 55.3.2 VRRP Parameters

This section describes the VRRP parameters.

#### 55.3.2.1 Advertisement Interval

The master router sends out Hello messages to let the other backup routers know that it is still up and running. The time interval between sending the Hello messages is the advertisement interval. By default, a Hello message is sent out every second.

If the backup routers do not receive a Hello message from the master router after this interval expires, it is assumed that the master router is down. Then the backup router with the highest priority becomes the master router.

Note: All routers participating in the virtual router must use the same advertisement interval.

#### 55.3.2.2 Priority

Configure the priority level (1 to 254) to set which backup router to take over in case the master router goes down. The backup router with the highest priority will take over. The priority of the VRRP router that owns the IP address(es) associated with the virtual router is 255.

#### 55.3.2.3 Preempt Mode

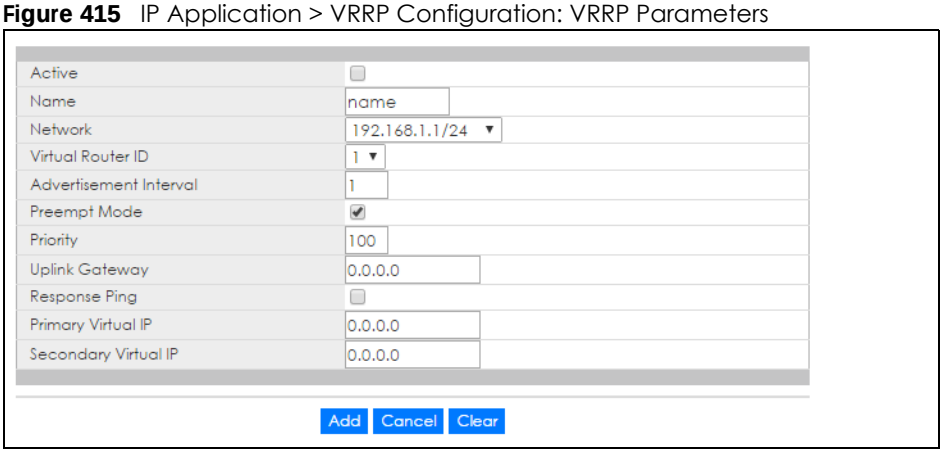
If the master router is unavailable, a backup router assumes the role of the master router. However, when another backup router with a higher priority joins the network, it will preempt the lower priority backup router that is the master. Disable preempt mode to prevent this from happening.

By default, a layer 3 device with the same IP address as the virtual router will become the master router regardless of the preempt mode.

### 55.3.3 Configuring VRRP Parameters

After you set up an IP interface, configure the VRRP parameters in the **VRRP Configuration** screen.

**Figure 415** IP Application > VRRP Configuration: VRRP Parameters




The following table describes the labels in this screen.

Table 249 IP Application > VRRP Configuration: VRRP Parameters

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable this VRRP entry. |
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| Network | Select an IP domain to which this VRRP entry applies. |

Table 249 IP Application > VRRP Configuration: VRRP Parameters (continued)

| LABEL | DESCRIPTION |
|---|---|
| Virtual Router ID | Select a virtual router number (1 to 7) for which this VRRP entry is created.<br>You can configure up to seven virtual routers for one network. |
| Advertisement Interval | Specify the number of seconds between Hello message transmissions. The default is **1**. |
| Preempt Mode | Select this option to activate preempt mode. |
| Priority | Enter a number (between 1 and 254) to set the priority level. The bigger the number, the higher the priority.<br>This field is **100** by default. |
| Uplink Gateway | Enter the IP address of the uplink gateway in dotted decimal notation.<br>The Switch checks the link to the uplink gateway. |
| Response Ping | Select this option to have the Switch respond to a ping that is sent to the virtual IP address. |
| Primary Virtual IP | Enter the IP address of the primary virtual router in dotted decimal notation. |
| Secondary Virtual IP | This field is optional. Enter the IP address of a secondary virtual router in dotted decimal notation. This field is ignored when you enter **0.0.0.0**. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to discard all changes made in this table. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |

## 55.3.4 Viewing VRRP Summary

View the VRRP configuration summary at the bottom of the screen.

**Figure 416** IP Application > VRRP Configuration: Summary

The following table describes the labels in this screen.

Table 250 IP Application > VRRP Configuration: Summary

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number of an entry. Click an index number to change the settings. |
| Active | This field shows whether a VRRP entry is enabled (**Yes**) or disabled (**No**). |
| Name | This field displays a descriptive name of an entry. |
| Network | This field displays the IP address and subnet mask of an interface. |
| VRID | This field displays the ID number of a virtual router. |
| Primary VIP | This field displays the IP address of the primary virtual router. |
| Uplink Gateway | This field displays the IP address of the uplink gateway. |
| Priority | This field displays the priority level (1 to 255) of the entry. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |

Table 250 IP Application > VRRP Configuration: Summary (continued)

| LABEL | DESCRIPTION |
|---|---|
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

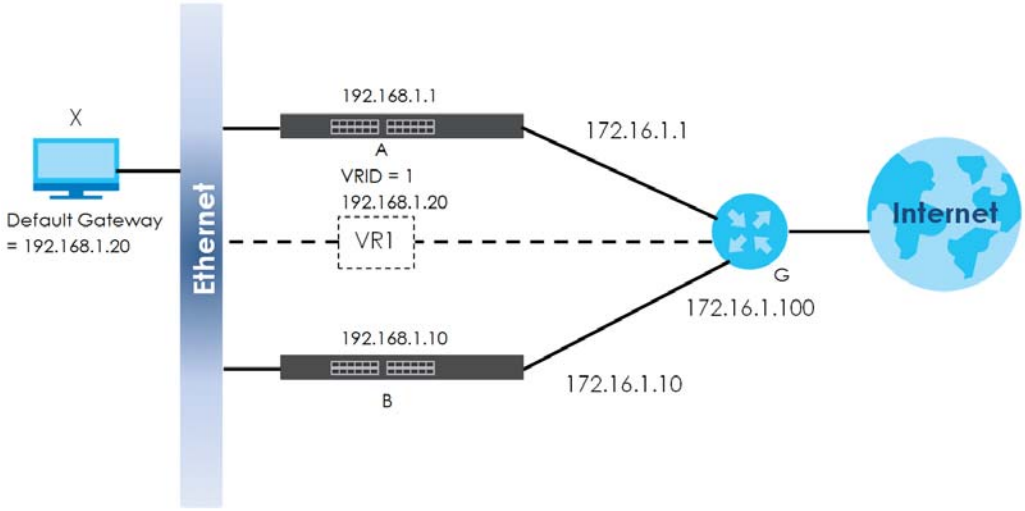
# 55.4 VRRP Configuration Examples

The following sections show two VRRP configuration examples on the Switch.

## 55.4.1 One Subnet Network Example

The figure below shows a simple VRRP network with only one virtual router **VR1** (VRID =1) and two switches. The network is connected to the WAN through an uplink gateway **G** (172.16.1.100). The host computer **X** is set to use **VR1** as the default gateway.

**Figure 417** VRRP Configuration Example: One Virtual Router Network




You want to set switch **A** as the master router. Configure the VRRP parameters in the **VRRP Configuration** screens on the switches as shown in the figures below.

**Figure 418** VRRP Example 1: VRRP Parameter Settings on Switch A

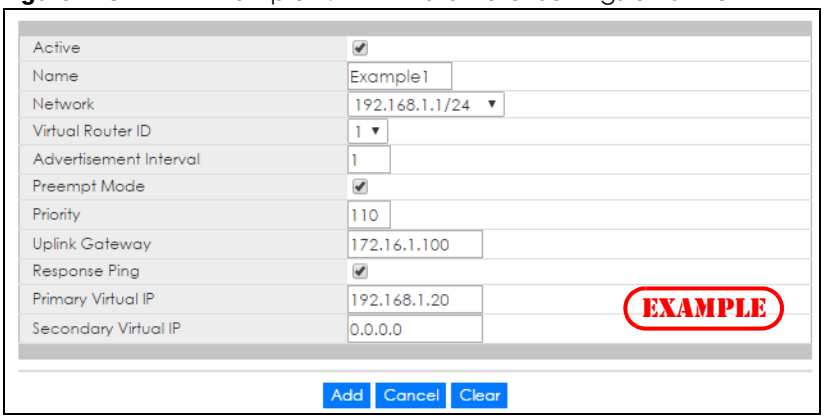
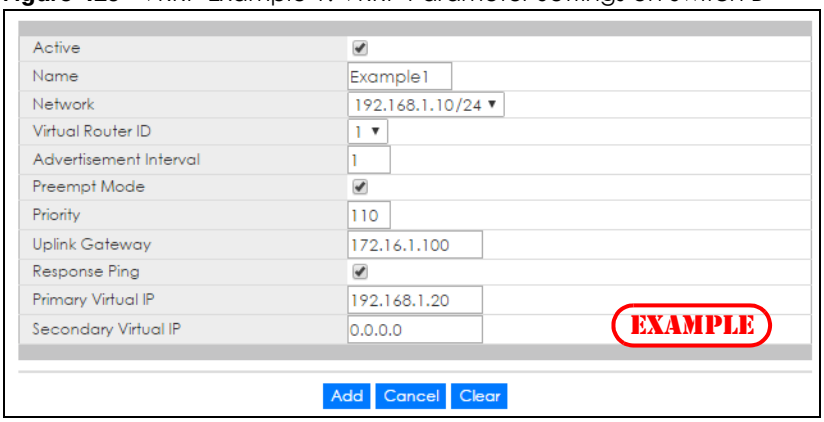


**Figure 419** VRRP Example 1: VRRP Parameter Settings on Switch B




After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

**Figure 420** VRRP Example 1: VRRP Status on Switch A

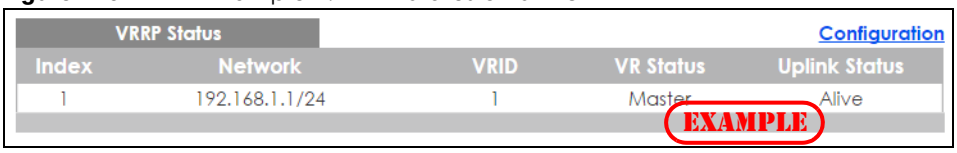
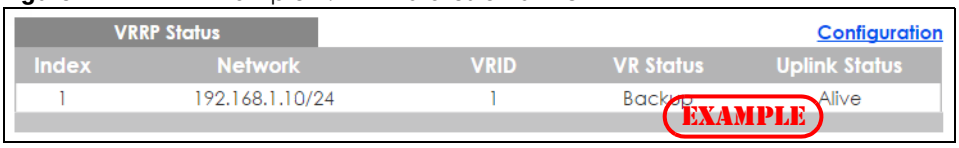



**Figure 421** VRRP Example 1: VRRP Status on Switch B

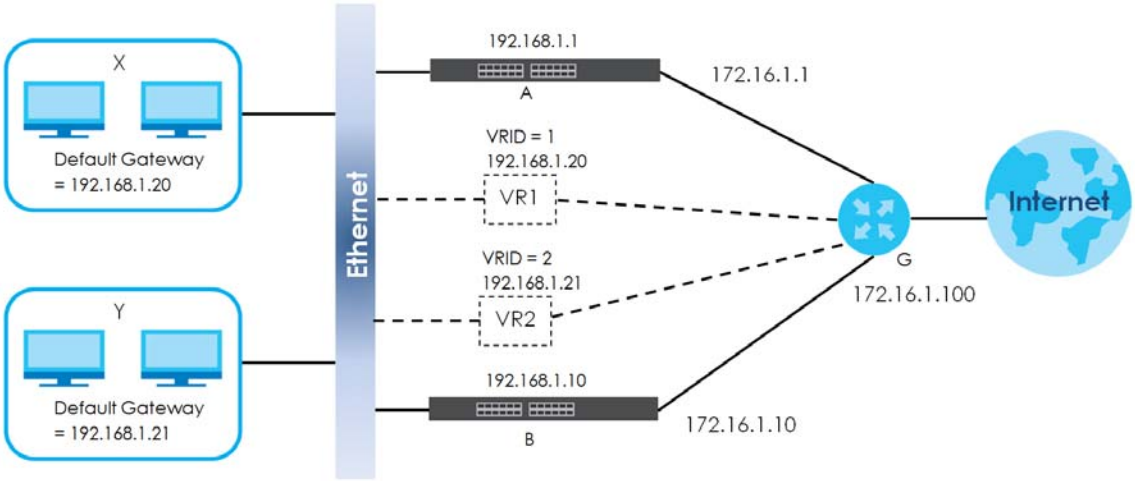



## 55.4.2 Two Subnets Example

The following figure depicts an example in which two switches share the network traffic. Hosts in the two network groups use different default gateways. Each switch is configured to backup a virtual router using VRRP.

You wish to configure switch **A** as the master router for virtual router **VR1** and as a backup for virtual router **VR2**. On the other hand, switch **B** is the master for **VR2** and a backup for **VR1**.

**Figure 422** VRRP Configuration Example: Two Virtual Router Network




You need to configure the **VRRP Configuration** screen for virtual router VR2 on each switch, while keeping the VRRP configuration in example 1 for virtual router **VR1** (refer to Section 55.4.2 on page 524). Configure the VRRP parameters on the switches as shown in the figures below.

**Figure 423** VRRP Example 2: VRRP Parameter Settings for VR2 on Switch A

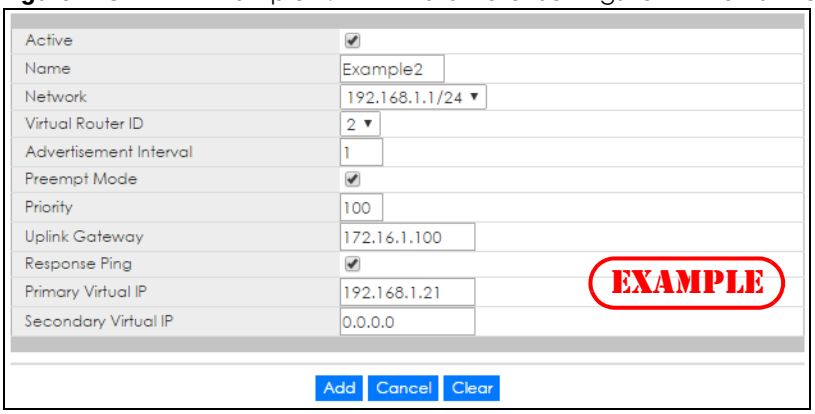
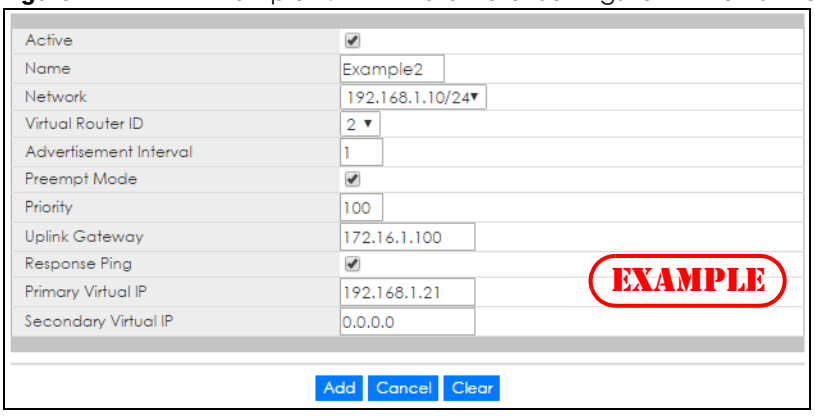
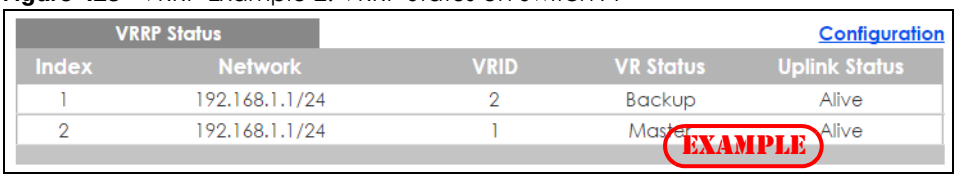



**Figure 424** VRRP Example 2: VRRP Parameter Settings for VR2 on Switch B




After configuring and saving the VRRP configuration, the **VRRP Status** screens for both switches are shown next.

**Figure 425** VRRP Example 2: VRRP Status on Switch A



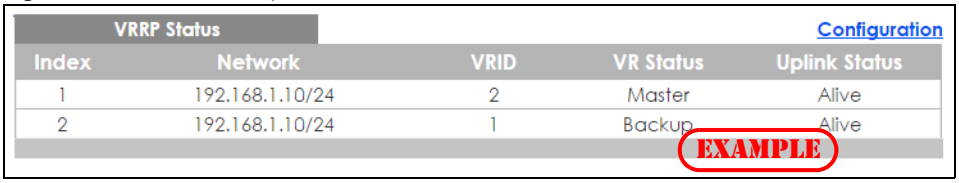
VRRP Status

Configuration

| Index | Network | VRID | VR Status | Uplink Status |
|---|---|---|---|---|
| 1 | 192.168.1.1/24 | 2 | Backup | Alive |
| 2 | 192.168.1.1/24 | 1 | Master | Alive |

EXAMPLE

**Figure 426** VRRP Example 2: VRRP Status on Switch B



VRRP Status

Configuration

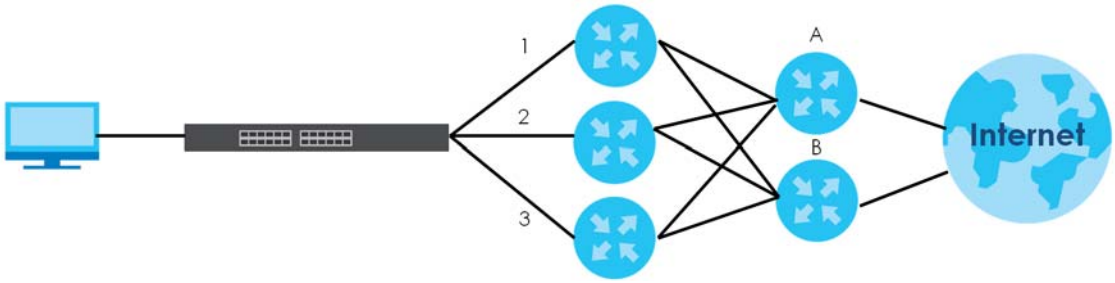
| Index | Network | VRID | VR Status | Uplink Status |
|---|---|---|---|---|
| 1 | 192.168.1.10/24 | 2 | Master | Alive |
| 2 | 192.168.1.10/24 | 1 | Backup | Alive |

EXAMPLE

# CHAPTER 56
# Router Setup

## 56.1 Router Setup Overview

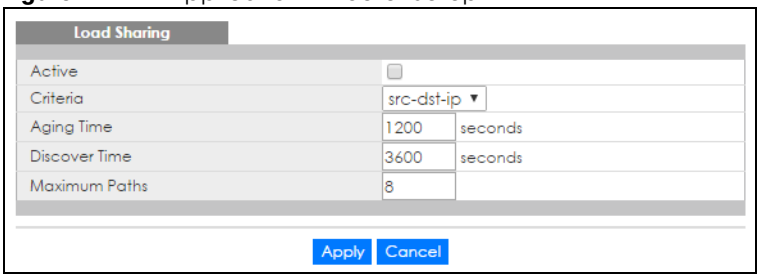
The Switch learns the next-hops using ARP and determines routing paths for a destination. The Switch supports Equal-Cost MultiPath (ECMP) to forward packets destined to the same device (**A** for example) through different routing paths (**1**, **2** and **3**) of equal path cost. This allows you to balance or share traffic loads between multiple routing paths when the Switch is connected to more than one next-hop. ECMP works with static routes or a routing protocol, such as OSPF. With ECMP, packets are routed through the paths of equal cost according to the hash algorithm output.




## 56.2 Configuring Router Setup

Click **IP Application** > **Router Setup** in the navigation panel to display the screen as shown next.

**Figure 427** IP Application > Router Setup



The following table describes the labels in this screen.

Table 251 IP Application > Router Setup

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this option to enable Equal-Cost MultiPath (ECMP) routing on the Switch. |
| Criteria | Select the criteria the Switch uses to determine the routing path for a packet.<br>Select **src-ip** to have the Switch use a hash algorithm to convert a packet's source IP address into a hash value which acts as an index to a route path.<br>Select **src-dst-ip** to have the Switch use a hash algorithm to convert a packet's source and destination IP addresses into a hash value which acts as an index to a route path. |
| Aging Time | Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update a resolved next-hop's MAC address. |
| Discover Time | Specify the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update an unresolved next-hop's MAC address. |
| Maximum Paths | Set the maximum number of paths for one ECMP (Equal-Cost MultiPath) route. The maximum number varies by Switch. A smaller number of maximum-paths means more ECMP routes are allowed and a larger number of maximum-paths means fewer ECMP routes are allowed.<br>The number of paths for a static route for ECMP cannot be bigger than the maximum-paths value configured here.<br>Throughput may be influenced while configuring ECMP maximum-paths. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 57
# ARP Setup

## 57.1 ARP Overview

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP table maintains an association between each MAC address and its corresponding IP address.

### 57.1.1 What You Can Do

Use the **ARP Learning** screen (Section 57.2.1 on page 531) to configure ARP learning mode on a per-port basis.

Use the **Static ARP** screen (Section 57.2.2 on page 533) to create static ARP entries that will display in the **Management** > **ARP Table** screen and will not age out.

### 57.1.2 What You Need to Know

Read on for concepts on ARP that can help you configure the screen in this chapter.

#### 57.1.2.1 How ARP Works

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch looks in the ARP Table and if it finds the address, it sends it to the device.

If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The Switch fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the Switch puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP Table for future reference and then sends the packet to the MAC address that replied.

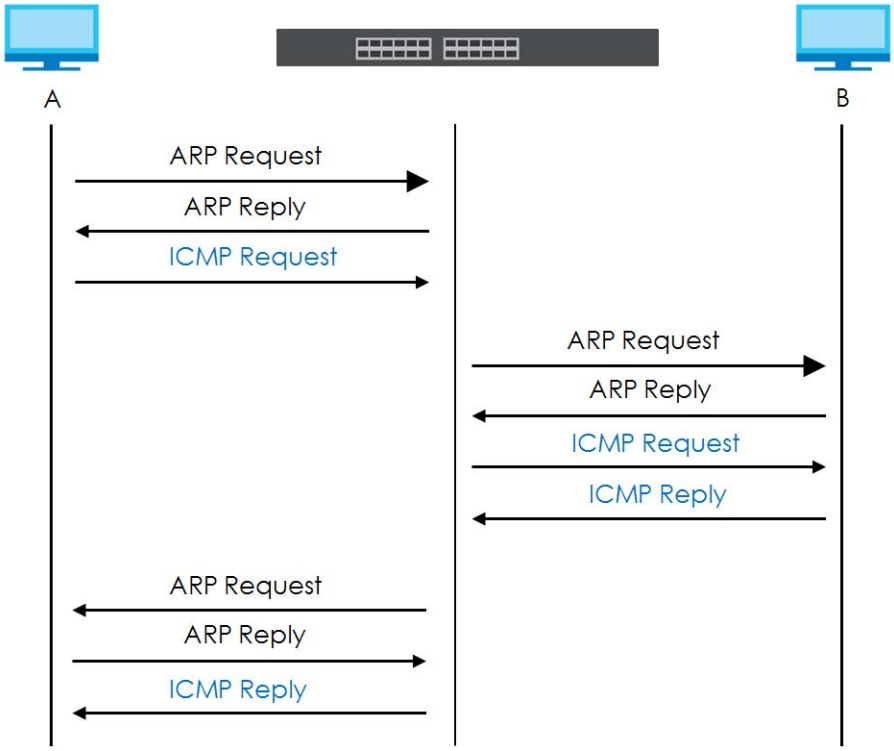
#### 57.1.2.2 ARP Learning Mode

The Switch supports three ARP learning modes: ARP-Reply, Gratuitous-ARP, and ARP-Request.

## ARP-Reply

The Switch in ARP-Reply learning mode updates the ARP table only with the ARP replies to the ARP requests sent by the Switch. This can help prevent ARP spoofing.

In the following example, the Switch does not have IP address and MAC address mapping information for hosts **A** and **B** in its ARP table, and host **A** wants to ping host **B**. Host **A** sends an ARP request to the Switch and then sends an ICMP request after getting the ARP reply from the Switch. The Switch finds no matched entry for host **B** in the ARP table and broadcasts the ARP request to all the devices on the LAN. When the Switch receives the ARP reply from host **B**, it updates its ARP table and also forwards host **A**'s ICMP request to host **B**. After the Switch gets the ICMP reply from host **B**, it sends out an ARP request to get host **A**'s MAC address and updates the ARP table with host **A**'s ARP reply. The Switch then can forward host **B**'s ICMP reply to host **A**.




## Gratuitous-ARP

A gratuitous ARP is an ARP request in which both the source and destination IP address fields are set to the IP address of the device that sends this request and the destination MAC address field is set to the broadcast address. There will be no reply to a gratuitous ARP request.

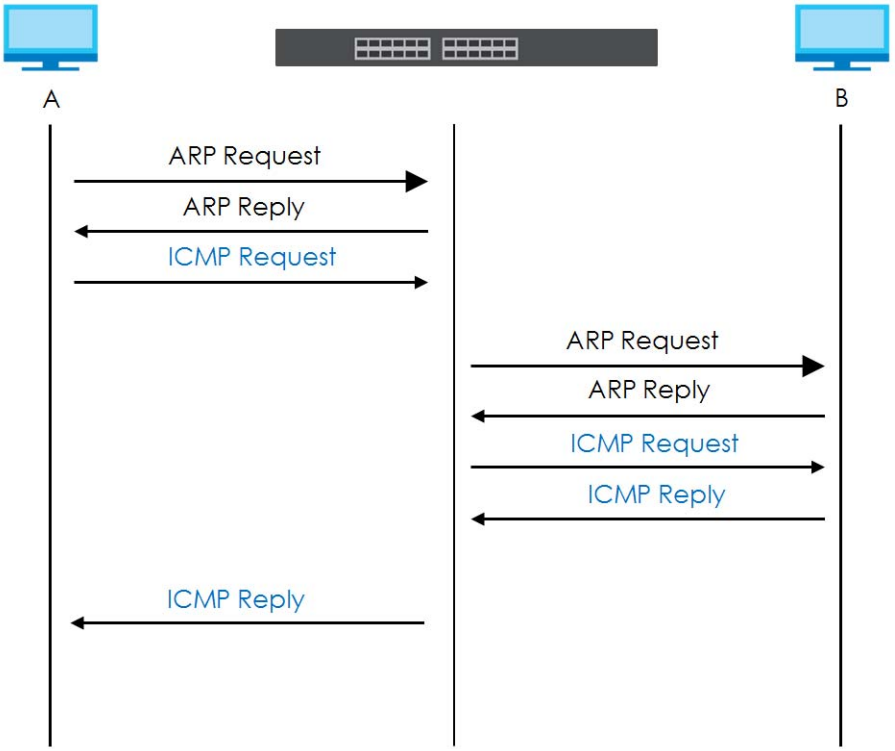
A device may send a gratuitous ARP packet to detect IP collisions. If a device restarts or its MAC address is changed, it can also use gratuitous ARP to inform other devices in the same network to update their ARP table with the new mapping information.

In Gratuitous-ARP learning mode, the Switch updates its ARP table with either an ARP reply or a gratuitous ARP request.

### ARP-Request

When the Switch is in ARP-Request learning mode, it updates the ARP table with both ARP replies, gratuitous ARP requests and ARP requests.

Therefore in the following example, the Switch can learn host **A**'s MAC address from the ARP request sent by host **A**. The Switch then forwards host **B**'s ICMP reply to host **A** right after getting host **B**'s MAC address and ICMP reply.




# 57.2 ARP Setup

Click the link next to **ARP Learning** to open a screen where you can set the ARP learning mode for each port. Click the link next to **Static ARP** to open a screen where you can create static ARP entries on the Switch.

**Figure 428** IP Application > ARP Setup

## 57.2.1 ARP Learning

Use this screen to configure each port's ARP learning mode. Click the link next to **ARP Learning** in the **IP Application** > **ARP Setup** screen to display the screen as shown next.

**Figure 429** IP Application > ARP Setup > ARP Learning (Standalone Mode)

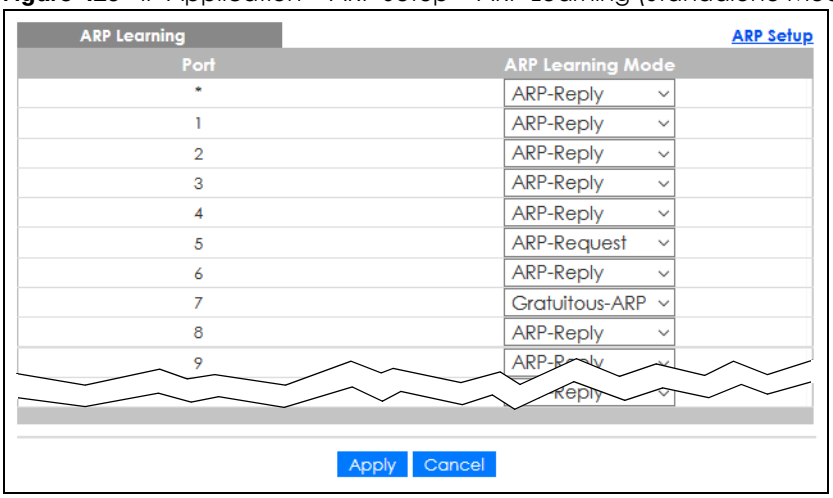
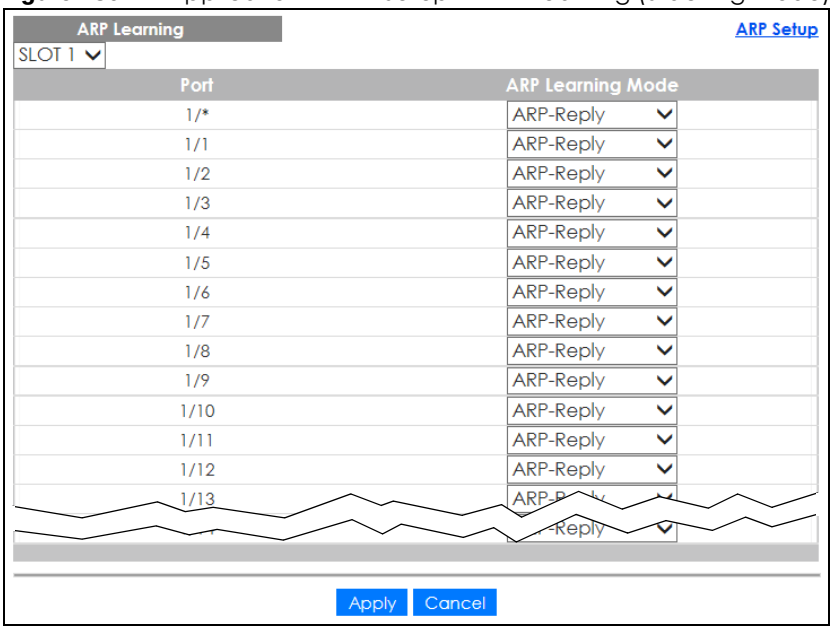



**Figure 430** IP Application > ARP Setup > ARP Learning (Stacking Mode)




The following table describes the labels in this screen.

Table 252 IP Application > ARP Setup > ARP Learning

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them. |

Table 252 IP Application > ARP Setup > ARP Learning (continued)

| LABEL | DESCRIPTION |
|---|---|
| ARP Learning Mode | Select the ARP learning mode the Switch uses on the port.<br>Select **ARP-Reply** to have the Switch update the ARP table only with the ARP replies to the ARP requests sent by the Switch.<br>Select **Gratuitous-ARP** to have the Switch update its ARP table with either an ARP reply or a gratuitous ARP request.<br>Select **ARP-Request** to have the Switch update the ARP table with both ARP replies, gratuitous ARP requests and ARP requests. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 57.2.2 Static ARP

Use this screen to create static ARP entries that will display in the **Management** > **ARP Table** screen and will not age out. Click the link next to **Static ARP** in the **IP Application** > **ARP Setup** screen to display the screen as shown.

**Figure 431** IP Application > ARP Setup > Static ARP (Standalone Mode)

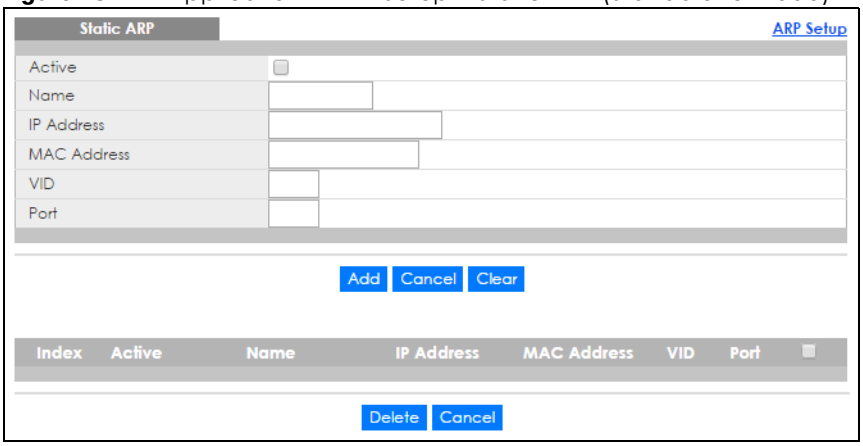
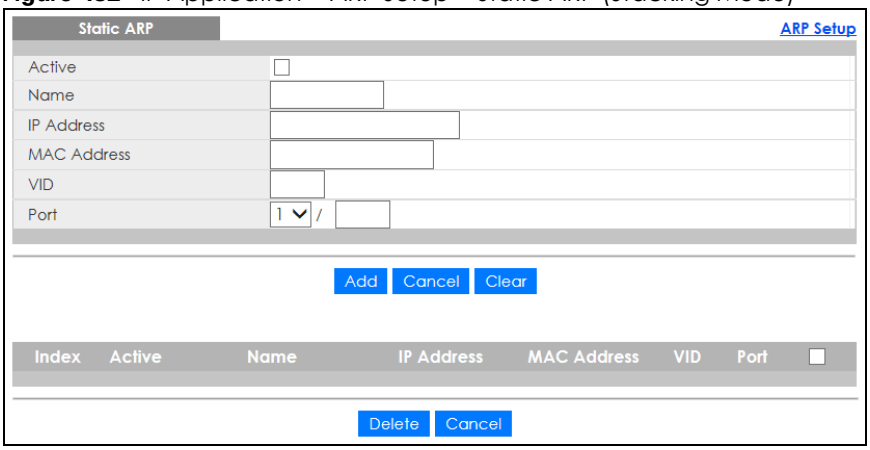



**Figure 432** IP Application > ARP Setup > Static ARP (Stacking Mode)



The following table describes the related labels in this screen.

Table 253 IP Application > ARP Setup > Static ARP

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to activate your rule. You may temporarily deactivate a rule without deleting it by clearing this check box. |
| Name | Enter a descriptive name (up to 32 printable ASCII characters) for identification purposes. |
| IP Address | Enter the IP address of a device connected to a Switch port with the corresponding MAC address below. |
| MAC Address | Enter the MAC address of the device with the corresponding IP address above. |
| VID | Enter the ID number of VLAN to which the device belongs. |
| Port | Enter the number of port to which the device connects. In stacking mode, the first field is the slot ID and the second field is the port number. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to set the above fields back to the factory defaults. |
| Index | This field displays the index number of an entry. Click an index number to change the settings. |
| Active | This field displays **Yes** when the entry is activated and **NO** when it is deactivated. |
| Name | This field displays the descriptive name for this entry. This is for identification purposes only. |
| IP Address | This is the IP address of a device connected to a Switch port with the corresponding MAC address below. |
| MAC Address | This is the MAC address of the device with the corresponding IP address above. |
| VID | This field displays the VLAN to which the device belongs. |
| Port | This field displays the port to which the device connects. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to clear the check boxes. |

# CHAPTER 58
# Maintenance

## 58.1 Overview

This chapter explains how to configure the screens that let you maintain the firmware and configuration files.

### 58.1.1 What You Can Do

- Use the **Maintenance** screen (Section 58.2 on page 535) to manage firmware and your configuration files.
- Use the **Firmware Upgrade** screen (Section 58.3 on page 540) to upload the latest firmware.
- Use the **Restore Configuration** screen (Section 58.4 on page 542) to upload a stored device configuration file.
- Use the **Backup Configuration** screen (Section 58.5 on page 542) to save your configurations for later use.
- Use the **Auto Configuration** screen (Section 58.6 on page 543) to overwrite the running configuration stored in the Switch's RAM.
- Use the **Erase Running-Configuration** screen (Section 58.2.1 on page 537) to reset the configuration to the Zyxel default configuration settings.
- Use the **Save Configuration** screen (Section 58.2.2 on page 537) to save the current configuration settings to a specific configuration file on the Switch.
- Use the **Reboot System** screen (Section 58.2.3 on page 538) to restart the Switch without physically turning the power off and load a specific configuration file.
- Use the **Tech-Support** screen (Section 58.7 on page 544) to create reports for customer support if there are problems with the Switch.
- Use the **Certificates** screen (Section 58.8 on page 546) to see the **Certificate** screen and import the Switch's CA-signed certificates.

## 58.2 Maintenance Settings

Use this screen to manage firmware and your configuration files. Click **Management** > **Maintenance** in the navigation panel to open the following screen.

**Figure 433** Management > Maintenance (Standalone Mode)

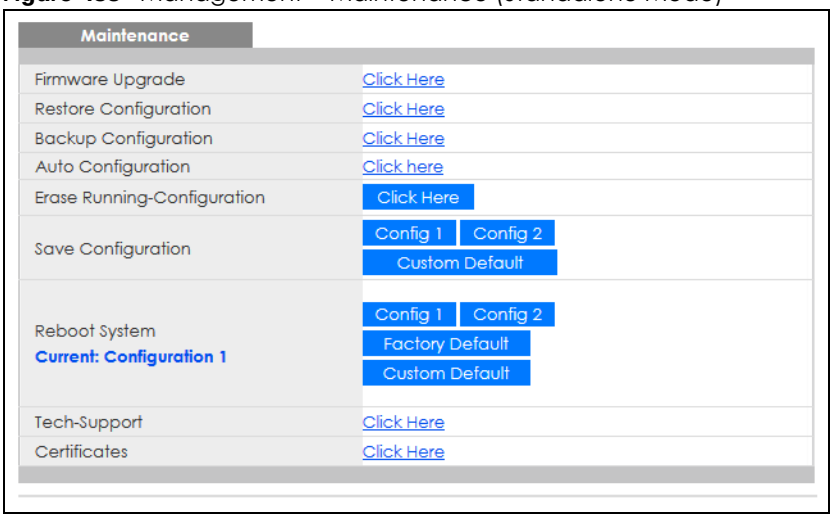
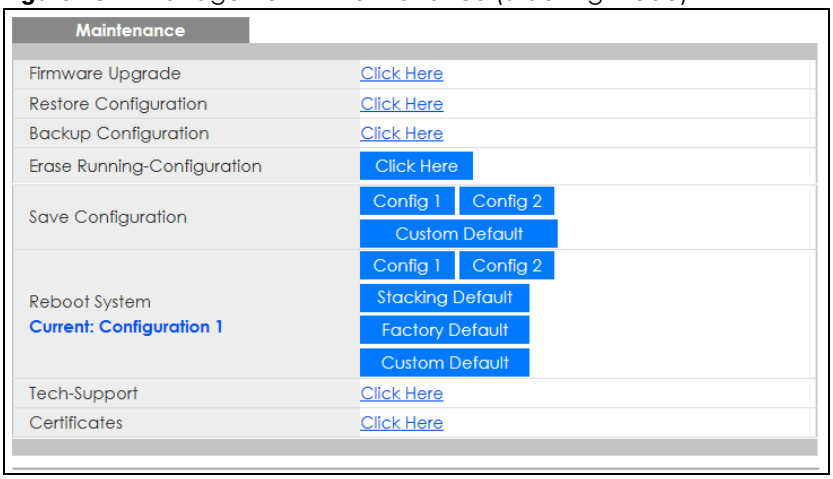



**Figure 434** Management > Maintenance (Stacking Mode)




The following table describes the labels in this screen.

Table 254 Management > Maintenance

| LABEL | DESCRIPTION |
|---|---|
| Firmware Upgrade | Click **Click Here** to go to the **Firmware Upgrade** screen. |
| Restore Configuration | Click **Click Here** to go to the **Restore Configuration** screen. |
| Backup Configuration | Click **Click Here** to go to the **Backup Configuration** screen. |
| Auto Configuration | Click **Click Here** to go to the **Auto Configuration** screen. |
| Erase Running-Configuration | Click **Click Here** to reset the configuration to the Zyxel default configuration settings. Note that this will not reset the configuration to the factory default settings. |
| Save Configuration | Click **Config 1** to save the current configuration settings to **Configuration 1** on the Switch.<br>Click **Config 2** to save the current configuration settings to **Configuration 2** on the Switch.<br>Click **Custom Default** to save the current configuration settings to a customized default file on the Switch. This file can be used instead of the Zyxel factory default configuration file. |

Table 254 Management > Maintenance (continued)

| LABEL | DESCRIPTION |
|---|---|
| Reboot System | Click **Config 1** to reboot the system and load **Configuration 1** on the Switch.<br>Click **Config 2** to reboot the system and load **Configuration 2** on the Switch.<br>Click **Stacking Default** to reboot the system and load stacking configurations on the Switch.<br>Click **Factory Default** to reboot the system and load the factory default configuration on the Switch.<br>Click **Custom Default** to reboot the system and load a saved **Custom Default** configuration file on the Switch. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**. If a **Custom Default** configuration file was not saved, clicking **Custom Default** loads the factory default configuration on the Switch.<br>Note: Make sure to click the **Save** button in any screen to save your settings to the current configuration on the Switch. |
| Current | This field displays which configuration (**Configuration 1** or **Configuration 2**) is currently operating on the Switch. |
| Tech-Support | Click **Click Here** to see the Tech-Support screen. You can set CPU and memory thresholds for log reports and download related log reports for issue analysis. Log reports include CPU history and utilization, crash and memory. |
| Certificates | Click **Click Here** to see the **Certificate** screen and import the Switch's CA-signed certificates. |

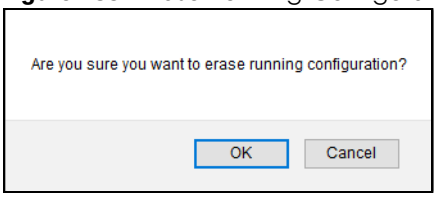
## 58.2.1 Erase Running-Configuration

Follow the steps below to clear current configuration on the Switch. Note that this will NOT reset the Switch back to its factory defaults. For example, if your Switch is set to stacking mode and you click erase running-configuration, after the Switch restarts, it will remain in stacking mode. If you want to change the Switch to its factory default mode, click the **Factory Default** button in **Reboot System**.

1 In the **Maintenance** screen, click the **Click Here** button next to **Erase Running-Configuration** to clear all Switch configuration information you configured and return to the Zyxel default configuration settings.

2 Click **OK** to reset all Switch configurations.

**Figure 435** Erase Running-Configuration: Confirmation




3 In the Web Configurator, click the **Save** button in the top of the screen to make the changes take effect. If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

## 58.2.2 Save Configuration

Click **Config 1** to save the current configuration settings permanently to **Configuration 1** on the Switch. These configurations are set up according to your network environment.

Click **Config 2** to save the current configuration settings permanently to **Configuration 2** on the Switch. These configurations are set up according to your network environment.

Click **Custom Default** to save the current configuration settings permanently to a customized default file on the Switch. If configuration changes cause the Switch to behave abnormally, click **Custom Default** (next to **Reboot System**) to have the Switch automatically reboot and restore the saved **Custom Default** configuration file.

Alternatively, click **Save** on the top right in any screen to save the configuration changes to the current configuration.

## 58.2.3 Reboot System

**Reboot System** allows you to restart the Switch without physically turning the power off. It also allows you to load configuration one (**Config 1**), configuration two (**Config 2**), a **Custom Default** or the **Factory Default** configuration when you reboot. Follow the steps below to reboot the Switch.

1. In the **Maintenance** screen, click a configuration button next to **Reboot System** to reboot and load that configuration file. The confirmation screen displays.
2. Click **OK** again and then wait for the Switch to restart. This takes up to 2 minutes. This does not affect the Switch's configuration.

Click **Config 1** and follow steps 1 to 2 to reboot and load configuration one on the Switch.

Click **Config 2** and follow steps 1 to 2 to reboot and load configuration two on the Switch.

Click **Stacking Default** and follow steps 1 to 2 to reboot and load stacking default configuration settings on the Switch.

Click **Factory Default** and follow steps 1 to 2 to reboot and load Zyxel factory default configuration settings on the Switch.

Click **Custom Default** and follow steps 1 to 2 to reboot and load a customized default file on the Switch. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

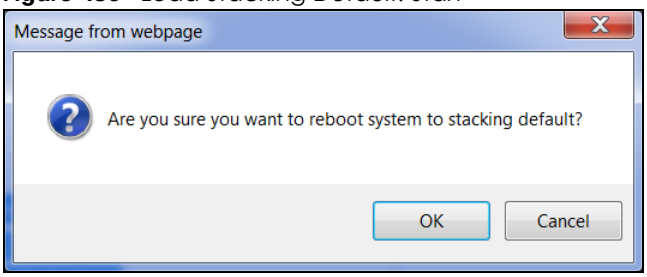
Note: If a customized default file was not saved, clicking **Custom Default** loads the factory default configuration on the Switch.

## 58.2.4 Stacking Default

Follow the steps below to reset the Switch back to the stacking defaults. The master Switch login information will not be reset.

1. Click the **Stacking Default** button to clear all Switch configuration information you configured and return to the stacking defaults.
2. Click **OK** to continue or **Cancel** to abort.

**Figure 436** Load Stacking Default: Start




3 If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1).

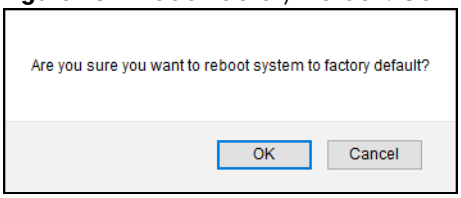
## 58.2.5 Factory Default

Follow the steps below to reset the Switch back to the factory defaults.

1 Click the **Factory Default** button.

2 Click **OK** to continue or **Cancel** to abort.

**Figure 437** Load Factory Default: Confirmation




If you want to access the Switch Web Configurator again, you may need to change the IP address of your computer to be in the same subnet as that of the default Switch IP address (192.168.1.1 or DHCP-assigned IP).

## 58.2.6 Custom Default

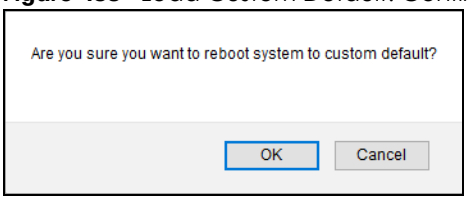
Follow the steps below to reset the Switch back to the **Custom Default** configuration file you created. This will save the custom default configuration settings to both **Configuration 1** and **Configuration 2**.

1 Click the **Custom Default** button.

2 Click **OK** to continue or **Cancel** to abort.

Note: If you did not save a **Custom Default** file in the Web Configurator or CLI using `copy running-config custom-default`, then the factory default file is restored after you press click **Custom Default** (next to **Reboot System**) on the Switch. You will then have to make all your configurations again on the Switch.

**Figure 438** Load Custom Default: Confirmation




# 58.3 Firmware Upgrade

Use the following screen to upgrade your Switch to the latest firmware. The Switch supports dual firmware images, **Firmware 1** and **Firmware 2**. Use this screen to specify which image is updated when firmware is uploaded using the Web Configurator and to specify which image is loaded when the Switch starts up.

Make sure you have downloaded (and unzipped) the correct model firmware and version to your computer before uploading to the device.

**Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.**

Click **Management** > **Maintenance** > **Firmware Upgrade** to view the screen as shown next.

**Figure 439** Management > Maintenance > Firmware Upgrade (Standalone Mode)

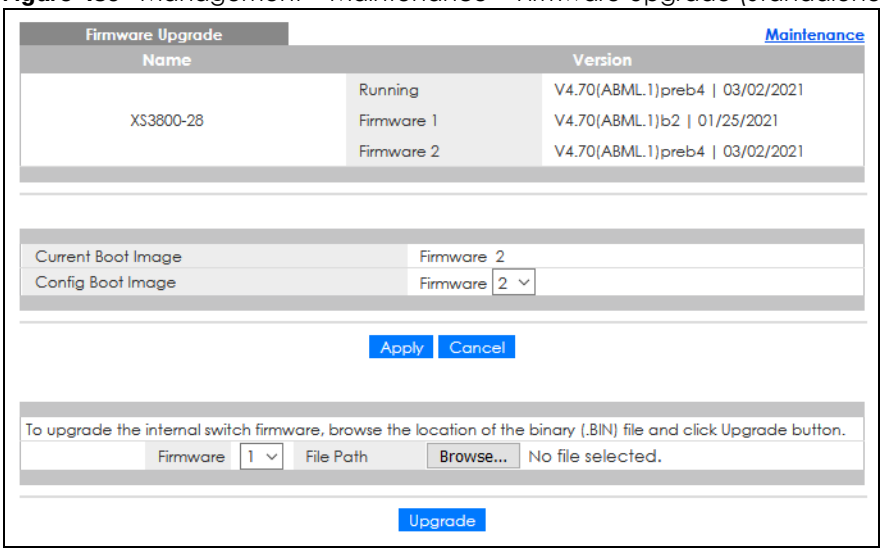
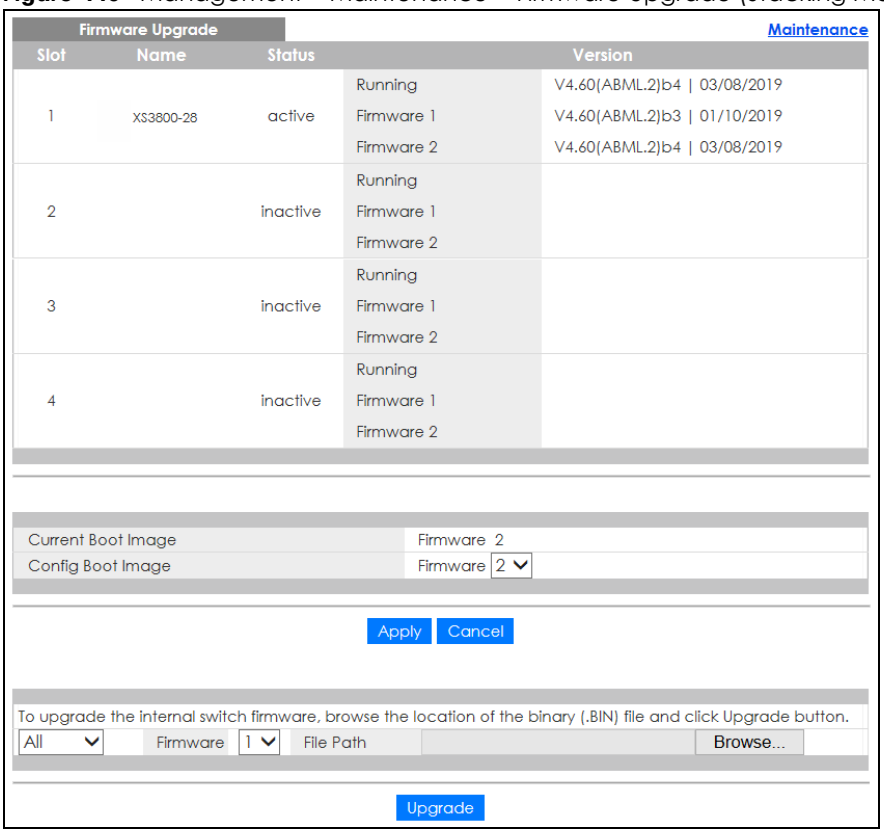


**Figure 440** Management > Maintenance > Firmware Upgrade (Stacking Mode)




The top of firmware upgrade screen shows which firmware version is currently running on the Switch. Enter the path and file name of the firmware file you wish to upload to the Switch in the **File Path** text box or click **Choose File** or **Browse** to locate it. Firmware upgrades are only applied after a reboot. Click **Upgrade** to load the new firmware. Select the **Config Boot Image** drop-down list box if you want to reboot the Switch and click **Apply** to apply the new firmware immediately. Click **Upgrade** to load the new firmware.

After the process is complete, see the **System Info** screen to verify your current firmware version number.

Table 255 Management > Maintenance > Firmware Upgrade

| LABEL | DESCRIPTION |
|---|---|
| Slot | This field appears only in stacking mode.<br>This is the slot index number. |
| Name | This is the name of the Switch that you are configuring. |
| Status | This field appears only in stacking mode.<br>This field displays the current stacking status on the Switch. |
| Version | The Switch has 2 firmware sets, **Firmware 1** and **Firmware 2**, residing in flash.<br>• **Running** shows the version number (and model code) and MM/DD/YYYY creation date of the firmware currently in use on the Switch (**Firmware 1** or **Firmware 2)**. The firmware information is also displayed at System Information in Basic Setting.<br>• **Firmware 1** shows its version number (and model code) and MM/DD/YYYY creation date.<br>• **Firmware 2** shows its version number (and model code) and MM/DD/YYYY creation date. |
| Current Boot Image | This displays which firmware is currently in use on the Switch (**Firmware 1** or **Firmware 2)**. |

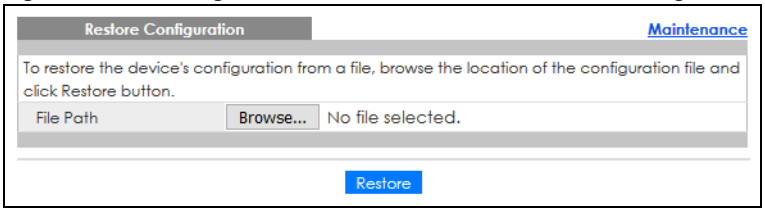
Table 255 Management > Maintenance > Firmware Upgrade (continued)

| LABEL | DESCRIPTION |
|---|---|
| Config Boot Image | Select which firmware (**Firmware 1** or **Firmware 2)** should load, click **Apply** and reboot the Switch to see changes, you will also see changes in the **Current Boot Image** field above as well. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| | This field appears only in stacking mode.<br>Click the drop-down list to choose the slot number of the Switch in a stack to upgrade the firmware on this slot. Or select **All** to upgrade the firmware for all slots. |
| Firmware | Choose to upload the new firmware to (Firmware) **1** or (Firmware) **2**. |
| File Path | Type the path and file name of the firmware file you wish to upload to the Switch in the **File Path** text box or click **Choose File** or **Browse** to locate it. |
| Upgrade | Click **Upgrade** to load the new firmware. s are only applied after a reboot. To reboot, go to **Management** > **Maintenance** > **Reboot System** and click **Config 1**, **Config 2** or **Factory Default** (**Config 1**, **Config 2** and **Factory Default** are the configuration files you want the Switch to use when it restarts). |

# 58.4 Restore Configuration

Use this screen to restore a previously saved configuration from your computer to the Switch.

**Figure 441** Management > Maintenance > Restore Configuration



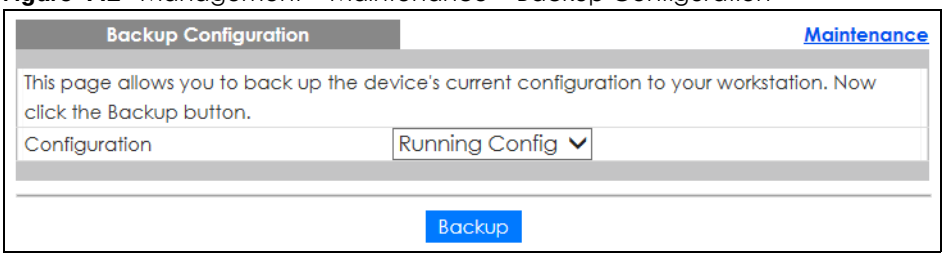

Enter the path and file name of the configuration file you wish to restore in the **File Path** text box or click **Choose File** or **Browse** to locate it. After you have specified the file, click **Restore**. "config" is the name of the configuration file on the Switch, so your backup configuration file is automatically renamed when you restore using this screen.

# 58.5 Backup Configuration

Backing up your Switch configurations allows you to create various "snap shots" of your device from which you may restore at a later date.

Back up your current Switch configuration to a computer using the **Backup Configuration** screen.

**Figure 442** Management > Maintenance > Backup Configuration




Follow the steps below to back up the current Switch configuration to your computer in this screen.

1 Select which Switch configuration file you want to download to your computer.

2 Click **Backup**.

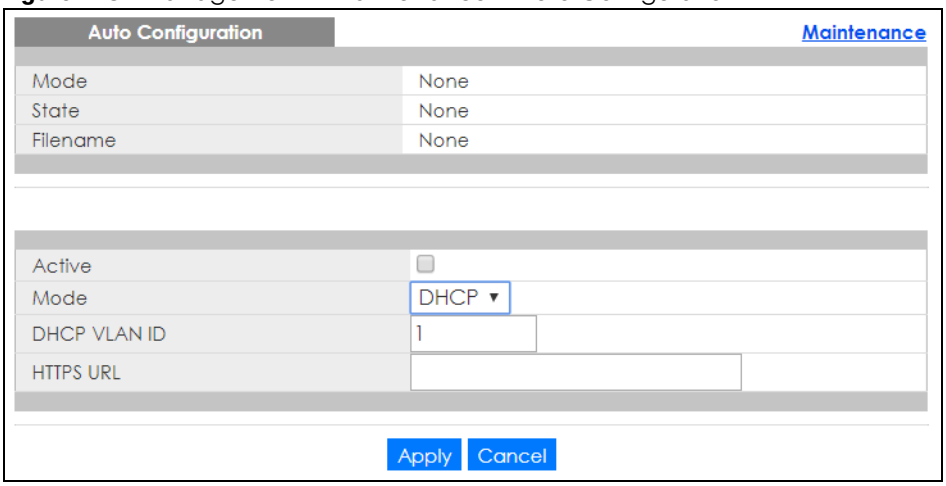
3 If the current configuration file is open and/or downloaded to your computer automatically, you can click **File** > **Save As** to save the file to a specific place.

If a dialog box pops up asking whether you want to open or save the file, click **Save** or **Save File** to download it to the default downloads folder on your computer. If a **Save As** screen displays after you click **Save** or **Save File**, choose a location to save the file on your computer from the **Save in** drop-down list box and type a descriptive name for it in the **File name** list box. Click **Save** to save the configuration file to your computer.

# 58.6 Auto Configuration

The Switch can download an pre-saved auto configuration file automatically when you reboot the Switch using the DHCP or HTTPS mode. This will overwrite the running configuration stored in the Switch's RAM instead of the startup configuration stored in the Switch's flash memory.

**Figure 443** Management > Maintenance > Auto Configuration



The following table describes the labels in this screen.

Table 256 Management > Maintenance > Auto Configuration

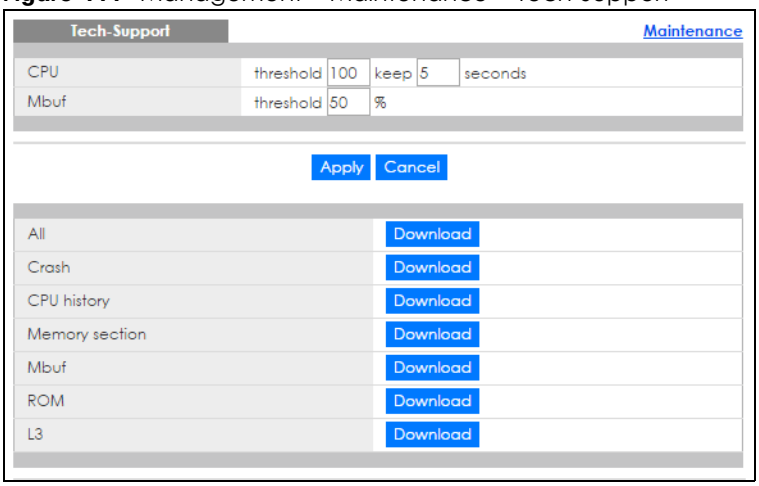
| LABEL | DESCRIPTION |
|---|---|
| Use this section to view the auto configuration status after you restarted the Switch. | |
| Mode | This field shows the mode (**DHCP** or **HTTPS**) that is used for auto configuration after you enabled auto configuration and restarted the Switch.<br>It shows **None** if auto configuration was not enabled. |
| State | This field shows whether auto configuration was executed successfully the last time the Switch rebooted.<br>**None** – Auto configuration was disabled and not executed.<br>**Success** – An auto configuration file was downloaded successfully to the Switch.<br>**Un-success** – An auto configuration file was not downloaded to the Switch. |
| Filename | This field displays the name of the auto configuration file that was downloaded the last time the Switch rebooted.<br>It shows **None** if auto configuration was not enabled or not executed successfully. |
| Use this section to enable auto configuration and select the mode that you want to use for auto configuration. | |
| Active | Select the check box to enable auto configuration. |
| Mode | Select **DHCP** to have the Switch use the TFTP server IP address and auto configuration file name assigned by a DHCP server to download a pre-saved configuration file when the Switch reboots.<br>Note: The Switch should act as a DHCP client to send a DHCP request so that it can get the TFTP server address and configuration file name from the DHCP server.<br>Select **HTTPS** to have the Switch use the URL you specified in the **HTTPS URL** field to access a web server and download the auto configuration file using HTTPS. |
| DHCP VLAN ID | Enter the VLAN ID of the DHCP server that assigns the TFTP server IP address and auto configuration file name to the Switch. |
| HTTPS URL | Type the URL that can be used to access and download the auto configuration file from a web server using HTTPS. For example, https://webserverIPaddress/configfilename.cfg.<br>Note: You must fill in this field if you select **HTTPS** in the **Mode** field. Otherwise, auto configuration will not work. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 58.7 Tech-Support

The Tech-Support feature is a log enhancement tool that logs useful information such as CPU utilization history, memory and Mbuf (Memory Buffer) log and crash reports for issue analysis by customer support should you have difficulty with your Switch. The Tech Support menu eases your effort in obtaining reports and it is also available in CLI command by typing "Show tech-support" command.

Click **Management** > **Maintenance** > **Tech-Support** to see the following screen.

**Figure 444** Management > Maintenance > Tech-Support




You may need WordPad or similar software to see the log report correctly. The table below describes the fields in the above screen.

Table 257 Management > Maintenance > Tech-Support

| LABEL | DESCRIPTION |
|---|---|
| CPU | Type a number ranging from 50 to 100 in the CPU threshold box, and type another number ranging from 5 to 60 in the seconds box then click **Apply**.<br><br>For example, 80 for CPU threshold and 5 for seconds means a log will be created when CPU utilization reaches over 80% and lasts for 5 seconds.<br><br>The log report holds 7 days of CPU log data and is stored in volatile memory (RAM). The data is lost if the Switch is turned off or in event of power outage. After 7 days, the logs wrap around and new ones and replace the earliest ones.<br><br>The higher the CPU threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa. |
| Mbuf | Type a number ranging from 50 to 100 in the Mbuf (Memory Buffer) threshold box. The Mbuf log report is stored in flash (permanent) memory.<br><br>For example, Mbuf 50 means a log will be created when the Mbuf utilization is over 50%.<br><br>The higher the Mbuf threshold number, the fewer logs will be created, and the less data technical support will have to analyze and vice versa. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| All | Click **Download** to see all the log report and system status. This log report is stored in flash memory. If the **All** log report is too large, you can download the log reports separately below. |
| Crash | Click **Download** to see the crash log report. The log will include information of the last crash and is stored in flash memory. |
| CPU history | Click **Download** to see the CPU history log report. The 7-days log is stored in RAM and you will need to save it, otherwise it will be lost when the Switch is shutdown or during power outage. |
| Memory Section | Click **Download** to see the memory section log report. This log report is stored in flash memory. |
| Mbuf | Click **Download** to see the Mbuf log report. The log includes Mbuf over threshold information. This log report is stored in flash memory. |

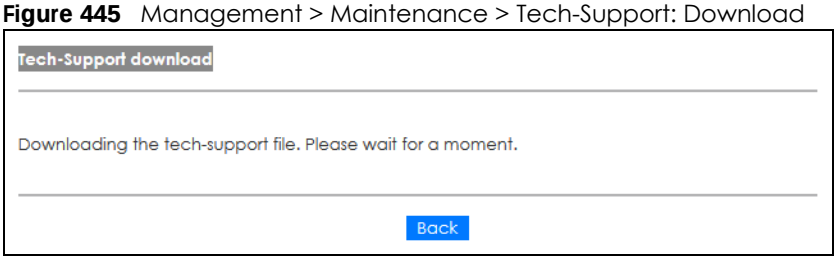
Table 257 Management > Maintenance > Tech-Support (continued)

| LABEL | DESCRIPTION |
|---|---|
| ROM | Click **Download** to see the Read Only Memory (ROM) log report. This report is stored in flash memory. |
| L3 | Click **Download** to see the layer-3 Switch log report. The log only applies to the layer-3 Switch models. This report is stored in flash memory. |

### 58.7.1 Tech-Support Download

When you click **Download** to save your current Switch configuration to a computer, the following screen appears. When the log report has downloaded successfully, click **Back** to return to the previous screen.

**Figure 445** Management > Maintenance > Tech-Support: Download



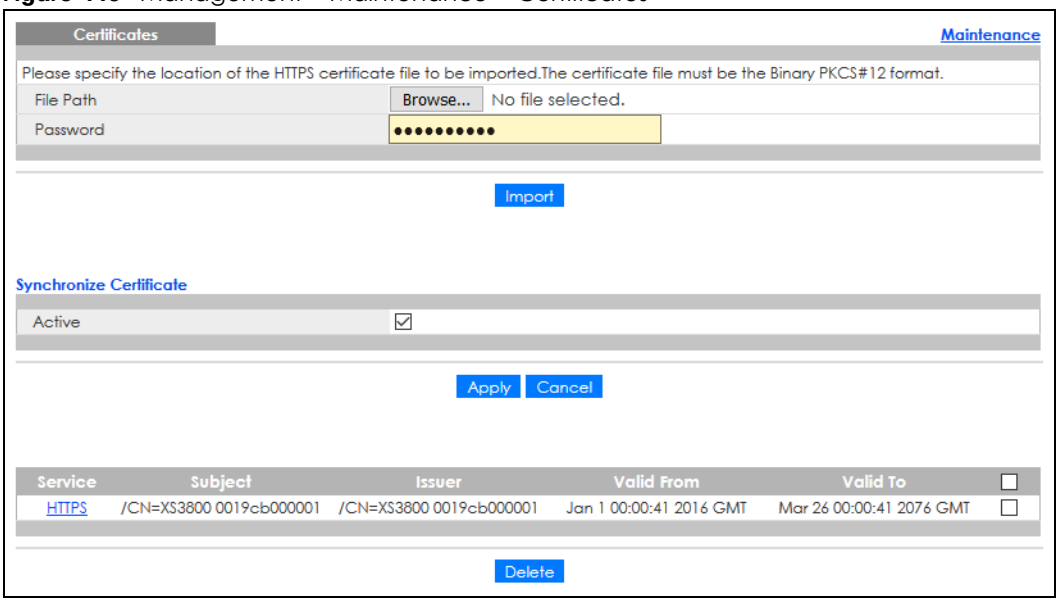

## 58.8 Certificates

The Switch can use HTTPS certificates that are verified by a third party to create secure HTTPS connections between your computer and the Switch. This way, you may securely access the Switch using the Web Configurator. See Section 59.8.3 on page 573 for more information about HTTPS.

Certificates are based on public-private key pairs. A certificate contains the certificate owner's identity and public key. Certificates provide a way to exchange public keys for use in authentication.

Click **Management** > **Maintenance** > **Certificates** to open the following screen. Use this screen to import the Switch's CA-signed certificates.

**Figure 446** Management > Maintenance > Certificates




The following table describes the labels in this screen.

Table 258 Management > Maintenance > Certificates

| LABEL | DESCRIPTION |
|---|---|
| File Path | Click **Choose File** or **Browse** to find the certificate file you want to upload. |
| Password | Enter the certificate file's password that was created when the PKCS #12 file was exported. The password consists of up to 32 ASCII characters. |
| Import | Click this button to save the certificate that you have enrolled from a certification authority from your computer to the Switch. |
| Synchronize Certificate | Note: This part only appears in stacking mode. |
| Active | Enable this option to allow the master Switch in stacking mode to synchronize CA-signed certificates to all stacking members and save it to their non-volatile memory.<br>Or, delete the stacking members' CA-signed certificate if a CA-signed certificate does not exist in the master Switch.<br><br>Otherwise, disable this option. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Service | This field displays the service type that this certificate is for. |
| Subject | This field displays identifying information about the certificate's owner, such as CN (Common Name), OU (Organizational Unit or department), O (Organization or company) and C (Country). It is recommended that each certificate have unique subject information. |
| Issuer | This field displays identifying information about the certificate's issuing certification authority, such as a common name, organizational unit or department, organization or company and country. |
| Valid From | This field displays the date that the certificate becomes applicable. |
| Valid To | This field displays the date that the certificate expires. |

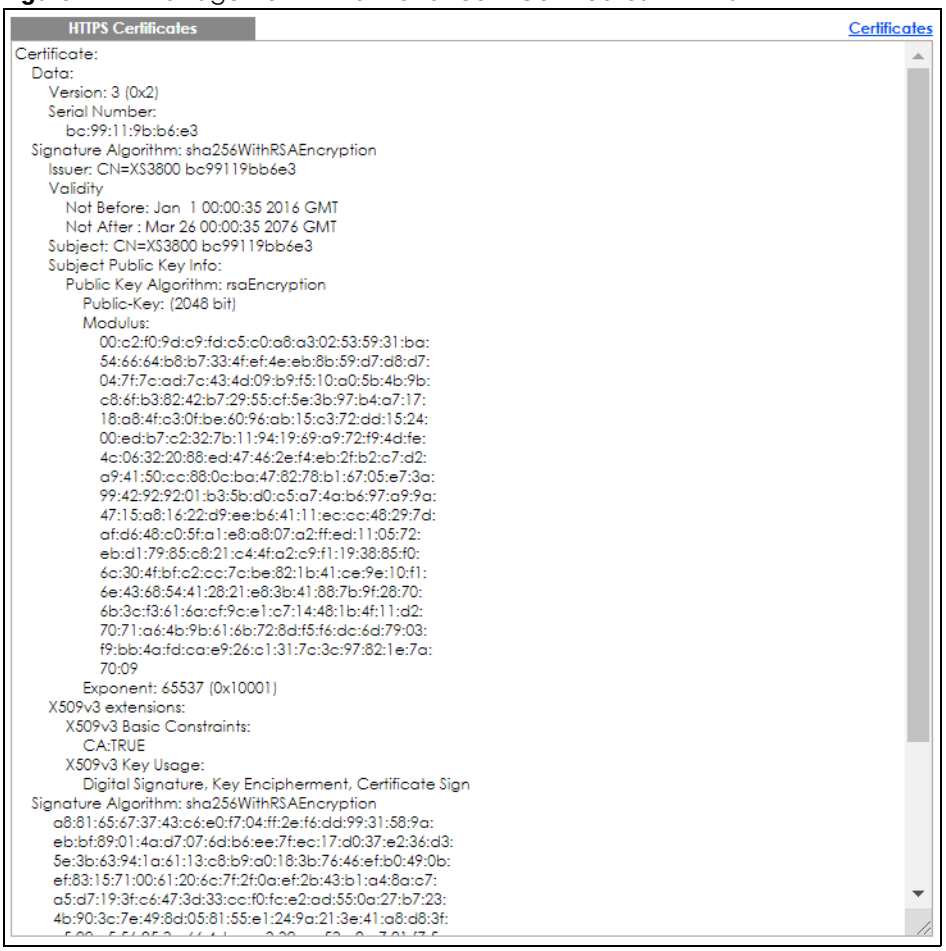
Table 258 Management > Maintenance > Certificates (continued)

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. |
| Delete | Click this button to delete the certificate (or certification request). You cannot delete a certificate that one or more features is configured to use. |

### 58.8.1 HTTPS Certificates

Use this screen to view the HTTPS certificate details. Click a hyperlink in the **Service** column in the **Management** > **Maintenance** > **Certificates** screen to open the following screen.

**Figure 447** Management > Maintenance > Certificates > HTTPS




# 58.9 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

### 58.9.1 FTP Command Line

This section shows some examples of uploading to or downloading files from the Switch using FTP

commands. First, understand the filename conventions.

## 58.9.2 Filename Conventions

The configuration file (also known as the romfile or ROM) contains the Zyxel factory default configuration settings in the screens such as password, Switch setup, IP Setup, and so on. Once you have customized the Switch's settings, they can be saved back to your computer under a filename of your choosing.

ZyNOS (Zyxel Network Operating System sometimes referred to as the "ras" file) is the system firmware and has a "bin" filename extension.

Table 259 Filename Conventions

| FILE TYPE | INTERNAL NAME | EXTERNAL NAME | DESCRIPTION |
|---|---|---|---|
| Configuration File | config | *.cfg | This is the configuration filename on the Switch. Uploading the config file replaces the specified configuration file system, including your Switch configurations, system-related data (including the default password), the error log and the trace log. |
| Firmware | ras-0<br>ras-1 | *.bin | This is the generic name for the ZyNOS firmware on the Switch. `ras-0` is image 1; `ras-1` is image 2. |

You can store up to two images, or firmware files of the same device model, on the Switch. Only one image is used at a time.

- Run the `boot image <1|2>` command to specify which image is updated when firmware is loaded using the Web Configurator and to specify which image is loaded when the Switch starts up.
- You can also use FTP commands to upload firmware to any image.

The Switch supports dual firmware images, `ras-0` and `ras-1`. You can switch from one to the other by using the `boot image <index>` command, where `<index>` is 1 (ras-0) or 2 (ras-1). See the CLI Reference Guide for more information about using commands. The system does not reboot after it switches from one image to the other.

### 58.9.2.1 Example FTP Commands

```
ftp> put firmware.bin ras
```

This is a sample FTP session showing the transfer of the computer file "firmware.bin" to the Switch.

```
ftp> get config config.cfg
```

This is a sample FTP session saving the current configuration to a file called "config.cfg" on your computer.

If your (T)FTP client does not allow you to have a destination filename different than the source, you will need to rename them as the Switch only recognizes "config" and "ras". Be sure you keep unaltered copies of both files for later use.

**Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.**

### 58.9.3 FTP Command Line Procedure

1. Launch the FTP client on your computer.
2. Enter `open`, followed by a space and the IP address of your Switch.
3. Press [ENTER] when prompted for a user name.
4. Enter your password as requested (the default is "1234").
5. Enter `bin` to set transfer mode to binary.
6. Use `put` to transfer files from the computer to the Switch, for example, `put firmware.bin ras` transfers the firmware on your computer (firmware.bin) to the Switch and renames it to "ras". Similarly, `put config.cfg config` transfers the configuration file on your computer (config.cfg) to the Switch and renames it to "config". Likewise `get config config.cfg` transfers the configuration file on the Switch to your computer and renames it to "config.cfg". See Table 259 on page 549 for more information on filename conventions.
7. Enter `quit` to exit the ftp prompt.

### 58.9.4 GUI-based FTP Clients

The following table describes some of the commands that you may see in GUI-based FTP clients.

Table 260 General Commands for GUI-based FTP Clients

| COMMAND | DESCRIPTION |
|---|---|
| Host Address | Enter the address of the host server. |
| Login Type | Anonymous.<br>This is when a user I.D. and password is automatically supplied to the server for anonymous access. Anonymous logins will work only if your ISP or service administrator has enabled this option.<br>Normal.<br>The server requires a unique User ID and Password to login. |
| Transfer Type | Transfer files in either ASCII (plain text format) or in binary mode. Configuration and firmware files should be transferred in binary mode. |
| Initial Remote Directory | Specify the default remote directory (path). |
| Initial Local Directory | Specify the default local directory (path). |

### 58.9.5 FTP Restrictions

FTP will not work when:

- FTP service is disabled in the **Service Access Control** screen.
- The IP addresses in the **Remote Management** screen does not match the client IP address. If it does not match, the Switch will disconnect the FTP session immediately.

# CHAPTER 59
# Access Control

## 59.1 Access Control Overview

This chapter describes how to control access to the Switch.

A console port and FTP are allowed one session each, Telnet and SSH share nine sessions, up to five web sessions (five different user names and passwords) and/or limitless SNMP access control sessions are allowed.

Table 261 Access Control Overview

| Console Port | SSH | Telnet | FTP | Web | SNMP |
|---|---|---|---|---|---|
| One session | Share up to 9 sessions | | One session | Up to 5 accounts | No limit |

A console port access control session and Telnet access control session cannot coexist when multi-login is disabled. See the CLI Reference Guide for more information on disabling multi-login.

### 59.1.1 What You Can Do

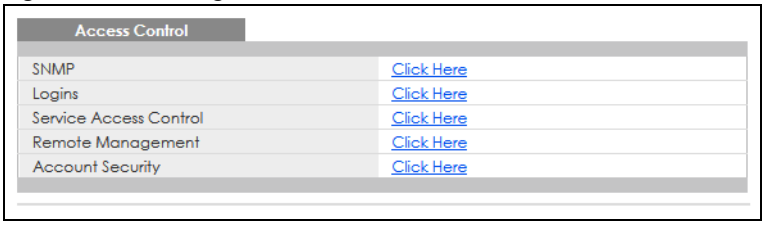
- Use the **Access Control** screen (Section 59.2 on page 551) to display the main screen.
- Use the **SNMP** screen (Section 59.3 on page 552) to configure your SNMP settings.
- Use the **Trap Group** screen (Section 59.3.1 on page 553) to specify the types of SNMP traps that should be sent to each SNMP manager.
- Use the **User Information** screen (Section 59.3.3 on page 556) to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups.
- Use the **Logins** screens (Section 59.4 on page 558) to assign which users can access the Switch through Web Configurator at any one time.
- Use the **Service Access Control** screen (Section 59.5 on page 559) to decide what services you may use to access the Switch.
- Use the **Remote Management** screen (Section 59.6 on page 560) to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.
- Use the **Account Security** screen (Section 59.7 on page 561) to encrypt all passwords configured in the Switch. You can also display the authentication, authorization, external authentication server information (RADIUS or TACACS+), system and SNMP user account information in the configuration file saved.

## 59.2 Access Control Main Settings

Use this screen to display the main screen.

Click **Management** > **Access Control** in the navigation panel to display the main screen as shown.

**Figure 448** Management > Access Control




The following table describes the labels in this screen.

Table 262 Management > Access Control

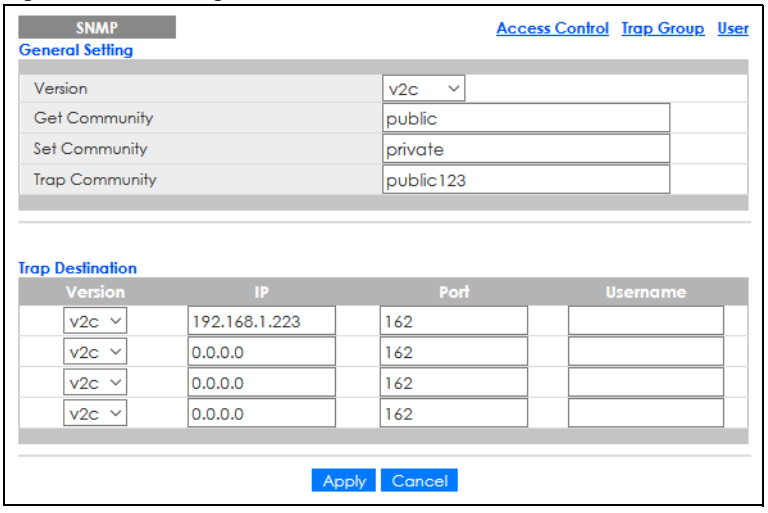
| LABEL | DESCRIPTION |
|---|---|
| SNMP | Click this link to configure your SNMP settings. |
| Logins | Click this link to assign which users can access the Switch through Web Configurator at any one time. |
| Service Access Control | Click this link to decide what services you may use to access the Switch. |
| Remote Management | Click this link to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. |
| Account Security | Click this link to encrypt all passwords configured in the Switch. You can also display the authentication, authorization, external authentication server information (RADIUS or TACACS+), system and SNMP user account information in the configuration file saved. |

# 59.3 Configure SNMP

Use this screen to configure your SNMP settings.

Click **Management** > **Access Control** > **SNMP** to view the screen as shown.

**Figure 449** Management > Access Control > SNMP



The following table describes the labels in this screen.

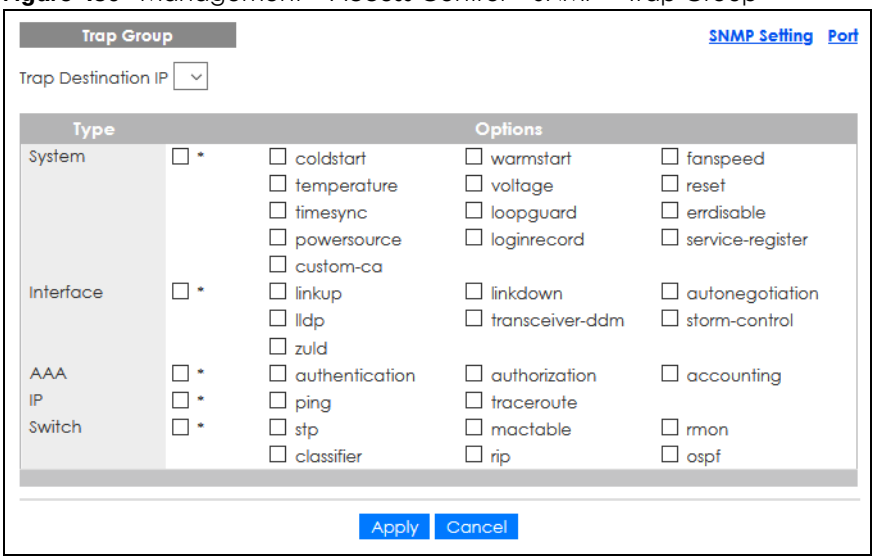
Table 263 Management > Access Control > SNMP

| LABEL | DESCRIPTION |
|---|---|
| General Setting | Use this section to specify the SNMP version and community (password) values. |
| Version | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (**v2c**), SNMP version 3 (**v3**) or both (**v3v2c**).<br>SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community | Enter the **Get Community** string, which is the password for the incoming Get- and GetNext-requests from the management station.<br>The **Get Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Set Community | Enter the **Set Community**, which is the password for incoming Set- requests from the management station.<br>The **Set Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Community | Enter the **Trap Community** string, which is the password sent with each trap to the SNMP manager.<br>The **Trap Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Destination | Use this section to configure where to send SNMP traps from the Switch. |
| Version | Specify the version of the SNMP trap messages. |
| IP | Enter the IP addresses of up to four managers to send your SNMP traps to. |
| Port | Enter the port number upon which the manager listens for SNMP traps. |
| Username | Enter the user name to be sent to the SNMP manager along with the SNMP v3 trap.<br>This user name must match an existing account on the Switch (configured in the **Management** > **Access Control** > **SNMP** > **User** screen). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 59.3.1 Configure SNMP Trap Group

From the **SNMP** screen, click **Trap Group** to view the screen as shown. Use the **Trap Group** screen to specify the types of SNMP traps that should be sent to each SNMP manager.

**Figure 450** Management > Access Control > SNMP > Trap Group




The following table describes the labels in this screen.

Table 264 Management > Access Control > SNMP > Trap Group

| LABEL | DESCRIPTION |
|---|---|
| Trap Destination IP | Select one of your configured trap destination IP addresses. These are the IP addresses of the SNMP managers. You must first configure a trap destination IP address in the **SNMP Setting** screen.<br><br>Use the rest of the screen to select which traps the Switch sends to that SNMP manager. |
| Type | Select the categories of SNMP traps that the Switch is to send to the SNMP manager. |
| Options | Select the individual SNMP traps that the Switch is to send to the SNMP station.<br><br>The traps are grouped by category. Selecting a category automatically selects all of the category's traps. Clear the check boxes for individual traps that you do not want the Switch to send to the SNMP station. Clearing a category's check box automatically clears all of the category's trap check boxes (the Switch only sends traps from selected categories). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 59.3.2 Enable or Disable Sending of SNMP Traps on a Port

From the **SNMP** > **Trap Group** screen, click **Port** to view the screen as shown. Use this screen to set whether a trap received on the ports would be sent to the SNMP manager.

**Figure 451** Management > Access Control > SNMP > Trap Group > Port (Standalone Mode)

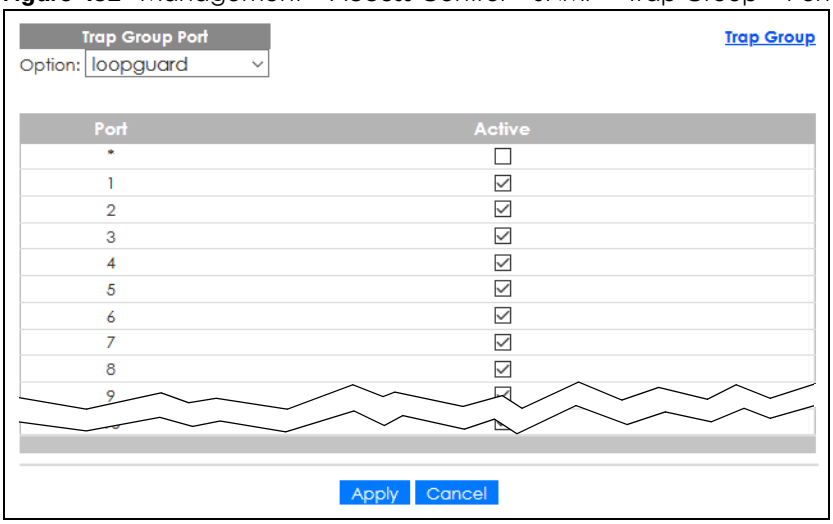
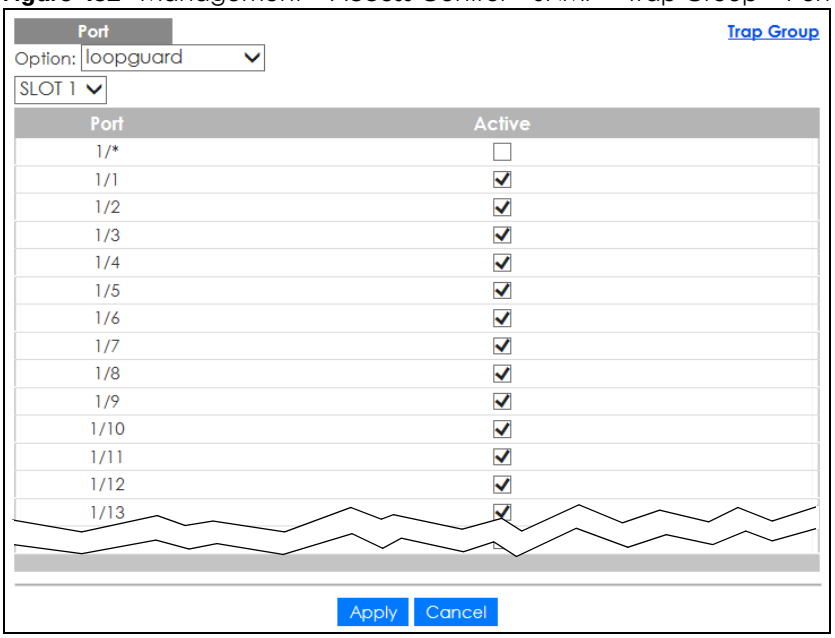



**Figure 452** Management > Access Control > SNMP > Trap Group > Port (Stacking Mode)




The following table describes the labels in this screen.

Table 265 Management > Access Control > SNMP > Trap Group > Port

| LABEL | DESCRIPTION |
|---|---|
| Option | Select the trap type you want to configure here. |
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This field displays the port number. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them. |

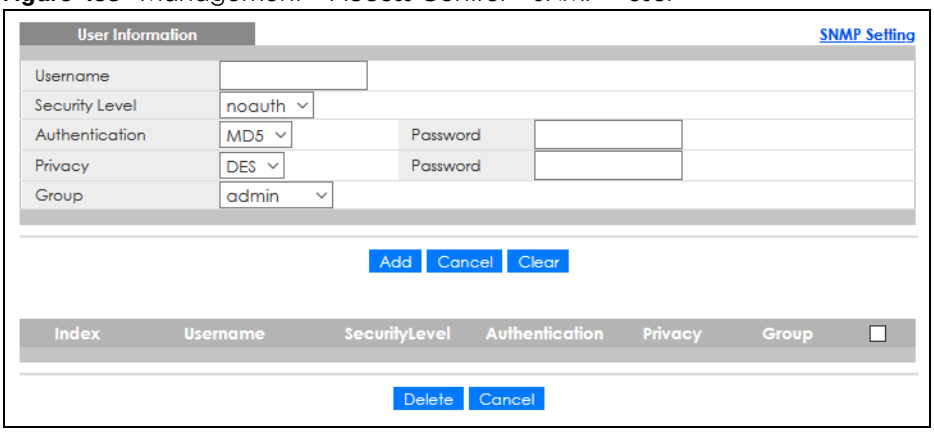
Table 265 Management > Access Control > SNMP > Trap Group > Port (continued)

| LABEL | DESCRIPTION |
|---|---|
| 1/* | Settings in this row apply to all ports for the Switch represented by the slot ID (in stacking mode).<br>Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Active | Select this check box to enable the trap type of SNMP traps on this port. The Switch sends the related traps received on this port to the SNMP manager.<br>Clear this check box to disable the sending of SNMP traps on this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

## 59.3.3 Configure SNMP User

From the **SNMP** screen, click **User** to view the screen as shown. Use the **User** screen to create SNMP users for authentication with managers using SNMP v3 and associate them to SNMP groups. An SNMP user is an SNMP manager.

**Figure 453** Management > Access Control > SNMP > User




The following table describes the labels in this screen.

Table 266 Management > Access Control > SNMP > User

| LABEL | DESCRIPTION |
|---|---|
| User Information | Note: Use the user name and password of the login accounts you specify in this screen to create accounts on the SNMP v3 manager. |
| Username | Specify the user name of a login account on the Switch. |

Table 266 Management > Access Control > SNMP > User (continued)

| LABEL | DESCRIPTION |
|---|---|
| Security Level | Select whether you want to implement authentication and/or encryption for SNMP communication from this user. Choose:<br>• **noauth** – to use the user name as the password string to send to the SNMP manager. This is equivalent to the Get, Set and Trap Community in SNMP v2c. This is the lowest security level.<br>• **auth** – to implement an authentication algorithm for SNMP messages sent by this user.<br>• **priv** – to implement authentication and encryption for SNMP messages sent by this user. This is the highest security level.<br>Note: The settings on the SNMP manager must be set at the same security level or higher than the security level settings on the Switch. |
| Authentication | Select an authentication algorithm. **MD5** (Message Digest 5) and **SHA** (Secure Hash Algorithm) are hash algorithms used to authenticate SNMP data. SHA authentication is generally considered stronger than MD5, but is slower. |
| Password | Enter the password of up to 32 ASCII characters (except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) for SNMP user authentication. |
| Privacy | Specify the encryption method for SNMP communication from this user. You can choose one of the following:<br>• **DES** – Data Encryption Standard is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data.<br>• **AES** – Advanced Encryption Standard is another method for data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data. |
| Password | Enter the password of up to 32 ASCII characters (except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) for encrypting SNMP packets. |
| Group | SNMP v3 adopts the concept of View-based Access Control Model (VACM) group. SNMP managers in one group are assigned common access rights to MIBs. Specify in which SNMP group this user is.<br>**admin** – Members of this group can perform all types of system configuration, including the management of administrator accounts.<br>**readwrite** – Members of this group have read and write rights, meaning that the user can create and edit the MIBs on the Switch, except the user account and AAA configuration.<br>**readonly** – Members of this group have read rights only, meaning the user can collect information from the Switch. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Index | This is a read-only number identifying a login account on the Switch. Click on an index number to view more details and edit an existing account. |
| Username | This field displays the user name of a login account on the Switch. |
| Security Level | This field displays whether you want to implement authentication and/or encryption for SNMP communication with this user. |
| Authentication | This field displays the authentication algorithm used for SNMP communication with this user. |
| Privacy | This field displays the encryption method used for SNMP communication with this user. |
| Group | This field displays the SNMP group to which this user belongs. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |

Table 266 Management > Access Control > SNMP > User (continued)

| LABEL | DESCRIPTION |
|---|---|
| Delete | Click **Delete** to remove the selected entry from the summary table. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 59.4 Set Up Login Accounts

Up to five people (one administrator and four non-administrators) may access the Switch through Web Configurator at any one time.

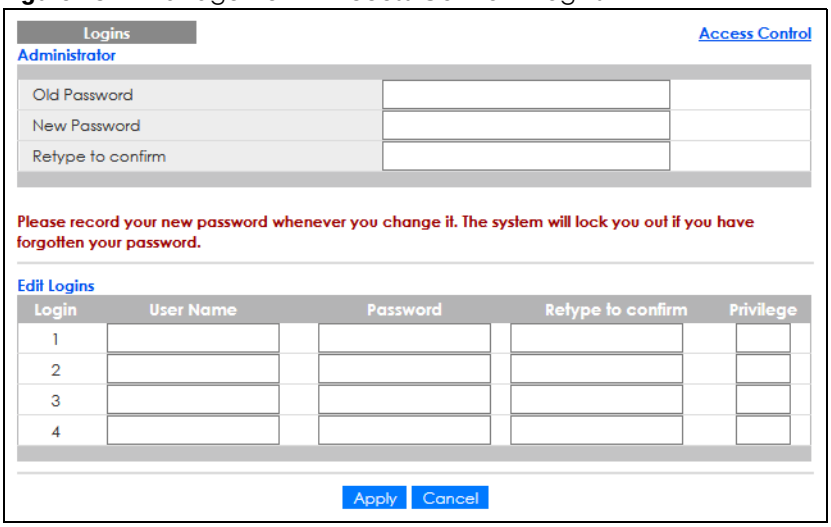
- An administrator is someone who can both view and configure Switch changes. The user name for the Administrator is always **admin**. The default administrator password is **1234**.

Note: It is highly recommended that you change the default administrator password (**1234**).

- A non-administrator (user name is something other than **admin**) is someone who can view and/or configure Switch settings. The configuration right varies depending on the user's privilege level.

Click **Management** > **Access Control** > **Logins** to view the screen as shown.

**Figure 454** Management > Access Control > Logins




The following table describes the labels in this screen.

Table 267 Management > Access Control > Logins

| LABEL | DESCRIPTION |
|---|---|
| Administrator<br>This is the default administrator account with the "admin" user name. You cannot change the default administrator user name. | |
| Old Password | Type the existing system password (**1234** is the default password when shipped). |
| New Password | Enter your new system password. |
| Retype to confirm | Retype your new system password for confirmation. |

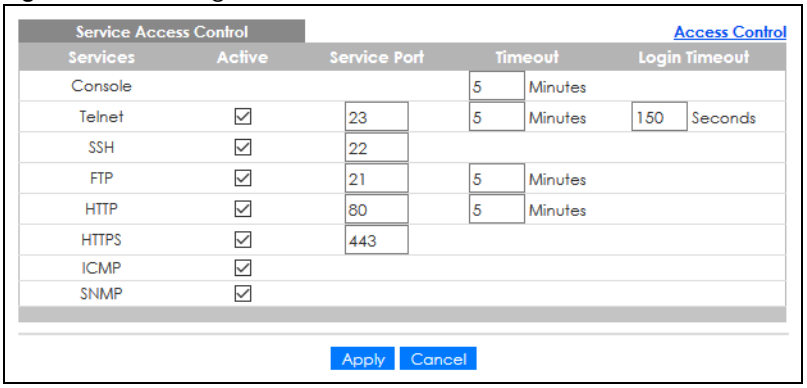
Table 267 Management > Access Control > Logins (continued)

| LABEL | DESCRIPTION |
|---|---|
| Edit Logins<br>You may configure passwords for up to four users. These users can have read-only or read/write access. You can give users higher privileges through the Web Configurator or the CLI. For more information on assigning privileges through the CLI see the Ethernet Switch CLI Reference Guide. | |
| User Name | Set a user name (up to 32 ASCII characters long). |
| Password | Enter your new system password. |
| Retype to confirm | Retype your new system password for confirmation. |
| Privilege | Type the privilege level for this user. At the time of writing, users may have a privilege level of 0, 3, 13, or 14 representing different configuration rights as shown below.<br>• 0 – Display basic system information.<br>• 3 – Display configuration or status.<br>• 13 – Configure features except for login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, administrator and enable passwords, and configuration information display.<br>• 14 – Configure login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, and administrator and enable passwords, and display configuration information.<br>Users can run command lines if the session's privilege level is greater than or equal to the command's privilege level. The session privilege initially comes from the privilege of the login account. For example, if the user has a privilege of 5, he or she can run commands that requires privilege level of 5 or less but not more. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 59.5 Service Access Control

Service Access Control allows you to decide what services you may use to access the Switch. You may also change the default service port and configure "trusted computers" for each service in the **Remote Management** screen (discussed later). Click **Access Control** to go back to the main **Access Control** screen.

**Figure 455** Management > Access Control > Service Access Control



The following table describes the fields in this screen.

Table 268 Management > Access Control > Service Access Control

| LABEL | DESCRIPTION |
|---|---|
| Services | Services you may use to access the Switch are listed here. |
| Active | Select this option for the corresponding services that you want to allow to access the Switch. |
| Service Port | For Telnet, SSH, FTP, HTTP or HTTPS services, you may change the default service port by typing the new port number in the **Service Port** field. If you change the default port number then you will have to let people (who wish to use the service) know the new port number for that service. |
| Timeout | Enter how many minutes (from 1 to 255) a management session can be left idle before the session times out. After it times out you have to log in with your password again. Very long idle timeouts may have security risks. |
| Login Timeout | The Telnet or SSH server do not allow multiple user logins at the same time. Enter how many seconds (from 30 to 300 seconds) a login session times out. After it times out you have to start the login session again. Very long login session timeouts may have security risks.<br>For example, if User A attempts to connect to the Switch (through SSH), but during the login stage, do not enter the user name and/or password, User B cannot connect to the Switch (through SSH) before the **Login Timeout** for User A expires (default 150 seconds). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

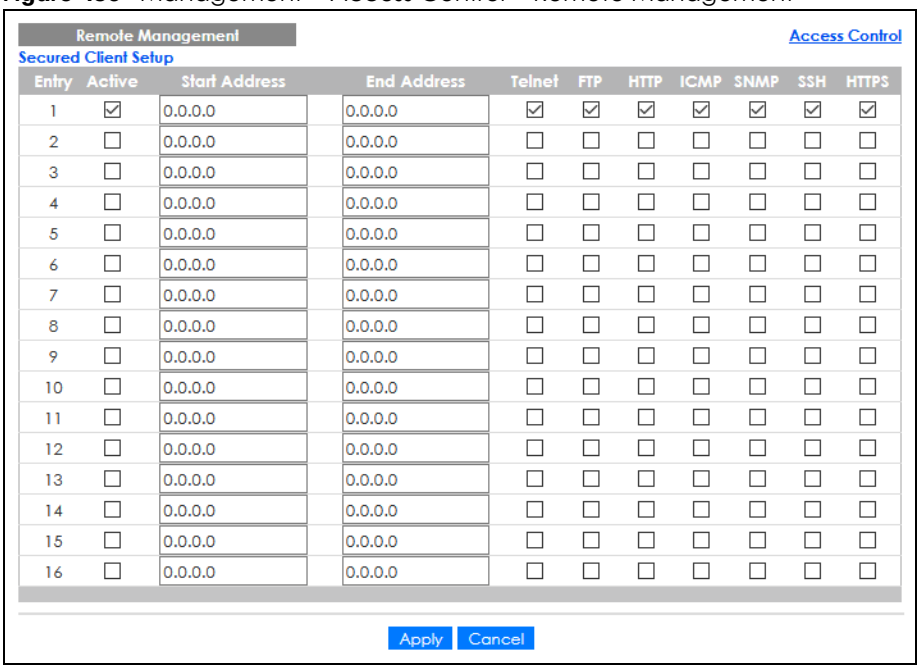
# 59.6 Remote Management

Use this screen to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

Click **Management** > **Access Control** > **Remote Management** to view the screen as shown next.

Click **Access Control** to return to the **Access Control** screen.

**Figure 456** Management > Access Control > Remote Management




The following table describes the labels in this screen.

Table 269 Management > Access Control > Remote Management

| LABEL | DESCRIPTION |
|---|---|
| Entry | This is the client set index number. A "client set" is a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. |
| Active | Select this check box to activate this secured client set. Clear the check box if you wish to temporarily disable the set without deleting it. |
| Start Address<br><br>End Address | Configure the IP address range of trusted computers from which you can manage this Switch.<br><br>The Switch checks if the client IP address of a computer requesting a service or protocol matches the range set here. The Switch immediately disconnects the session if it does not match. |
| Telnet/FTP/ HTTP/ICMP/ SNMP/SSH/ HTTPS | Select services that may be used for managing the Switch from the specified trusted computers. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 59.7 Account Security

Use this screen to encrypt all passwords configured in the Switch. This setting will affect how the password is shown (as plain text or encrypted text) in the configuration file saved in **Management** > **Maintenance** > **Save Configuration**.

Note: Make sure to enable **Password Encryption** to avoid displaying passwords as plain text in the configuration file.

**Password Encryption** encrypts all passwords in the configuration file. However, if you want to show some passwords as plain text in the configuration file, select them as below.

Note: Be careful who can access configuration files with plain text passwords!

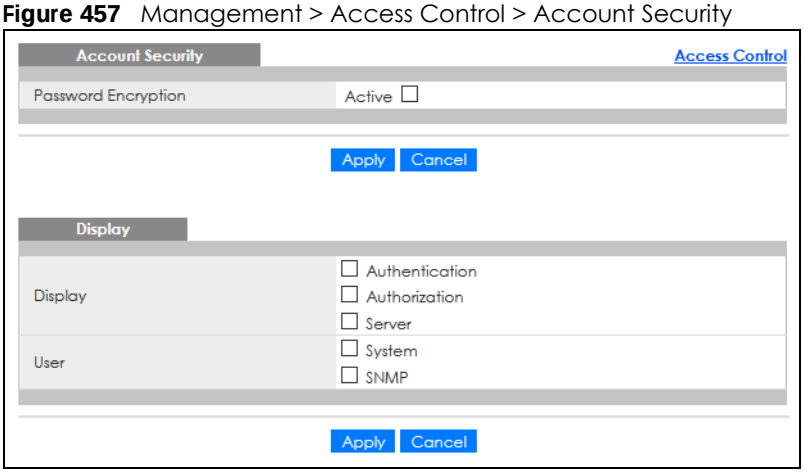
- **Authentication** information configured for **Authentication** in the **Advanced Application** > **AAA** > **AAA Setup** screen (**Method 1**/**2**/**3** setting in the **Privilege Enable** and **Login** fields).
- **Authorization** information configured for **Authorization** in the **Advanced Application** > **AAA** > **AAA Setup** screen (**Active**/**Console**/**Method** setting in the **Exec** and **Dot1x** fields).
- **Server** information configured for **Authentication Server** in the **Advanced Application** > **AAA** > **RADIUS Server Setup** screen, and for **Authentication Server** in the **Advanced Application** > **AAA** > **TACACS+ Server Setup** screen (**Mode**/**Timeout** fields).
- **System** account information configured in the Switch (admin, user login name, and password).
- **SNMP** user account information configured in the **Management** > **Access Control** > **SNMP** > **User** screen (password for SNMP user authentication in the **Authentication** field, and the password for the encryption method for SNMP communication in the **Privacy** field).

Note: The passwords will appear as encrypted text when **Password Encryption** is **Active**.

Click **Management** > **Access Control** > **Account Security** to view the screen as shown next.

Click **Access Control** to return to the **Access Control** screen.

**Figure 457** Management > Access Control > Account Security




The following table describes the labels in this screen.

Table 270 Management > Access Control > Account Security

| LABEL | DESCRIPTION |
|---|---|
| Account Security | |
| Password Encryption | Select this check box to encrypt all passwords configured on the Switch. This displays the password as encrypted text, in a saved configuration file.<br><br>Otherwise, the passwords configured on the Switch are displayed in plain text. |
| Apply | Click **Apply** to save your changes for **Account Security** to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring **Account Security** afresh. |

Table 270 Management > Access Control > Account Security (continued)

| LABEL | DESCRIPTION |
|---|---|
| Display | |
| Display | Select which specific authentication, authorization, or external authentication server information to display in plain text, in the saved configuration file.<br>• **Authentication**<br>• **Authorization**<br>• **Server** |
| User | Select which user account information to display in plain text, in the saved configuration file.<br>• **System**<br>• **SNMP** |
| Apply | Click **Apply** to save your changes for **Display** to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring **Display** afresh. |

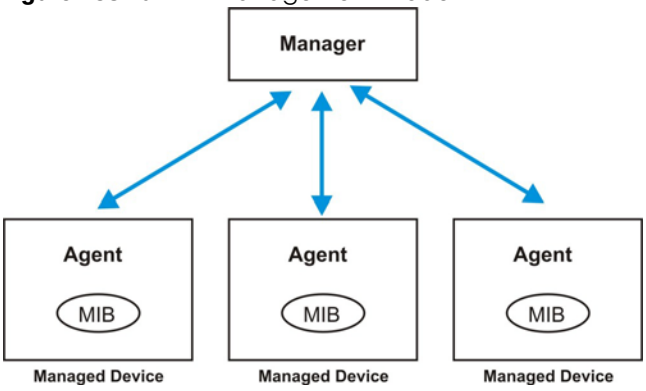
# 59.8 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 59.8.1 About SNMP

Simple Network Management Protocol (SNMP) is an application layer protocol used to manage and monitor TCP/IP-based devices. SNMP is used to exchange management information between the network management system (NMS) and a network element (NE). A manager station can manage and monitor the Switch through the network through SNMP version 1 (SNMPv1), SNMP version 2c or SNMP version 3. The next figure illustrates an SNMP management operation. SNMP is only available if TCP/IP is configured.

**Figure 458** SNMP Management Model




An SNMP managed network consists of two main components: agents and a manager.

An agent is a management software module that resides in a managed Switch (the Switch). An agent translates the local management information from the managed Switch into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables or managed objects that define each piece of information to be collected about a Switch. Examples of variables include number of packets received, node port status, and so on. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request or response protocol based on the manager or agent model. The manager issues a request and the agent returns responses using the following protocol operations:

Table 271 SNMP Commands

| LABEL | DESCRIPTION |
|---|---|
| Get | Allows the manager to retrieve an object variable from the agent. |
| GetNext | Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations. |
| Set | Allows the manager to set values for object variables within an agent. |
| Trap | Used by the agent to inform the manager of some events. |

## SNMP v3 and Security

SNMP v3 enhances security for SNMP management. SNMP managers can be required to authenticate with agents before conducting SNMP management sessions.

Security can be further enhanced by encrypting the SNMP messages sent from the managers. Encryption protects the contents of the SNMP messages. When the contents of the SNMP messages are encrypted, only the intended recipients can read them.

## Supported MIBs

A MIB is a collection of managed objects that is organized according to hierarchy. The objects define the attributes of the managed device, which includes the names, status, access rights, and data types. Each object can be addressed through an object identifier (OID). An OID that begins with "**1.3.6.1.4.1.890.1.15**" is a Zyxel-defined private MIB. Otherwise, it is a standard MIB OID.

MIBs let administrators collect statistics and monitor status and performance. The Switch uses both standard public (RFC-defined) MIBs for standard functionality, and private MIBs that support additional Switch functionality. Private MIBs contain Switch specific managed objects.

To view a list of standard MIBs supported by your Switch, see the product datasheet at www.zyxel.com (**Support** > **Download Library** > **Datasheet**).

To get the private MIBs supported by your Switch, download (and unzip) the correct model MIB from www.zyxel.com (**Support** > **Download Library** > **MIB File**).

## SNMP Traps

The Switch sends traps to an SNMP manager when an event occurs. The following tables outline the SNMP traps by category.

Table 272 SNMP System Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| coldstart | coldStart | 1.3.6.1.6.3.1.1.5.1 | This trap is sent when the Switch is turned on. |
| warmstart | warmStart | 1.3.6.1.6.3.1.1.5.2 | This trap is sent when the Switch restarts. |
| fanspeed | zyHwMonitorFanSpeedOutOfRange | 1.3.6.1.4.1.890.1.15.3.26.2.1 | This trap is sent when the fan speed goes above or below the normal operating range. |
| | zyHwMonitorFANSpeedOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.26.2.6 | This trap is sent when the fan speed is recovered from the out of range to normal operating range. |
| temperature | zyHwMonitorTemperatureOutOfRange | 1.3.6.1.4.1.890.1.15.3.26.2.2 | This trap is sent when the temperature goes above or below the normal operating range. |
| | zyHwMonitorTemperatureOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.26.2.7 | This trap is sent when the temperature is recovered from the out of range to normal operating range. |
| voltage | zyHwMonitorPowerSupplyVoltageOutOfRange | 1.3.6.1.4.1.890.1.15.3.26.2.3 | This trap is sent when the voltage goes above or below the normal operating range. |
| reset | zySysMgmtUncontrolledSystemReset | 1.3.6.1.4.1.890.1.15.3.49.2.1 | This trap is sent when the Switch automatically resets. |
| | zySysMgmtControlledSystemReset | 1.3.6.1.4.1.890.1.15.3.49.2.2 | This trap is sent when the Switch resets by an administrator through a management interface. |
| | zySysMgmtBootImageInconsistence | 1.3.6.1.4.1.890.1.15.3.49.2.3 | This trap is sent when the index number of image which is loaded when the Switch starts up is different from what is specified through the CLI. |
| | RebootEvent | 1.3.6.1.4.1.890.1.5.1.1.2 | This trap is sent when the Switch reboots by an administrator through a management interface. |
| timesync | zyDateTimeTrapTimeServerNotReachable | 1.3.6.1.4.1.890.1.15.3.82.3.1 | This trap is sent when the Switch's date and time is not manually entered or the specified time server is not reachable. |
| | zyDateTimeTrapTimeServerNotReachableRecovered | 1.3.6.1.4.1.890.1.15.3.82.3.2 | This trap is sent when the Switch's real time clock is up to date. |
| loopguard | zyLoopGuardLoopDetect | 1.3.6.1.4.1.890.1.15.3.45.2.1 | This trap is sent when loopguard shuts down a port. |
| errdisable | zyErrdisableDetect | 1.3.6.1.4.1.890.1.15.3.24.4.1 | This trap is sent when an error is detected on a port, such as a loop occurs or the rate limit for specific control packets is exceeded. |
| | zyErrdisableRecovery | 1.3.6.1.4.1.890.1.15.3.24.4.2 | This trap is sent when the Switch ceases the action taken on a port, such as shutting down the port or discarding packets on the port, after the specified recovery interval. |

Table 272 SNMP System Traps (continued)

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| poe<br>(For PoE models only) | pethPsePortOnOffNotification | 1.3.6.1.2.1.105.0.1 | This trap is sent when the PoE port delivers power or delivers no power to a PD. |
| | pethMainPowerUsageOnNotification | 1.3.6.1.2.1.105.0.2 | This trap is sent when the usage power is above the usage indication threshold. |
| | pethMainPowerUsageOffNotification | 1.3.6.1.2.1.105.0.3 | This trap is sent when the usage power is below the usage indication threshold. |
| | zyPoePowerPortOverload | 1.3.6.1.4.1.890.1.15.3.59.4.1 | This trap is sent when the port is turned off to supply power due to overloading. |
| | zyPoePowerPortShortCircuit | 1.3.6.1.4.1.890.1.15.3.59.4.2 | This trap is sent when the port is turned off to supply power due to short circuit. |
| | zyPoePowerPortOverSystemBudget | 1.3.6.1.4.1.890.1.15.3.59.4.3 | This trap is sent when the port is turned off to supply power because the requested power exceeds the total PoE power budget on the Switch. |
| | zyPoePowerPortOverloadRecovered | 1.3.6.1.4.1.890.1.15.3.59.4.5 | This trap is sent when the port is turned on to recover from an overloaded state. |
| | zyPoePowerPortShortCircuitRecovered | 1.3.6.1.4.1.890.1.15.3.59.4.6 | This trap is sent when the port is turned on to recover from a short circuit. |
| | zyPoePowerPortOverSystemBudgetRecovered | 1.3.6.1.4.1.890.1.15.3.59.4.7 | This trap is sent when the port is turned on to recover from an over system budget. |
| loginrecord | zyAccessControlLoginRecord | 1.3.6.1.4.1.890.1.15.3.9.4.1 | This trap is sent when users log in. |
| | zyAccessControlLogoutRecord | 1.3.6.1.4.1.890.1.15.3.9.4.2 | This trap is sent when users log out. |
| | zyAccessControlLoginFail | 1.3.6.1.4.1.890.1.15.3.9.4.3 | This trap is sent when users fail in login. |

Table 272 SNMP System Traps (continued)

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| stacking | zyStackingChannelUp | 1.3.6.1.4.1.890.1.15.3.97.4.1 | This trap is sent when stacking channel changes from down to up. |
| | zyStackingChannelDown | 1.3.6.1.4.1.890.1.15.3.97.4.2 | This trap is sent when stacking channel changes from up to down. |
| | zyStackingSlotAttach | 1.3.6.1.4.1.890.1.15.3.97.4.3 | This trap is sent when a Switch is attached successfully into the stacking system. |
| | zyStackingSlotDetach | 1.3.6.1.4.1.890.1.15.3.97.4.4 | This trap is sent when a Switch is detached from a stacking system. |
| | zyStackingNewMaster | 1.3.6.1.4.1.890.1.15.3.97.4.5 | This trap is sent when a Switch is selected as the new master in stacking system. |
| | zyStackingUpgradeFirmwareFail | 1.3.6.1.4.1.890.1.15.3.97.4.6 | This trap is sent when upgrade firmware fails on a stacked Switch. |
| | zyStackingNewBackup | 1.3.6.1.4.1.890.1.15.3.97.4.7 | This trap is sent when a Switch is selected as the new backup in stacking system. |
| | zyStackingBackupTakeover | 1.3.6.1.4.1.890.1.15.3.97.4.8 | This trap is sent when a master Switch is loss and replaced by a backup to become the new master. |
| | zyStackingNewMasterFromTakeover | 1.3.6.1.4.1.890.1.15.3.97.4.9 | This trap is sent when a new master Switch takes over from a former master. |
| | zyStackingSyncConfFail | 1.3.6.1.4.1.890.1.15.3.97.4.10 | This trap is sent when a configuration sync fails. |
| | zyStackingSysRestoreConfFail | 1.3.6.1.4.1.890.1.15.3.97.4.11 | This trap is sent when a backup Switch becomes the master and configuration restore fails. |
| | zyStackingSlotInitFail | 1.3.6.1.4.1.890.1.15.3.97.4.12 | This trap is sent when a newly attached Switch initialization fails. |
| | zyStackingSlotChangeIndex | 1.3.6.1.4.1.890.1.15.3.97.4.13 | This trap is sent when a stacking slot index changes. |
| | zyStackingPriorityChange | 1.3.6.1.4.1.890.1.15.3.97.4.14 | This trap is sent when the stacking priority changes. Stacking priority determines which is master. |
| | zyStackingTopologyChange | 1.3.6.1.4.1.890.1.15.3.97.4.15 | This trap is sent when a stacking topology (ring or chain) changes. |

Table 273 SNMP Stacking Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| Channel | zyStackingChannelUp | 1.3.6.1.4.1.890.1.15.3.97.4.1 | Stacking channel up. |
| | zyStackingChannelDown | 1.3.6.1.4.1.890.1.15.3.97.4.2 | Stacking channel down. |
| Slot | zyStackingSlotAttach | 1.3.6.1.4.1.890.1.15.3.97.4.3 | Stacking slot attached success. |
| | zyStackingSlotDetach | 1.3.6.1.4.1.890.1.15.3.97.4.4 | Stacking slot detached. |
| Master | zyStackingNewMaster | 1.3.6.1.4.1.890.1.15.3.97.4.5 | Backup takeover as master. |
| Upgrade Firmware | zyStackingUpgradeFirmwareFail | 1.3.6.1.4.1.890.1.15.3.97.4.6 | Upgrade Firmware fail with correspond slot ID. |

Table 273 SNMP Stacking Traps (continued)

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| Backup | zyStackingNewBackup | 1.3.6.1.4.1.890.1.15.3.97.4.7 | New Backup with correspond slot ID. |
| | zyStackingBackupTakeover | 1.3.6.1.4.1.890.1.15.3.97.4.8 | Replaced master with correspond slot ID. |
| Master | zyStackingNewMasterFromTakeover | 1.3.6.1.4.1.890.1.15.3.97.4.9 | New master from taking over with correspond slot ID. |
| Fail | zyStackingSyncConfFail | 1.3.6.1.4.1.890.1.15.3.97.4.10 | Sync. configuration fail with correspond slot ID. |
| | zyStackingSysRestoreConfFail | 1.3.6.1.4.1.890.1.15.3.97.4.11 | Stacking backup takeover restore configuration fail. |
| | zyStackingSlotInitFail | 1.3.6.1.4.1.890.1.15.3.97.4.12 | Stacking Slot init fail. |
| Change | zyStackingSlotChangeIndex | 1.3.6.1.4.1.890.1.15.3.97.4.13 | Stacking change slot index. |
| | zyStackingPriorityChange | 1.3.6.1.4.1.890.1.15.3.97.4.14 | Staking priority change. |
| | zyStackingTopologyChange | 1.3.6.1.4.1.890.1.15.3.97.4.15 | Staking topology change. |

Table 274 SNMP Interface Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| linkup | linkUp | 1.3.6.1.6.3.1.1.5.4 | This trap is sent when the Ethernet link is up. |
| linkdown | linkDown | 1.3.6.1.6.3.1.1.5.3 | This trap is sent when the Ethernet link is down. |
| autonegotiation | zyPortAutonegotiationFailed | 1.3.6.1.4.1.890.1.15.3.61.3.1 | This trap is sent when an Ethernet interface fails to auto-negotiate with the peer Ethernet interface. |
| lldp | lldpRemTablesChange | 1.0.8802.1.1.2.0.0.1 | The trap is sent when entries in the remote database have any updates.<br>Link Layer Discovery Protocol (LLDP), defined as IEEE 802.1ab, enables LAN devices that support LLDP to exchange their configured settings. This helps eliminate configuration mismatch issues. |

Table 274 SNMP Interface Traps (continued)

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| transceiver-ddm | zyTransceiverDdmiTemperatureOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.1 | This trap is sent when the transceiver temperature is above or below the normal operating range. |
| | zyTransceiverDdmiTxPowerOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.2 | This trap is sent when the transmitted optical power is above or below the normal operating range. |
| | zyTransceiverDdmiRxPowerOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.3 | This trap is sent when the received optical power is above or below the normal operating range. |
| | zyTransceiverDdmiVoltageOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.4 | This trap is sent when the transceiver supply voltage is above or below the normal operating range. |
| | zyTransceiverDdmiTxBiasOutOfRange | 1.3.6.1.4.1.890.1.15.3.84.3.5 | This trap is sent when the transmitter laser bias current is above or below the normal operating range. |
| | zyTransceiverDdmiTemperatureOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.84.3.6 | This trap is sent when the transceiver temperature is recovered from the out of normal operating range. |
| | zyTransceiverDdmiTxPowerOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.84.3.7 | This trap is sent when the transmitted optical power is recovered from the out of normal operating range. |
| | zyTransceiverDdmiRxPowerOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.84.3.8 | This trap is sent when the received optical power is recovered from the out of normal operating range. |
| | zyTransceiverDdmiVoltageOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.84.3.9 | This trap is sent when the transceiver supply voltage is recovered from the out of normal operating range. |
| | zyTransceiverDdmiTxBiasOutOfRangeRecovered | 1.3.6.1.4.1.890.1.15.3.84.3.10 | This trap is sent when the transmitter laser bias current is recovered from the out of normal operating range. |
| Storm-control | zyPortStormControlTrap | 1.3.6.1.4.1.890.1.15.3.78.2.1 | This trap is sent when storm control is detected on a specific port. A packet filter action has been applied on the interface. |
| zuld | zyZuldUnidirectionalDetected | 1.3.6.1.4.1.890.1.15.3.110.3.1 | This trap is sent when a unidirectional link is detected. |
| | zyZuldBidirectionalRecovered | 1.3.6.1.4.1.890.1.15.3.110.3.2 | This trap is sent when the port which is shut down by ZULD becomes active again. |

Table 275 SNMP AAA Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| authentication | authenticationFailure | 1.3.6.1.6.3.1.1.5.5 | This trap is sent when authentication fails due to incorrect user name and/or password. |
| | zyAaaAuthenticationFailure | 1.3.6.1.4.1.890.1.15.3.8.3.1 | This trap is sent when authentication fails due to incorrect user name and/or password. |
| | zyRadiusServerAuthenticationServerNotReachable | 1.3.6.1.4.1.890.1.15.3.71.2.1 | This trap is sent when there is no response message from the RADIUS authentication server. |
| | zyRadiusServerAuthenticationServerNotReachableRecovered | 1.3.6.1.4.1.890.1.15.3.71.2.3 | This trap is sent when there is a response message from the previously unreachable RADIUS authentication server. |
| authorization | zyAaaAuthorizationFailure | 1.3.6.1.4.1.890.1.15.3.8.3.2 | This trap is sent when management connection authorization failed. |
| accounting | zyRadiusServerAccountingServerNotReachable | 1.3.6.1.4.1.890.1.15.3.71.2.2 | This trap is sent when there is no response message from the RADIUS accounting server. |
| | zyTacacsServerAccountingServer Unreachable | 1.3.6.1.4.1.890.1.15.3.83.2.2 | This trap is sent when there is no response message from the TACACS+ accounting server. |
| | zyRadiusServerAccountingServerNotReachableRecovered | 1.3.6.1.4.1.890.1.15.3.71.2.4 | This trap is sent when there is a response message from the previously unreachable RADIUS accounting server. |
| | zyTacacsServerAccountingServer UnreachableRecovered | 1.3.6.1.4.1.890.1.15.3.83.2.4 | This trap is sent when there is a response message from the previously unreachable TACACS+ accounting server. |

Table 276 SNMP IP Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| ping | pingProbeFailed | 1.3.6.1.2.1.80.0.1 | This trap is sent when a single ping probe fails. |
| | pingTestFailed | 1.3.6.1.2.1.80.0.2 | This trap is sent when a ping test (consisting of a series of ping probes) fails. |
| | pingTestCompleted | 1.3.6.1.2.1.80.0.3 | This trap is sent when a ping test is completed. |
| traceroute | traceRouteTestFailed | 1.3.6.1.2.1.81.0.2 | This trap is sent when a traceroute test fails. |
| | traceRouteTestCompleted | 1.3.6.1.2.1.81.0.3 | This trap is sent when a traceroute test is completed. |

Table 277 SNMP Switch Traps

| OPTION | OBJECT LABEL | OBJECT ID | DESCRIPTION |
|---|---|---|---|
| stp | STPNewRoot | 1.3.6.1.2.1.17.0.1 | This trap is sent when the STP root switch changes. |
| | zyMrstpNewRoot | 1.3.6.1.4.1.890.1.15.3.52.3.1 | This trap is sent when the MRSTP root switch changes. |
| | zyMstpNewRoot | 1.3.6.1.4.1.890.1.15.3.53.3.1 | This trap is sent when the MSTP root switch changes. |
| | STPTopologyChange | 1.3.6.1.2.1.17.0.2 | This trap is sent when the STP topology changes. |
| | zyMrstpTopologyChange | 1.3.6.1.4.1.890.1.15.3.52.3.2 | This trap is sent when the MRSTP topology changes. |
| | zyMstpTopologyChange | 1.3.6.1.4.1.890.1.15.3.53.3.2 | This trap is sent when the MSTP root switch changes. |
| mactable | zyMacForwardingTableFull | 1.3.6.1.4.1.890.1.15.3.48.2.1 | This trap is sent when more than 99% of the MAC table is used. |
| | zyMacForwardingTableFullRecovered | 1.3.6.1.4.1.890.1.15.3.48.2.2 | This trap is sent when the MAC address switching table has become normal from full. |
| rmon | RmonRisingAlarm | 1.3.6.1.2.1.16.0.1 | This trap is sent when a variable goes over the RMON "rising" threshold. |
| | RmonFallingAlarm | 1.3.6.1.2.1.16.0.2 | This trap is sent when the variable falls below the RMON "falling" threshold. |
| classifier | zyAclV2ClassifierLogNotification | 1.3.6.1.4.1.890.1.15.3.105.4.1 | This trap is sent when the Switch detects classifier log information. |
| rip | zyRipExceedMaxDynamicRoute | 1.3.6.1.4.1.890.1.15.3.74.2.1 | This trap is sent when the maximum allowed number of dynamic routes learned through RIP has been exceeded. |
| ospf | zyOspfExceedMaxDynamicRoutePath | 1.3.6.1.4.1.890.1.15.3.57.3.1 | This trap is sent when the maximum allowed number of dynamic routes learned through OSPF has been exceeded. |

## 59.8.2 SSH Overview

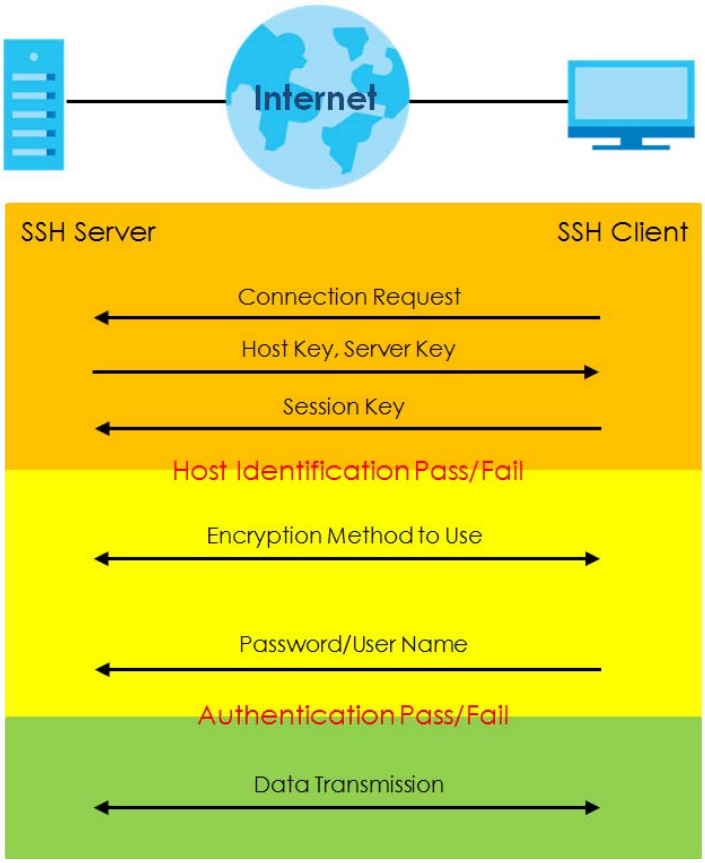
Unlike Telnet or FTP, which transmit data in clear text, SSH (Secure Shell) is a secure communication protocol that combines authentication and data encryption to provide secure encrypted communication between two hosts over an unsecured network.

**Figure 459** SSH Communication Example

### 59.8.2.1 How SSH Works

The following table summarizes how a secure connection is established between two remote hosts.

**Figure 460** How SSH Works




1 Host Identification

The SSH client sends a connection request to the SSH server. The server identifies itself with a host key. The client encrypts a randomly generated session key with the host key and server key and sends the result back to the server.

The client automatically saves any new server public keys. In subsequent connections, the server public key is checked against the saved version on the client computer.

2 Encryption Method

Once the identification is verified, both the client and server must agree on the type of encryption method to use.

3 Authentication and Data Transmission

After the identification is verified and data encryption activated, a secure tunnel is established between the client and the server. The client then sends its authentication information (user name and password) to the server to log in to the server.

### 59.8.2.2 SSH Implementation on the Switch

Your Switch supports SSH version 2 using RSA authentication and three encryption methods (DES, 3DES and Blowfish). The SSH server is implemented on the Switch for remote management and file transfer on port 22. Only one SSH connection is allowed at a time.

### 59.8.2.3 Requirements for Using SSH

You must install an SSH client program on a client computer (Windows or Linux operating system) that is

used to connect to the Switch over SSH.

## 59.8.3 Introduction to HTTPS

HTTPS (HyperText Transfer Protocol over Secure Socket Layer, or HTTP over SSL) is a web protocol that encrypts and decrypts web pages. Secure Socket Layer (SSL) is an application-level protocol that enables secure transactions of data by ensuring confidentiality (an unauthorized party cannot read the transferred data), authentication (one party can identify the other party) and data integrity (you know if data has been changed).

It relies upon certificates, public keys, and private keys.

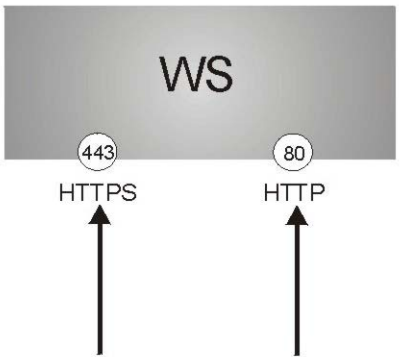
HTTPS on the Switch is used so that you may securely access the Switch using the Web Configurator. The SSL protocol specifies that the SSL server (the Switch) must always authenticate itself to the SSL client (the computer which requests the HTTPS connection with the Switch), whereas the SSL client only should authenticate itself when the SSL server requires it to do so. Authenticating client certificates is optional and if selected means the SSL-client must send the Switch a certificate. You must apply for a certificate for the browser from a Certificate Authority (CA) that is a trusted CA on the Switch.

Please refer to the following figure.

1 HTTPS connection requests from an SSL-aware web browser go to port 443 (by default) on the Switch's WS (web server).

2 HTTP connection requests from a web browser go to port 80 (by default) on the Switch's WS (web server).

**Figure 461** HTTPS Implementation




Note: If you disable HTTP in the Service Access Control screen, then the Switch blocks all HTTP connection attempts.

### 59.8.3.1 HTTPS Example

If you have not changed the default HTTPS port on the Switch, then in your browser enter "https://Switch IP Address/" as the web site address where "Switch IP Address" is the IP address or domain name of the Switch you wish to access.

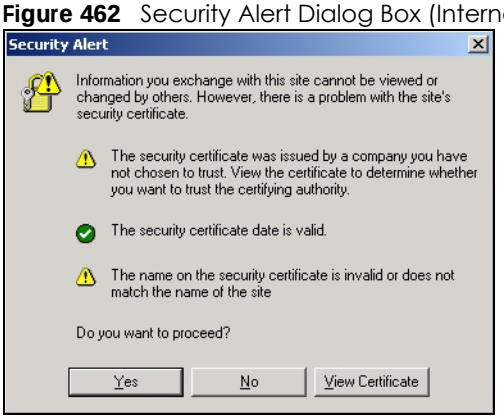
#### Internet Explorer Warning Messages

**Internet Explorer 6**

When you attempt to access the Switch HTTPS server, a Windows dialog box pops up asking if you trust the server certificate.

You see the following **Security Alert** screen in Internet Explorer. Select **Yes** to proceed to the Web Configurator login screen; if you select **No**, then Web Configurator access is blocked.

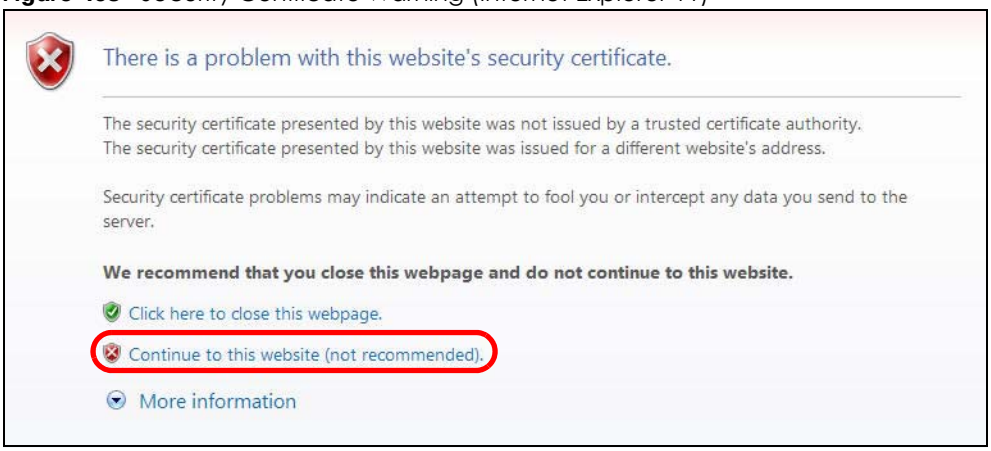
**Figure 462** Security Alert Dialog Box (Internet Explorer 6)




**Internet Explorer 7 later version**

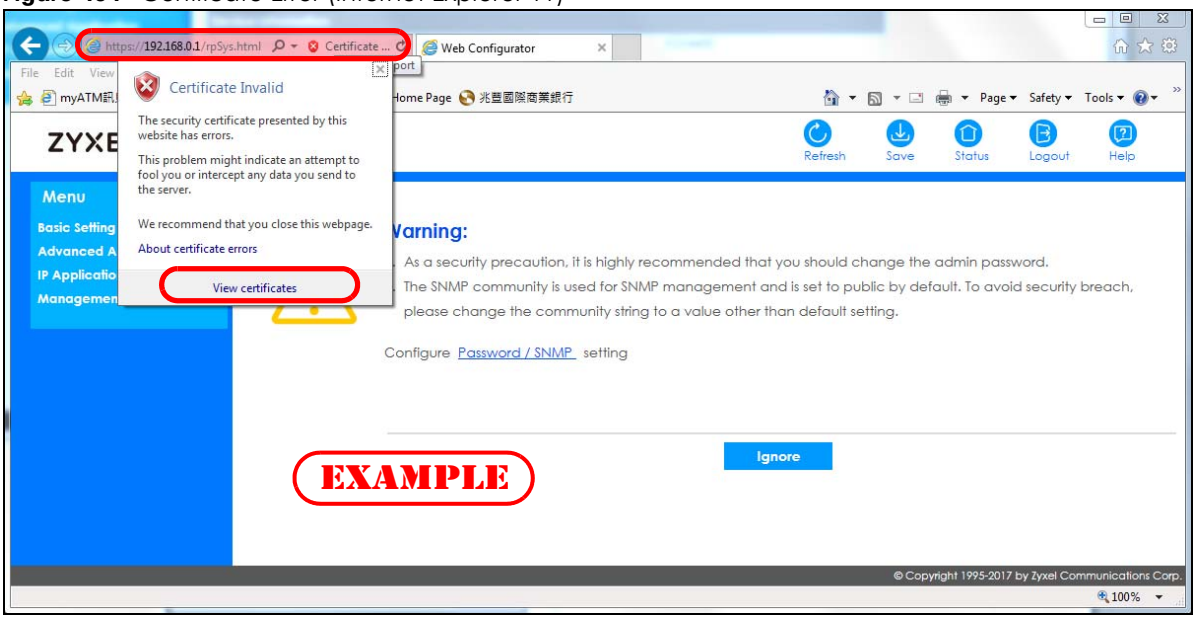
When you attempt to access the Switch HTTPS server, a screen with the message "There is a problem with this website's security certificate." may display. If that is the case, click **Continue to this website (not recommended)** to proceed to the Web Configurator login screen.

**Figure 463** Security Certificate Warning (Internet Explorer 11)



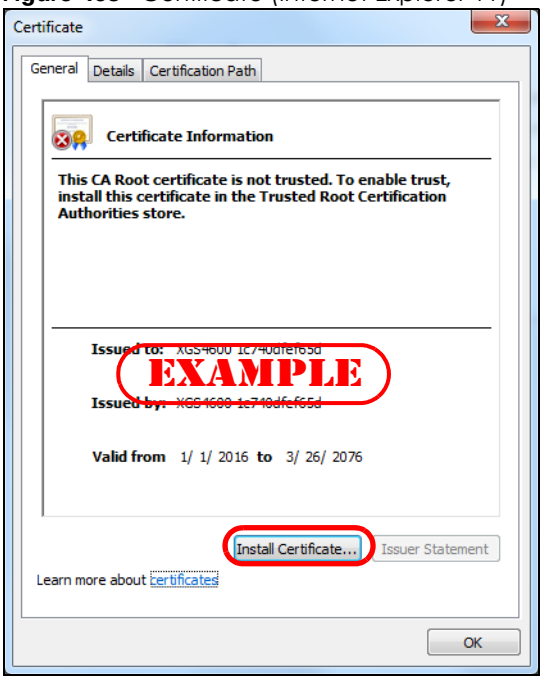

After you log in, you will see the red address bar with the message **Certificate Error**. Click on **Certificate Error** next to the address bar and click **View certificates**.

**Figure 464** Certificate Error (Internet Explorer 11)




Click **Install Certificate...** and follow the on-screen instructions to install the certificate in your browser.

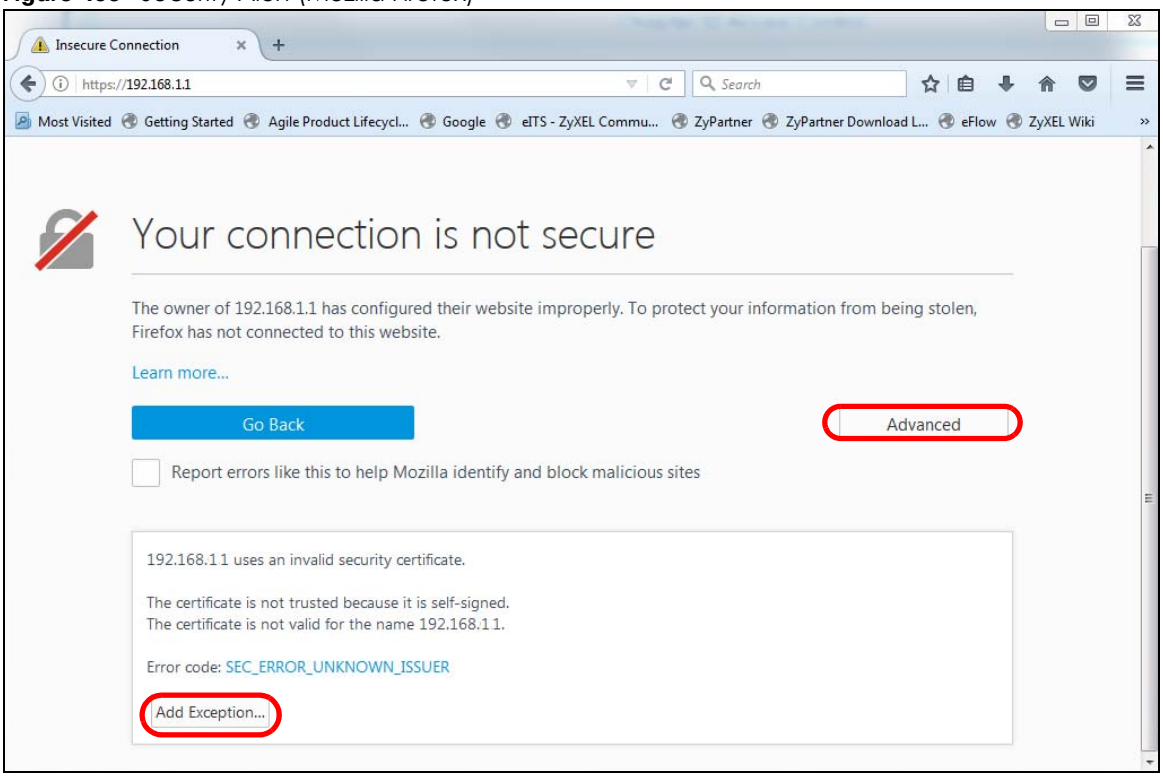
**Figure 465** Certificate (Internet Explorer 11)




## Mozilla Firefox Warning Messages

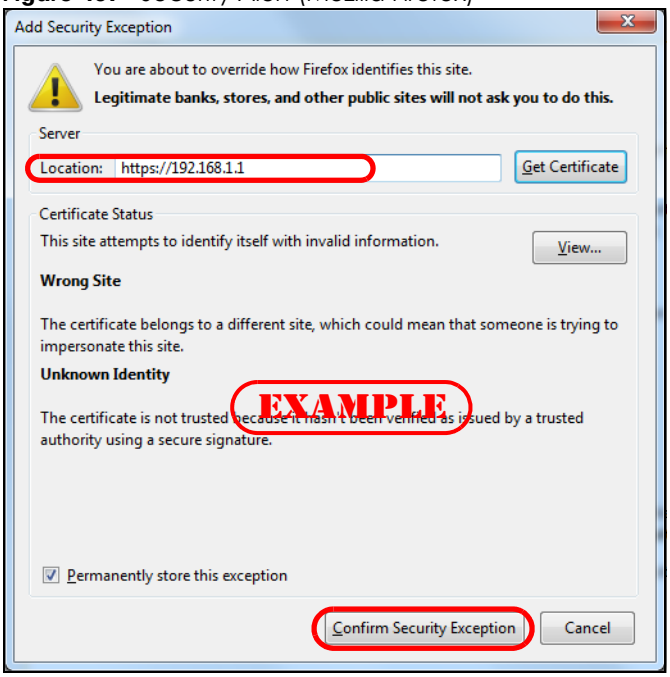
When you attempt to access the Switch HTTPS server, a **Your connection is not secure** screen may display. If that is the case, click **I Understand the Risks** and then the **Add Exception...** button.

**Figure 466** Security Alert (Mozilla Firefox)




Confirm the HTTPS server URL matches. Click **Confirm Security Exception** to proceed to the Web Configurator login screen.

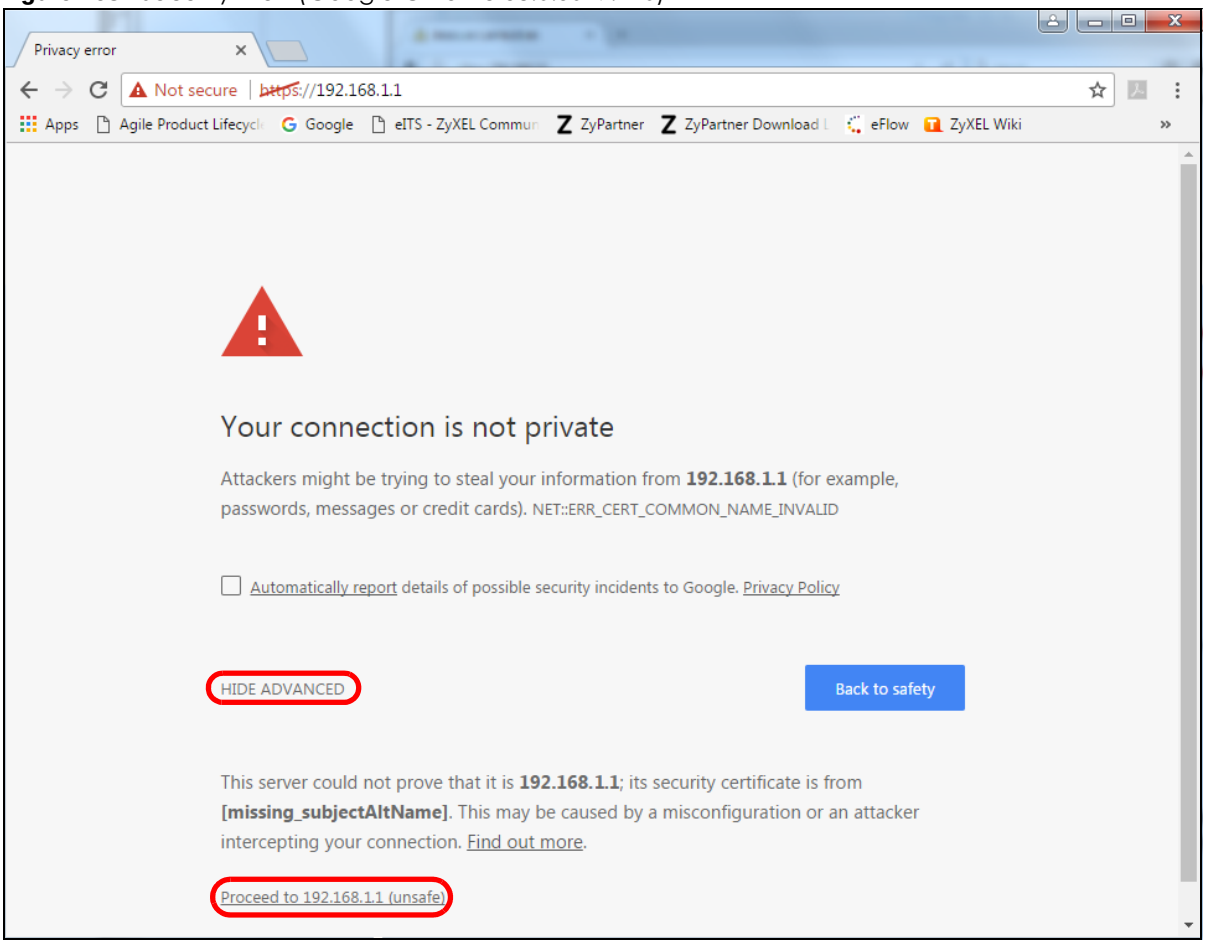
**Figure 467** Security Alert (Mozilla Firefox)



## 59.8.4 Google Chrome Warning Messages

When you attempt to access the Switch HTTPS server, a **Your connection is not private** screen may display. If that is the case, click **Advanced** and then **Proceed to x.x.x.x (unsafe)** to proceed to the Web Configurator login screen.

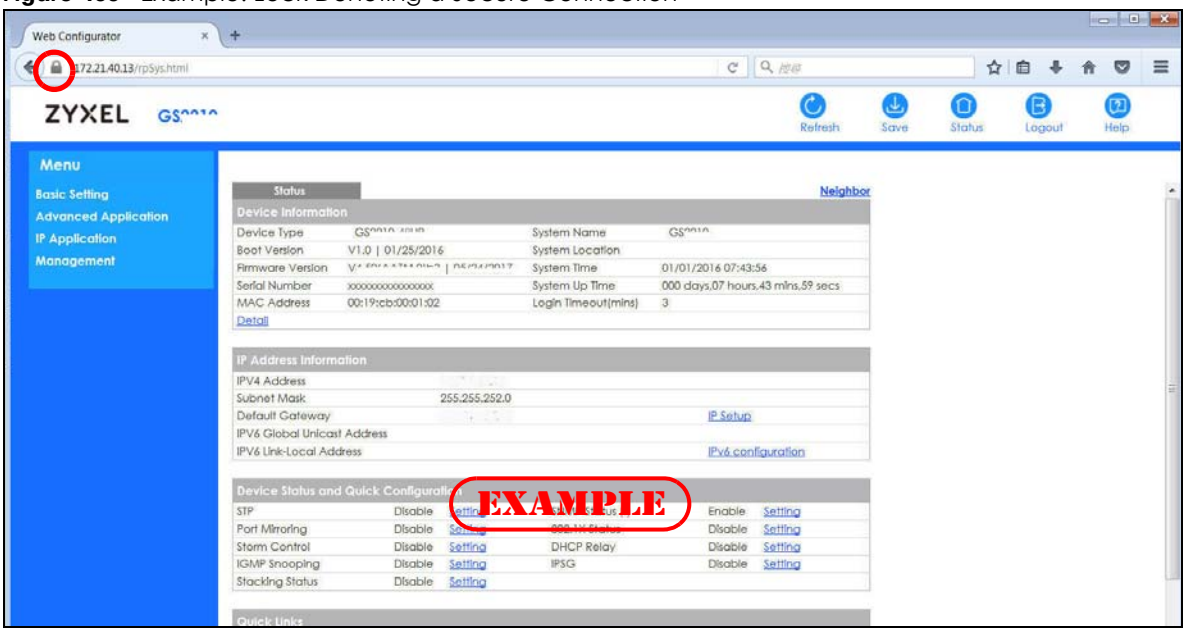
**Figure 468** Security Alert (Google Chrome 58.0.3029.110)




### 59.8.4.1 Main Settings

After you accept the certificate and enter the login user name and password, the Switch main screen appears. The lock displayed in the bottom right of the browser status bar or next to the website address denotes a secure connection.

**Figure 469** Example: Lock Denoting a Secure Connection



# CHAPTER 60
# Diagnostic

## 60.1 Overview

This chapter explains the **Diagnostic** screen. You can use this screen to help you identify problems.

## 60.2 Diagnostic

Click **Management** > **Diagnostic** in the navigation panel to open this screen. Use this screen to ping IP addresses, run a traceroute, perform port tests or show the Switch's location between devices.

**Figure 470** Management > Diagnostic (Standalone Mode)

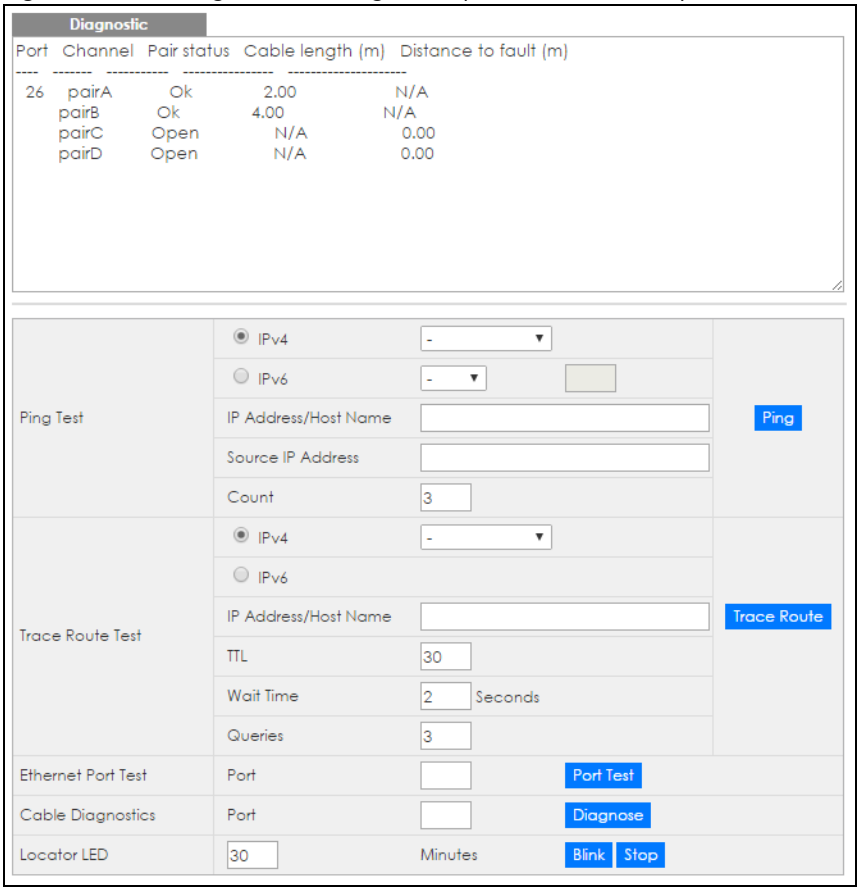
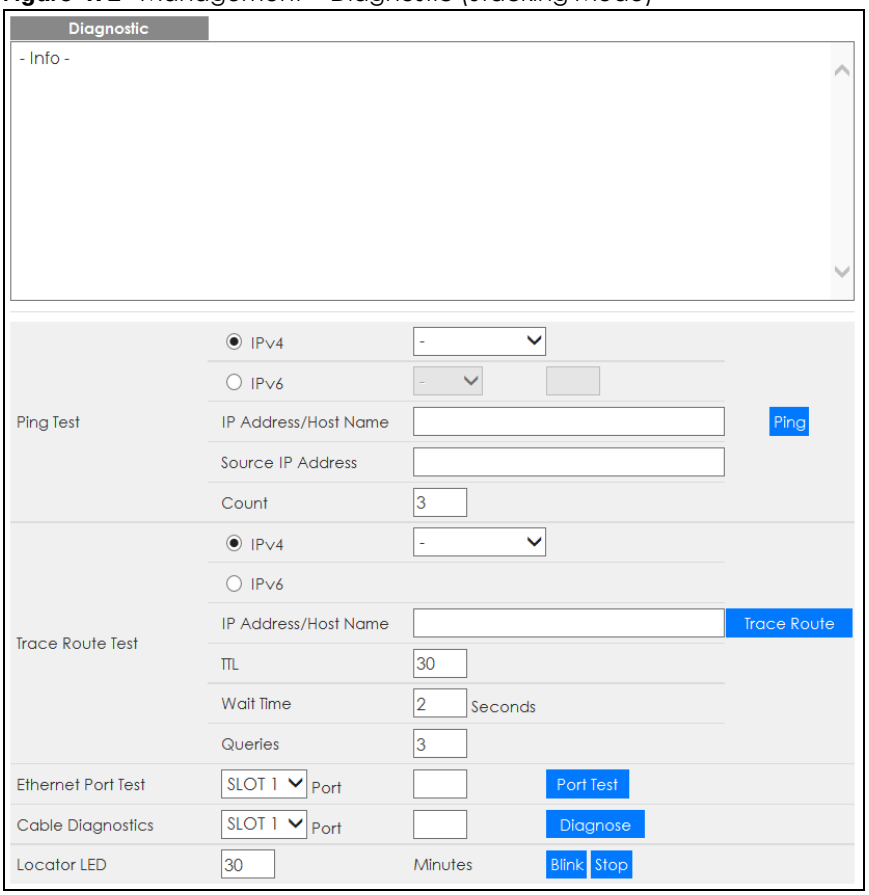


**Figure 471** Management > Diagnostic (Stacking Mode)




The following table describes the labels in this screen.

Table 278 Management > Diagnostic

| LABEL | DESCRIPTION |
|---|---|
| Ping Test | |
| IPv4 | Select this option if you want to ping an IPv4 address, and select which traffic flow (**in-band** or **out-of-band**) the Switch is to send ping frames.<br>If you select **in-band**, the Switch sends the frames to all ports except the management port (labeled **MGMT**).<br>If you select **out-of-band**, the Switch sends the frames to the management port (labeled **MGMT**).<br>Otherwise, select **–** to send ping requests to all VLANs on the Switch. |
| IPv6 | Select this option if you want to ping an IPv6 address. You can also select **vlan** and specify the ID number of the VLAN to which the Switch is to send ping requests. Otherwise, select **–** to send ping requests to all VLANs on the Switch. |
| IP Address/Host Name | Type the IP address or host name of a device that you want to ping in order to test a connection.<br>Click **Ping** to have the Switch ping the IP address. |
| Source IP Address | Type the source IP address that you want to ping in order to test a connection.<br>Click **Ping** to have the Switch ping the IP address. |
| Count | Enter the number of ICMP Echo Request (ping) messages the Switch continuously sends. |

Table 278 Management > Diagnostic (continued)

| LABEL | DESCRIPTION |
|---|---|
| Trace Route Test | |
| IPv4 | Select this option if you want to trace the route packets take to a device with an IPv4 address, and select **in-band** or **out-of-band** on which the Switch traces the path. Otherwise, select **–** to trace the path on any VLAN. |
| IPv6 | Select this option if you want to trace the route packets taken to a device with an IPv6 address. |
| IP Address/Host Name | Enter the IP address or host name of a device to which you want to perform a traceroute.<br>Click **Trace Route** to have the Switch perform the traceroute function. This determines the path a packet takes to the specified device. |
| TTL | Enter the Time To Live (TTL) value for the ICMP Echo Request packets. This is to set the maximum number of the hops (routers) a packet can travel through. Each router along the path will decrement the TTL value by one and forward the packets. When the TTL value becomes zero and the destination is not found, the router drops the packets and informs the sender. |
| Wait Time | Specify how many seconds the Switch waits for a response to a probe before running another traceroute. |
| Queries | Specify how many times the Switch performs the traceroute function. |
| Ethernet Port Test | The slot field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. Enter a port number and click **Port Test** to perform an internal loopback test. |
| Port | This is the number of the physical Ethernet port on the Switch. |
| Cable Diagnostics | The slot field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. Enter an Ethernet port number and click **Diagnose** to perform a physical wire-pair test of the Ethernet connections on the specified ports. The following fields display when you diagnose a port.<br>This field is available only on the Switch that has one or more copper Ethernet ports (except the **MGMT** port). |
| Port | This is the number of the physical Ethernet port on the Switch. |
| Channel | An Ethernet cable usually has four pairs of wires. A 10BASE-T or 100BASE-TX port only use and test two pairs, while a 1000BASE-T port requires all four pairs.<br>This displays the descriptive name of the wire-pair in the cable. |
| Pair status | **Ok**: The physical connection between the wire-pair is okay.<br>**Open**: There is no physical connection (an open circuit detected) between the wire-pair.<br>**Short**: There is an short circuit detected between the wire-pair.<br>**Unknown**: The Switch failed to run cable diagnostics on the cable connected this port.<br>**Unsupported**: The port is a fiber port or it is not active. |
| Cable length | This displays the total length of the Ethernet cable that is connected to the port when the **Pair status** is **Ok** and the Switch chipset supports this feature.<br>This shows **N/A** if the **Pair status** is **Open** or **Short**. Check the **Distance to fault**.<br>This shows **Unsupported** if the Switch chipset does not support to show the cable length. |

Table 278 Management > Diagnostic (continued)

| LABEL | DESCRIPTION |
|---|---|
| Distance to fault | This displays the distance between the port and the location where the cable is open or shorted.<br>This shows **N/A** if the **Pair status** is **Ok**.<br>This shows **Unsupported** if the Switch chipset does not support to show the distance. |
| Locator LED | Enter a time interval (in minutes) and click **Blink** to show the actual location of the Switch between several devices in a rack.<br>The default time interval is 30 minutes.<br>Click **Stop** to have the Switch terminate the blinking locater LED. |

# CHAPTER 61
# System Log

## 61.1 Overview

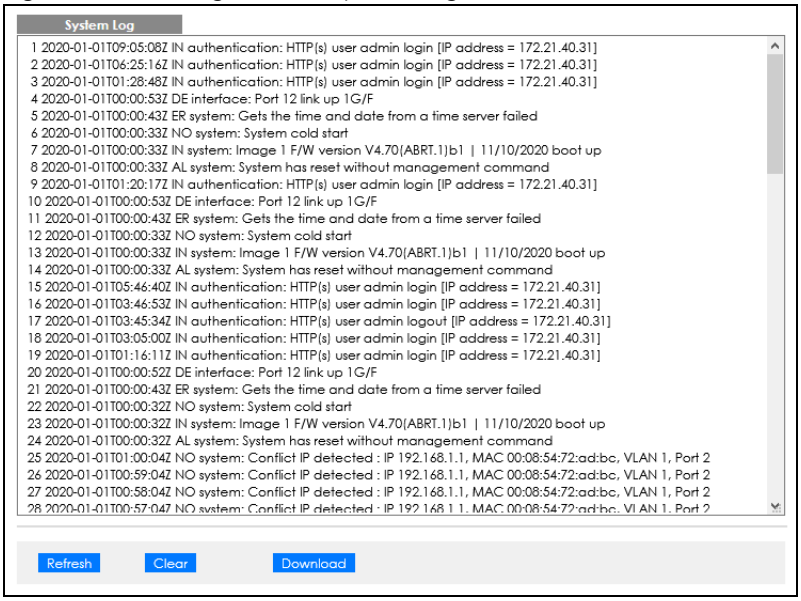
A log message stores the information for viewing.

## 61.2 System Log

Click **Management** > **System Log** in the navigation panel to open this screen. Use this screen to check current system logs.

Note: When a log reaches the maximum number of log messages, new log messages automatically overwrite existing log messages, starting with the oldest existing log message first.

**Figure 472** Management > System Log




The summary table shows the time the log message was recorded and the reason the log message was generated. Click **Refresh** to update this screen. Click **Clear** to clear the whole log, regardless of what is currently displayed on the screen. Click **Download** to save the log to your computer.

# CHAPTER 62
# Syslog Setup

## 62.1 Syslog Overview

This chapter explains the syslog screens.

The syslog protocol allows devices to send event notification messages across an IP network to syslog servers that collect the event messages. A syslog-enabled device can generate a syslog message and send it to a syslog server.

Syslog is defined in RFC 3164. The RFC defines the packet format, content and system log related information of syslog messages. Each syslog message has a facility and severity level. The syslog facility identifies a file in the syslog server. Refer to the documentation of your syslog program for details. The following table describes the syslog severity levels.

Table 279 Syslog Severity Levels

| CODE | SEVERITY |
|---|---|
| 0 | Emergency: The system is unusable. |
| 1 | Alert: Action must be taken immediately. |
| 2 | Critical: The system condition is critical. |
| 3 | Error: There is an error condition on the system. |
| 4 | Warning: There is a warning condition on the system. |
| 5 | Notice: There is a normal but significant condition on the system. |
| 6 | Informational: The syslog contains an informational message. |
| 7 | Debug: The message is intended for debug-level purposes. |

### 62.1.1 What You Can Do

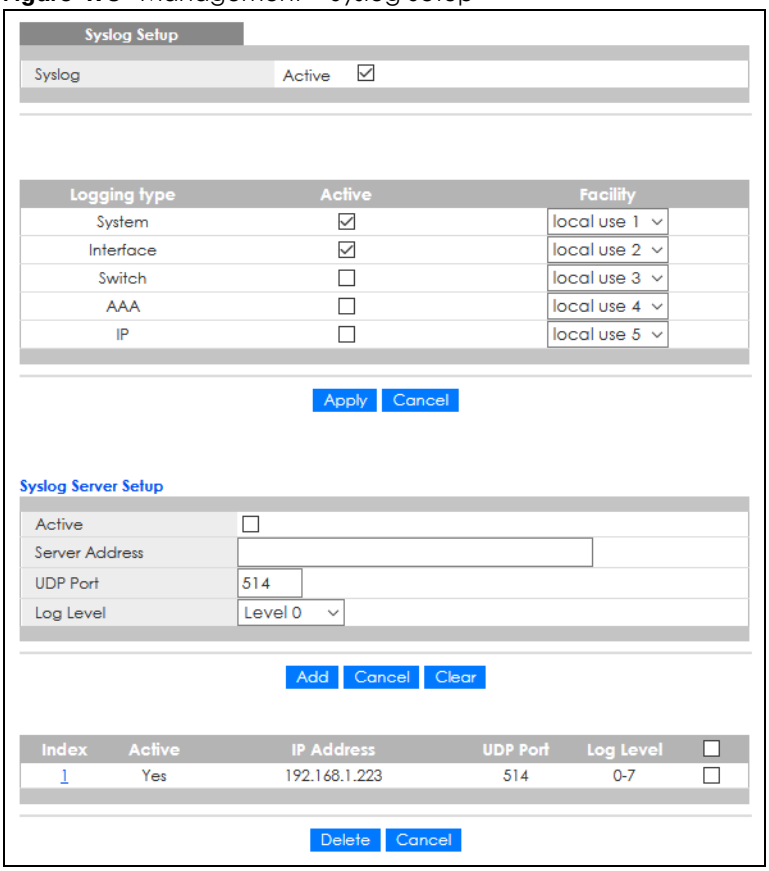
Use the **Syslog Setup** screen (Section 62.2 on page 584) to configure the device's system logging settings and configure a list of external syslog servers.

## 62.2 Syslog Setup

The syslog feature sends logs to an external syslog server. Use this screen to configure the device's system logging settings and configure a list of external syslog servers.

Click **Management** > **Syslog Setup** in the navigation panel to display this screen.

**Figure 473** Management > Syslog Setup




The following table describes the labels in this screen.

Table 280 Management > Syslog Setup

| LABEL | DESCRIPTION |
|---|---|
| Syslog | Select **Active** to turn on syslog (system logging) and then configure the syslog setting. |
| Logging Type | This column displays the names of the categories of logs that the device can generate. |
| Active | Select this option to set the device to generate logs for the corresponding category. |
| Facility | The log facility allows you to send logs to different files in the syslog server. Refer to the documentation of your syslog program for more details. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Syslog Server Setup | |
| Active | Select this check box to have the device send logs to this syslog server. Clear the check box if you want to create a syslog server entry but not have the device send logs to it (you can edit the entry later). |
| Server Address | Enter the IPv4 or IPv6 address of the syslog server. |
| UDP Port | The default syslog server port is 514. If your syslog server uses a different port, configure the one it uses here. |
| Log Level | Select the severity levels of the logs that you want the device to send to this syslog server. The lower the number, the more critical the logs are. |

Table 280 Management > Syslog Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clear | Click **Clear** to return the fields to the factory defaults. |
| Index | This is the index number of a syslog server entry. Click this number to edit the entry. |
| Active | This field displays **Yes** if the device is to send logs to the syslog server. **No** displays if the device is not to send logs to the syslog server. |
| IP Address | This field displays the IP address of the syslog server. |
| UDP Port | This field displays the port of the syslog server. |
| Log Level | This field displays the severity level of the logs that the device is to send to this syslog server. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Delete | Click **Delete** to remove the selected entries. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 63
# Cluster Management

## 63.1 Cluster Management Overview

This chapter introduces cluster management.

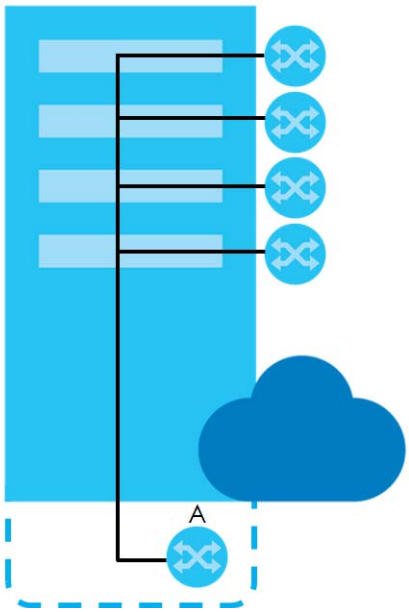
Cluster Management allows you to manage switches through one Switch, called the cluster manager. The switches must be directly connected and be in the same VLAN group so as to be able to communicate with one another.

Table 281 Zyxel Clustering Management Specifications

| | |
|---|---|
| Maximum number of cluster members | 24 |
| Cluster Member Models | Must be compatible with Zyxel cluster management implementation. |
| Cluster Manager | The Switch through which you manage the cluster member switches. |
| Cluster Members | The switches being managed by the cluster manager Switch. |

In the following example, switch **A** in the basement is the cluster manager and the other switches on the upper floors of the building are cluster members.

**Figure 474** Clustering Application Example



### 63.1.1 What You Can Do

- Use the **Cluster Management Status** screen (Section 63.2 on page 588) to view the role of the Switch within the cluster and to access a cluster member Switch's Web Configurator.
- Use the **Clustering Management Configuration** screen (Section 63.3 on page 589) to configure clustering management.

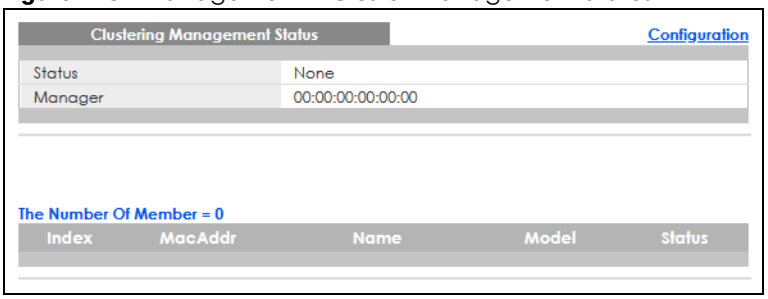
## 63.2 Cluster Management Status

Use this screen to view the role of the Switch within the cluster and to access a cluster member Switch's Web Configurator.

Click **Management** > **Cluster Management** in the navigation panel to display the following screen.

Note: A cluster can only have one manager.

**Figure 475** Management > Cluster Management Status




The following table describes the labels in this screen.

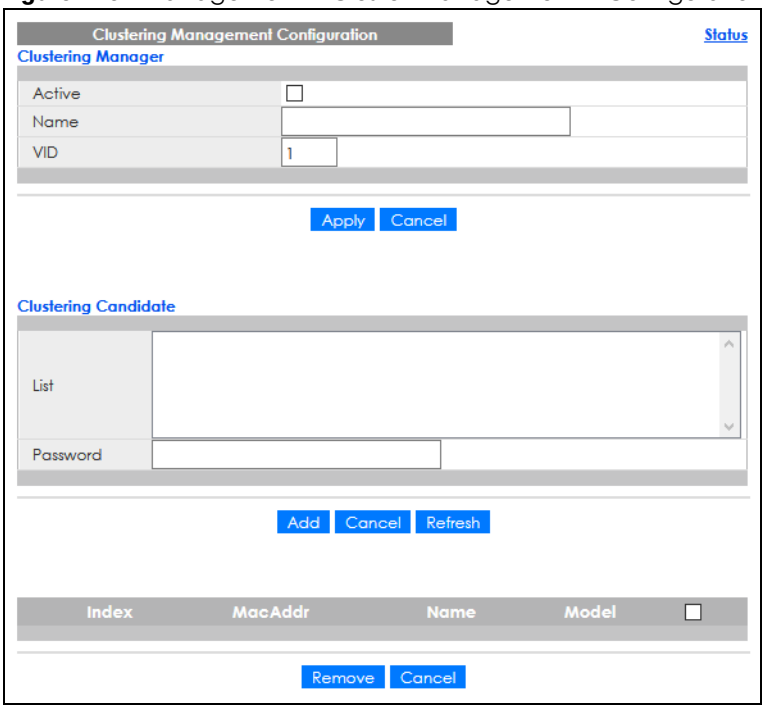
Table 282 Management > Cluster Management Status

| LABEL | DESCRIPTION |
|---|---|
| Status | This field displays the role of this Switch within the cluster.<br>**Manager**<br>**Member** (you see this if you access this screen in the cluster member Switch directly and not through the cluster manager)<br>**None** (neither a manager nor a member of a cluster) |
| Manager | This field displays the cluster manager Switch's hardware MAC address. |
| The Number of Member | This field displays the number of switches that make up this cluster. The following fields describe the cluster member switches. |
| Index | You can manage cluster member switches through the cluster manager Switch. Each number in the **Index** column is a hyperlink leading to the cluster member Switch's Web Configurator. |
| MacAddr | This is the cluster member Switch's hardware MAC address. |
| Name | This is the cluster member Switch's **System Name**. |
| Model | This field displays the model name. |
| Status | This field displays:<br>**Online** (the cluster member Switch is accessible)<br>**Error** (for example the cluster member Switch password was changed or the Switch was set as the manager and so left the member list, and so on)<br>**Offline** (the Switch is disconnected – **Offline** shows approximately 1.5 minutes after the link between cluster member and manager goes down) |

# 63.3 Clustering Management Configuration

Use this screen to configure clustering management. Click **Management** > **Cluster Management** > **Configuration** to display the next screen.

**Figure 476** Management > Cluster Management > Configuration




The following table describes the labels in this screen.

Table 283 Management > Cluster Management > Configuration

| LABEL | DESCRIPTION |
|---|---|
| Clustering Manager | The following fields relate to configuring the cluster manager. |
| Active | Select **Active** to have this Switch become the cluster manager switch. A cluster can only have one manager. Other (directly connected) switches that are set to be cluster managers will not be visible in the **Clustering Candidates** list. If a switch that was previously a cluster member is later set to become a cluster manager, then its **Status** is displayed as **Error** in the **Cluster Management Status** screen and a warning icon ( ⚠ ) appears in the member summary list below. |
| Name | Type a name to identify the **Clustering Manager.** You may use up to 32 printable characters (spaces are allowed). |
| VID | This is the VLAN ID and is only applicable if the Switch is set to **802.1Q** VLAN. All switches must be directly connected and in the same VLAN group to belong to the same cluster. Switches that are not in the same VLAN group are not visible in the **Clustering Candidates** list. This field is ignored if the **Clustering Manager** is using **Port-based** VLAN. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Clustering Candidate | The following fields relate to the switches that are potential cluster members. |
| List | A list of suitable candidates found by auto-discovery is shown here. The switches must be directly connected. Directly connected switches that are set to be cluster managers will not be visible in the **Clustering Candidate** list. Switches that are not in the same management VLAN group will not be visible in the **Clustering Candidate** list. |

Table 283 Management > Cluster Management > Configuration (continued)

| LABEL | DESCRIPTION |
|---|---|
| Password | Each cluster member's password is its Web Configurator password. Select a member in the **Clustering Candidate** list and then enter its Web Configurator password. If that switch administrator changes the Web Configurator password afterwards, then it cannot be managed from the **Cluster Manager**. Its **Status** is displayed as **Error** in the **Cluster Management Status** screen.<br>If multiple devices have the same password then hold [SHIFT] and click those switches to select them. Then enter their common Web Configurator password. |
| Add | Click **Add** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| Refresh | Click **Refresh** to perform auto-discovery again to list potential cluster members. |
| The next summary table shows the information for the clustering members configured. | |
| Index | This is the index number of a cluster member switch. |
| MacAddr | This is the cluster member switch's hardware MAC address. |
| Name | This is the cluster member switch's **System Name**. |
| Model | This is the cluster member switch's model name. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Remove | Click the **Remove** button to remove the selected cluster member switches from the cluster. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

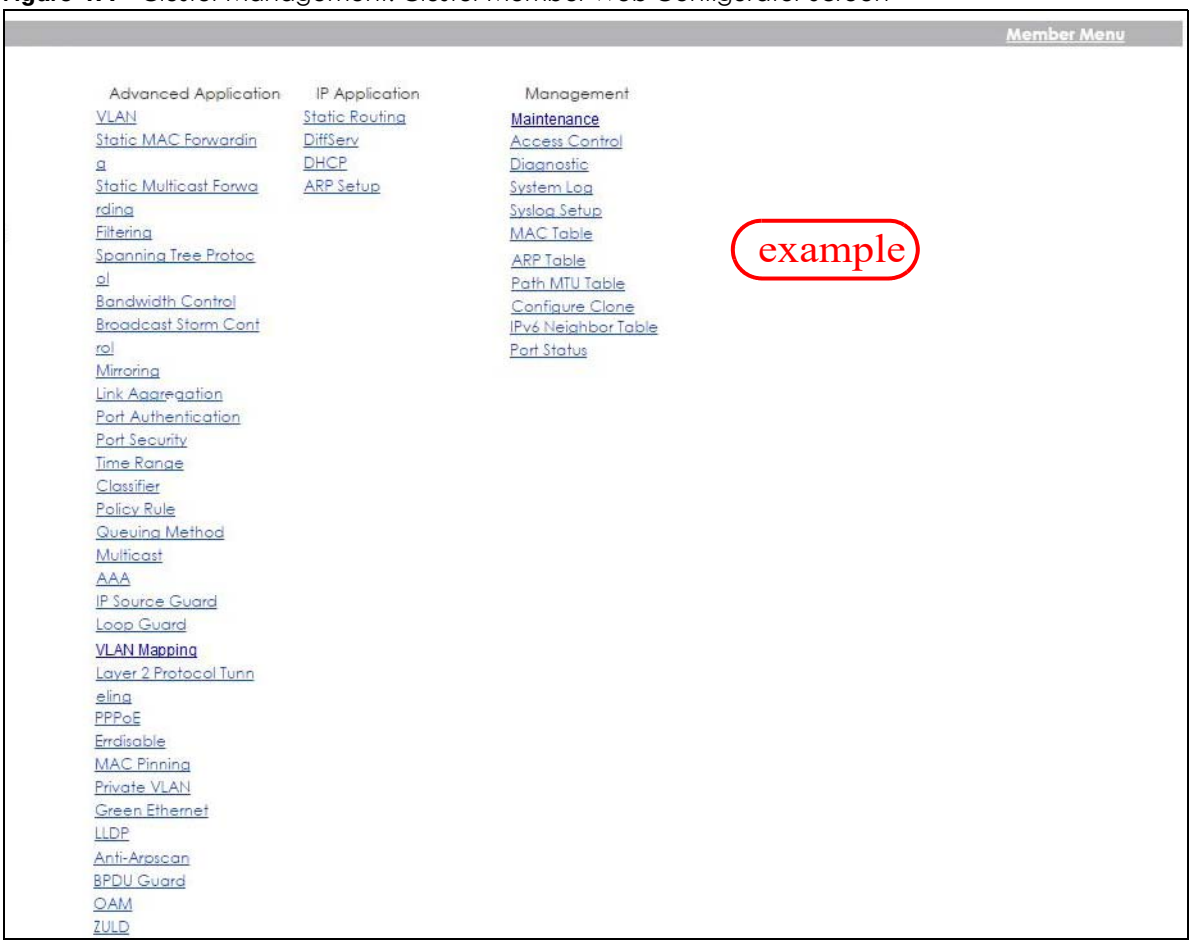
# 63.4 Technical Reference

This section provides technical background information on the topics discussed in this chapter.

## 63.4.1 Cluster Member Switch Management

Go to the **Clustering Management Status** screen of the cluster manager switch and then select an **Index** hyperlink from the list of members to go to that cluster member switch's Web Configurator home page. This cluster member Web Configurator home page and the home page that you would see if you accessed it directly are different.

**Figure 477** Cluster Management: Cluster Member Web Configurator Screen




### 63.4.1.1 Uploading Firmware to a Cluster Member Switch

You can use FTP to upload firmware to a cluster member switch through the cluster manager switch as shown in the following example.

**Figure 478** Example: Uploading Firmware to a Cluster Member Switch

```
C:\>ftp 192.168.1.1
Connected to 192.168.1.1.
220 Switch FTP version 1.0 ready at Thu Jan  1 00:58:46 1970
User (192.168.0.1:(none)): admin
331 Enter PASS command
Password:
230 Logged in
ftp> ls
200 Port command okay
150 Opening data connection for LIST
--w--w--w-   1 owner    group         3042210 Jul 01 12:00 ras
-rw-rw-rw-   1 owner    group          393216 Jul 01 12:00 config
--w--w--w-   1 owner    group               0 Jul 01 12:00 fw-00-a0-c5-01-23-46
-rw-rw-rw-   1 owner    group               0 Jul 01 12:00 config-00-a0-c5-01-23-46
226 File sent OK
ftp: 297 bytes received in 0.00Seconds 297000.00Kbytes/sec.
ftp> bin
200 Type I OK
ftp> put 460ABPI0.bin fw-00-a0-c5-01-23-46
200 Port command okay
150 Opening data connection for STOR fw-00-a0-c5-01-23-46
226 File received OK
ftp: 262144 bytes sent in 0.63Seconds 415.44Kbytes/sec.
ftp>
```

The following table explains some of the FTP parameters.

Table 284 FTP Upload to Cluster Member Example

| FTP PARAMETER | DESCRIPTION |
|---|---|
| `User` | Enter “admin”. |
| `Password` | The Web Configurator password default is 1234. |
| `ls` | Enter this command to list the name of cluster member switch’s firmware and configuration file. |
| `460ABPI0.bin` | This is the name of the firmware file you want to upload to the cluster member switch. |
| `fw-00-a0-c5-01-23-46` | This is the cluster member switch’s firmware name as seen in the cluster manager switch. |
| `config-00-a0-c5-01-23-46` | This is the cluster member switch's configuration file name as seen in the cluster manager switch. |

# CHAPTER 64
# MAC Table

## 64.1 MAC Table Overview

This chapter introduces the **MAC Table** screen.

The **MAC Table** screen (a MAC table is also known as a filtering database) shows how frames are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the MAC address of the device is shown on the Switch's **MAC Table**. It also shows whether the MAC address is dynamic (learned by the Switch) or static (manually entered in the **Static MAC Forwarding** screen).

### 64.1.1 What You Can Do

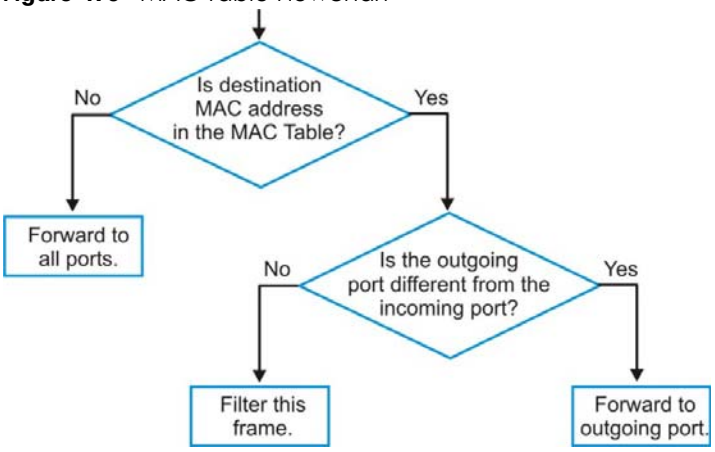
Use the **MAC Table** screen (Section 64.2 on page 594) to check whether the MAC address is dynamic or static.

### 64.1.2 What You Need to Know

The Switch uses the **MAC Table** to determine how to forward frames. See the following figure.

1. The Switch examines a received frame and learns the port on which this source MAC address came.
2. The Switch checks to see if the frame's destination MAC address matches a source MAC address already learned in the **MAC Table**.
   - If the Switch has already learned the port for this MAC address, then it forwards the frame to that port.
   - If the Switch has not already learned the port for this MAC address, then the frame is flooded to all ports. Too much port flooding leads to network congestion, then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
   - If the Switch has already learned the port for this MAC address, but the destination port is the same as the port it came in on, then it filters the frame.

**Figure 479** MAC Table Flowchart

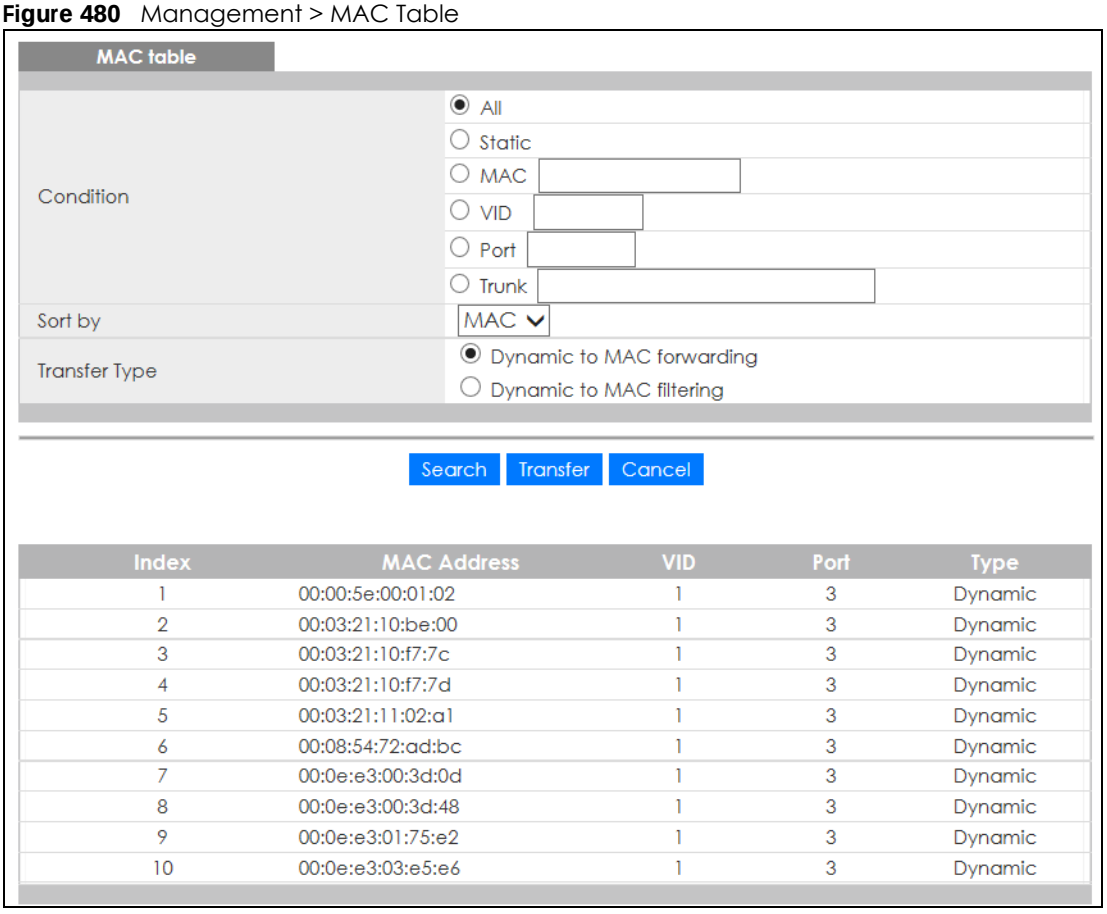



# 64.2 Viewing the MAC Table

Use this screen to search specific MAC addresses. You can also directly add dynamic MAC addresses into the static MAC forwarding table or MAC filtering table from the MAC table using this screen.

Click **Management** > **MAC Table** in the navigation panel to display the following screen.

**Figure 480** Management > MAC Table




| Index | MAC Address | VID | Port | Type |
|---|---|---|---|---|
| 1 | 00:00:5e:00:01:02 | 1 | 3 | Dynamic |
| 2 | 00:03:21:10:be:00 | 1 | 3 | Dynamic |
| 3 | 00:03:21:10:f7:7c | 1 | 3 | Dynamic |
| 4 | 00:03:21:10:f7:7d | 1 | 3 | Dynamic |
| 5 | 00:03:21:11:02:a1 | 1 | 3 | Dynamic |
| 6 | 00:08:54:72:ad:bc | 1 | 3 | Dynamic |
| 7 | 00:0e:e3:00:3d:0d | 1 | 3 | Dynamic |
| 8 | 00:0e:e3:00:3d:48 | 1 | 3 | Dynamic |
| 9 | 00:0e:e3:01:75:e2 | 1 | 3 | Dynamic |
| 10 | 00:0e:e3:03:e5:e6 | 1 | 3 | Dynamic |

The following table describes the labels in this screen.

Table 285 Management > MAC Table

| LABEL | DESCRIPTION |
|---|---|
| Condition | Select one of the buttons and click **Search** to only display the data which matches the criteria you specified.<br>Select **All** to display any entry in the MAC table of the Switch.<br>Select **Static** to display the MAC entries manually configured on the Switch.<br>Select **MAC** and enter a MAC address in the field provided to display a specified MAC entry.<br>Select **VID** and enter a VLAN ID in the field provided to display the MAC entries belonging to the specified VLAN.<br>Select **Port** and enter a port number in the field provided to display the MAC addresses which are forwarded on the specified port.<br>Select **Trunk** and type the ID of a trunk group to display all MAC addresses learned from the ports in the trunk group. |
| Sort by | Define how the Switch displays and arranges the data in the summary table below.<br>Select **MAC** to display and arrange the data according to MAC address.<br>Select **VID** to display and arrange the data according to VLAN group.<br>Select **PORT** to display and arrange the data according to port number. |
| Transfer Type | Select **Dynamic to MAC forwarding** and click the **Transfer** button to change all dynamically learned MAC address entries in the summary table below into static entries. They also display in the **Static MAC Forwarding** screen.<br>Select **Dynamic to MAC filtering** and click the **Transfer** button to change all dynamically learned MAC address entries in the summary table below into MAC filtering entries. These entries will then display only in the **Filtering** screen and the default filtering action is **Discard source**. |
| Search | Click this to search data in the MAC table according to your input criteria. |
| Transfer | Click this to perform the MAC address transferring you selected in the **Transfer Type** field. |
| Cancel | Click **Cancel** to change the fields back to their last saved values. |
| Index | This is the incoming frame index number. |
| MAC Address | This is the MAC address of the device from which this incoming frame came. |
| VID | This is the VLAN group to which this frame belongs. |
| Port | This is the port from which the above MAC address was learned. In stacking mode, the first number represents the slot and the second the port number. |
| Type | This shows whether the MAC address is **dynamic** (learned by the Switch) or **static** (manually entered in the **Static MAC Forwarding** screen). |

# CHAPTER 65
# IP Table

This chapter introduces the IP table.

## 65.1 IP Table Overview

The **IP Table** screen shows how packets are forwarded or filtered across the Switch's ports. When a device (which may belong to a VLAN group) sends a packet which is forwarded to a port on the Switch, the IP address of the device is shown on the Switch's **IP Table**. The **IP Table** also shows whether the IP address is dynamic (learned by the Switch) or static (belonging to the Switch).

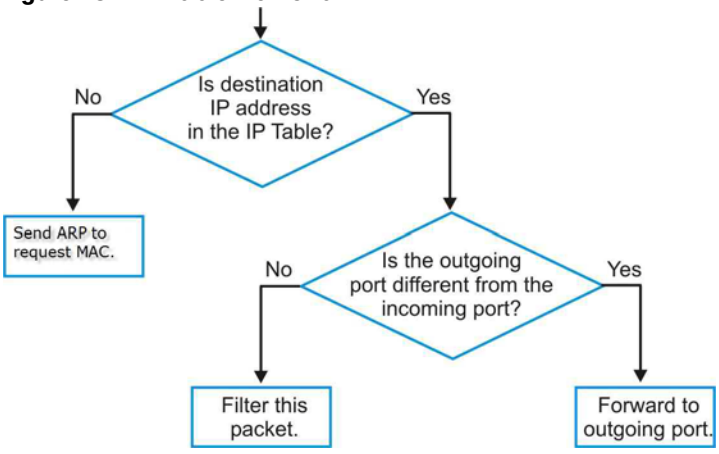
The Switch uses the **IP Table** to determine how to forward packets. See the following figure.

1 The Switch examines a received packet and learns the port from which this source IP address came.

2 The Switch checks to see if the packet's destination IP address matches a source IP address already learned in the **IP Table**.

- If the Switch has already learned the port for this IP address, then it forwards the packet to that port.
- If the Switch has not already learned the port for this IP address, then the packet is flooded to all ports. Too much port flooding leads to network congestion then the Switch sends an ARP to request the MAC address. The Switch then learns the port that replies with the MAC address.
- If the Switch has already learned the port for this IP address, but the destination port is the same as the port it came in on, then it filters the packet.

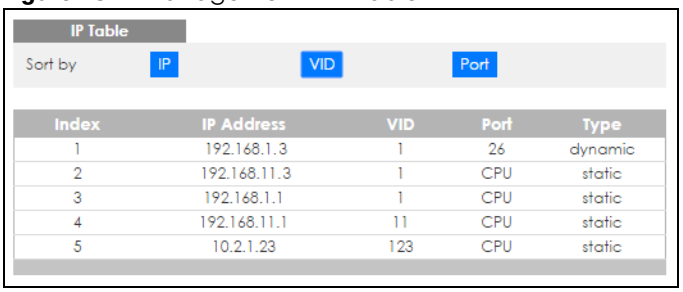
**Figure 481** IP Table Flowchart



# 65.2 Viewing the IP Table

Click **Management** > **IP Table** in the navigation panel to display the following screen.

**Figure 482** Management > IP Table




The following table describes the labels in this screen.

Table 286 Management > IP Table

| LABEL | DESCRIPTION |
|---|---|
| Sort by | Click one of the following buttons to display and arrange the data according to that button type. The information is then displayed in the summary table below. |
| IP | Click this button to display and arrange the data according to IP address. |
| VID | Click this button to display and arrange the data according to VLAN group. |
| Port | Click this button to display and arrange the data according to port number. |
| Index | This field displays the index number. |
| IP Address | This is the IP address of the device from which the incoming packets came. |
| VID | This is the VLAN group to which the packet belongs. |
| Port | This is the port from which the above IP address was learned. This field displays **CPU** to indicate the IP address belongs to the Switch. In stacking mode, the first number represents the slot and the second the port number. |
| Type | This shows whether the IP address is **dynamic** (learned by the Switch) or **static** (belonging to the Switch). |

# CHAPTER 66
# ARP Table

## 66.1 Overview

This chapter introduces ARP Table.

Address Resolution Protocol (ARP) is a protocol for mapping an Internet Protocol address (IP address) to a physical machine address, also known as a Media Access Control or MAC address, on the local area network.

An IP (version 4) address is 32 bits long. In an Ethernet LAN, MAC addresses are 48 bits long. The ARP Table maintains an association between each MAC address and its corresponding IP address.

### 66.1.1 What You Can Do

Use the **ARP Table** screen (Section 66.2 on page 598) to view IP-to-MAC address mappings.

### 66.1.2 What You Need to Know

When an incoming packet destined for a host device on a local area network arrives at the Switch, the Switch's ARP program looks in the ARP Table and if it finds the address, it sends it to the device.

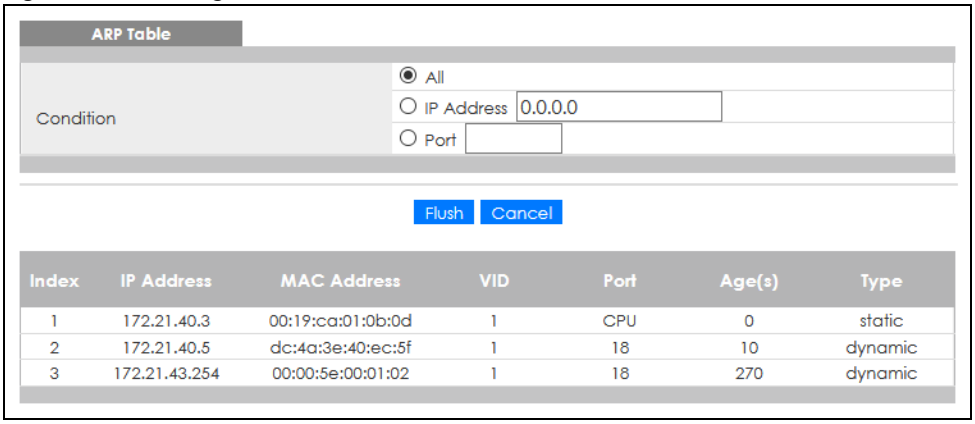
If no entry is found for the IP address, ARP broadcasts the request to all the devices on the LAN. The Switch fills in its own MAC and IP address in the sender address fields, and puts the known IP address of the target in the target IP address field. In addition, the Switch puts all ones in the target MAC field (FF.FF.FF.FF.FF.FF is the Ethernet broadcast address). The replying device (which is either the IP address of the device being sought or the router that knows the way) replaces the broadcast address with the target's MAC address, swaps the sender and target pairs, and unicasts the answer directly back to the requesting machine. ARP updates the ARP Table for future reference and then sends the packet to the MAC address that replied.

## 66.2 Viewing the ARP Table

Use the ARP table to view IP-to-MAC address mappings and remove specific dynamic ARP entries.

Click **Management** > **ARP Table** in the navigation panel to open the following screen.

**Figure 483** Management > ARP Table




The following table describes the labels in this screen.

Table 287 Management > ARP Table

| LABEL | DESCRIPTION |
|---|---|
| Condition | Specify how you want the Switch to remove ARP entries when you click **Flush**.<br>Select **All** to remove all of the dynamic entries from the ARP table.<br>Select **IP Address** and enter an IP address to remove the dynamic entries learned with the specified IP address.<br>Select **Port** and enter a port number to remove the dynamic entries learned on the specified port. |
| Flush | Click **Flush** to remove the ARP entries according to the condition you specified. |
| Cancel | Click **Cancel** to return the fields to the factory defaults. |
| Index | This is the ARP table entry number. |
| IP Address | This is the IP address of a device connected to a Switch port with the corresponding MAC address below. |
| MAC Address | This is the MAC address of the device with the corresponding IP address above. |
| VID | This field displays the VLAN to which the device belongs. |
| Port | This field displays the port to which the device connects. **CPU** means this IP address is the Switch's management IP address. In stacking mode, the first number represents the slot and the second the port number. |
| Age(s) | This field displays how long (in seconds) an entry can still remain in the ARP table before it ages out and needs to be relearned. This shows **0** for a static entry. |
| Type | This shows whether the IP address is dynamic (learned by the Switch) or static (manually configured in the **Basic Setting** > **IP Setup** or **IP Application** > **ARP Setup** > **Static ARP** screen). |

# CHAPTER 67
# Routing Table

This chapter introduces the routing table.

## 67.1 Routing Table Overview

The routing table contains the route information to the networks that the Switch can reach.

## 67.2 The Routing Table Main Screen

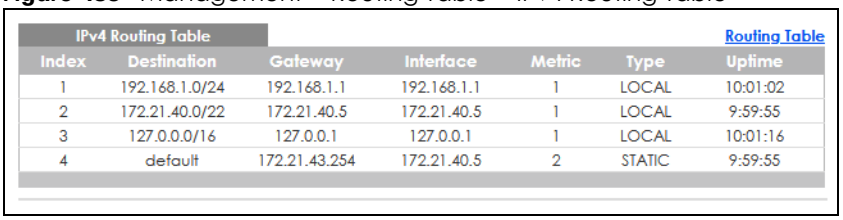
Click **Management** > **Routing Table** in the navigation panel to display the main screen as shown. Click the link next to **IPv4 Routing Table** to open a screen where you can view the IPv4 routing table information. Click the link next to **IPv6 Routing Table** to open a screen where you can view the IPv6 routing table information.

**Figure 484** Management > Routing Table

## 67.3 IPv4 Routing Table

Use this screen to view IPv4 routing table information. Click **Management** > **Routing Table** > **IPv4 Routing Table** in the navigation panel to display the screen as shown.

**Figure 485** Management > Routing Table > IPv4 Routing Table




| Index | Destination | Gateway | Interface | Metric | Type | Uptime |
|---|---|---|---|---|---|---|
| 1 | 192.168.1.0/24 | 192.168.1.1 | 192.168.1.1 | 1 | LOCAL | 10:01:02 |
| 2 | 172.21.40.0/22 | 172.21.40.5 | 172.21.40.5 | 1 | LOCAL | 9:59:55 |
| 3 | 127.0.0.0/16 | 127.0.0.1 | 127.0.0.1 | 1 | LOCAL | 10:01:16 |
| 4 | default | 172.21.43.254 | 172.21.40.5 | 2 | STATIC | 9:59:55 |

The following table describes the labels in this screen.

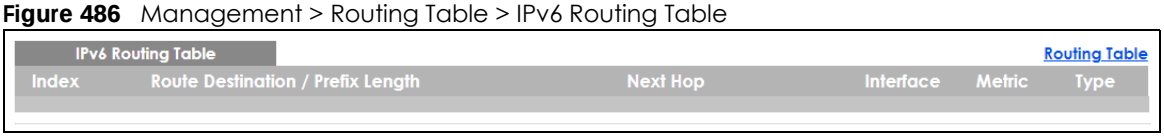
Table 288 Management > Routing Table > IPv4 Routing Table

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number. |
| Destination | This field displays the destination IP routing domain. |
| Gateway | This field displays the IP address of the gateway device. |
| Interface | This field displays the IP address of the IPv4 Interface. |
| Metric | This field displays the cost of the route. |
| Type | This field displays the method used to learn the route.<br>**STATIC** – added as a static entry.<br>**LOCAL** – added as a local interface entry. |
| Uptime | This field displays how long the route has been running since the Switch learned the route and added an entry in the routing table. |

# 67.4 IPv6 Routing Table

Use this screen to view IPv6 routing table information. Click **Management** > **Routing Table** > **IPv6 Routing Table** in the navigation panel to display the screen as shown.

**Figure 486** Management > Routing Table > IPv6 Routing Table




The following table describes the labels in this screen.

Table 289 Management > Routing Table > IPv6 Routing Table

| LABEL | DESCRIPTION |
|---|---|
| Index | This field displays the index number. |
| Route Destination/ Prefix Length | This field displays the IPv6 subnet prefix and prefix length of the final destination. |
| Next Hop | This field displays the IPv6 address of the gateway that helps forward the packet to the destination. |
| Interface | This field displays the descriptive name of the IPv6 interface that is used to forward the packets to the destination. |
| Metric | This field displays the cost of the route. |
| Type | This field displays the method used to learn the route.<br>**STATIC** – added as a static entry.<br>**Connect** – added as a local interface entry. |

# CHAPTER 68
# Path MTU Table

## 68.1 Path MTU Overview

This chapter introduces the IPv6 Path MTU table.

The largest size (in bytes) of a packet that can be transferred over a data link is called the maximum transmission unit (MTU). The Switch uses Path MTU Discovery to discover Path MTU (PMTU), that is, the minimum link MTU of all the links in a path to the destination. If the Switch receives an ICMPv6 Packet Too Big error message after sending a packet, it fragments the next packet according to the suggested MTU in the error message.

## 68.2 Viewing the Path MTU Table

Use this screen to view IPv6 path MTU information on the Switch. Click **Management** > **Path MTU Table** in the navigation panel to display the screen as shown.

**Figure 487** Management > Path MTU Table

The following table describes the labels in this screen.

Table 290 Management > Path MTU Table

| LABEL | DESCRIPTION |
|---|---|
| Path MTU aging time | This field displays how long an entry remains in the Path MTU table before it ages out and needs to be relearned. |
| Index | This field displays the index number of each entry in the table. |
| Destination Address | This field displays the destination IPv6 address of each path or entry. |
| MTU | This field displays the maximum transmission unit of the links in the path. |
| Expire | This field displays how long (in minutes) an entry can still remain in the Path MTU table before it ages out and needs to be relearned. |

# CHAPTER 69
# Configure Clone

## 69.1 Overview

This chapter shows you how you can copy the settings of one port onto other ports.

## 69.2 Configure Clone

Cloning allows you to copy the basic and advanced settings from a source port to a destination port or ports. Click **Management** > **Configure Clone** to open the following screen.

**Figure 488** Management > Configure Clone (Standalone Mode)

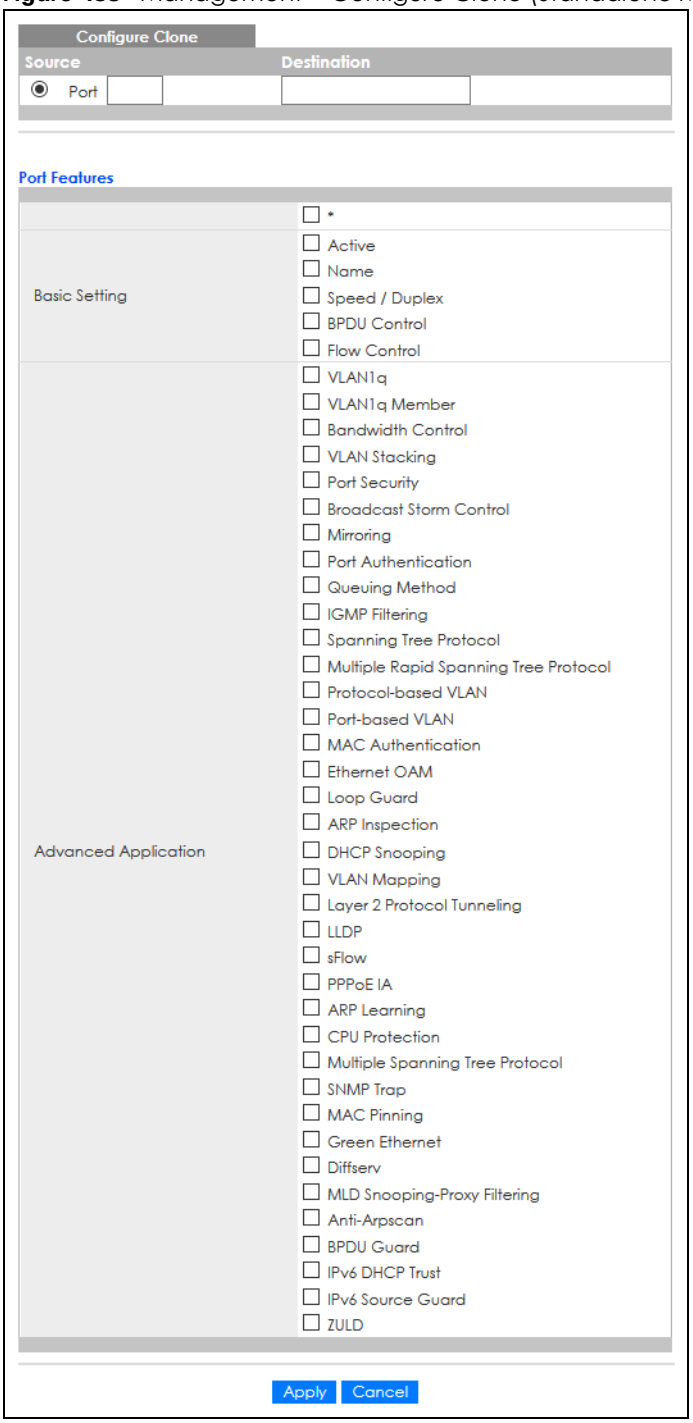
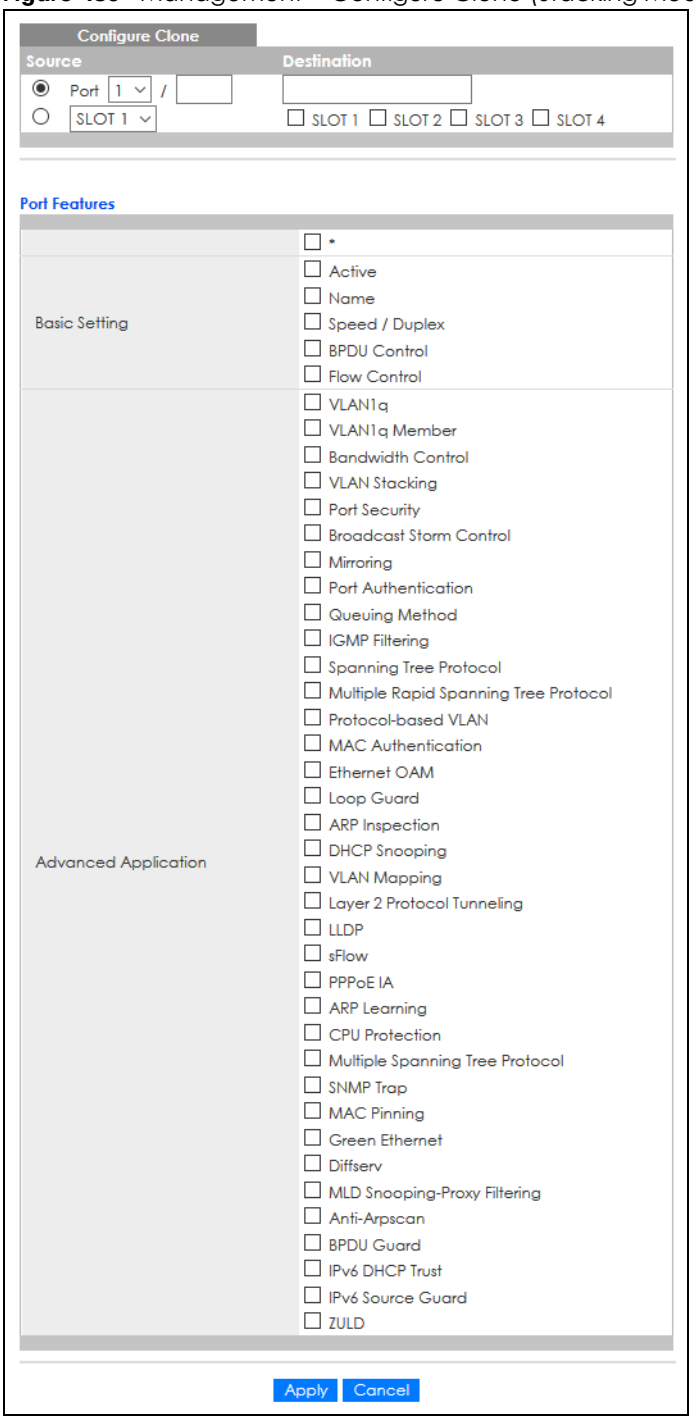


**Figure 489** Management > Configure Clone (Stacking Mode)



The following table describes the labels in this screen.

Table 291 Management > Configure Clone

| LABEL | DESCRIPTION |
|---|---|
| Source/ Destination | In stacking mode, a port is defined by a slot ID representing the Switch in the stack and a port number.<br>Select the source port and slot (in stacking mode) under the **Source** label. This port's attributes are copied.<br>Enter the destination port or ports under the **Destination** label. These are the ports which are going to have the same attributes as the source port. You can enter individual ports separated by a comma or a range of ports by using a hyphen. For example, **2, 4, 6** indicates that ports 2, 4 and 6 are the destination ports. **2–6** indicates that ports 2 through 6 are the destination ports.<br>In stacking mode, you can select multiple destination slots. |
| * | Select * to apply all settings to the port. Use this first to select the common settings and then remove the settings you do not want copied. |
| Basic Setting | Select which port settings (you configured in the **Basic Setting** menus) should be copied to the destination ports. |
| Advanced Application | Select which port settings (you configured in the **Advanced Application** menus) should be copied to the destination ports. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 70
# IPv6 Neighbor Table

## 70.1 IPv6 Neighbor Table Overview

This chapter introduces the IPv6 neighbor table.

An IPv6 host is required to have a neighbor table. If there is an address to be resolved or verified, the Switch sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor table. You can also manually create a static IPv6 neighbor entry using the **Basic Setting** > **IPv6** > **IPv6 Configuration** > **IPv6 Neighbor Setup** screen.

When the Switch needs to send a packet, it first consults other table to determine the next hop. Once the next hop IPv6 address is known, the Switch looks into the neighbor table to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor table or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

## 70.2 Viewing the IPv6 Neighbor Table

Use this screen to view IPv6 neighbor information on the Switch. Click **Management** > **IPv6 Neighbor Table** in the navigation panel to display the screen as shown.

**Figure 490** Management > IPv6 Neighbor Table

IPv6 Neighbor Table

Sort by: Address MAC Interface

| Index | Address | MAC | Status | Type | Interface |
|---|---|---|---|---|---|
| 1 | fe80::219:caff:fe01:b0d | 00:19:ca:01:0b:0d | R | L | VLAN1 |
| 2 | fe80::1458:63cd:d345:4780 | 00:00:00:00:00:00 | IV | D | VLAN1 |
| 3 | fe80::39ff:cf44:b86:78e3 | 90:2b:34:bb:7a:a4 | S | D | VLAN1 |
| 4 | fe80::486c:c733:60a8:c292 | 04:d4:c4:b1:a5:e3 | S | D | VLAN1 |
| 5 | fe80::4d24:c05c:81c3:55a4 | 30:65:ec:49:85:c3 | S | D | VLAN1 |
| 6 | fe80::4d76:d275:b9ef:2c91 | f8:a9:63:e8:be:fa | S | D | VLAN1 |
| 7 | fe80::85e7:9b83:3713:b9b7 | 90:2b:34:bb:7a:81 | S | D | VLAN1 |
| 8 | fe80::a954:c1d:f468:22f4 | 0c:9d:92:5e:60:89 | S | D | VLAN1 |
| 9 | fe80::d8ee:6a49:b436:80c9 | dc:0e:a1:af:c3:ac | S | D | VLAN1 |
| 10 | fe80::eddc:67ff:8464:d233 | 00:00:e8:88:e7:52 | S | D | VLAN1 |

The following table describes the labels in this screen.

Table 292 Management > IPv6 Neighbor Table

| LABEL | DESCRIPTION |
|---|---|
| Sort by | Select this to display and arrange the data according to IPv6 address (**Address**), MAC address (**MAC**) or IPv6 interface (**Interface**). The information is then displayed in the summary table below. |
| Index | This field displays the index number of each entry in the table. |
| Address | This field displays the IPv6 address of the Switch or a neighboring device. |
| MAC | This field displays the MAC address of the IPv6 interface on which the IPv6 address is configured or the MAC address of the neighboring device. |
| Status | This field displays whether the neighbor IPv6 interface is reachable. In IPv6, "reachable" means an IPv6 packet can be correctly forwarded to a neighbor node (host or router) and the neighbor can successfully receive and handle the packet. The available options in this field are:<br>• reachable (R): The interface of the neighboring device is reachable. (The Switch has received a response to the initial request.)<br>• stale (S): The last reachable time has expired and the Switch is waiting for a response to another initial request. The field displays this also when the Switch receives an unrequested response from the neighbor's interface.<br>• delay (D): The neighboring interface is no longer known to be reachable, and traffic has been sent to the neighbor recently. The Switch delays sending request packets for a short to give upper-layer protocols a chance to determine reachability.<br>• probe (P): The Switch is sending request packets and waiting for the neighbor's response.<br>• invalid (IV): The neighbor address is with an invalid IPv6 address.<br>• unknown (?): The status of the neighboring interface cannot be determined for some reason.<br>• incomplete (I): Address resolution is in progress and the link-layer address of the neighbor has not yet been determined. The interface of the neighboring device did not give a complete response. |
| Type | This field displays the type of an address mapping to a neighbor interface. The available options in this field are:<br>• other (O): none of the following type.<br>• local (L): A Switch interface is using the address.<br>• dynamic (D): The IP address to MAC address can be successfully resolved using IPv6 Neighbor Discovery protocol. Is it similar as IPv4 ARP (Address Resolution protocol).<br>• static (S): The interface address is statically configured. |
| Interface | This field displays the ID number of the IPv6 interface on which the IPv6 address is created or through which the neighboring device can be reached. |

# CHAPTER 71
# Port Status

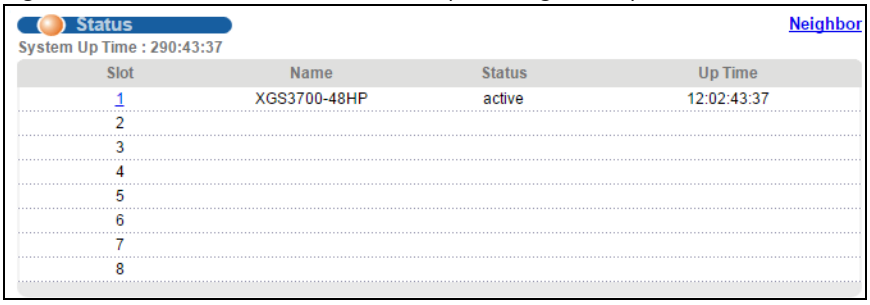
## 71.1 Overview

This chapter introduces the port status screens.

## 71.2 Status

This screen displays only when the Switch is in stacking mode and you click the **Port Status** quick link from the **Status** screen. Use this screen to view system status and click a number in the **Slot** column to display each port statistical summary on the stacked Switch.

**Figure 491** Status > Port Status: Status (Stacking Mode)




The following table describes the labels in this screen.

Table 293 Status > Port Status: Status (Stacking Mode)

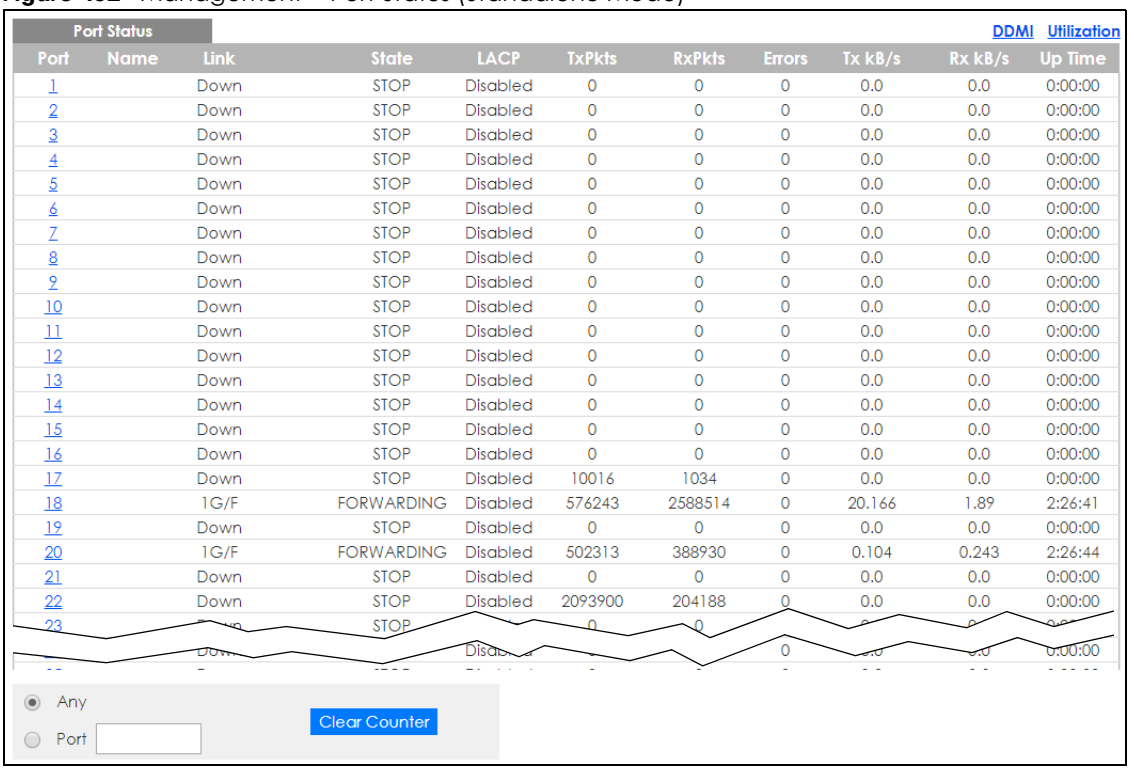
| LABEL | DESCRIPTION |
|---|---|
| System Up Time | This field displays how long the stacked Switch has been running since it last restarted or was turned on. |
| Slot | This field displays the slot ID of the stacked Switch. You can click the ID number to go to the **Port Status** screen. |
| Name | This field displays the model name of the stacked Switch. |
| Status | This field displays whether the stacked Switch is active or inactive in a stack system. |
| Up Time | This field displays the time that the active Switch in a stack has been running. |

## 71.3 Port Status

This screen displays a port statistical summary with links to each port showing statistical details. To view the port statistics, click **Status** in all Web Configurator screens and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen as shown next. You can also click

**Management** > **Port Status** to see the following screen.

**Figure 492** Management > Port Status (Standalone Mode)



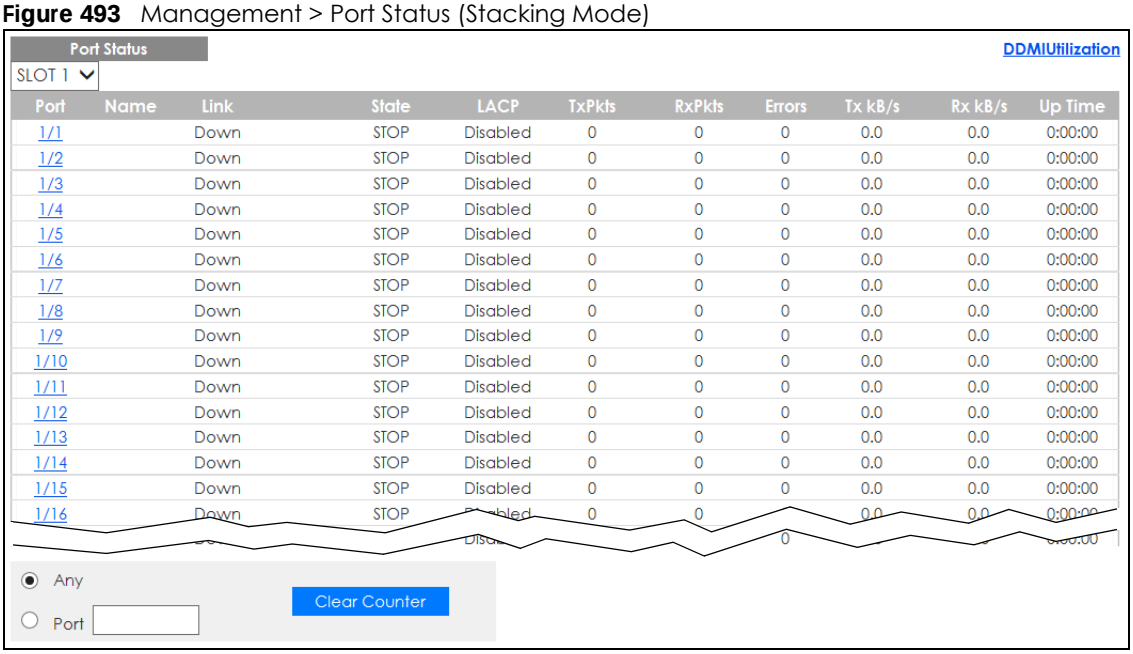
Port Status

DDMI Utilization

| Port | Name | Link | State | LACP | TxPkts | RxPkts | Errors | Tx kB/s | Rx kB/s | Up Time |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 2 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 3 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 4 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 5 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 6 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 7 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 8 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 9 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 10 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 11 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 12 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 13 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 14 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 15 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 16 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 17 | | Down | STOP | Disabled | 10016 | 1034 | 0 | 0.0 | 0.0 | 0:00:00 |
| 18 | | 1G/F | FORWARDING | Disabled | 576243 | 2588514 | 0 | 20.166 | 1.89 | 2:26:41 |
| 19 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 20 | | 1G/F | FORWARDING | Disabled | 502313 | 388930 | 0 | 0.104 | 0.243 | 2:26:44 |
| 21 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 22 | | Down | STOP | Disabled | 2093900 | 204188 | 0 | 0.0 | 0.0 | 0:00:00 |
| 23 | | | STOP | | 0 | 0 | | | | |

Any
Port
Clear Counter

**Figure 493** Management > Port Status (Stacking Mode)



Port Status

DDMIUtilization

SLOT 1

| Port | Name | Link | State | LACP | TxPkts | RxPkts | Errors | Tx kB/s | Rx kB/s | Up Time |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/1 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/2 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/3 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/4 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/5 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/6 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/7 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/8 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/9 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/10 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/11 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/12 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/13 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/14 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/15 | | Down | STOP | Disabled | 0 | 0 | 0 | 0.0 | 0.0 | 0:00:00 |
| 1/16 | | Down | STOP | | 0 | 0 | | | | |

Any
Port
Clear Counter

The following table describes the labels in this screen.

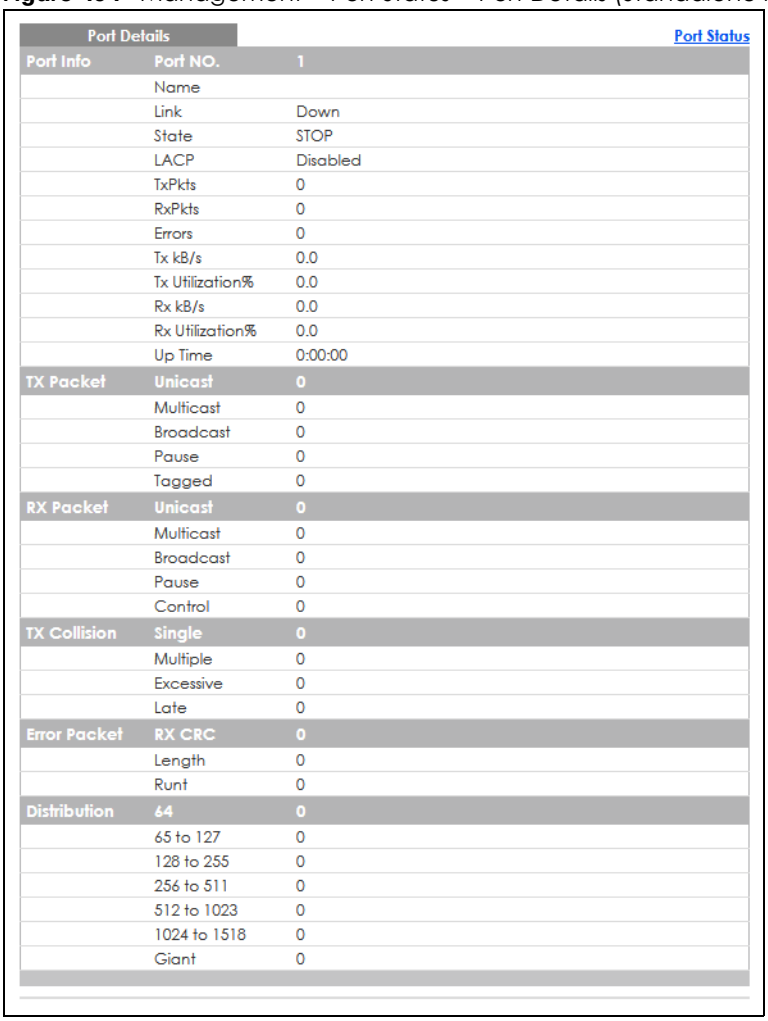
Table 294 Management > Port Status

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This identifies the Ethernet port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only.<br>Click a port number to display the **Port Details** screen. |
| Name | This is the name you assigned to this port in the **Basic Setting** > **Port Setup** screen. |
| Link | This field displays the speed (either **100M** for 100 Mbps, **1G** for 1 Gbps, **2.5G** for 2.5 Gbps, **5G** for 5 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). It also shows the cable type (**Copper** or **Fiber**) for the combo ports. This field displays **Down** if the port is not connected to any device. |
| State | If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port.<br>If STP is disabled, this field displays **FORWARDING** if the link is up, otherwise, it displays **STOP**.<br>When LACP (Link Aggregation Control Protocol) and STP are in blocking state, it displays **Blocking**. |
| LACP | This fields displays whether LACP (Link Aggregation Control Protocol) has been enabled on the port. |
| TxPkts | This field shows the number of transmitted frames on this port. |
| RxPkts | This field shows the number of received frames on this port. |
| Errors | This field shows the number of received errors on this port. |
| Tx KB/s | This field shows the number of kilobytes per second transmitted on this port. |
| Rx KB/s | This field shows the number of kilobytes per second received on this port. |
| Up Time | This field shows the total amount of time in hours, minutes and seconds the port has been up. |
| Clear Counter | Select **Port**, enter a port number and then click **Clear Counter** to erase the recorded statistical information for that port, or select **Any** to clear statistics for all ports. |

## 71.3.1 Port Details

Click a number in the **Port** column in the **Port Status** screen to display individual port statistics. Use this screen to check status and detailed performance data about an individual port on the Switch.

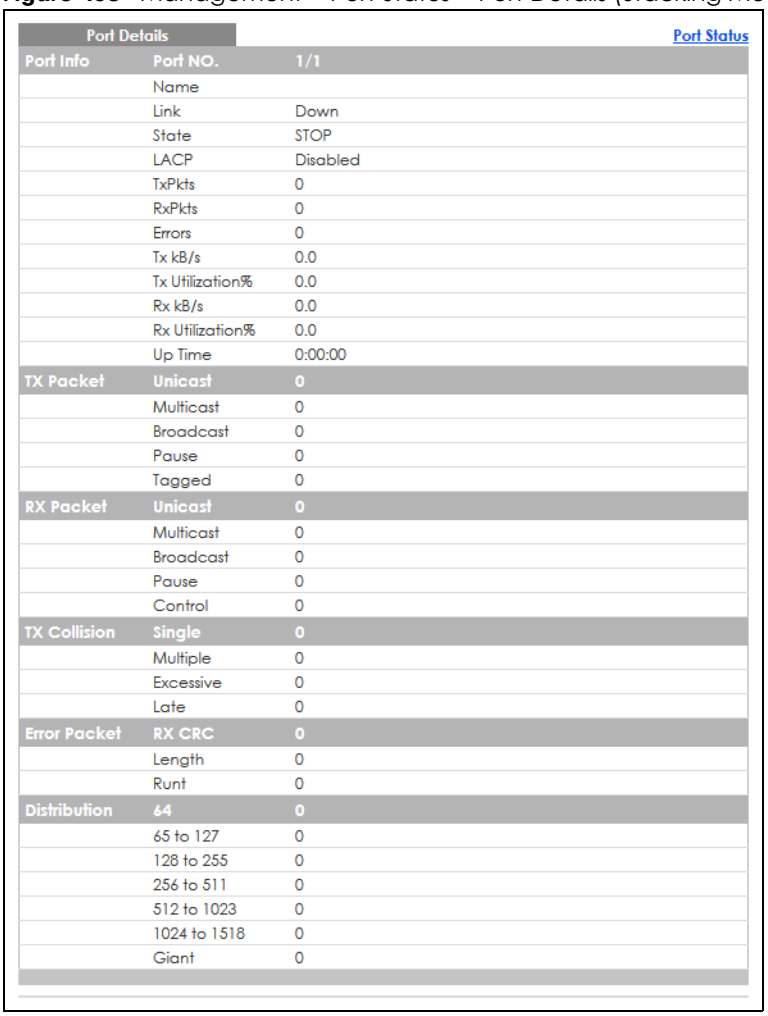
**Figure 494** Management > Port Status > Port Details (Standalone Mode)



Port Details — Port Status

| | | |
|---|---|---|
| Port Info | Port NO. | 1 |
| | Name | |
| | Link | Down |
| | State | STOP |
| | LACP | Disabled |
| | TxPkts | 0 |
| | RxPkts | 0 |
| | Errors | 0 |
| | Tx kB/s | 0.0 |
| | Tx Utilization% | 0.0 |
| | Rx kB/s | 0.0 |
| | Rx Utilization% | 0.0 |
| | Up Time | 0:00:00 |
| TX Packet | Unicast | 0 |
| | Multicast | 0 |
| | Broadcast | 0 |
| | Pause | 0 |
| | Tagged | 0 |
| RX Packet | Unicast | 0 |
| | Multicast | 0 |
| | Broadcast | 0 |
| | Pause | 0 |
| | Control | 0 |
| TX Collision | Single | 0 |
| | Multiple | 0 |
| | Excessive | 0 |
| | Late | 0 |
| Error Packet | RX CRC | 0 |
| | Length | 0 |
| | Runt | 0 |
| Distribution | 64 | 0 |
| | 65 to 127 | 0 |
| | 128 to 255 | 0 |
| | 256 to 511 | 0 |
| | 512 to 1023 | 0 |
| | 1024 to 1518 | 0 |
| | Giant | 0 |

**Figure 495** Management > Port Status > Port Details (Stacking Mode)



Port Details — Port Status

| Port Info | Port NO. | 1/1 |
|---|---|---|
| | Name | |
| | Link | Down |
| | State | STOP |
| | LACP | Disabled |
| | TxPkts | 0 |
| | RxPkts | 0 |
| | Errors | 0 |
| | Tx kB/s | 0.0 |
| | Tx Utilization% | 0.0 |
| | Rx kB/s | 0.0 |
| | Rx Utilization% | 0.0 |
| | Up Time | 0:00:00 |
| TX Packet | Unicast | 0 |
| | Multicast | 0 |
| | Broadcast | 0 |
| | Pause | 0 |
| | Tagged | 0 |
| RX Packet | Unicast | 0 |
| | Multicast | 0 |
| | Broadcast | 0 |
| | Pause | 0 |
| | Control | 0 |
| TX Collision | Single | 0 |
| | Multiple | 0 |
| | Excessive | 0 |
| | Late | 0 |
| Error Packet | RX CRC | 0 |
| | Length | 0 |
| | Runt | 0 |
| Distribution | 64 | 0 |
| | 65 to 127 | 0 |
| | 128 to 255 | 0 |
| | 256 to 511 | 0 |
| | 512 to 1023 | 0 |
| | 1024 to 1518 | 0 |
| | Giant | 0 |

The following table describes the labels in this screen.

Table 295 Management > Port Status > Port Details

| LABEL | DESCRIPTION |
|---|---|
| Port Info | |
| Port NO. | This field displays the port number you are viewing. In stacking mode, the first number represents the slot and the second the port number. |
| Name | This field displays the name of the port. |
| Link | This field displays the speed (either **100M** for 100Mbps, **1G** for 1 Gbps, **2.5G** for 2.5 Gbps, **5G** for 5 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). It also shows the cable type (**Copper** or **Fiber**) for the combo ports. This field displays **Down** if the port is not connected to any device. |
| State | If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port.<br>If STP is disabled, this field displays **FORWARDING** if the link is up, otherwise, it displays **STOP**.<br>When LACP (Link Aggregation Control Protocol), STP, and dot1x are in blocking state, it displays **Blocking**. |
| LACP | This field shows if LACP is enabled on this port or not. |
| TxPkts | This field shows the number of transmitted frames on this port. |

Table 295 Management > Port Status > Port Details (continued)

| LABEL | DESCRIPTION |
|---|---|
| RxPkts | This field shows the number of received frames on this port. |
| Errors | This field shows the number of received errors on this port. |
| Tx kB/s | This field shows the number of kilobytes per second transmitted on this port. |
| Tx Utilization% | This field shows the percentage of actual transmitted frames on this port as a percentage of the **Link** speed. |
| Rx kB/s | This field shows the number of kilobytes per second received on this port. |
| Rx Utilization% | This field shows the percentage of actual received frames on this port as a percentage of the **Link** speed. |
| Up Time | This field shows the total amount of time the connection has been up. |
| Tx Packet<br>The following fields display detailed information about packets transmitted. | |
| Unicast | This field shows the number of good unicast packets transmitted. |
| Multicast | This field shows the number of good multicast packets transmitted. |
| Broadcast | This field shows the number of good broadcast packets transmitted. |
| Pause | This field shows the number of 802.3x pause packets transmitted. |
| Tagged | This field shows the number of packets with VLAN tags transmitted. |
| Rx Packet<br>The following fields display detailed information about packets received. | |
| Unicast | This field shows the number of good unicast packets received. |
| Multicast | This field shows the number of good multicast packets received. |
| Broadcast | This field shows the number of good broadcast packets received. |
| Pause | This field shows the number of 802.3x pause packets received. |
| Control | This field shows the number of control packets received (including those with CRC error) but it does not include the 802.3x Pause packets. |
| TX Collision<br>The following fields display information on collisions while transmitting. | |
| Single | This is a count of successfully transmitted packets for which transmission is inhibited by exactly one collision. |
| Multiple | This is a count of successfully transmitted packets for which transmission was inhibited by more than one collision. |
| Excessive | This is a count of packets for which transmission failed due to excessive collisions. Excessive collision is defined as the number of maximum collisions before the retransmission count is reset. |
| Late | This is the number of times a late collision is detected, that is, after 512 bits of the packets have already been transmitted. |
| Error Packet | The following fields display detailed information about packets received that were in error. |
| RX CRC | This field shows the number of packets received with CRC (Cyclic Redundant Check) errors. |
| Length | This field shows the number of packets received with a length that was out of range. |
| Runt | This field shows the number of packets received that were too short (shorter than 64 octets), including the ones with CRC errors. |
| Distribution | |
| 64 | This field shows the number of packets (including bad packets) received that were 64 octets in length. |
| 65 to 127 | This field shows the number of packets (including bad packets) received that were between 65 and 127 octets in length. |

Table 295 Management > Port Status > Port Details (continued)

| LABEL | DESCRIPTION |
|---|---|
| 128 to 255 | This field shows the number of packets (including bad packets) received that were between 128 and 255 octets in length. |
| 256 to 511 | This field shows the number of packets (including bad packets) received that were between 256 and 511 octets in length. |
| 512 to 1023 | This field shows the number of packets (including bad packets) received that were between 512 and 1023 octets in length. |
| 1024 to 1518 | This field shows the number of packets (including bad packets) received that were between 1024 and 1518 octets in length. |
| Giant | This field shows the number of packets (including bad packets) received that were between 1519 octets and the maximum frame size.<br><br>The maximum frame size varies depending on your switch model. |

## 71.3.2 DDMI

The optical SFP transceiver's support for the Digital Diagnostics Monitoring Interface (DDMI) function lets you monitor the transceiver's parameters to perform component monitoring, fault isolation and failure prediction tasks. This allows proactive, preventative network maintenance to help ensure service continuity.

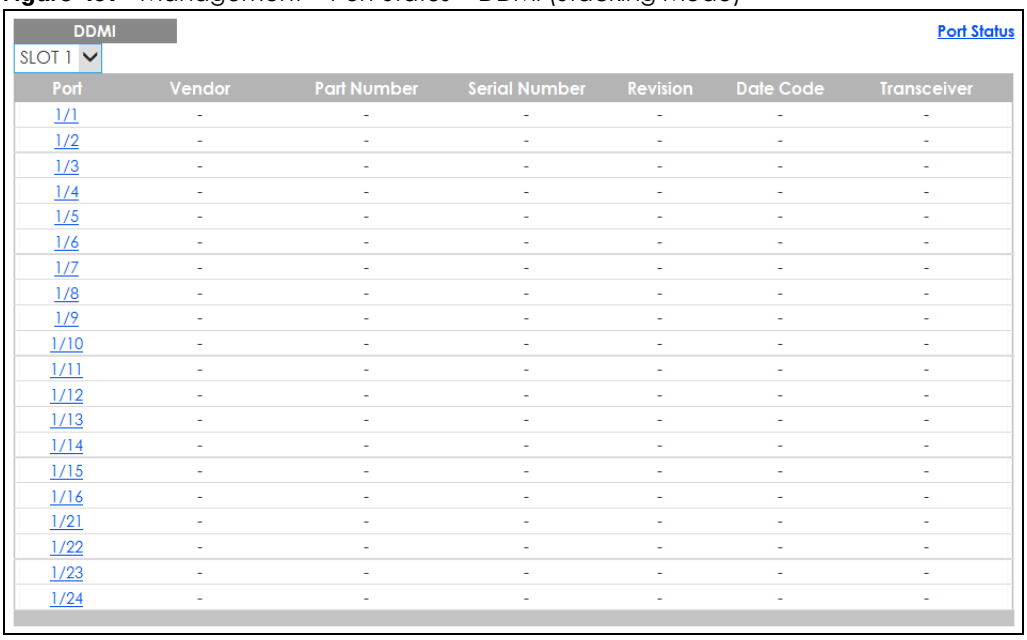
Use this screen to view the DDMI status of the Switch's SFP transceivers. Click **Management** > **Port Status** > **DDMI** to see the following screen. Alternatively, click **Status** from any Web Configurator screen and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen and then click the **DDMI** link tab.

**Figure 496** Management > Port Status > DDMI (Standalone Mode)

DDMI — Port Status

| Port | Vendor | Part Number | Serial Number | Revision | Date Code | Transceiver |
|---|---|---|---|---|---|---|
| 1 | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - |
| 3 | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - |
| 5 | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - |
| 7 | - | - | - | - | - | - |
| 8 | - | - | - | - | - | - |
| 9 | - | - | - | - | - | - |
| 10 | - | - | - | - | - | - |
| 11 | - | - | - | - | - | - |
| 12 | - | - | - | - | - | - |
| 13 | - | - | - | - | - | - |
| 14 | - | - | - | - | - | - |
| 15 | - | - | - | - | - | - |
| 16 | - | - | - | - | - | - |
| 21 | - | - | - | - | - | - |
| 22 | - | - | - | - | - | - |
| 23 | - | - | - | - | - | - |
| 24 | - | - | - | - | - | - |
| 25 | - | - | - | - | - | - |
| 26 | - | - | - | - | - | - |
| 27 | - | - | - | - | - | - |
| 28 | - | - | - | - | - | - |

**Figure 497** Management > Port Status > DDMI (Stacking Mode)




The following table describes the labels in this screen.

Table 296 Management > Port Status > DDMI

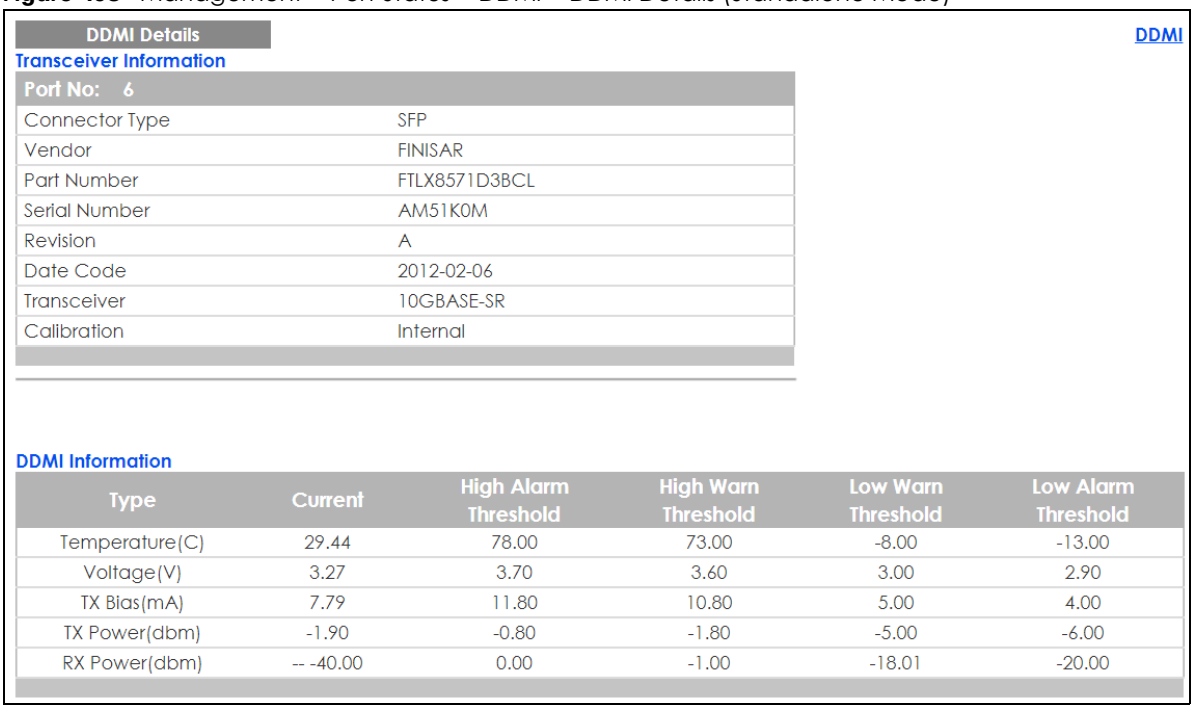
| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This identifies the SFP port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Vendor | This displays the vendor name of the optical transceiver. |
| Part Number | This displays the part number of the optical transceiver. |
| Serial Number | This displays the serial number of the optical transceiver. |
| Revision | This displays the revision number of the optical transceiver. |
| Date Code | This displays the date when the optical transceiver was manufactured. |
| Transceiver | This displays the type of transceiver installed in the SGP slot. |

## 71.3.3 DDMI Details

Use this screen to view the real-time SFP (Small Form Factor Pluggable) transceiver information and operating parameters on the SFP port. The parameters include, for example, transmitting and receiving power, and module temperature.

Click a number in the **Port** column in the **DDMI** screen to view current transceivers' status.

**Figure 498** Management > Port Status > DDMI > DDMI Details (Standalone Mode)



DDMI Details

DDMI

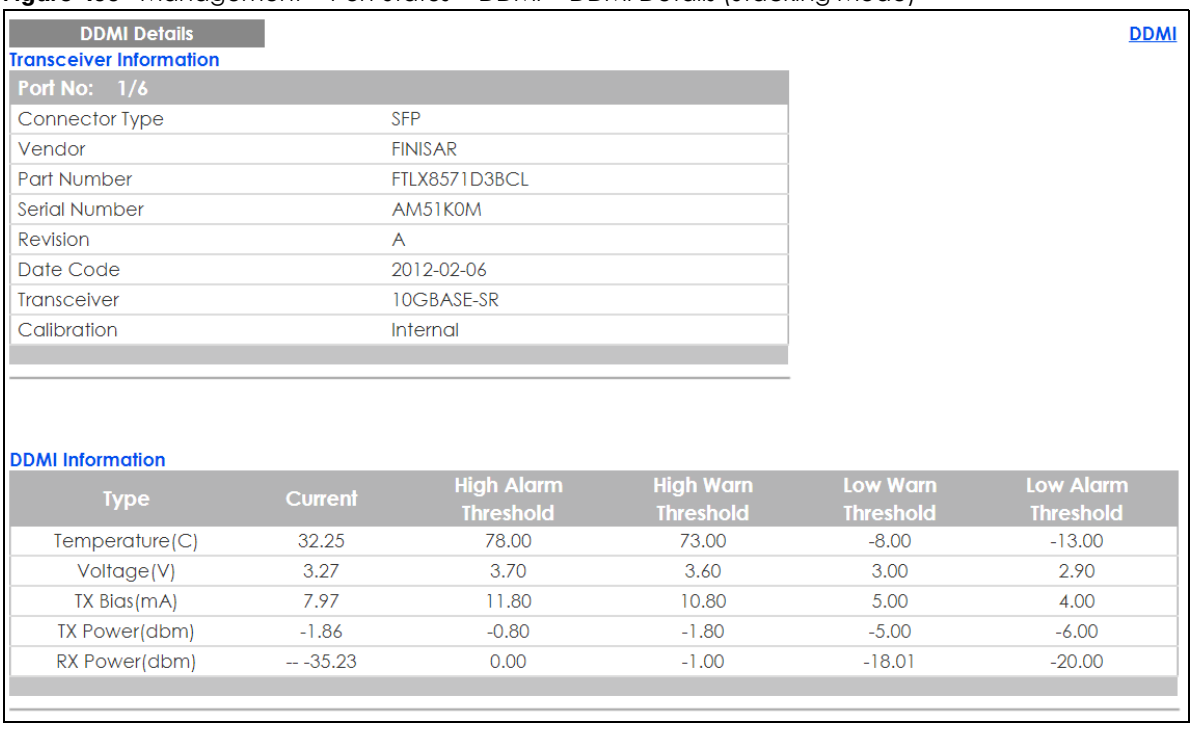
Transceiver Information

| Port No: 6 | |
|---|---|
| Connector Type | SFP |
| Vendor | FINISAR |
| Part Number | FTLX8571D3BCL |
| Serial Number | AM51K0M |
| Revision | A |
| Date Code | 2012-02-06 |
| Transceiver | 10GBASE-SR |
| Calibration | Internal |

DDMI Information

| Type | Current | High Alarm Threshold | High Warn Threshold | Low Warn Threshold | Low Alarm Threshold |
|---|---|---|---|---|---|
| Temperature(C) | 29.44 | 78.00 | 73.00 | -8.00 | -13.00 |
| Voltage(V) | 3.27 | 3.70 | 3.60 | 3.00 | 2.90 |
| TX Bias(mA) | 7.79 | 11.80 | 10.80 | 5.00 | 4.00 |
| TX Power(dbm) | -1.90 | -0.80 | -1.80 | -5.00 | -6.00 |
| RX Power(dbm) | -- -40.00 | 0.00 | -1.00 | -18.01 | -20.00 |

**Figure 499** Management > Port Status > DDMI > DDMI Details (Stacking Mode)



DDMI Details

DDMI

Transceiver Information

| Port No: 1/6 | |
|---|---|
| Connector Type | SFP |
| Vendor | FINISAR |
| Part Number | FTLX8571D3BCL |
| Serial Number | AM51K0M |
| Revision | A |
| Date Code | 2012-02-06 |
| Transceiver | 10GBASE-SR |
| Calibration | Internal |

DDMI Information

| Type | Current | High Alarm Threshold | High Warn Threshold | Low Warn Threshold | Low Alarm Threshold |
|---|---|---|---|---|---|
| Temperature(C) | 32.25 | 78.00 | 73.00 | -8.00 | -13.00 |
| Voltage(V) | 3.27 | 3.70 | 3.60 | 3.00 | 2.90 |
| TX Bias(mA) | 7.97 | 11.80 | 10.80 | 5.00 | 4.00 |
| TX Power(dbm) | -1.86 | -0.80 | -1.80 | -5.00 | -6.00 |
| RX Power(dbm) | -- -35.23 | 0.00 | -1.00 | -18.01 | -20.00 |

The following table describes the labels in this screen.

Table 297 Management > Port Status > DDMI > DDMI Details

| LABEL | DESCRIPTION |
|---|---|
| Transceiver Information | |
| Port No | This identifies the SFP port. In stacking mode, the first number represents the slot and the second the port number. |
| Connector Type | This displays the connector type of the optical transceiver. |
| Vendor | This displays the vendor name of the optical transceiver. |
| Part Number | This displays the part number of the optical transceiver. |
| Serial Number | This displays the serial number of the optical transceiver. |
| Revision | This displays the revision number of the optical transceiver. |
| Date Code | This displays the date when the optical transceiver was manufactured. |
| Transceiver | This displays details about the type of transceiver installed in the SFP slot. |
| Calibration | This field is available only when an SFP transceiver is inserted into the SFP slot.<br>**Internal** displays if the measurement values are calibrated by the transceiver. **External** displays if the measurement values are raw data which the Switch calibrates. |
| DDMI Information | |
| Type | This displays the DDMI parameter. |
| Temperature (C/F) | This displays the temperature inside the SFP transceiver in degrees Celsius or Fahrenheit. |
| Voltage (V) | This displays the level of voltage being supplied to the SFP transceiver. |
| TX Bias (mA) | This displays the milliamps (mA) being supplied to the SFP transceiver's Laser Diode Transmitter. |
| TX Power (dbm) | This displays the amount of power the SFP transceiver is transmitting. |
| RX Power (dbm) | This displays the amount of power the SFP transceiver is receiving from the fiber cable. |
| Current | This displays the current status for each monitored DDMI parameter. |
| High Alarm Threshold | This displays the high value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value. |
| High Warn Threshold | This displays the high value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value. |
| Low Warn Threshold | This displays the low value warning threshold for each monitored DDMI parameter. A warning signal is reported to the Switch if the monitored DDMI parameter reaches this value. |
| Low Alarm Threshold | This displays the low value alarm threshold for each monitored DDMI parameter. An alarm signal is reported to the Switch if the monitored DDMI parameter reaches this value. |

## 71.3.4 Port Utilization

This screen displays the percentage of actual transmitted or received frames on a port as a percentage of the **Link** speed. To view port utilization, click **Management** > **Port Status** > **Port Utilization** to see the following screen. Alternatively, click **Status** from any Web Configurator screen and then the **Port Status** link in the **Quick Links** section of the **Status** screen to display the **Port Status** screen and then click the **Utilization** link tab.

**Figure 500** Management > Port Status > Utilization (Standalone Mode)

Port Utilization — Port Status

| Port | Link | Tx kB/s | Tx Utilization% | Rx kB/s | Rx Utilization% |
|---|---|---|---|---|---|
| 1 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | 1G/F | 0.55 | 0.0 | 0.164 | 0.0 |
| 19 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | 1G/F | 0.164 | 0.0 | 0.55 | 0.0 |
| 21 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 22 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 23 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 24 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 25 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 26 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | Down | 0.0 | 0.0 | 0.0 | 0.0 |

**Figure 501** Management > Port Status > Utilization (Stacking Mode)

Port Utilization — Port Status

SLOT 1

| Port | Link | Tx kB/s | Tx Utilization% | Rx kB/s | Rx Utilization% |
|---|---|---|---|---|---|
| 1/1 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/2 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/3 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/4 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/5 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/6 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/7 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/8 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/9 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/10 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/11 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/12 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/13 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/14 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/15 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/16 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/17 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/18 | 1G/F | 0.635 | 0.0 | 0.644 | 0.0 |
| 1/19 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/20 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/21 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/22 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/23 | Down | 0.0 | 0.0 | 0.0 | 0.0 |
| 1/24 | Down | 0.0 | 0.0 | 0.0 | 0.0 |

The following table describes the labels in this screen.

Table 298 Management > Port Status > Utilization

| LABEL | DESCRIPTION |
|---|---|
| SLOT | This field appears only in stacking mode. Click the drop-down list to choose the slot number of the Switch in a stack. |
| Port | This identifies the Ethernet port. In stacking mode, the first number represents the slot ID and the second is the port number. Please note that the default stacking ports (the last four ports of your Switch) cannot be configured. They are reserved for stacking only. |
| Link | This field displays the speed (either **100M** for 100Mbps, **1G** for 1 Gbps, **2.5G** for 2.5 Gbps, **5G** for 5 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). It also shows the cable type (**Copper** or **Fiber**) for the combo ports. This field displays **Down** if the port is not connected to any device. |
| Tx kB/s | This field shows the transmission speed of data sent on this port in kilobytes per second. |
| Tx Utilization% | This field shows the percentage of actual transmitted frames on this port as a percentage of the **Link** speed. |
| Rx KB/s | This field shows the transmission speed of data received on this port in kilobytes per second. |
| Rx Utilization% | This field shows the percentage of actual received frames on this port as a percentage of the **Link** speed. |

# CHAPTER 72
# Service Register

This chapter shows you how to view service license information.

## 72.1 Service Register Overview

Switch requires a license to use certain services.You can register your Switch and manage Switch licenses at www.myzyxel.com.

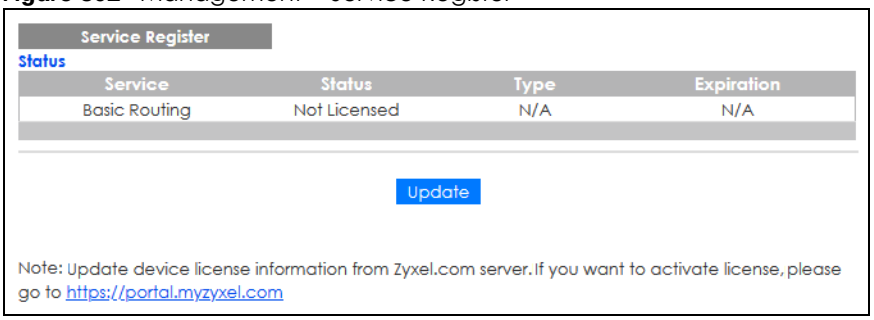
See Table 1 on page 29 for the new services supported when you purchase a Basic Routing License.

Note: You can configure licensed features without a license, but the features will not work.

## 72.2 Service Register Screen

Click **Management** > **Service Register** to display the screen as shown. Use this screen to display the status of your service registration. Go to myZyxel to activate the subscription.

**Figure 502** Management > Service Register




The following table describes the labels in this screen.

Table 299 Management > Service Register

| LABEL | DESCRIPTION |
|---|---|
| Service | This lists the name of the service that is available on the Switch. |
| Status | This field displays whether the service license is enabled at myZyxel (**Licensed**) or not (**Not Licensed**). |

Table 299 Management > Service Register (continued)

| LABEL | DESCRIPTION |
|---|---|
| Type | **Trial** indicates a 30-day trial service license is currently applied on the Switch.<br>**Standard** indicates a service license is registered at www.myzyxel.com.<br>**N/A** is displayed if the service license is not registered. |
| Expiration | This field displays the amount of time remaining before your trial license expires.<br>Note: You can enable a standard license at myZyxel if the trial license expires. |
| Update | Click this button to renew service license information (such as the registration status and expiration day).<br>Note: It is recommended you use this button after you register for a new service. |

# CHAPTER 73
# Networked AV Mode

## 73.1 Overview

Aside from the Web Configurator in Standard mode that has a complete set of configuration for network installation, you can switch to Networked AV mode. Networked AV mode contains just the necessary configurations for setting up and managing audio-video traffic on your network.

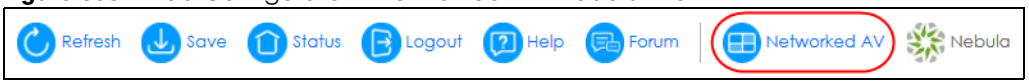
AV over IP is the transmission of audio-video data over an IP network.

Use a browser that supports HTML5, such Microsoft Edge, Internet Explorer 11, Mozilla Firefox, or Google Chrome. The recommended minimum screen resolution is 1024 by 768 pixels.

The following sections introduces the configuration and functions of the Web Configurator In Networked AV mode.

Click **Networked AV** at the top right of the Web Configurator to switch between the Web Configurator's **Standard** or **Networked AV** mode.

**Figure 503** Web Configurator – Networked AV Mode Switch

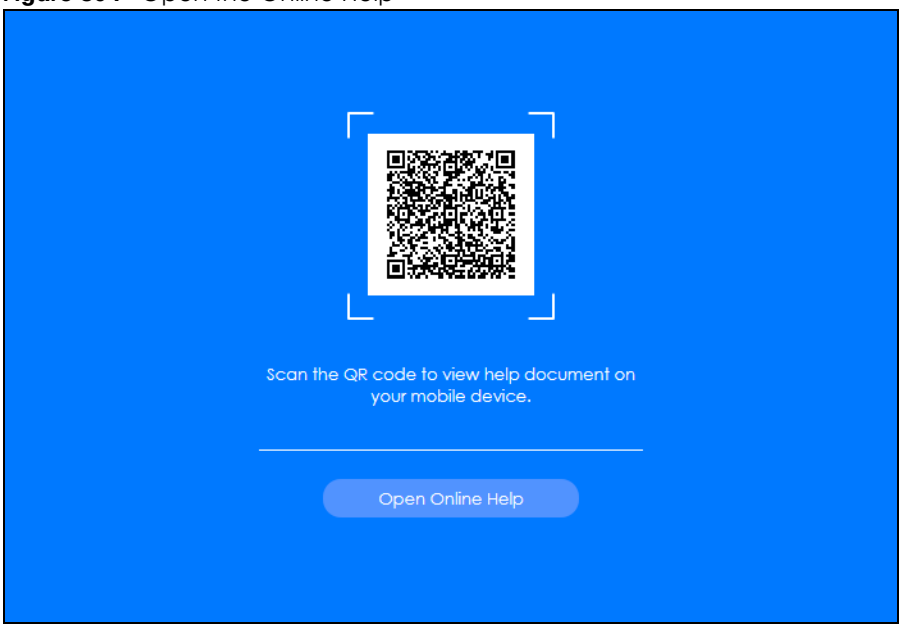



## 73.2 Help

The Web Configurator's online help has descriptions of individual Networked AV mode screens and some supplementary information.

Click the **Help** link from a Web Configurator screen to scan the QR code or click the web link to display the online help.

**Figure 504** Open the Online Help

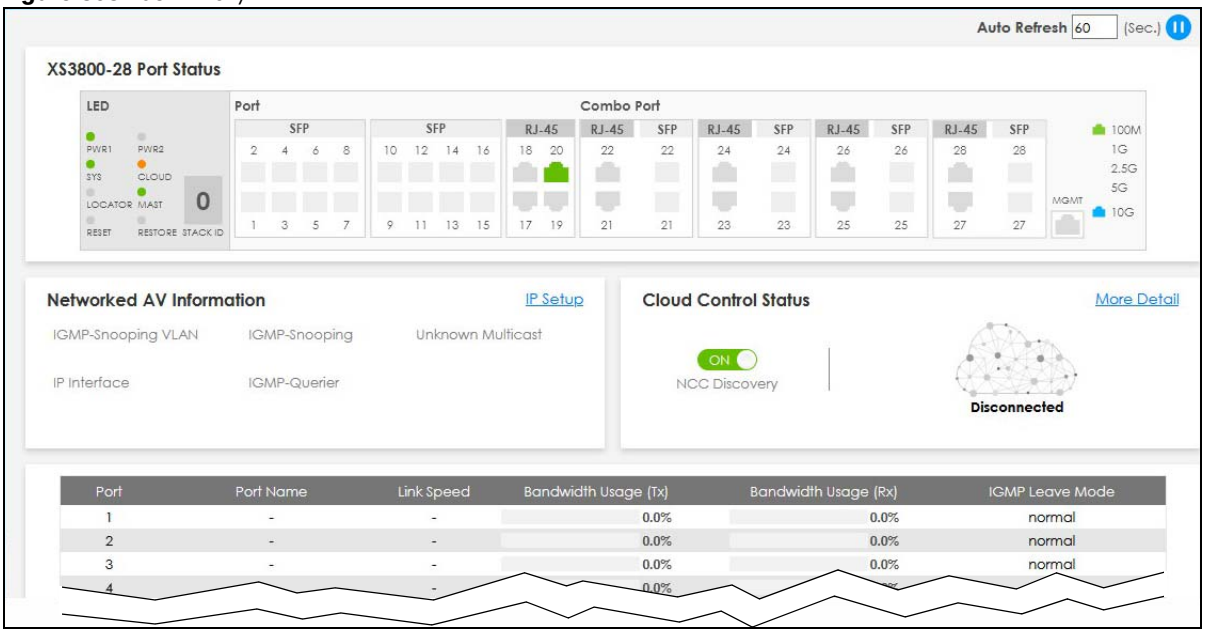



# 73.3 Summary

Use the **Summary** screen to see the Switch's front panel port status, connected ports information, networked AV information, Nebula Cloud Control status, and a link to go to the **IP Setup** screen (Section 77.1 on page 657).

The **Summary** screen displays when you log into the Switch in Networked AV mode.

**Figure 505** Summary



The following table describes the labels in this screen.

Table 300 Summary

| LABEL | DESCRIPTION |
|---|---|
| Auto Refresh | Enter the number of seconds when the **Summary** screen details will be updated. Click the Pause or Play icon to stop or resume the screen update, or to update the automatic refresh interval. |
| Port Status | This chart displays the status of the Switch's front panel ports with connection (**LED**, **Port**, and **Combo Port**). |
| Networked AV Information | |
| IP Setup | This link takes you to a screen where you can configure the IP address and subnet mask (necessary for Switch management) and set up to 128 IP routing domains. |
| IGMP-Snooping VLAN | This displays the ID number of the VLAN group upon which the Switch is to perform IGMP snooping. |
| IGMP Snooping | This displays **Active** when IGMP snooping is enabled to forward group multicast traffic only to ports that are members of that group.<br>Otherwise, it is **Inactive**. |
| Unknown Multicast | This displays the action to perform when the Switch receives an unknown multicast frame.<br>It displays **Drop** when the frames are discarded.<br>It displays **Flooding** when the frames are sent to all ports.<br>It displays **Drop on VLAN** when the frames are discarded on the specified VLANs. |
| IP Interface | This displays the IP address of the Switch for it to be managed over the network. |
| IGMP-Querier | This displays **Active** when the Switch is allowed to send IGMP General Query messages to the VLANs with the multicast hosts attached.<br>Otherwise, it is **Inactive**. |
| Cloud Control Status | This displays the registration and connection status between the Switch and the NCC (Nebula Control Center).<br>Click **More Detail** to go to **System** > **Cloud Management** screen. |
| Port | This displays the port of this Switch. |
| Port Name | This displays the port description of this Switch. |
| Link Speed | This displays the speed (either **100M** for 100 Mbps, **1G** for 1 Gbps, **2.5G** for 2.5 Gbps, **5G** for 5 Gbps, or **10G** for 10 Gbps) and the duplex (**F** for full duplex or **H** for half). It also shows the cable type (**Copper** or **Fiber**) for the combo ports. This field displays **Down** if the port is not connected to any device. |
| Bandwidth Usage (Tx)<br>Bandwidth Usage (Rx) | These display the percentage of bandwidth usage on this port as a percentage of the **Link Speed**. |
| IGMP Leave Mode | This displays **immediate** when the Switch receives IGMP leave packets, the Switch will close the multicast stream immediately without any further action.<br>This displays **fast** when the Switch will further generate a group specific query packet to all the receivers. This could prevent the traffic being cut if some receivers still want to receive the multicast stream.<br>This displays **normal** when the Switch receives an IGMP leave message from a host on a port, it forwards the message to the multicast router. The multicast router then sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. The Switch forwards the query message to all hosts connected to the port and waits for IGMP reports from hosts to update the forwarding table for this port. |

# CHAPTER 74
# System

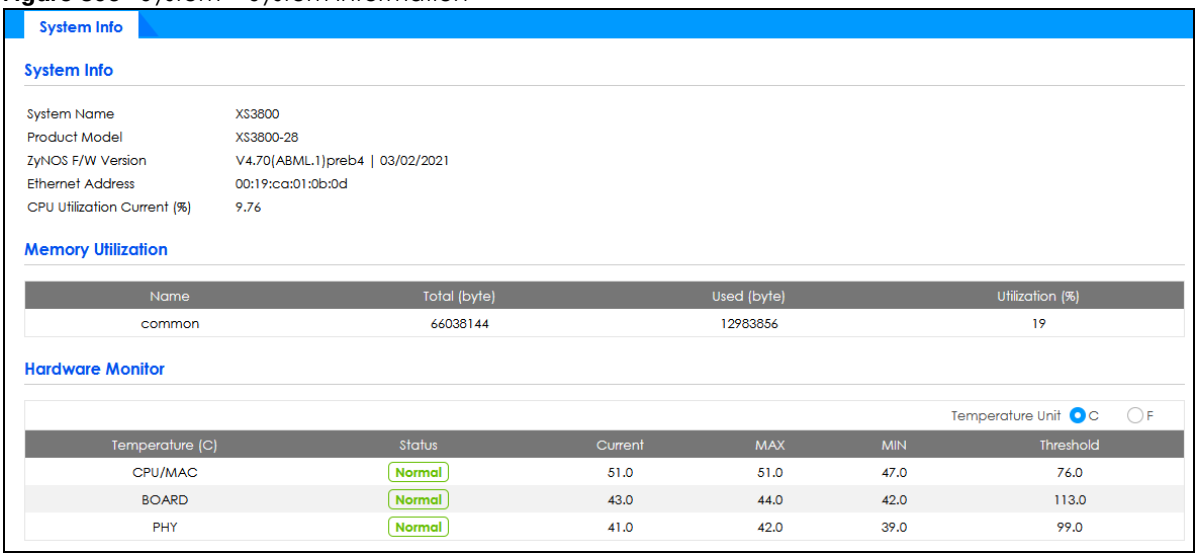
## 74.1 What You Can Do

- Use the **System Information** screen (Section 74.2 on page 626) to check the firmware version number and monitor the Switch temperature.
- Use the **General Setup** screen (Section 74.3 on page 627) to configure general settings such as the system name and time.

## 74.2 System Information

In the navigation panel, click **System** > **System Information** to display the screen as shown. Use this screen to view general system information. You can check the firmware version number and monitor the Switch temperature.

**Figure 506** System > System Information




The following table describes the labels in this screen.

Table 301 System > System Information

| LABEL | DESCRIPTION |
|---|---|
| System Name | This field displays the descriptive name of the Switch for identification purposes. |
| Product Model | This field displays the product model of the Switch. Use this information when searching for firmware upgrade or looking for other support information in the website. |

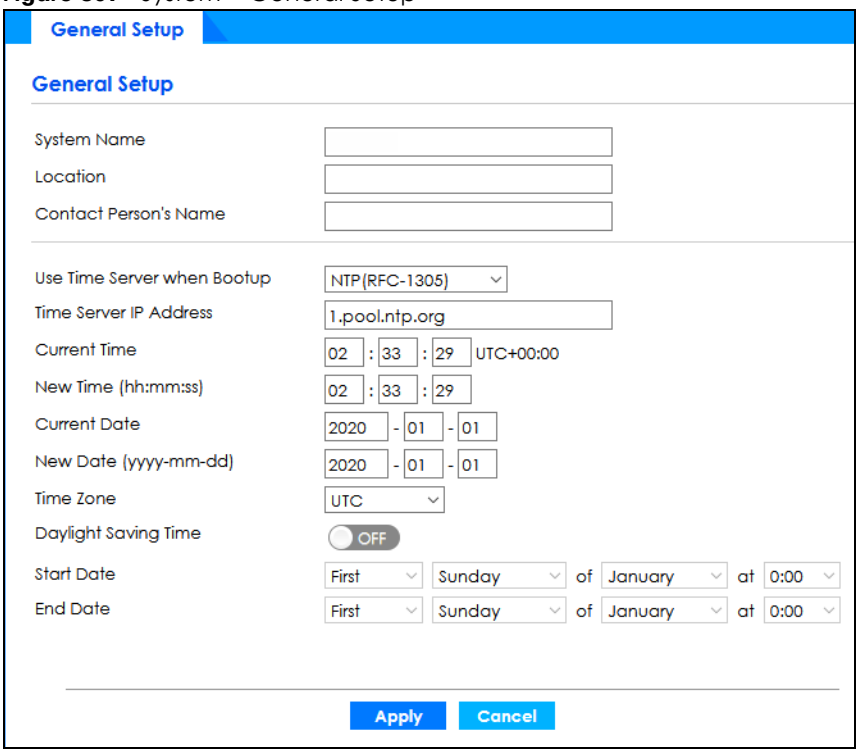
Table 301 System > System Information (continued)

| LABEL | DESCRIPTION |
|---|---|
| ZyNOS F/W Version | This field displays the version number of the Switch 's current firmware including the creation date. |
| Ethernet Address | This field refers to the Ethernet MAC (Media Access Control) address of the Switch. |
| CPU Utilization Current (%) | CPU utilization quantifies how busy the system is. **Current (%)** displays the current percentage of CPU utilization. |
| Memory Utilization | Memory utilization shows how much DRAM memory is available and in use. It also displays the current percentage of memory utilization. |
| Name | This field displays the name of memory pool. |
| Total (byte) | This field displays the total number of bytes in this memory pool. |
| Used (byte) | This field displays the number of bytes being used in this memory pool. |
| Utilization (%) | This field displays the percentage (%) of memory being used in this memory pool. |
| Hardware Monitor | |
| Temperature Unit | The Switch has temperature sensors that are capable of detecting and reporting if the temperature rises above the threshold. You may choose the temperature unit (Centigrade or Fahrenheit) in this field. |
| Status | This field displays **Normal** for temperatures below the threshold and **Error** for those above. |
| Current | This shows the current temperature at this sensor. |
| MAX | This field displays the maximum temperature measured at this sensor. |
| MIN | This field displays the minimum temperature measured at this sensor. |
| Threshold | This field displays the upper temperature limit at this sensor. |

# 74.3 General Setup

Use this screen to configure general settings such as the system name and time. Click **System** > **General Setup** in the navigation panel to display the screen as shown.

**Figure 507** System > General Setup




The following table describes the labels in this screen.

Table 302 System > General Setup

| LABEL | DESCRIPTION |
|---|---|
| System Name | Choose a descriptive name for identification purposes. This name consists of up to 64 printable characters; spaces are allowed. |
| Location | Enter the geographic location of your Switch. You can use up to 128 printable ASCII characters; spaces are allowed. |
| Contact Person's Name | Enter the name of the person in charge of this Switch. You can use up to 32 printable ASCII characters; spaces are allowed. |
| Use Time Server when Bootup | Enter the time service protocol that your time server uses. Not all time servers support all protocols, so you may have to use trial and error to find a protocol that works. The main differences between them are the time format.<br><br>When you select the **Daytime (RFC 867)** format, the Switch displays the day, month, year and time with no time zone adjustment. When you use this format it is recommended that you use a Daytime timeserver within your geographical time zone.<br><br>**Time (RFC-868)** format displays a 4-byte integer giving the total number of seconds since 2020/1/1 at 0:0:0.<br><br>**NTP (RFC-1305)** is similar to **Time (RFC-868)**.<br><br>**None** is the default value. Enter the time manually. Each time you turn on the Switch, the time and date will be reset to 2020-1-1 0:0:0. |
| Time Server IP Address | Enter the IP address or domain name of your timeserver. The Switch searches for the timeserver for up to 60 seconds. |
| Current Time | This field displays the time you open this menu (or refresh the menu). |
| New Time (hh:mm:ss) | Enter the new time in hour, minute and second format. The new time then appears in the **Current Time** field after you click **Apply**. |
| Current Date | This field displays the date you open this menu. |

Table 302 System > General Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| New Date (yyyy-mm-dd) | Enter the new date in year, month and day format. The new date then appears in the **Current Date** field after you click **Apply**. |
| Time Zone | Select the time difference between UTC (Universal Time Coordinated, formerly known as GMT, Greenwich Mean Time) and your time zone from the drop-down list box. |
| Daylight Saving Time | Daylight saving is a period from late spring to early fall when many countries set their clocks ahead of normal local time by one hour to give more daytime light in the evening.<br><br>Set the switch to **ON** if you use Daylight Saving Time. |
| Start Date | Configure the day and time when Daylight Saving Time starts if you selected **Daylight Saving Time**. The time is displayed in the 24 hour format. Here are a couple of examples:<br><br>Daylight Saving Time starts in most parts of the United States on the second Sunday of March. Each time zone in the United States starts using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **Second**, **Sunday**, **March** and **2:00**.<br><br>Daylight Saving Time starts in the European Union on the last Sunday of March. All of the time zones in the European Union start using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **March** and the last field depends on your time zone. In Germany for instance, you would select **2:00** because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). |
| End Date | Configure the day and time when Daylight Saving Time ends if you selected **Daylight Saving Time**. The time field uses the 24 hour format. Here are a couple of examples:<br><br>Daylight Saving Time ends in the United States on the first Sunday of November. Each time zone in the United States stops using Daylight Saving Time at 2 A.M. local time. So in the United States you would select **First**, **Sunday**, **November** and **2:00**.<br><br>Daylight Saving Time ends in the European Union on the last Sunday of October. All of the time zones in the European Union stop using Daylight Saving Time at the same moment (1 A.M. GMT or UTC). So in the European Union you would select **Last**, **Sunday**, **October** and the last field depends on your time zone. In Germany for instance, you would select **2:00** because Germany's time zone is one hour ahead of GMT or UTC (GMT+1). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 75
# Port

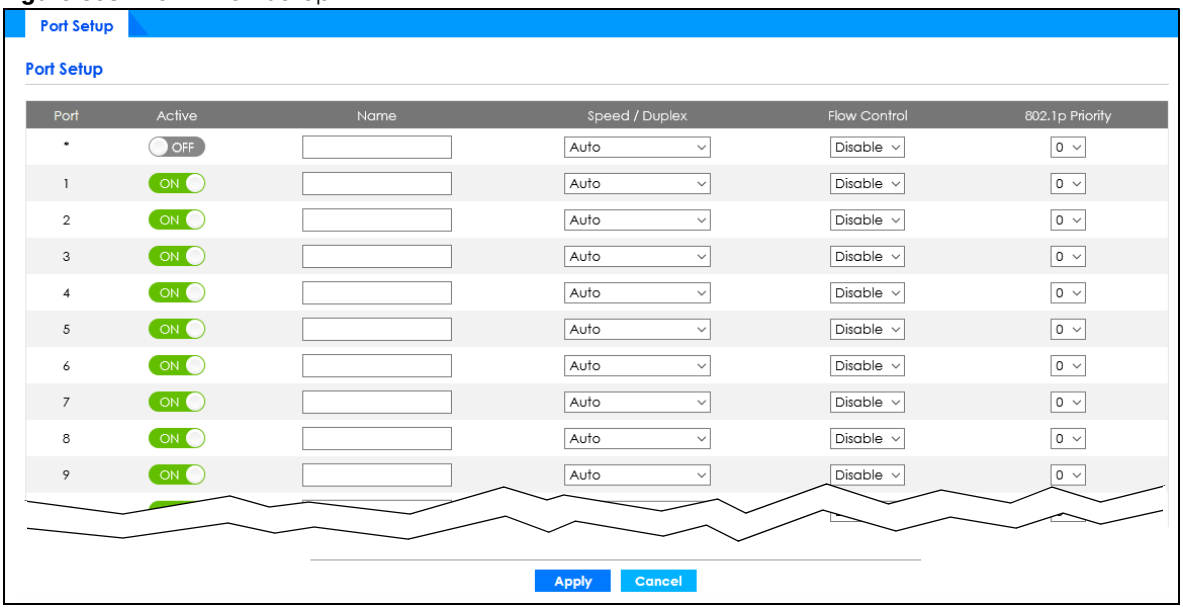
## 75.1 What You Can Do

- Use the **Port Setup** screen (Section 75.2 on page 630) to configure Switch port settings.

## 75.2 Port Setup

Use this screen to configure Switch port settings. Click **Port** > **Port Setup** in the navigation panel to display the configuration screen.

**Figure 508** Port > Port Setup




The following table describes the labels in this screen.

Table 303 Port > Port Setup

| LABEL | DESCRIPTION |
|---|---|
| Port | This is the port index number. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Note: Changes in this row are copied to all the ports as soon as you make them. |

Table 303 Port > Port Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Active | Select this check box to enable a port. The factory default for all ports is enabled. A port must be enabled for data transmission to occur. |
| Name | Enter a descriptive name that identifies this port. You can enter up to 128 ASCII characters except [ ? ], [ \| ], [ ' ] or [ " ].<br><br>Note: Due to space limitation, the port name may be truncated in some Web Configurator screens. |
| Speed/Duplex | Select the speed and the duplex mode of the Ethernet connection on this port. The choices are **Auto**, **Auto-1G**, **2.5G / Full Duplex**, **5G / Full Duplex**, and **100M / Full Duplex** for a 100Base-T connection. **1G / Full Duplex** is supported by both 1000Base-T and 1000Base-X connections. **10G / Full Duplex** is supported by the 10 Gigabit Ethernet connections on the Switch that has a 10 Gigabit interface.<br><br>Selecting **Auto-1G** or **Auto** (auto-negotiation) allows one port to negotiate with a peer port automatically to obtain the connection speed and duplex mode that both ends support. When auto-negotiation is turned on, a port on the Switch negotiates with the peer automatically to determine the connection speed and duplex mode. If the peer port does not support auto-negotiation or turns off this feature, the Switch determines the connection speed by detecting the signal on the cable and using half duplex mode. When the Switch's auto-negotiation is turned off, a port uses the pre-configured speed and duplex mode when making a connection, thus requiring you to make sure that the settings of the peer port are the same in order to connect. |
| Flow Control | A concentration of traffic on a port decreases port bandwidth and overflows buffer memory causing packet discards and frame losses. **Flow Control** is used to regulate transmission of signals to match the bandwidth of the receiving port.<br><br>The Switch uses IEEE 802.3x flow control in full duplex mode and back pressure flow control in half duplex mode.<br><br>IEEE 802.3x flow control is used in full duplex mode to send a pause signal to the sending port, causing it to temporarily stop sending signals when the receiving port memory buffers fill.<br><br>Back Pressure flow control is typically used in half duplex mode to send a "collision" signal to the sending port (mimicking a state of packet collision) causing the sending port to temporarily stop sending signals and resend later.<br><br>Select **Tx Rx** to allow the Switch port to send pause signal to the connected device, and for the connected device to send a pause signal to the Switch. The Switch will temporarily stop sending signals after receiving pause signal.<br><br>Select **Tx** to allow the Switch port to send pause signal to the connected device.<br><br>Select **Rx** to allow the connected device to send a pause signal to the Switch. The Switch will temporarily stop sending signals. This is the default (recommended) setting to prevent data overload.<br><br>Otherwise, select **Disable**. |
| 802.1p Priority | This priority value is added to incoming frames without a (802.1p) priority queue tag. See **Priority Queue Assignment** in Table 28 on page 112 for more information. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

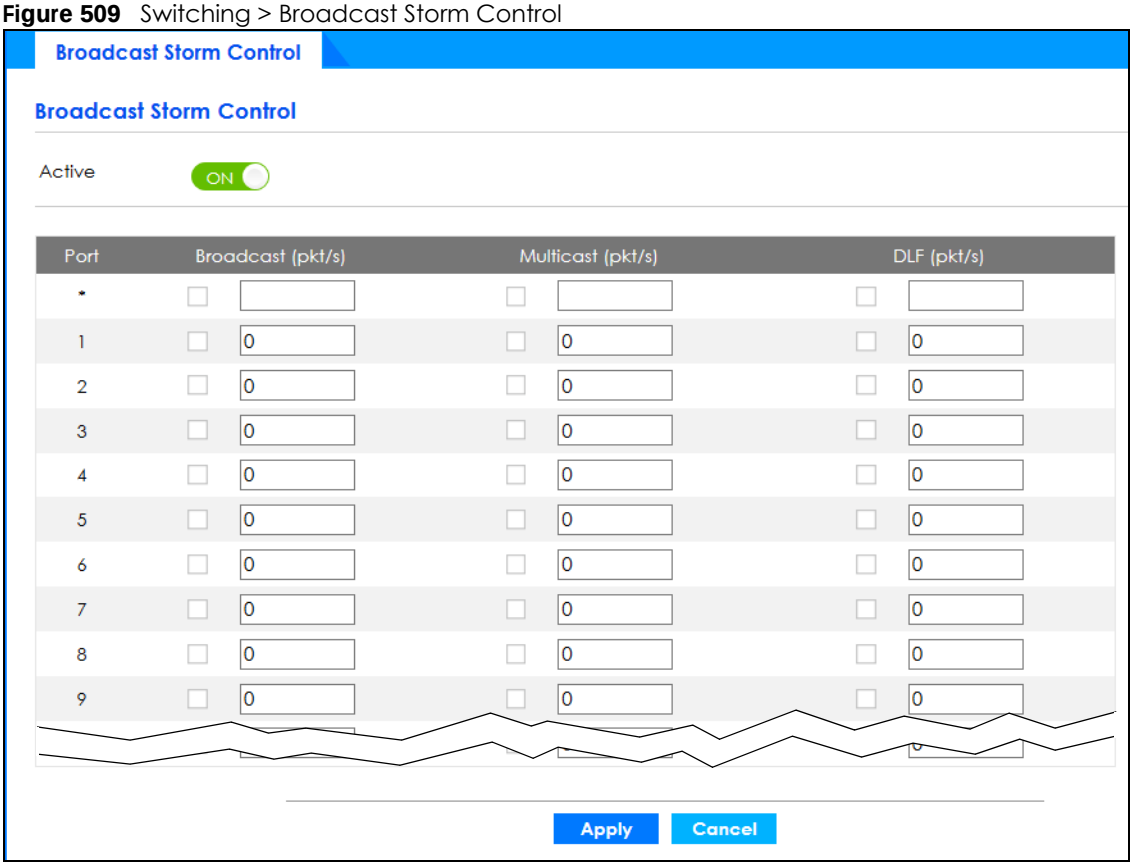
# CHAPTER 76
# Switching

## 76.1 Broadcast Storm Control

Broadcast storm control limits the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports. When the maximum number of allowable broadcast, multicast and/or DLF packets is reached per second, the subsequent packets are discarded. Enable this feature to reduce broadcast, multicast and/or DLF packets in your network. You can specify limits for each packet type on each port.

Click **Switching** > **Broadcast Storm Control** in the navigation panel to display the screen as shown next.

**Figure 509** Switching > Broadcast Storm Control



The following table describes the labels in this screen.

Table 304 Security > Broadcast Storm Control

| LABEL | DESCRIPTION |
|---|---|
| Active | Set this switch to **ON** to enable traffic storm control on the Switch. Otherwise, select **OFF** to disable this feature. |
| Port | This field displays the port number. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Broadcast (pkt/s) | Select this option and specify how many broadcast packets the port receives per second. |
| Multicast (pkt/s) | Select this option and specify how many multicast packets the port receives per second. |
| DLF (pkt/s) | Select this option and specify how many destination lookup failure (DLF) packets the port receives per second. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields. |

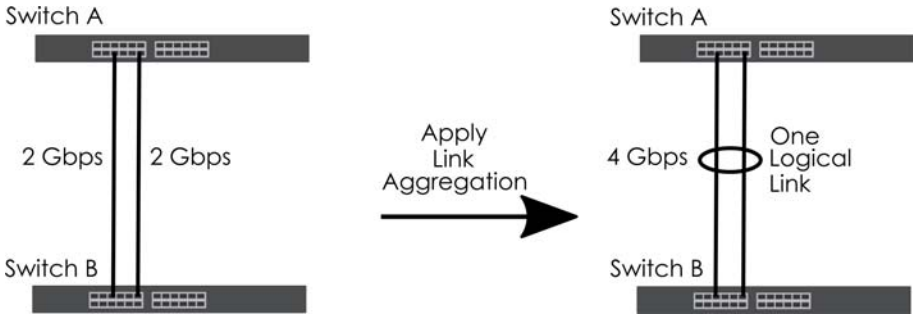
# 76.2 Link Aggregation

This section shows you how to logically aggregate physical links to form one logical, higher-bandwidth link.

Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. You may want to trunk ports if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link. However, the more ports you aggregate then the fewer available ports you have. A trunk group is one logical link containing multiple ports.

The beginning port of each trunk group must be physically connected to form a trunk group.

**Figure 510** Link Aggregation




## 76.2.1 What You Can Do

- Use the **Link Aggregation Status** screen (Section 76.3 on page 634) to view ports you have configured to be in the trunk group, ports that are currently transmitting data as one logical link in the trunk group and so on.

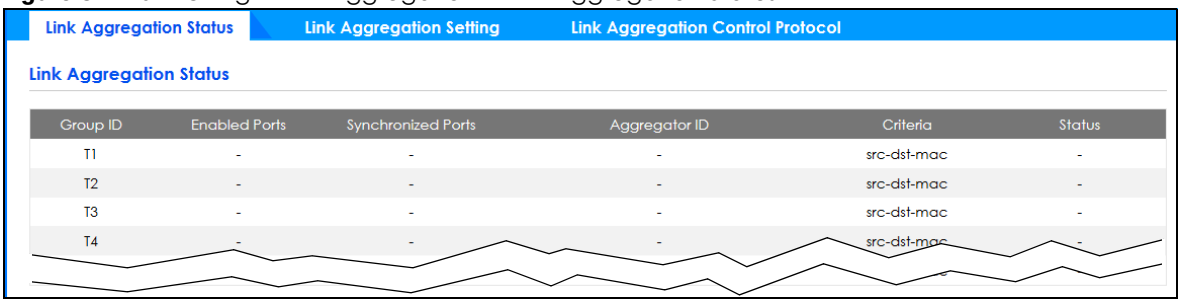
- Use the **Link Aggregation Setting** screen (Section 76.4 on page 635) to configure to enable static link aggregation.
- Use the **Link Aggregation Control Protocol** screen (Section 76.5 on page 637) to enable Link Aggregation Control Protocol (LACP).

# 76.3 Link Aggregation Status

Use the **Link Aggregation Status** screen to view ports you have configured to be in the trunk group, ports that are currently transmitting data as one logical link in the trunk group and so on.

Click **Switching** > **Link Aggregation** > **Link Aggregation Status** in the navigation panel.

**Figure 511** Switching > Link Aggregation > Link Aggregation Status




The following table describes the labels in this screen.

Table 305 Switching > Link Aggregation > Link Aggregation Status

| LABEL | DESCRIPTION |
|---|---|
| Group ID | This field displays the group ID to identify a trunk group, that is, one logical link containing multiple ports. |
| Enabled Ports | These are the ports you have configured in the **Link Aggregation** screen to be in the trunk group.<br>The port numbers displays only when this trunk group is activated and there is a port belonging to this group. |
| Synchronized Ports | These are the ports that are currently transmitting data as one logical link in this trunk group. |
| Aggregator ID | Link Aggregator ID consists of the following: system priority, MAC address, key, port priority and port number.<br>The ID displays only when there is a port belonging to this trunk group and LACP is also enabled for this group. |

Table 305 Switching > Link Aggregation > Link Aggregation Status (continued)

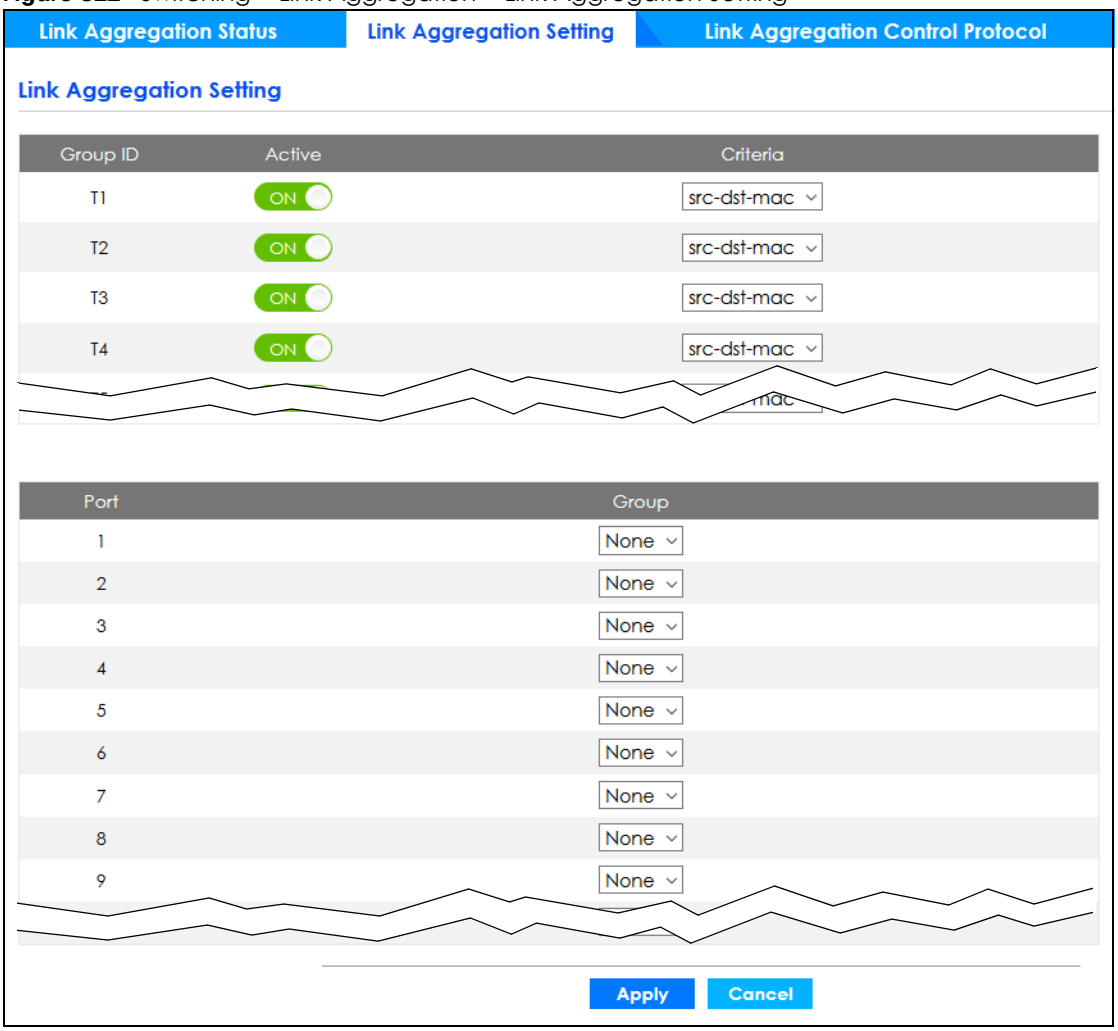
| LABEL | DESCRIPTION |
|---|---|
| Criteria | This shows the outgoing traffic distribution algorithm used in this trunk group. Packets from the same source and/or to the same destination are sent over the same link within the trunk.<br>**src-mac** means the Switch distributes traffic based on the packet's source MAC address.<br>**dst-mac** means the Switch distributes traffic based on the packet's destination MAC address.<br>**src-dst-mac** means the Switch distributes traffic based on a combination of the packet's source and destination MAC addresses.<br>**src-ip** means the Switch distributes traffic based on the packet's source IP address.<br>**dst-ip** means the Switch distributes traffic based on the packet's destination IP address.<br>**src-dst-ip** means the Switch distributes traffic based on a combination of the packet's source and destination IP addresses. |
| Status | This field displays how these ports were added to the trunk group. It displays:<br>• **Static** – if the ports are configured as static members of a trunk group.<br>• **LACP** – if the ports are configured to join a trunk group through LACP. |

# 76.4 Link Aggregation Setting

Use the **Link Aggregation Setting** screen to enable static link. Link aggregation (trunking) is the grouping of physical ports into one logical higher-capacity link. You may want to trunk ports if for example, it is cheaper to use multiple lower-speed links than to under-utilize a high-speed, but more costly, single-port link. However, the more ports you aggregate then the fewer available ports you have. A trunk group is one logical link containing multiple ports.

Click **Switching** > **Link Aggregation** > **Link Aggregation Setting** to display the screen shown next.

**Figure 512** Switching > Link Aggregation > Link Aggregation Setting




The following table describes the labels in this screen.

Table 306 Switching > Link Aggregation > Link Aggregation Setting

| LABEL | DESCRIPTION |
|---|---|
| Link Aggregation Setting | This is the only screen you need to configure to enable static link aggregation. |
| Group ID | The field identifies the link aggregation group, that is, one logical link containing multiple ports. |
| Active | Set this switch to on to activate a trunk group. |

Table 306 Switching > Link Aggregation > Link Aggregation Setting (continued)

| LABEL | DESCRIPTION |
|---|---|
| Criteria | Select the outgoing traffic distribution type. Packets from the same source and/or to the same destination are sent over the same link within the trunk. By default, the Switch uses the **src-dst-mac** distribution type. If the Switch is behind a router, the packet's destination or source MAC address will be changed. In this case, set the Switch to distribute traffic based on its IP address to make sure port trunking can work properly.<br>Select **src-mac** to distribute traffic based on the packet's source MAC address.<br>Select **dst-mac** to distribute traffic based on the packet's destination MAC address.<br>Select **src-dst-mac** to distribute traffic based on a combination of the packet's source and destination MAC addresses.<br>Select **src-ip** to distribute traffic based on the packet's source IP address.<br>Select **dst-ip** to distribute traffic based on the packet's destination IP address.<br>Select **src-dst-ip** to distribute traffic based on a combination of the packet's source and destination IP addresses. |
| Port | This field displays the port number. |
| Group | Select the trunk group to which a port belongs.<br>Note: When you enable the port security feature on the Switch and configure port security settings for a port, you cannot include the port in an active trunk group. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 76.5 Link Aggregation Control Protocol

When you enable LACP link aggregation on a port, the port can automatically negotiate with the ports at the remote end of a link to establish trunk groups. LACP also allows port redundancy, that is, if an operational port fails, then one of the "standby" ports become operational without user intervention.

Click **Switching** > **Link Aggregation** > **Link Aggregation Control Protocol** to display the screen shown next.

**Figure 513** Switching > Link Aggregation > Link Aggregation Control Protocol

The following table describes the labels in this screen.

Table 307 Switching > Link Aggregation > Link Aggregation Control Protocol

| LABEL | DESCRIPTION |
|---|---|
| Link Aggregation Control Protocol | Note: Do NOT configure this screen unless you want to enable dynamic link aggregation. |
| Active | Set this switch to **ON** to enable Link Aggregation Control Protocol (LACP). |
| System Priority | LACP system priority is a number between 1 and 65535. The switch with the lowest system priority (and lowest port number if system priority is the same) becomes the LACP "server". The LACP "server" controls the operation of LACP setup. Enter a number to set the priority of an active port using Link Aggregation Control Protocol (LACP). The smaller the number, the higher the priority level. |
| Group ID | The field identifies the link aggregation group, that is, one logical link containing multiple ports. |
| LACP Active | Select this option to enable LACP for a trunk. |
| Port | This field displays the port number. |

Table 307 Switching > Link Aggregation > Link Aggregation Control Protocol (continued)

| LABEL | DESCRIPTION |
|---|---|
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| LACP Timeout | Timeout is the time interval between the individual port exchanges of LACP packets in order to check that the peer port in the trunk group is still up. If a port does not respond after three tries, then it is deemed to be "down" and is removed from the trunk. Set a short timeout (one second) for busy trunked links to ensure that disabled ports are removed from the trunk group as soon as possible.<br>Select either 1 second or 30 seconds. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 76.6 VLAN

This section shows you how to configure 802.1Q tagged and port-based VLANs.

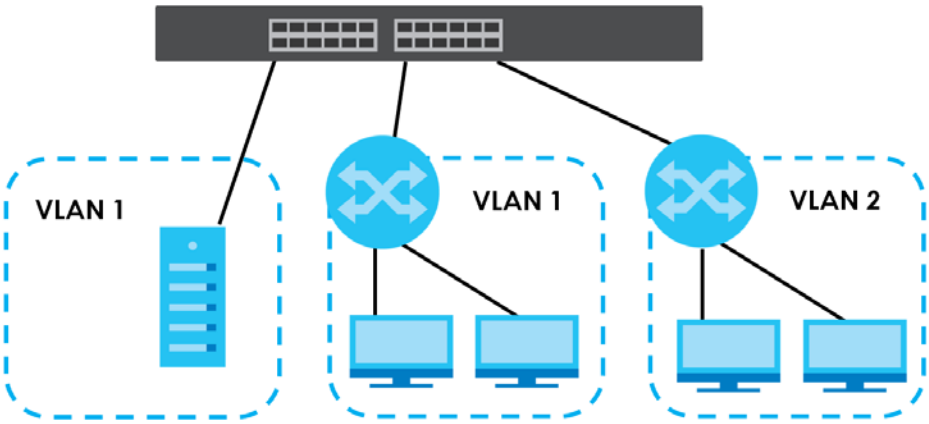
## 76.6.1 What You Can Do

- Use the **VLAN Status** screen (Section 76.7 on page 642) to view and search all static VLAN groups.
- Use the **VLAN Detail** screen (Section 76.7.1 on page 643) to view detailed port settings and status of the static VLAN group.
- Use the **Static VLAN** screen (Section 76.8 on page 644) to configure a static VLAN for the Switch.
- Use the **VLAN Port Setting** screen (Section 76.9 on page 646) to configure the static VLAN (IEEE 802.1Q) settings on a port.

## 76.6.2 What You Need to Know

Read this section to know more about VLAN and how to configure the screens.

**Figure 514** Shared Server Using VLAN Example




## IEEE 802.1Q Tagged VLANs

A tagged VLAN uses an explicit tag (VLAN ID) in the MAC header to identify the VLAN membership of a frame across bridges – they are not confined to the switch on which they were created. The VLANs can be created statically by hand dynamically through GVRP. The VLAN ID associates a frame with a specific VLAN and provides the information that switches need to process the frame across the network. A tagged frame is 4 bytes longer than an untagged frame and contains 2 bytes of TPID (Tag Protocol Identifier, residing within the type or length field of the Ethernet frame) and 2 bytes of TCI (Tag Control Information, starts after the source address field of the Ethernet frame).

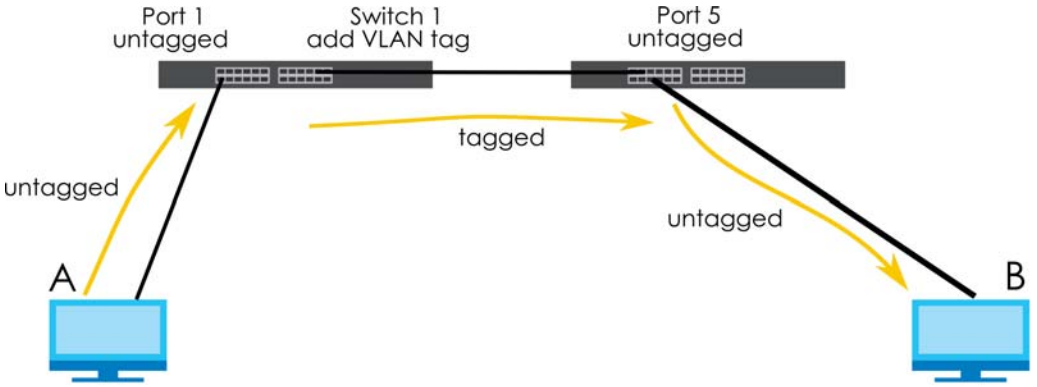
The CFI (Canonical Format Indicator) is a single-bit flag, always set to zero for Ethernet switches. If a frame received at an Ethernet port has a CFI set to 1, then that frame should not be forwarded as it is to an untagged port. The remaining twelve bits define the VLAN ID, giving a possible maximum number of 4,096 VLANs. Note that user priority and VLAN ID are independent of each other. A frame with VID (VLAN Identifier) of null (0) is called a priority frame, meaning that only the priority level is significant and the default VID of the ingress port is given as the VID of the frame. Of the 4,096 possible VIDs, a VID of 0 is used to identify priority frames and value 4095 (FFF) is reserved, so the maximum possible VLAN configurations are 4,094.

| TPID | User Priority | CFI | VLAN ID |
|---|---|---|---|
| 2 Bytes | 3 Bits | 1 Bit | 12 bits |

## Forwarding Tagged and Untagged Frames

Each port on the Switch is capable of passing tagged or untagged frames. To forward a frame from an 802.1Q VLAN-aware switch to an 802.1Q VLAN-unaware switch, the Switch first decides where to forward the frame and then strips off the VLAN tag. To forward a frame from an 802.1Q VLAN-unaware switch to an 802.1Q VLAN-aware switch, the Switch first decides where to forward the frame, and then inserts a VLAN tag reflecting the ingress port's default VID. The default PVID is VLAN 1 for all ports, but this can be changed.

**Figure 515** VLAN Forwarding Frame




A broadcast frame (or a multicast frame for a multicast group that is known by the system) is duplicated only on ports that are members of the VID (except the ingress port itself), thus confining the broadcast to a specific domain.

### 76.6.2.1 Automatic VLAN Registration

GARP and GVRP are the protocols used to automatically register VLAN membership across switches.

#### GARP

GARP (Generic Attribute Registration Protocol) allows network switches to register and de-register attribute values with other GARP participants within a bridged LAN. GARP is a protocol that provides a generic mechanism for protocols that serve a more specific application, for example, GVRP.

#### GARP Timers

Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values.

#### GVRP

GVRP (GARP VLAN Registration Protocol) is a registration protocol that defines a way for switches to register necessary VLAN members on ports across the network. Enable this function to permit VLAN groups beyond the local Switch.

Please refer to the following table for common IEEE 802.1Q VLAN terminology.

Table 308 IEEE 802.1Q VLAN Terminology

| VLAN PARAMETER | TERM | DESCRIPTION |
|---|---|---|
| VLAN Type | Permanent VLAN | This is a static VLAN created manually. |
| | Dynamic VLAN | This is a VLAN configured by a GVRP registration or de-registration process. |
| VLAN Administrative Control | Registration Fixed | Fixed registration ports are permanent VLAN members. |
| | Registration Forbidden | Ports with registration forbidden are forbidden to join the specified VLAN. |
| | Normal Registration | Ports dynamically join a VLAN using GVRP. |

Table 308 IEEE 802.1Q VLAN Terminology (continued)

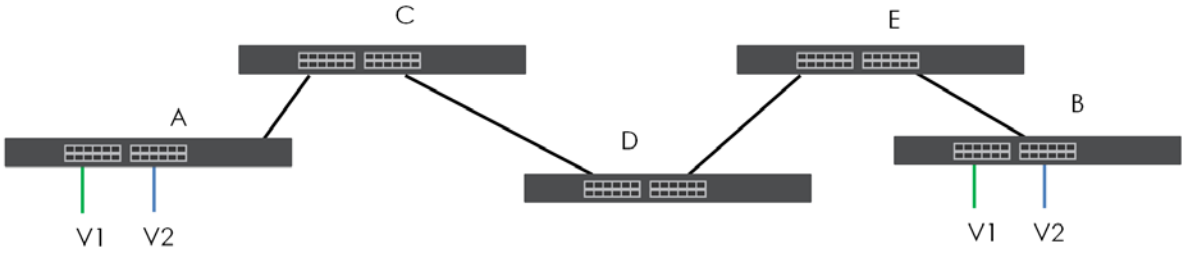
| VLAN PARAMETER | TERM | DESCRIPTION |
|---|---|---|
| VLAN Tag Control | Tagged | Ports belonging to the specified VLAN tag all outgoing frames transmitted. |
| | Untagged | Ports belonging to the specified VLAN do not tag all outgoing frames transmitted. |
| VLAN Port | Port VID | This is the VLAN ID assigned to untagged frames that this port received. |
| | Acceptable Frame Type | You may choose to accept both tagged and untagged incoming frames, just tagged incoming frames or just untagged incoming frames on a port. |
| | Ingress filtering | If set, the Switch discards incoming frames for VLANs that do not have this port as a member. |

### 76.6.2.2 Port VLAN Trunking

Enable **VLAN Trunking** on a port to allow frames belonging to unknown VLAN groups to pass through that port. This is useful if you want to set up VLAN groups on end devices without having to configure the same VLAN groups on intermediary devices.

Refer to the following figure. Suppose you want to create VLAN groups 1 and 2 (V1 and V2) on devices A and B. Without **VLAN Trunking**, you must configure VLAN groups 1 and 2 on all intermediary switches C, D and E; otherwise they will drop frames with unknown VLAN group tags. However, with **VLAN Trunking** enabled on ports in each intermediary switch you only need to create VLAN groups in the end devices (A and B). C, D and E automatically allow frames with VLAN group tags 1 and 2 (VLAN groups that are unknown to those switches) to pass through their VLAN trunking ports.

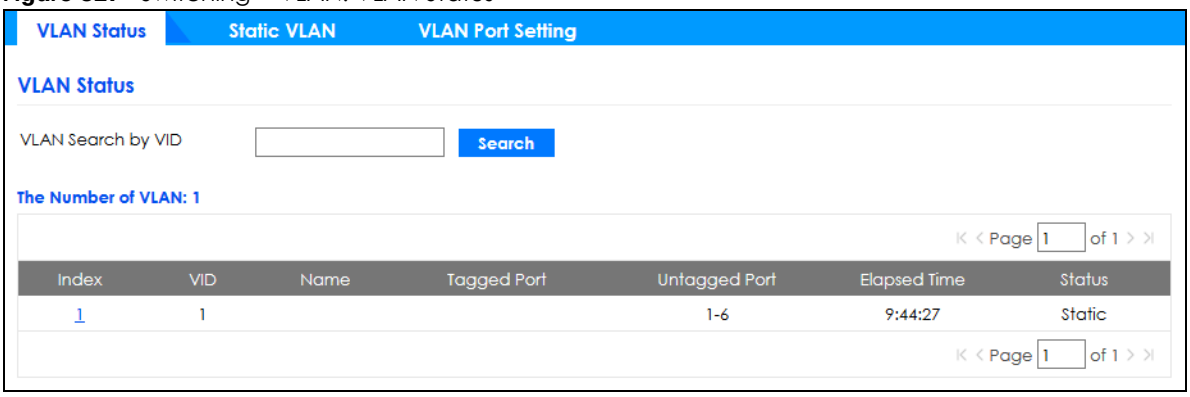
**Figure 516** Port VLAN Trunking




# 76.7 VLAN Status

Use this screen to view and search all static VLAN groups. Click **Switching** > **VLAN** from the navigation panel to display the **VLAN Status** screen as shown next.

**Figure 517** Switching > VLAN: VLAN Status




The following table describes the labels in this screen.

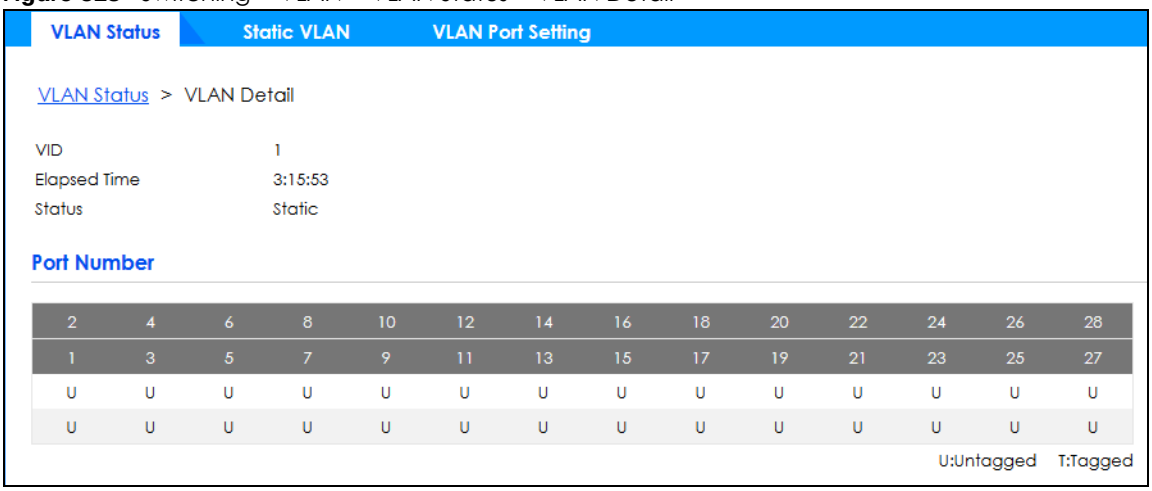
Table 309 Switching > VLAN: VLAN Status

| LABEL | DESCRIPTION |
|---|---|
| VLAN Search by VID | Enter existing VLAN ID numbers (separated by a comma) and click **Search** to display only the specified VLANs in the list below.<br>Leave this field blank and click **Search** to display all VLANs configured on the Switch. |
| The Number of VLAN | This is the number of VLANs configured on the Switch. |
| The Number of Search Results | This is the number of VLANs that match the searching criteria and display in the list below.<br>This field displays only when you use the **Search** button to look for certain VLANs. |
| Index | This is the VLAN index number. Click on an index number to view more VLAN details. |
| VID | This is the VLAN identification number that was configured in the corresponding VLAN configuration screen. |
| Name | This fields shows the descriptive name of the VLAN. |
| Tagged Port | This field shows the tagged ports that are participating in the VLAN. |
| Untagged Port | This field shows the untagged ports that are participating in the VLAN. |
| Elapsed Time | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up. |
| Status | This field shows how this VLAN was added to the Switch.<br>**Static**: added as a permanent entry. |
| Page | Click the forward or back icon to show the previous or next screen if all status information cannot be seen in one screen. Or enter the page number. |

## 76.7.1 VLAN Detail

Use this screen to view detailed port settings and status of the static VLAN group. Click an index number in the **VLAN Status** screen to display VLAN details.

**Figure 518** Switching > VLAN > VLAN Status > VLAN Detail




The following table describes the labels in this screen.

Table 310 Switching > VLAN > VLAN Status > VLAN Detail

| LABEL | DESCRIPTION |
|---|---|
| VLAN Status | Click this to go to the **VLAN Status** screen. |
| VID | This is the VLAN identification number that was configured in the corresponding VLAN configuration screen. |
| Elapsed Time | This field shows how long it has been since a normal VLAN was registered or a static VLAN was set up. |
| Status | This field shows how this VLAN was added to the Switch.<br>**Static**: added as a permanent entry. |
| Port Number | This column displays the ports that are participating in a VLAN. A tagged port is marked as **T**, an untagged port is marked as **U** and ports not participating in a VLAN are marked as "**–**". |

# 76.8 Static VLAN

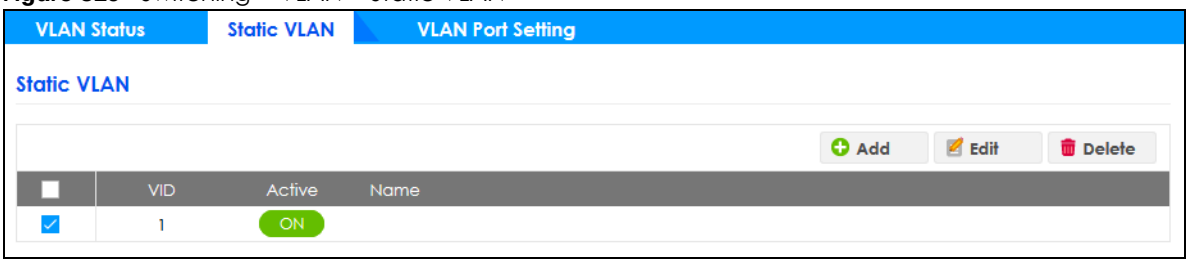
Use a static VLAN to decide whether an incoming frame on a port should be

- sent to a VLAN group as normal depending on its VLAN tag.
- sent to a group whether it has a VLAN tag or not.
- blocked from a VLAN group regardless of its VLAN tag.

You can also tag all outgoing frames (that were previously untagged) from a port with the specified VID.

Use this screen to view static VLAN status for the Switch. Click **Switching** > **VLAN** > **Static VLAN** to display the screen as shown next.

**Figure 519** Switching > VLAN > Static VLAN



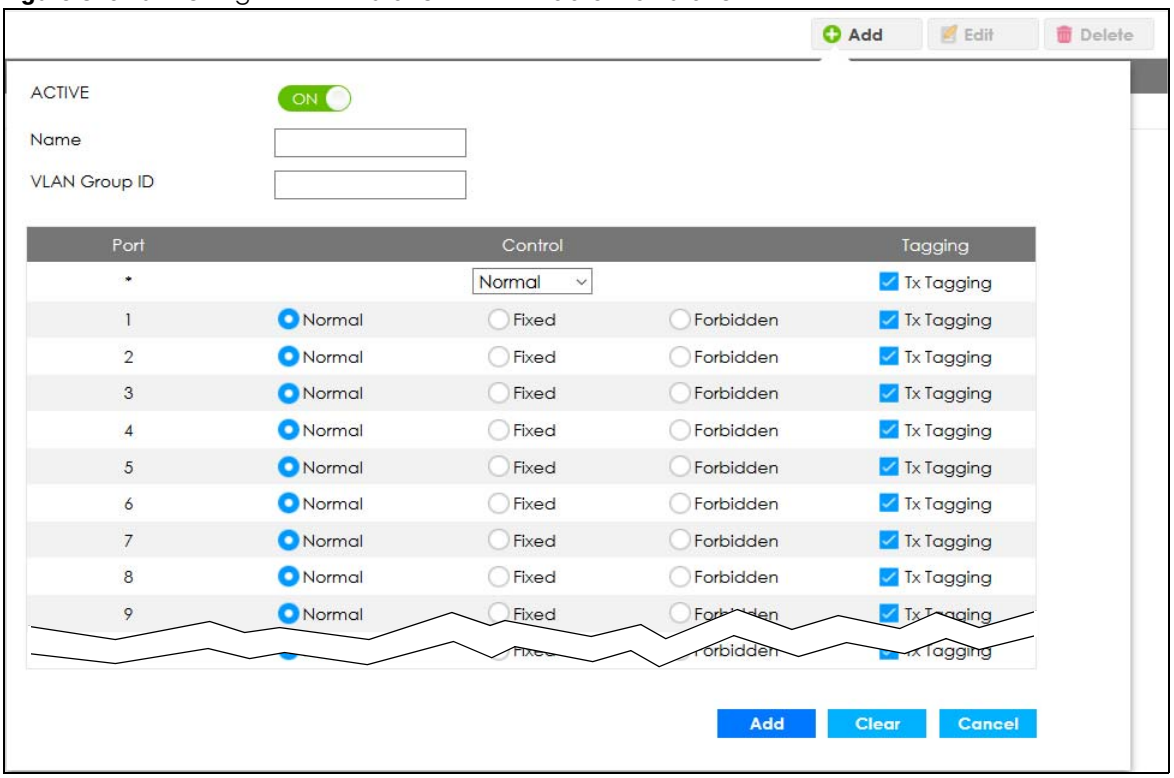

The following table describes the related labels in this screen.

Table 311 Switching > VLAN > Static VLAN

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| VID | This field displays the ID number of the VLAN group. Click the number to edit the VLAN settings. |
| Active | This field indicates whether the VLAN settings are enabled (**ON**) or disabled (**OFF**). |
| Name | This field displays the descriptive name for this VLAN group. |
| Add | Click this button to create a new static VLAN. |
| Edit | Click this button to configure the static VLAN. |
| Delete | Click this button to remove the static VLAN. |

Click **Add** or **Edit** button to open the following screen. Use this screen to configure a static VLAN for the Switch.

**Figure 520** Switching > VLAN > Static VLAN > Add or Edit Static VLAN



The following table describes the related labels in this screen.

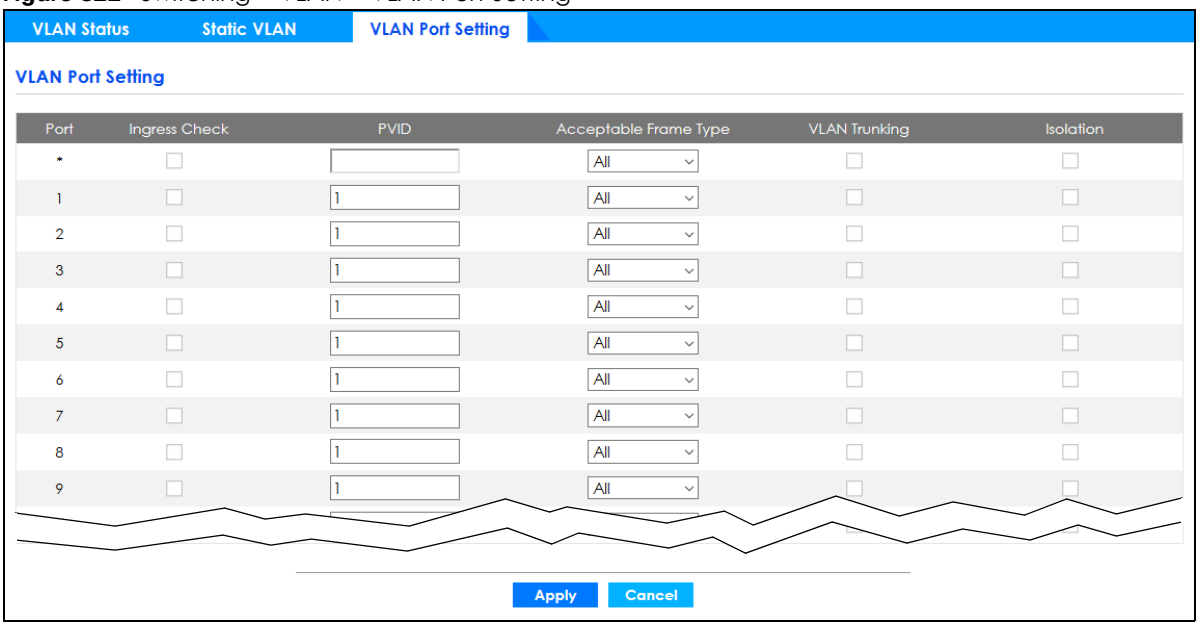
Table 312 Switching > VLAN > Static VLAN > Add or Edit Static VLAN

| LABEL | DESCRIPTION |
|---|---|
| ACTIVE | Select this switch to activate the VLAN settings. |
| Name | Enter a descriptive name for the VLAN group for identification purposes. This name consists of up to 64 printable characters. Spaces are allowed. |
| VLAN Group ID | Enter the VLAN ID for this static entry; the valid range is between 1 and 4094. |
| Port | The port number identifies the port you are configuring. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Control | Select **Normal** for the port to dynamically join this VLAN group. This is the default selection.<br>Select **Fixed** for the port to be a permanent member of this VLAN group.<br>Select **Forbidden** if you want to prohibit the port from joining this VLAN group. |
| Tagging | Select **TX Tagging** if you want outgoing traffic to contain this VLAN tag.<br>Otherwise, to ensure that VLAN-unaware devices (such as computers and hubs) can receive frames properly, clear the **TX Tagging** check box to set the Switch to remove VLAN tags before sending. |
| Add/Edit | Click **Add** or **Edit** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Cancel | Click **Cancel** to change the fields back to their last saved values. |

# 76.9 VLAN Port Setting

Use this screen to configure the static VLAN (IEEE 802.1Q) settings on a port. Click the **VLAN Port Setting** tab in the **VLAN** screen.

**Figure 521** Switching > VLAN > VLAN Port Setting




The following table describes the labels in this screen.

Table 313 Switching > VLAN > VLAN Port Setting

| LABEL | DESCRIPTION |
|---|---|
| Port | This field displays the port number. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Ingress Check | If this check box is selected, the Switch discards incoming frames on a port for VLANs that do not include this port in its member set.<br>Clear this check box to disable ingress filtering. |
| PVID | A PVID (Port VLAN ID) is a tag that adds to incoming untagged frames received on a port so that the frames are forwarded to the VLAN group that the tag defines.<br>Enter a number between 1 and 4094 as the port VLAN ID. |
| Acceptable Frame Type | Specify the type of frames allowed on a port. Choices are **All**, **Tag Only** and **Untag Only**.<br>Select **All** from the drop-down list box to accept all untagged or tagged frames on this port. This is the default setting.<br>Select **Tag Only** to accept only tagged frames on this port. All untagged frames will be dropped.<br>Select **Untag Only** to accept only untagged frames on this port. All tagged frames will be dropped. |
| VLAN Trunking | Enable **VLAN Trunking** on ports connected to other switches or routers (but not ports directly connected to end users) to allow frames belonging to unknown VLAN groups to pass through the Switch. |
| Isolation | Select this to allows this port to communicate only with the CPU management port and the ports on which the isolation feature is NOT enabled. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 76.10 Multicast

Traditionally, IP packets are transmitted in one of either two ways – Unicast (1 sender to 1 recipient) or Broadcast (1 sender to everybody on the network). Multicast delivers IP packets to just a group of hosts on the network.

IGMP (Internet Group Management Protocol) is a network-layer protocol used to establish membership in a multicast group – it is not used to carry user data. Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively.

This section shows you how to configure various multicast features.

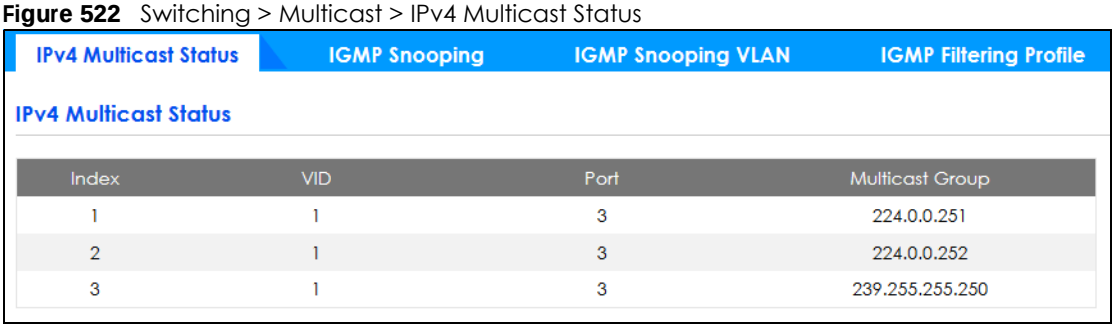
## 76.10.1 What You Can Do

- Use the **IPv4 Multicast Status** screen (Section 76.11 on page 648) to view multicast group information.
- Use the **IGMP Snooping** screen (Section 76.12 on page 649) to enable IGMP snooping to forward group multicast traffic only to ports that are members of that group.
- Use the **IGMP Snooping VLAN** screen (Section 76.13 on page 652) to perform IGMP snooping on up to 16 VLANs.
- Use the **IGMP Filtering Profile** screen (Section 76.14 on page 654) to specify a range of multicast groups that clients connected to the Switch are able to join.

# 76.11 IPv4 Multicast Status

Use this screen to view the IPv4 multicast group information. Click **Switching** > **Multicast** from the navigation panel to display the **IPv4 Multicast Status** screen as shown next.

**Figure 522** Switching > Multicast > IPv4 Multicast Status




The following table describes the labels in this screen.

Table 314 Switching > Multicast > IPv4 Multicast Status

| LABEL | DESCRIPTION |
|---|---|
| Index | This is the index number of the entry. |
| VID | This field displays the multicast VLAN ID. |
| Port | This field displays the port number that belongs to the multicast group. |
| Multicast Group | This field displays IP multicast group addresses. |

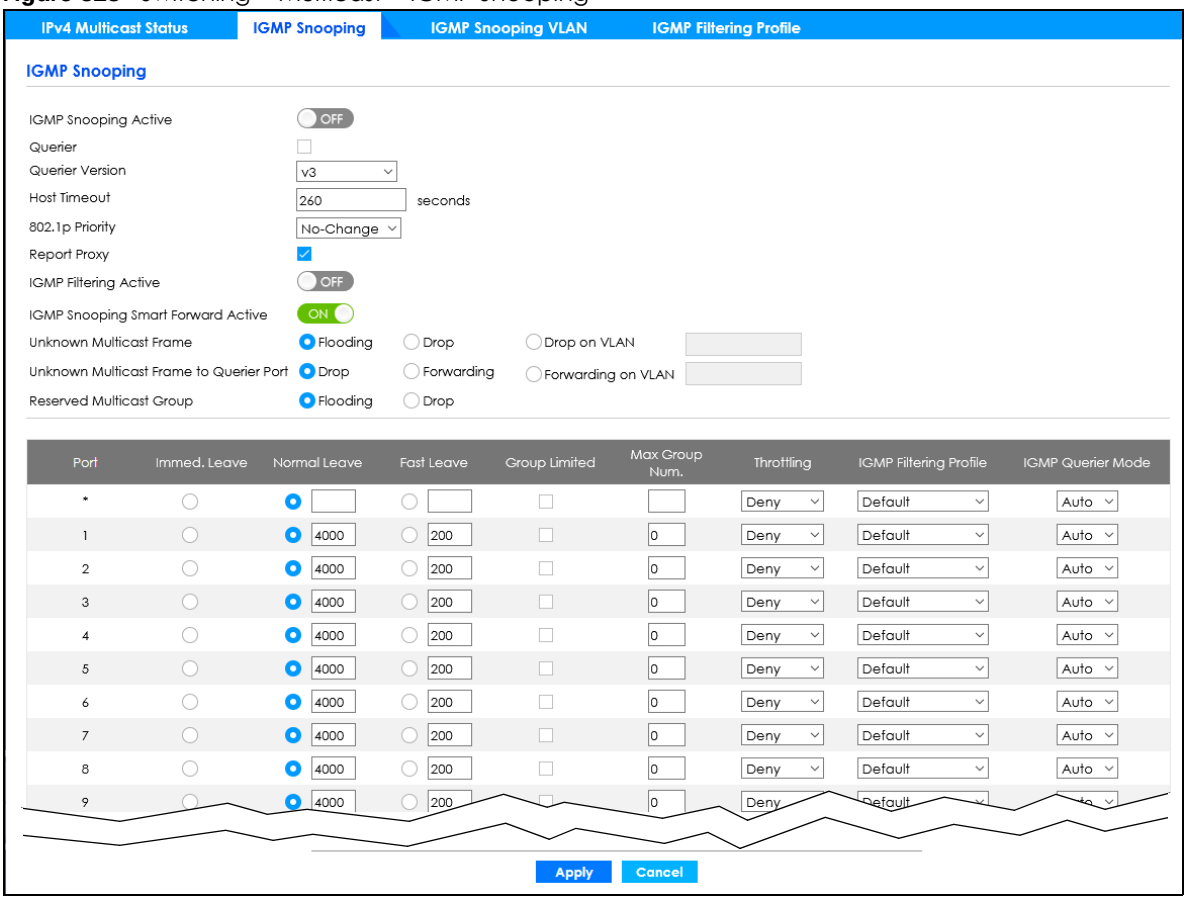
# 76.12 IGMP Snooping

A Switch can passively snoop on IGMP packets transferred between IP multicast routers or switches and IP multicast hosts to learn the IP multicast group membership. It checks IGMP packets passing through it, picks out the group registration information, and configures multicasting accordingly. IGMP snooping allows the Switch to learn multicast groups without you having to manually configure them.

The Switch forwards multicast traffic destined for multicast groups (that it has learned from IGMP snooping or that you have manually configured) to ports that are members of that group. IGMP snooping generates no additional network traffic, allowing you to significantly reduce multicast traffic passing through your Switch.

Click the **IGMP Snooping** link in the **Switching** > **Multicast** screen to display the screen as shown.

**Figure 523** Switching > Multicast > IGMP Snooping




The following table describes the labels in this screen.

Table 315 Switching > Multicast > IGMP Snooping

| LABEL | DESCRIPTION |
|---|---|
| IGMP Snooping | Use these settings to configure IGMP snooping. |
| Active | Select **ON** to enable IGMP Snooping to forward group multicast traffic only to ports that are members of that group. |

Table 315 Switching > Multicast > IGMP Snooping (continued)

| LABEL | DESCRIPTION |
|---|---|
| Querier | IGMP Snooping Querier is used in the absence of an IP multicast router. For example, in a network where IP multicast is configured, the IP multicast router acts as the IGMP Snooping Querier. If the multicast traffic in a VLAN only needs to be Layer 2 switched, an IP multicast router is NOT required. But without an IP multicast router on the VLAN, you must configure the Switch as the IGMP Snooping Querier so that it can send queries.<br><br>Select this option to allow the Switch to send IGMP General Query messages to the VLANs with the multicast hosts attached. |
| Querier Version | IGMP snooping query works only when both host and Switch support the same IGMP version.<br><br>Select **v2** to allow the Switch to send IGMPv2 queries only.<br><br>Select **v3** to allow the Switch to send IGMPv3 queries only. |
| Host Timeout | Specify the time (from 1 to 16711450) in seconds that elapses before the Switch removes an IGMP group membership entry if it does not receive report messages from the port. |
| 802.1p Priority | Select a priority level (0 – 7) to which the Switch changes the priority in outgoing IGMP control packets. Otherwise, select **No-Change** to not replace the priority. |
| Report Proxy | Select this option to allow the Switch to act as the IGMP report proxy and leave proxy. It will report group changes to a connected multicast router.<br><br>The Switch not only checks IGMP packets between multicast routers or switches and multicast hosts to learn the multicast group membership, but also replaces the source MAC address in an IGMP v1/v2 report with its own MAC address before forwarding to the multicast router or switch. When the Switch receives more than one IGMP v1/v2 join report that requests to join the same multicast group, it only sends a new join report with its MAC address. This helps reduce the number of multicast join reports passed to the multicast router or switch.<br><br>The Switch sends a leave message with its MAC address to the multicast router or switch only when it receives the leave message from the last host in a multicast group. |
| IGMP Filtering Active | Select **On** to enable IGMP filtering to control which IGMP groups a subscriber on a port can join.<br><br>If you enable IGMP filtering, you must create and assign IGMP filtering profiles for the ports that you want to allow to join multicast groups. |
| IGMP Snooping Smart Forward Active | Select **On** to enable sending of multicast frame to querier port and IGMP subscriber groups. Otherwise, the querier port forwards the frames only when it receives a join report and it belongs to the IGMP group. |
| Unknown Multicast Frame | Specify the action to perform when the Switch receives an unknown multicast frame.<br><br>• Select **Drop** to discard the frames.<br>• Select **Flooding** to send the frames to all ports.<br>• Select **Drop on VLAN** and enter the VLAN ID numbers to discard the frames on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52. |
| Unknown Multicast Frame to Querier Port | Specify the action to perform when **Unknown Multicast Frame** is set to **Drop**.<br><br>• Select **Drop** to discard the frames.<br>• Select **Forwarding** to send the frames to all querier ports.<br>• Select **Forwarding on VLAN** and enter the VLAN ID numbers to send the frames to the ports which are used as an IGMP query port on the specified VLANs. Use a dash to specify consecutive VLANs and a comma (no spaces) to specify non-consecutive VLANs. For example, 51–53 includes 51, 52 and 53, but 51,53 does not include 52. |

Table 315 Switching > Multicast > IGMP Snooping (continued)

| LABEL | DESCRIPTION |
|---|---|
| Reserved Multicast Group | The IP address range of 224.0.0.0 to 224.0.0.255 are reserved for multicasting on the local network only. For example, 224.0.0.1 is for all hosts on a local network segment and 224.0.0.9 is used to send RIP routing information to all RIP v2 routers on the same network segment. A multicast router will not forward a packet with the destination IP address within this range to other networks. See the IANA web site for more information.<br><br>The layer-2 multicast MAC addresses used by Cisco layer-2 protocols, 01:00:0C:CC:CC:CC and 01:00:0C:CC:CC:CD, are also included in this group.<br><br>Specify the action to perform when the Switch receives a frame with a reserved multicast address.<br><br>• Select **Drop** to discard the frames.<br>• Select **Flooding** to send the frames to all ports. |
| Port | This field displays the port number. |
| * | Settings in this row apply to all ports.<br><br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br><br>Changes in this row are copied to all the ports as soon as you make them. |
| Immed. Leave | Select this option to set the Switch to remove this port from the multicast tree when an IGMP version 2 leave message is received on this port.<br><br>Select this option if there is only one host connected to this port. |
| Normal Leave | Enter an IGMP normal leave timeout value (from 200 to 6348800) in miliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.<br><br>In normal leave mode, when the Switch receives an IGMP leave message from a host on a port, it forwards the message to the multicast router. The multicast router then sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. The Switch forwards the query message to all hosts connected to the port and waits for IGMP reports from hosts to update the forwarding table.<br><br>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. |
| Fast Leave | Enter an IGMP fast leave timeout value (from 200 to 6348800) in miliseconds. Select this option to have the Switch use this timeout to update the forwarding table for the port.<br><br>In fast leave mode, right after receiving an IGMP leave message from a host on a port, the Switch itself sends out an IGMP Group-Specific Query (GSQ) message to determine whether other hosts connected to the port should remain in the specific multicast group. This helps speed up the leave process.<br><br>This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. |
| Group Limited | Select this option to limit the number of multicast groups this port is allowed to join. |
| Max Group Num. | Enter the number of multicast groups this port is allowed to join. Once a port is registered in the specified number of multicast groups, any new IGMP join report frames is dropped on this port. |
| Throttling | IGMP throttling controls how the Switch deals with the IGMP reports when the maximum number of the IGMP groups a port can join is reached.<br><br>Select **Deny** to drop any new IGMP join report received on this port until an existing multicast forwarding table entry is aged out.<br><br>Select **Replace** to replace an existing entry in the multicast forwarding table with the new IGMP reports received on this port. |

Table 315 Switching > Multicast > IGMP Snooping (continued)

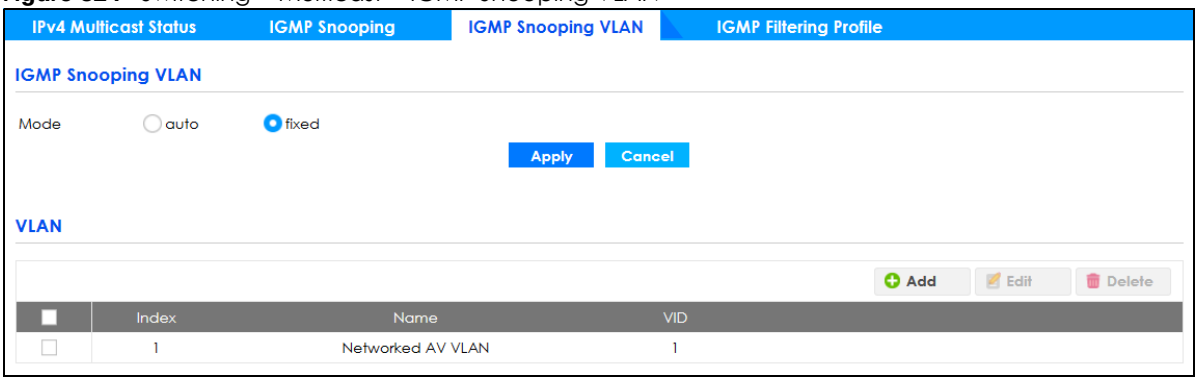
| LABEL | DESCRIPTION |
|---|---|
| IGMP Filtering Profile | Select the name of the IGMP filtering profile to use for this port. Otherwise, select **Default** to prohibit the port from joining any multicast group.<br>You can create IGMP filtering profiles in the **Switching** > **Multicast** > **IGMP Filtering Profile** screen. |
| IGMP Querier Mode | The Switch treats an IGMP query port as being connected to an IGMP multicast router (or server). The Switch forwards IGMP join or leave packets to an IGMP query port.<br>Select **Auto** to have the Switch use the port as an IGMP query port if the port receives IGMP query packets.<br>Select **Fixed** to have the Switch always use the port as an IGMP query port. Select this when you connect an IGMP multicast server to the port.<br>Select **Edge** to stop the Switch from using the port as an IGMP query port. The Switch will not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 76.13 IGMP Snooping VLAN

The Switch can perform IGMP snooping on up to 16 VLANs. You can configure the Switch to automatically learn multicast group membership of any VLANs. The Switch then performs IGMP snooping on the first 16 VLANs that send IGMP packets. This is referred to as auto mode. Alternatively, you can specify the VLANs that IGMP snooping should be performed on. This is referred to as fixed mode. In fixed mode the Switch does not learn multicast group membership of any VLANs other than those explicitly added as an IGMP snooping VLAN.

Click **Switching** > **Multicast** in the navigation panel. Click the **IGMP Snooping VLAN** tab to display the screen as shown.

**Figure 524** Switching > Multicast > IGMP Snooping VLAN



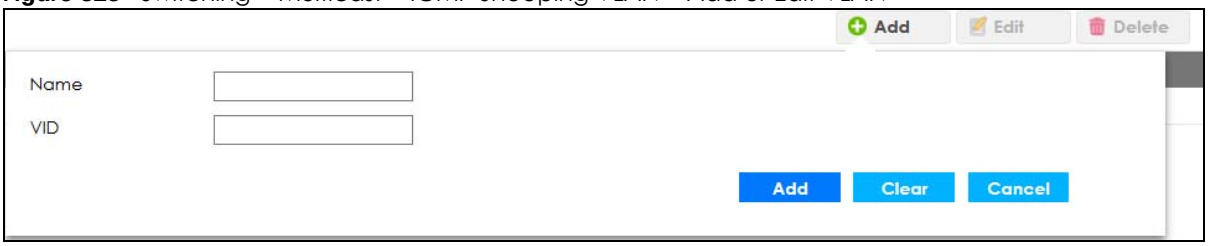
The following table describes the labels in this screen.

Table 316 Switching > Multicast > IGMP Snooping VLAN

| LABEL | DESCRIPTION |
|---|---|
| Mode | Select **auto** to have the Switch learn multicast group membership information of any VLANs automatically.<br>Select **fixed** to have the Switch only learn multicast group membership information of the VLANs that you specify below.<br>In either **auto** or **fixed** mode, the Switch can learn up to 16 VLANs.<br>The Switch drops any IGMP control messages which do not belong to these 16 VLANs.<br>You must also enable IGMP snooping in the **Switching** > **Multicast** > **IGMP Snooping** screen first. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |
| VLAN | Use this section of the screen to view and add or edit VLANs upon which the Switch is to perform IGMP snooping. |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Index | This is the index number of the IGMP snooping VLAN entry in the table. Click on an index number to view more details or change the settings. |
| Name | This field displays the descriptive name for this VLAN group. |
| VID | This field displays the ID number of the VLAN group. |
| Add<br>Edit | Click **Add** to create a new entry or **Edit** to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Delete | Check the entries that you want to remove, then click the **Delete** button. |

Click **Add** or **Edit** button to open the following screen. Use this screen to configure a static VLAN for the Switch.

**Figure 525** Switching > Multicast > IGMP Snooping VLAN > Add or Edit VLAN




The following table describes the related labels in this screen.

Table 317 Switching > Multicast > IGMP Snooping VLAN > Add or Edit VLAN

| LABEL | DESCRIPTION |
|---|---|
| Name | Enter the descriptive name of the VLAN for identification purposes. |
| VID | Enter the ID of a static VLAN; the valid range is between 1 and 4094. |
| Add/Edit | Click **Add** or **Edit** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |

Table 317 Switching > Multicast > IGMP Snooping VLAN > Add or Edit VLAN (continued)

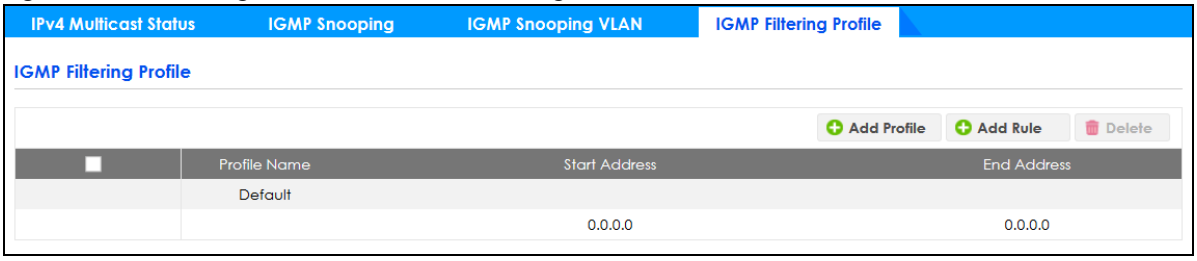
| LABEL | DESCRIPTION |
|---|---|
| Clear | Click **Clear** to have the fields display blanks. |
| Cancel | Click **Cancel** to change the fields back to their last saved values. |

# 76.14 IGMP Filtering Profile

An IGMP filtering profile specifies a range of multicast groups that clients connected to the Switch are able to join. A profile contains a range of multicast IP addresses which you want clients to be able to join. Profiles are assigned to ports (in the **IGMP Snooping** screen). Clients connected to those ports are then able to join the multicast groups specified in the profile. Each port can be assigned a single profile. A profile can be assigned to multiple ports.

Click **Switching** > **Multicast** in the navigation panel. Click the **IGMP Filtering Profile** tab to display the screen as shown.

**Figure 526** Switching > Multicast > IGMP Filtering Profile




The following table describes the labels in this screen.

Table 318 Switching > Multicast > IGMP Filtering Profile

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Profile Name | This field displays the descriptive name of the profile. |
| Start Address | This field displays the start of the multicast address range. |
| End Address | This field displays the end of the multicast address range. |
| Add Profile | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Add Rule | Click this to create a new rule for a profile. |
| Delete | To delete the profiles and all the accompanying rules, select the profiles that you want to remove in the corresponding row, then click the **Delete** button.<br>To delete a rule from a profile, select the rule that you want to remove in the corresponding row, then click the **Delete** button. |

Click the **Add Profile** button to open the following screen. Use this screen to configure an IGMP filtering profile for the Switch.

**Figure 527** Switching > Multicast > IGMP Filtering Profile > Add Profile

The following table describes the related labels in this screen.

Table 319 Switching > Multicast > IGMP Filtering Profile > Add Profile

| LABEL | DESCRIPTION |
|---|---|
| Profile Name | Enter a descriptive name for the profile for identification purposes.<br>To configure additional rules for a profile that you have already added, select the profile name and specify a different IP multicast address range. |
| Start Address | Type the starting multicast IP address for a range of multicast IP addresses that you want to belong to the IGMP filter profile. |
| End Address | Type the ending multicast IP address for a range of IP addresses that you want to belong to the IGMP filter profile.<br>If you want to add a single multicast IP address, enter it in both the **Start Address** and **End Address** fields. |
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to have the fields display blanks. |
| Cancel | Click **Cancel** to leave this screen. |

Click the **Add Rule** button to open the following screen. Use this screen to configure a rule for an IGMP filtering profile.

**Figure 528** Switching > Multicast > IGMP Filtering Profile > Add Rule

The following table describes the related labels in this screen.

Table 320 Switching > Multicast > IGMP Filtering Profile > Add Rule

| LABEL | DESCRIPTION |
|---|---|
| Profile Name | Select the profile name to add a rule.<br>To configure additional rules for a profile that you have already added, select the profile name and specify a different IP multicast address range. |
| Start Address | Type the starting multicast IP address for a range of multicast IP addresses that you want to belong to the IGMP filter profile. |
| End Address | Type the ending multicast IP address for a range of IP addresses that you want to belong to the IGMP filter profile.<br>If you want to add a single multicast IP address, enter it in both the **Start Address** and **End Address** fields. |
| Add | Click this to create a new entry.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to have the fields display blanks. |
| Cancel | Click **Cancel** to leave this screen. |

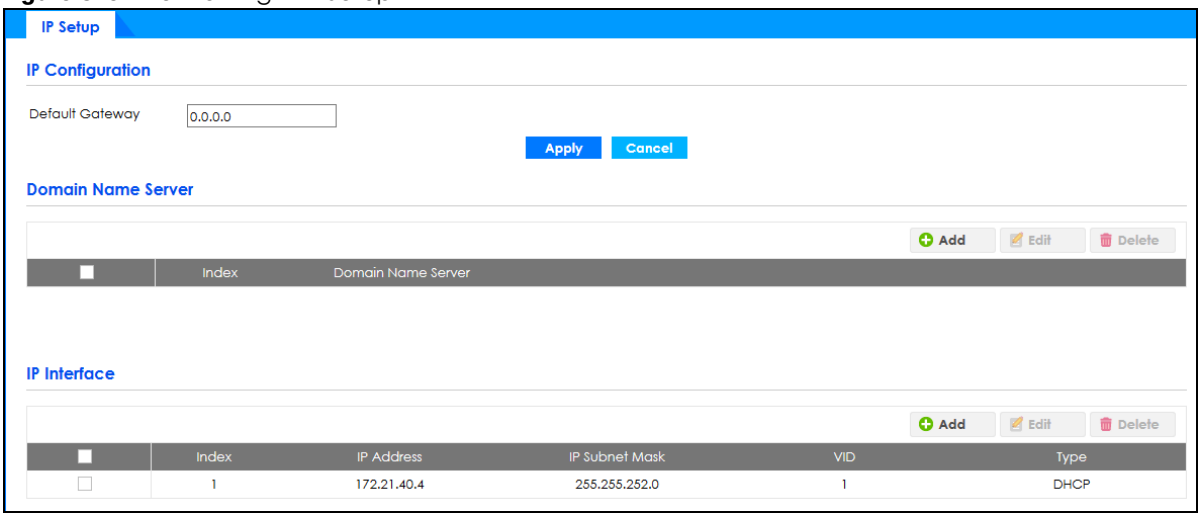
# CHAPTER 77
# Networking

This section shows you how to configure the default gateway device, the default domain name server and add IP domains.

## 77.1 IP Setup

Use the **IP Setup** screen to configure the default gateway device, the default domain name server and add IP domains.

**Figure 529** Networking > IP Setup




The following table describes the labels in this screen.

Table 321 Networking > IP Setup

| LABEL | DESCRIPTION |
|---|---|
| IP Configuration<br><br>Use these fields to create or edit IP routing domains on the Switch. | |
| Default Gateway | Type the IP address of the default outgoing gateway in dotted decimal notation, for example 172.21.43.254. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |

Table 321 Networking > IP Setup (continued)

| LABEL | DESCRIPTION |
|---|---|
| Domain Name Server<br>Use these fields to add, edit, or delete the IP address of the DNS server. | |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Index | This field displays the index number of an entry. |
| Domain Name Server | This field displays the IP address of the DNS server. |
| Add | Click this button to create a new IP address for the DNS server. |
| Edit | Click this button to configure the IP address of the DNS server. |
| Delete | Click this button to remove the IP address of the DNS server. |
| IP Interface<br>Use these fields to set the settings for the management port. | |
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Index | This field displays the index number of an entry. |
| IP Address | This field displays IP address of the Switch in the IP domain. |
| IP Subnet Mask | This field displays the subnet mask of the Switch in the IP domain. |
| VID | This field displays the VLAN identification number of the IP domain on the Switch. |
| Type | This shows whether this IP address is dynamically assigned from a DHCP server (**DHCP**) or manually assigned (**Static**). |
| Add | Click this button to create new settings for the management port. |
| Edit | Click this button to configure the settings for the management port. |
| Delete | Click this button to remove the settings for the management port. |

# CHAPTER 78
# Security

## 78.1 Access Control

A console port and FTP are allowed one session each, Telnet and SSH share nine sessions, up to five Web sessions (five different user names and passwords) and/or limitless SNMP access control sessions are allowed.

Table 322 Access Control Overview

| Console Port | SSH | Telnet | FTP | Web | SNMP |
|---|---|---|---|---|---|
| One session | Share up to 9 sessions | | One session | Up to 5 accounts | No limit |

A console port access control session and Telnet access control session cannot coexist when multi-login is disabled. See the CLI Reference Guide for more information on disabling multi-login.

This section describes how to control access to the Switch.

### 78.1.1 What You Can Do

- Use the **Logins** screen (Section 78.2 on page 659) to assign which users can access the Switch through Web Configurator at any one time.
- Use the **Remote Management** screen (Section 78.3 on page 661) to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.
- Use the **SNMP** screen (Section 78.4 on page 663) to configure your SNMP settings.
- Use the **Service Access Control** screen (Section 78.8 on page 669) to decide what services you may use to access the Switch.

## 78.2 Set Up Login Accounts

Up to five people (one administrator and four non-administrators) may access the Switch through Web Configurator at any one time.

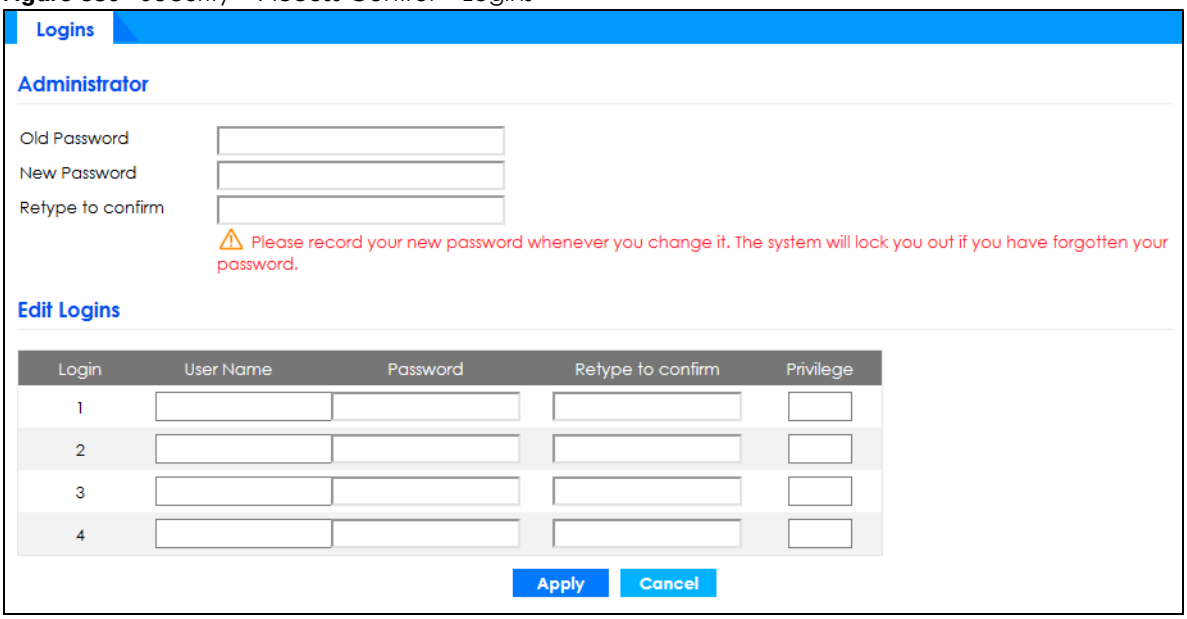
- An administrator is someone who can both view and configure Switch changes. The user name for the Administrator is always **admin**. The default administrator password is **1234**.

Note: It is highly recommended that you change the default administrator password (**1234**).

- A non-administrator (user name is something other than **admin**) is someone who can view and/or configure Switch settings. The configuration right varies depending on the user's privilege level.

Click **Security** > **Access Control** > **Logins** to view the screen as shown.

**Figure 530** Security > Access Control > Logins




The following table describes the labels in this screen.

Table 323 Security > Access Control > Logins

| LABEL | DESCRIPTION |
|---|---|
| Administrator<br><br>This is the default administrator account with the "admin" user name. You cannot change the default administrator user name. | |
| Old Password | Type the existing system password (**1234** is the default password when shipped). |
| New Password | Enter your new system password. Up to 32 characters are allowed for the new password except [ ? ], [ \| ], [ ' ], [ " ], [ space ], or [ , ]. |
| Retype to confirm | Retype your new system password for confirmation. |
| Edit Logins<br><br>You may configure passwords for up to four users. These users can have read-only or read/write access. You can give users higher privileges through the Web Configurator or the CLI. For more information on assigning privileges through the CLI see the Ethernet Switch CLI Reference Guide. | |
| Login | This field displays the index number of an entry. |
| User Name | Set a user name (up to 32 ASCII characters long). |
| Password | Enter your new system password. Up to 32 characters are allowed for the new password except [ ? ], [ \| ], [ ' ], [ " ], [ space ], or [ , ]. |
| Retype to confirm | Retype your new system password for confirmation. |

Table 323 Security > Access Control > Logins (continued)

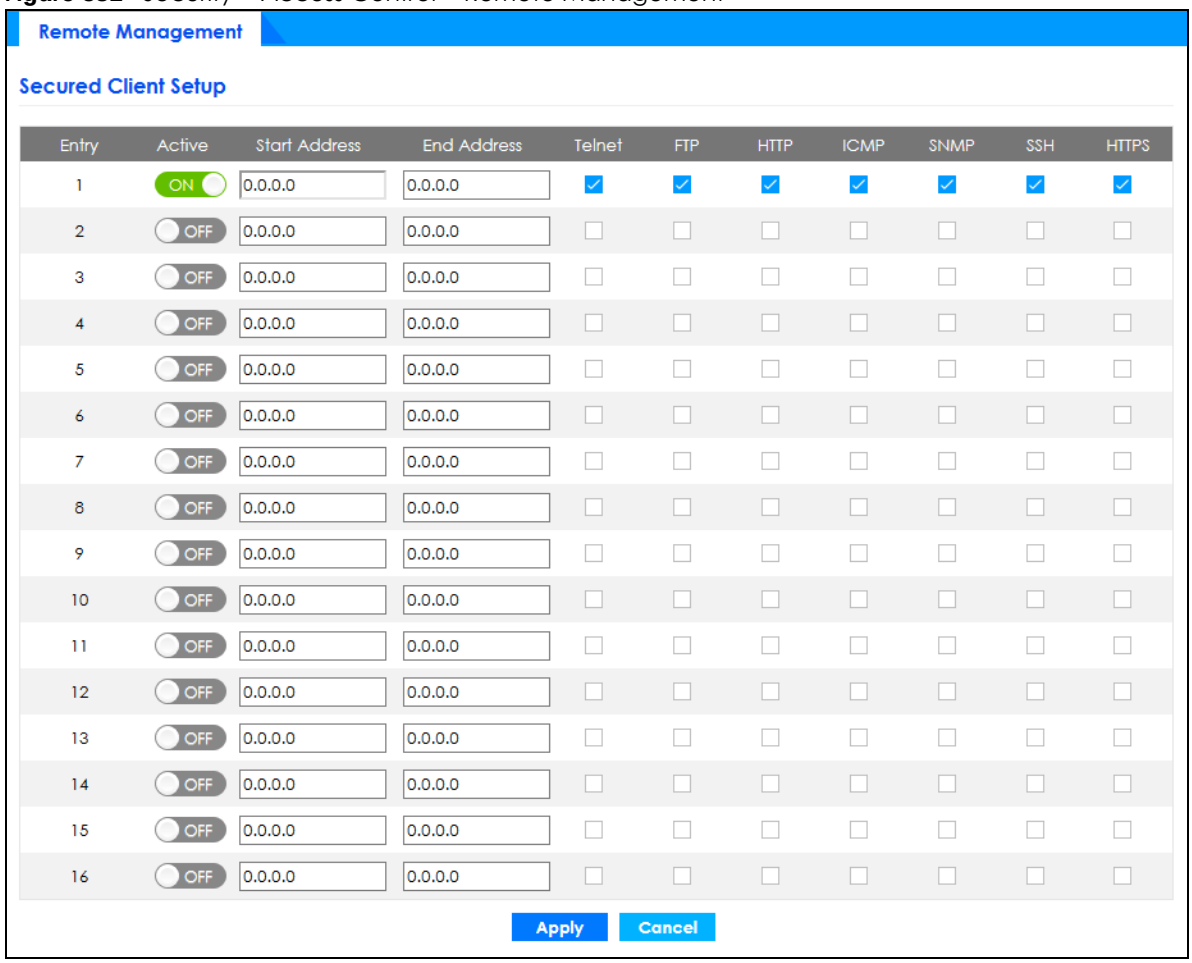
| LABEL | DESCRIPTION |
|---|---|
| Privilege | Type the privilege level for this user. At the time of writing, users may have a privilege level of 0, 3, 13, or 14 representing different configuration rights as shown below.<br>• 0 – Display basic system information.<br>• 3 – Display configuration or status.<br>• 13 – Configure features except for login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, administrator and enable passwords, and configuration information display.<br>• 14 – Configure login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, and administrator and enable passwords, and display configuration information.<br>Users can run command lines if the session's privilege level is greater than or equal to the command's privilege level. The session privilege initially comes from the privilege of the login account. For example, if the user has a privilege of 5, he or she can run commands that requires privilege level of 5 or less but not more. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 78.3 Remote Management

Use this screen to specify a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch.

Click **Security** > **Access Control** > **Remote Management** to view the screen as shown next.

**Figure 531** Security > Access Control > Remote Management




The following table describes the labels in this screen.

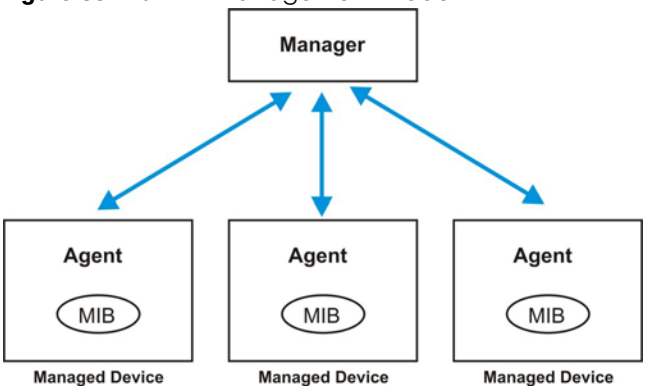
Table 324 Security > Access Control > Remote Management

| LABEL | DESCRIPTION |
|---|---|
| Entry | This is the client set index number. A "client set" is a group of one or more "trusted computers" from which an administrator may use a service to manage the Switch. |
| Active | Set this switch to **ON** to activate this secured client set. Clear the check box if you wish to temporarily disable the set without deleting it. |
| Start Address<br><br>End Address | Configure the IP address range of trusted computers from which you can manage this Switch.<br><br>The Switch checks if the client IP address of a computer requesting a service or protocol matches the range set here. The Switch immediately disconnects the session if it does not match. |
| Telnet/FTP/ HTTP/ICMP/ SNMP/SSH/ HTTPS | Select services that may be used for managing the Switch from the specified trusted computers. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 78.4 Configure SNMP

Use this screen to configure your SNMP settings. Simple Network Management Protocol (SNMP) is an application layer protocol used to manage and monitor TCP/IP-based devices. SNMP is used to exchange management information between the network management system (NMS) and a network element (NE). A manager station can manage and monitor the Switch through the network through SNMP version 1 (SNMPv1), SNMP version 2c or SNMP version 3. The next figure illustrates an SNMP management operation. SNMP is only available if TCP/IP is configured.

**Figure 532** SNMP Management Model




An SNMP managed network consists of two main components: agents and a manager.

An agent is a management software module that resides in a managed Switch (the Switch). An agent translates the local management information from the managed Switch into a form compatible with SNMP. The manager is the console through which network administrators perform network management functions. It executes applications that control and monitor managed devices.

The managed devices contain object variables or managed objects that define each piece of information to be collected about a Switch. Examples of variables include number of packets received, node port status and so on. A Management Information Base (MIB) is a collection of managed objects. SNMP allows a manager and agents to communicate for the purpose of accessing these objects.

SNMP itself is a simple request or response protocol based on the manager or agent model. The manager issues a request and the agent returns responses using the following protocol operations:

Table 325 SNMP Commands

| LABEL | DESCRIPTION |
|---|---|
| Get | Allows the manager to retrieve an object variable from the agent. |
| GetNext | Allows the manager to retrieve the next object variable from a table or list within an agent. In SNMPv1, when a manager wants to retrieve all elements of a table from an agent, it initiates a Get operation, followed by a series of GetNext operations. |
| Set | Allows the manager to set values for object variables within an agent. |
| Trap | Used by the agent to inform the manager of some events. |

## SNMP v3 and Security

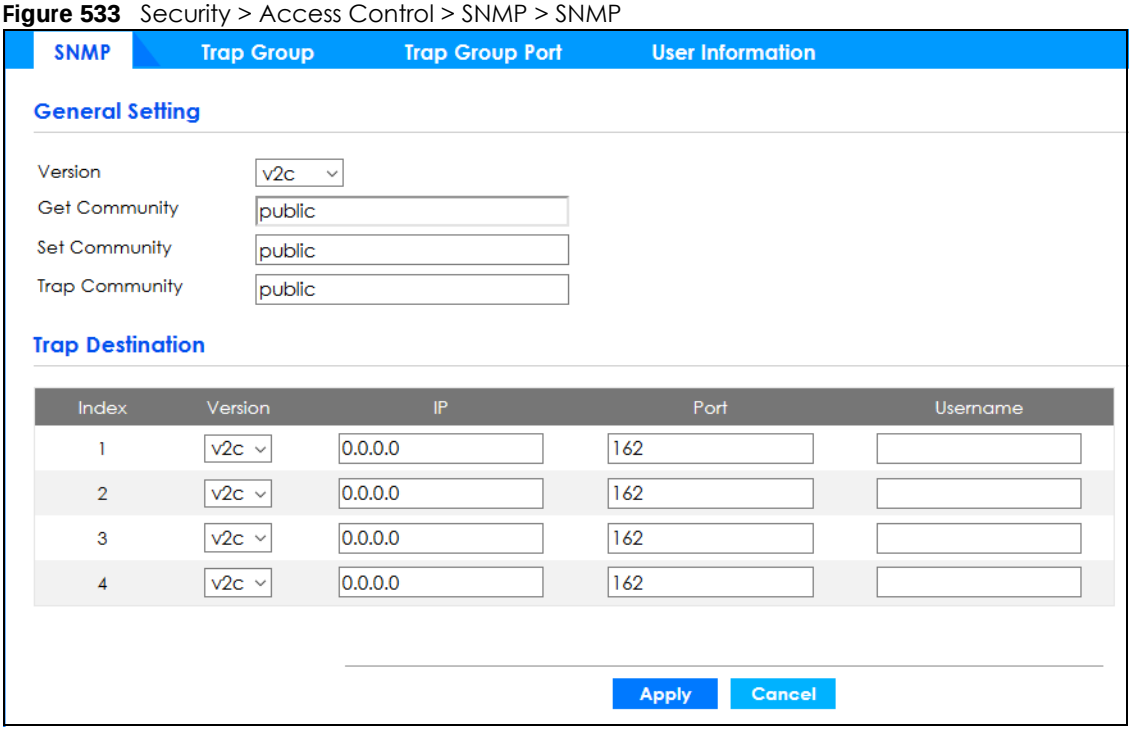
SNMP v3 enhances security for SNMP management. SNMP managers can be required to authenticate with agents before conducting SNMP management sessions.

Security can be further enhanced by encrypting the SNMP messages sent from the managers.

Encryption protects the contents of the SNMP messages. When the contents of the SNMP messages are encrypted, only the intended recipients can read them.

Click **Security** > **Access Control** > **SNMP** > **SNMP** to view the screen as shown.

**Figure 533** Security > Access Control > SNMP > SNMP




The following table describes the labels in this screen.

Table 326 Security > Access Control > SNMP > SNMP

| LABEL | DESCRIPTION |
|---|---|
| General Setting | Use this section to specify the SNMP version and community (password) values. |
| Version | Select the SNMP version for the Switch. The SNMP version on the Switch must match the version on the SNMP manager. Choose SNMP version 2c (**v2c**), SNMP version 3 (**v3**) or both (**v3v2c**).<br><br>SNMP version 2c is backwards compatible with SNMP version 1. |
| Get Community | Enter the **Get Community** string, which is the password for the incoming Get- and GetNext-requests from the management station.<br><br>The **Get Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Set Community | Enter the **Set Community**, which is the password for incoming Set- requests from the management station.<br><br>The **Set Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Community | Enter the **Trap Community** string, which is the password sent with each trap to the SNMP manager.<br><br>The **Trap Community** string is only used by SNMP managers using SNMP version 2c or lower. |
| Trap Destination | Use this section to configure where to send SNMP traps from the Switch. |
| Index | This field displays the index number of an entry. |
| Version | Specify the version of the SNMP trap messages. |
| IP | Enter the IP addresses of up to 4 managers to send your SNMP traps to. |
| Port | Enter the port number upon which the manager listens for SNMP traps. |

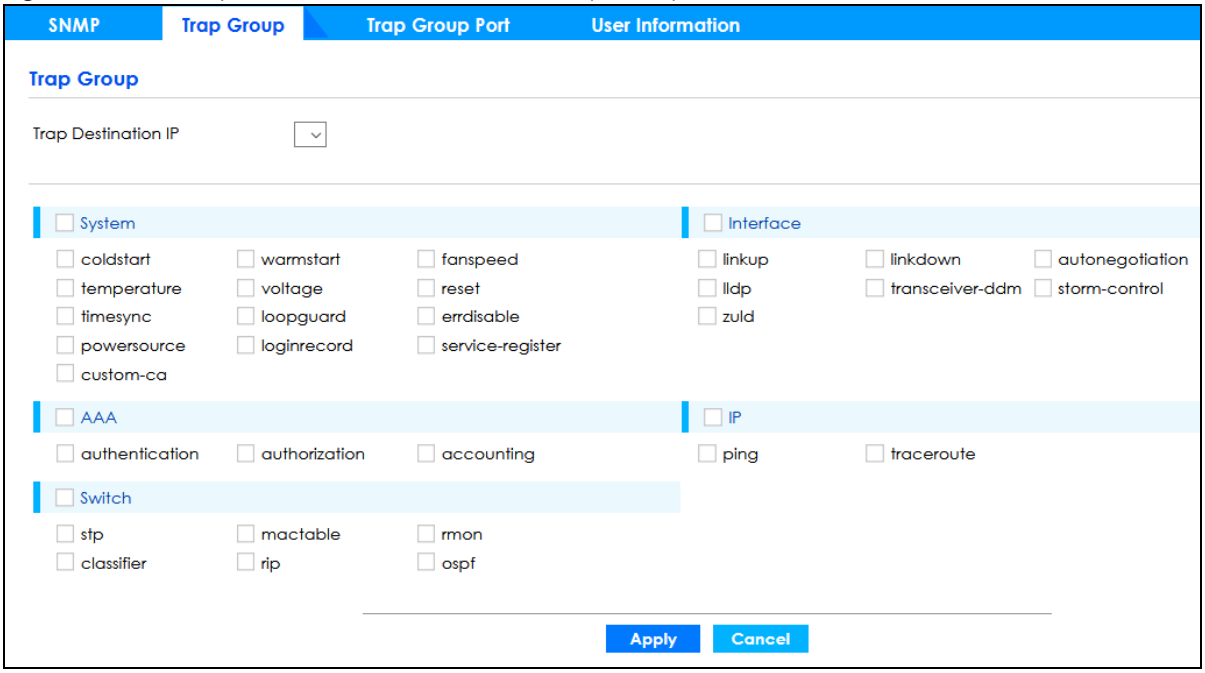
Table 326 Security > Access Control > SNMP > SNMP (continued)

| LABEL | DESCRIPTION |
|---|---|
| Username | Enter the user name to be sent to the SNMP manager along with the SNMP v3 trap.<br>This user name must match an existing account on the Switch (configured in the **Security** > **Access Control** > **SNMP** > **User Information** screen). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 78.5 Configure SNMP Trap Group

The Switch sends traps to an SNMP manager when an event occurs. From the **SNMP** screen, click **Trap Group** to view the screen as shown. Use the **Trap Group** screen to specify the types of SNMP traps that should be sent to each SNMP manager.

**Figure 534** Security > Access Control > SNMP > Trap Group



The following table describes the labels in this screen.

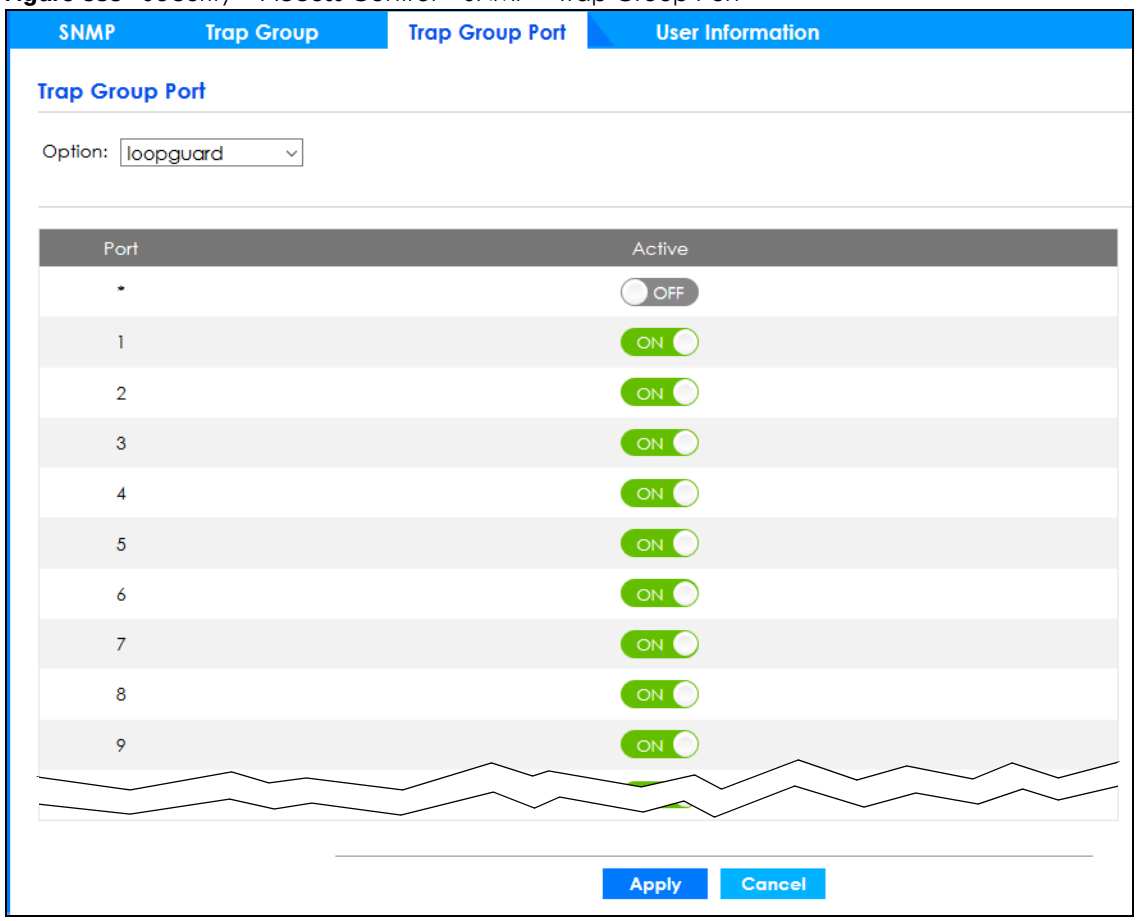
Table 327 Security > Access Control > SNMP > Trap Group

| LABEL | DESCRIPTION |
|---|---|
| Trap Destination IP | Select one of your configured trap destination IP addresses. These are the IP addresses of the SNMP managers. You must first configure a trap destination IP address in the **SNMP** screen.<br>Use the rest of the screen to select the following:<br>• Categories of SNMP traps that the Switch is to send to the SNMP manager.<br>• Individual SNMP traps that the Switch is to send to the SNMP station.<br>The traps are grouped by category. Selecting a category automatically selects all of the category's traps. Clear the check boxes for individual traps that you do not want the Switch to send to the SNMP station. Clearing a category's check box automatically clears all of the category's trap check boxes (the Switch only sends traps from selected categories) |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 78.6 Enable or Disable Sending of SNMP Traps on a Port

Click **Security** > **Access Control** > **SNMP** > **Trap Group Port** to view the screen as shown. Use this screen to set whether a trap received on the ports would be sent to the SNMP manager.

**Figure 535** Security > Access Control > SNMP > Trap Group Port




The following table describes the labels in this screen.

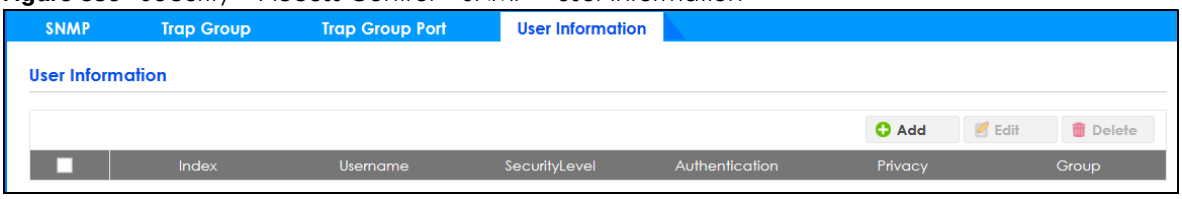
Table 328 Security > Access Control > SNMP > Trap Group Port

| LABEL | DESCRIPTION |
|---|---|
| Option | Select the trap type you want to configure here. |
| Port | This field displays a port number. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some of the settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Changes in this row are copied to all the ports as soon as you make them. |
| Active | Set this switch to **ON** to enable the trap type of SNMP traps on this port.<br>Set this switch to **OFF** to disable the sending of SNMP traps on this port. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# 78.7 Configure SNMP User

From the **SNMP** screen, click **User Information** to view the screen as shown. Use the **User Information** screen to view SNMP users for authentication with managers using SNMPv3 and SNMPv2c. An SNMP user is an SNMP manager.

**Figure 536** Security > Access Control > SNMP > User Information



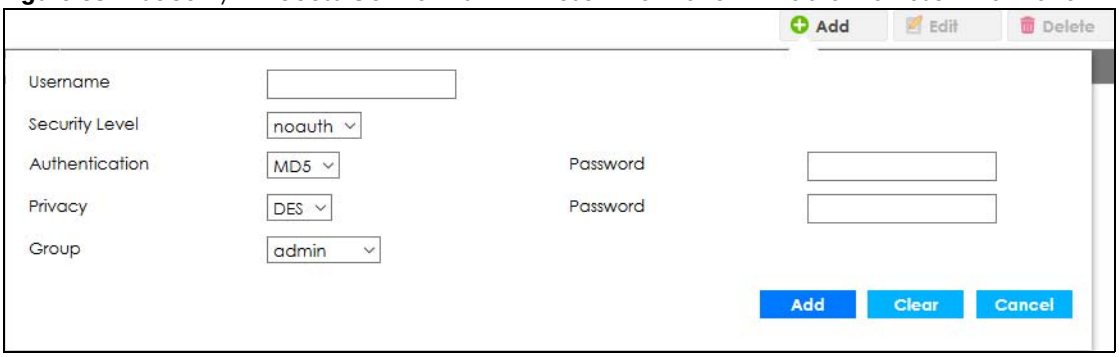

The following table describes the labels in this screen.

Table 329 Security > Access Control > SNMP > User Information

| LABEL | DESCRIPTION |
|---|---|
| | Select an entry's check box to select a specific entry. Otherwise, select the check box in the table heading row to select all entries. |
| Index | This is a read-only number identifying a login account on the Switch. Click an index number to view more details and edit an existing account. |
| Username | This field displays the user name of a login account on the Switch. |
| Security Level | This field displays whether you want to implement authentication and/or encryption for SNMP communication with this user. |
| Authentication | This field displays the authentication algorithm used for SNMP communication with this user. |
| Privacy | This field displays the encryption method used for SNMP communication with this user. |
| Group | This field displays the SNMP group to which this user belongs. |
| Add | Click this button to create new SNMP users for authentication with managers. |
| Edit | Click this button to configure SNMP users for authentication with managers. |
| Delete | Click this button to remove the selected entry from the summary table. |

Click **Add** or **Edit** button to open the following screen. Use this screen to create or edit SNMP users for authentication with managers using SNMPv3 or SNMPv2c and associate them to SNMP groups.

**Figure 537** Security > Access Control > SNMP > User Information > Add or Edit User Information



The following table describes the labels in this screen.

Table 330 Security > Access Control > SNMP > User Information > Add or Edit User Information

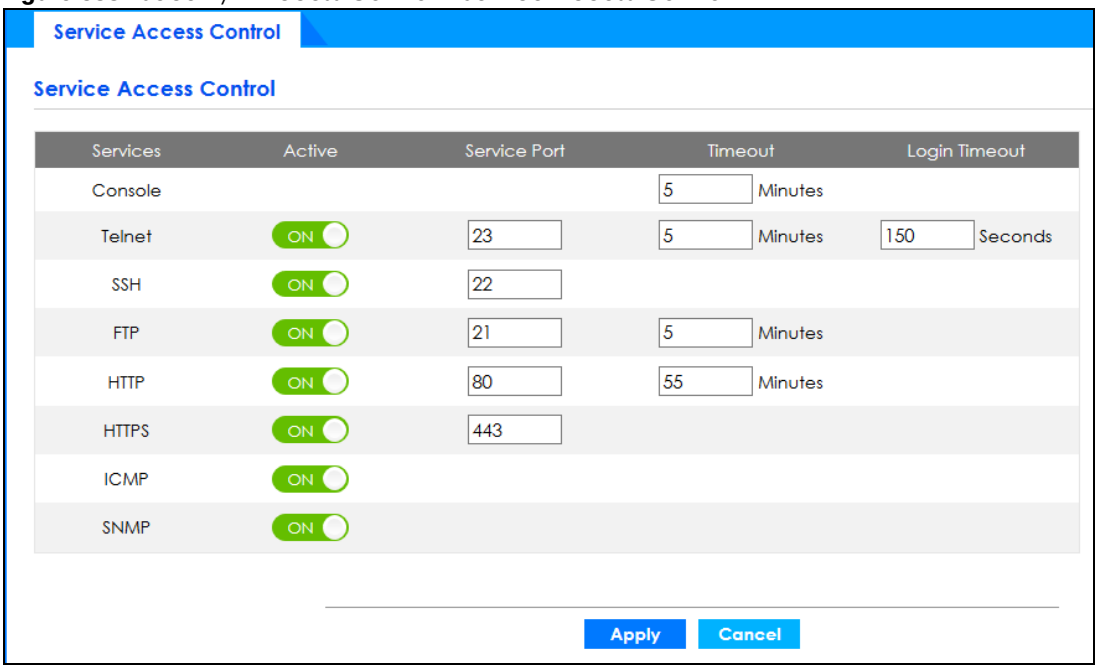
| LABEL | DESCRIPTION |
|---|---|
| User Information | Note: Use the user name and password of the login accounts you specify in this screen to create accounts on the SNMPv3 or SNMPv2c manager. |
| Username | Specify the user name of a login account on the Switch. |
| Security Level | Select whether you want to implement authentication and/or encryption for SNMP communication from this user. Choose:<br>• **noauth** – to use the user name as the password string to send to the SNMP manager. This is equivalent to the Get, Set and Trap Community in SNMPv2c. This is the lowest security level.<br>• **auth** – to implement an authentication algorithm for SNMP messages sent by this user.<br>• **priv** – to implement authentication and encryption for SNMP messages sent by this user. This is the highest security level.<br>Note: The settings on the SNMP manager must be set at the same security level or higher than the security level settings on the Switch. |
| Authentication | Select an authentication algorithm. **MD5** (Message Digest 5) and **SHA** (Secure Hash Algorithm) are hash algorithms used to authenticate SNMP data. SHA authentication is generally considered stronger than MD5, but is slower. |
| Password | Enter the password of up to 32 ASCII characters (except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) for SNMP user authentication. |
| Privacy | Specify the encryption method for SNMP communication from this user. You can choose one of the following:<br>• **DES** – Data Encryption Standard is a widely used (but breakable) method of data encryption. It applies a 56-bit key to each 64-bit block of data.<br>• **AES** – Advanced Encryption Standard is another method for data encryption that also uses a secret key. AES applies a 128-bit key to 128-bit blocks of data. |
| Password | Enter the password of up to 32 ASCII characters (except [ ? ], [ \| ], [ ' ], [ " ] or [ , ]) (for encrypting SNMP packets. |
| Group | SNMPv3 adopts the concept of View-based Access Control Model (VACM) group. SNMP managers in one group are assigned common access rights to MIBs. Specify in which SNMP group this user is.<br>**admin** – Members of this group can perform all types of system configuration, including the management of administrator accounts.<br>**readwrite** – Members of this group have read and write rights, meaning that the user can create and edit the MIBs on the Switch, except the user account and AAA configuration.<br>**readonly** – Members of this group have read rights only, meaning the user can collect information from the Switch. |
| Add | Click this to create a new entry or to update an existing one.<br>This saves your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Clear | Click **Clear** to reset the fields to the factory defaults. |
| Cancel | Click **Cancel** to reset the fields to your previous configuration. |

# 78.8 Service Access Control

Service Access Control allows you to decide what services you may use to access the Switch. You may

also change the default service port and configure "trusted computers" for each service in the **Remote Management** screen (discussed earlier). Click **Security** > **Access Control** > **Service Access Control** to view the screen as shown.

**Figure 538** Security > Access Control > Service Access Control




The following table describes the fields in this screen.

Table 331 Security > Access Control > Service Access Control

| LABEL | DESCRIPTION |
|---|---|
| Services | Services you may use to access the Switch are listed here. |
| Active | Select this option for the corresponding services that you want to allow to access the Switch. |
| Service Port | For Telnet, SSH, FTP, HTTP or HTTPS services, change the default service port by typing the new port number in the **Service Port** field. If you change the default port number then you will have to let people (who wish to use the service) know the new port number for that service. |
| Timeout | Enter how many minutes (from 1 to 255) a management session can be left idle before the session times out. After it times out you have to log in with your password again. Very long idle timeouts may have security risks. |
| Login Timeout | The Telnet or SSH server do not allow multiple user logins at the same time. Enter how many seconds (from 30 to 300 seconds) a login session times out. After it times out you have to start the login session again. Very long login session timeouts may have security risks.<br><br>For example, if User A attempts to connect to the Switch (through SSH), but during the login stage, do not enter the user name and/or password, User B cannot connect to the Switch (through SSH) before the **Login Timeout** for User A expires (default 150 seconds). |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to begin configuring this screen afresh. |

# CHAPTER 79 Maintenance

This section explains how to configure the screens that let you maintain the firmware and configuration files.

## 79.1 What You Can Do

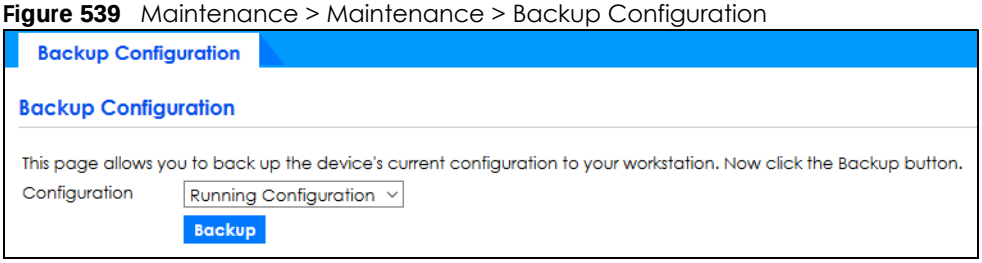
- Use the **Backup Configuration** screen (Section 79.2 on page 671) to save your configuration for later use.
- Use the **Firmware Upgrade** screen (Section 79.3 on page 672) to upload the latest firmware.
- Use the **Reboot System** screen (Section 79.4 on page 673) to restart the Switch without physically turning the power off and load a specific configuration file.
- Use the **Restore Configuration** screen (Section 79.5 on page 674) to upload a stored device configuration file.
- Use the **Save Configuration** screen (Section 79.6 on page 674) to save the current configuration settings to a specific configuration file on the Switch.
- Use the **Tech-Support** screen (Section 79.7 on page 675) to create reports for customer support if there are problems with the Switch.

## 79.2 Backup Configuration

Backing up your Switch configurations allows you to create various "snap shots" of your device from which you may restore at a later date.

Click **Maintenance** > **Maintenance** > **Backup Configuration** to display the screen as shown next. Use this screen to back up your current Switch configuration and log files to a server or as local files to your computer.

**Figure 539** Maintenance > Maintenance > Backup Configuration




Follow the steps below to back up the current Switch configuration to your computer in this screen.

1 Choose the type of configuration files for backup (running, current, and custom default).

2 Click **Backup**.

3 If a dialog box pops up asking whether you want to open or save the file, click **Save File** to download it to the default downloads folder on your computer. Click **OK** to save the configuration file to your computer.

# 79.3 Firmware Upgrade

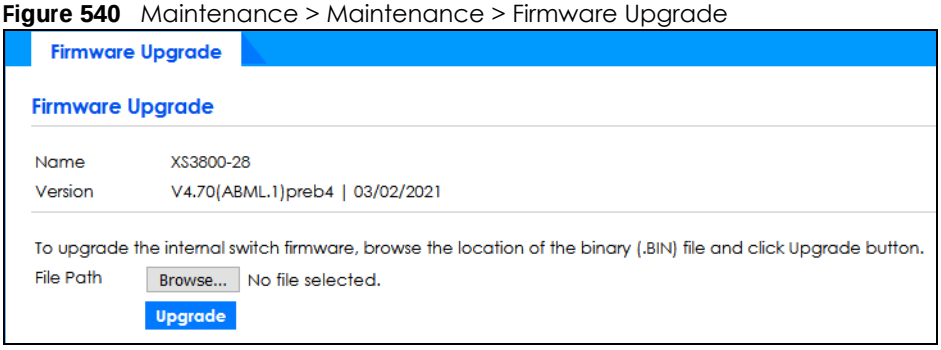
Use the following screen to upgrade your Switch to the latest firmware.

Make sure you have downloaded (and unzipped) the correct model firmware and version to your computer before uploading to the device.

> **Be sure to upload the correct model firmware as uploading the wrong model firmware may damage your device.**

Click **Maintenance** > **Maintenance** > **Firmware Upgrade** to view the screen as shown next.

**Figure 540** Maintenance > Maintenance > Firmware Upgrade




Click **Choose File** or **Browse** to locate the firmware file you wish to upload to the Switch. Firmware upgrades are only applied after a reboot. Click **Upgrade** to load the new firmware.

After the firmware upgrade process is complete, see the **System Info** screen to verify your current firmware version number.

Table 332 Maintenance > Maintenance > Firmware Upgrade

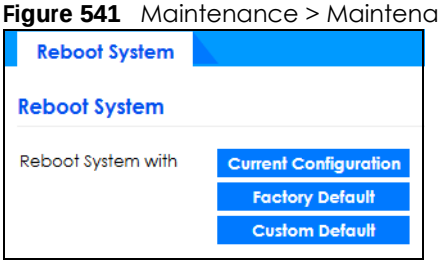
| LABEL | DESCRIPTION |
|---|---|
| Name | This is the name of the Switch that you are configuring. |
| Version | This is the version number (and model code) and MM/DD/YYYY creation date of the firmware currently in use on the Switch. The firmware information is also displayed in **System** > **System Information**. |
| File Path | Enter the path and file name of the firmware file you wish to upload to the Switch in the **File Upload** text box or click **Choose File** or **Browse** to locate it. |
| Upgrade | Click **Upgrade** to load the new firmware. Firmware upgrades are only applied after a reboot. To reboot, go to **Maintenance** > **Maintenance** > **Reboot System** and click **Current Configuration**, **Factory Default**, or **Custom Default** (**Current Configuration**, **Factory Default**, and **Custom Default** are the configuration files you want the Switch to use when it restarts). |

# 79.4 Reboot System

**Reboot System** allows you to restart the Switch without physically turning the power off. It also allows you to load the **Current Configuration**, a **Custom Default** or the **Factory Default** configuration when you reboot. Follow the steps below to reboot the Switch.

Click **Maintenance** > **Maintenance** > **Reboot System** to view the screen as shown next.

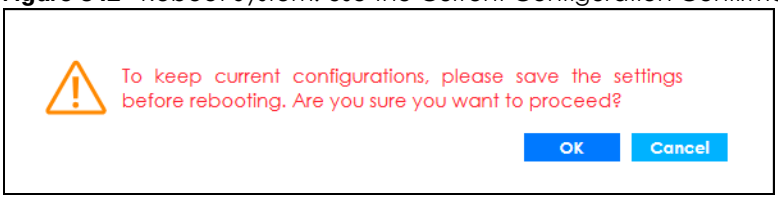
**Figure 541** Maintenance > Maintenance > Reboot System




1 In the **Reboot System** screen, click a configuration button next to **Reboot System with** to reboot and load that configuration file. The following screen displays.

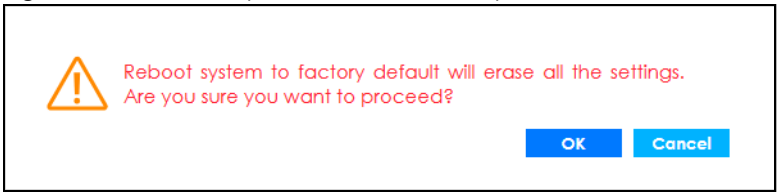
If you select **Current Configuration**, make sure to save the Switch settings as the current configuration in the **Maintenance** > **Maintenance** > **Save Configuration** screen.

**Figure 542** Reboot System: Use the Current Configuration Confirmation



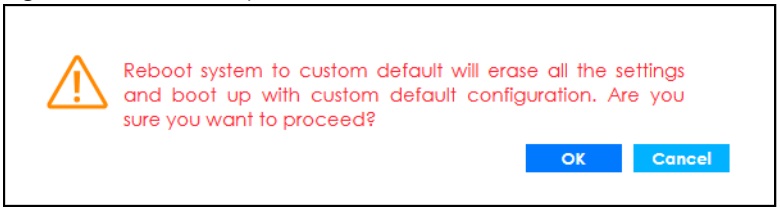

If you select **Factory Default**, the following warning will appear.

**Figure 543** Reboot System: Use the Factory Default Confirmation




If you select **Custom Default**, the following warning will appear.

**Figure 544** Reboot System: Use the Custom Default Confirmation




2 Click **OK** again and then wait for the Switch to restart. This takes up to 2 minutes. This does not affect the Switch's configuration.

Click **Current Configuration** and follow steps 1 to 2 to reboot and load the current configuration on the Switch.

Click **Factory Default** and follow steps 1 to 2 to reboot and load Zyxel factory default configuration settings on the Switch.

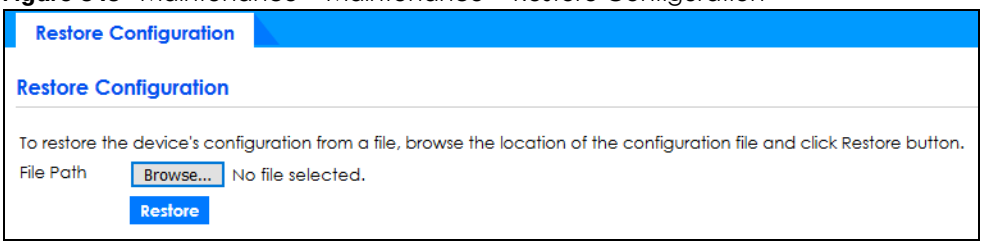
Click **Custom Default** and follow steps 1 to 2 to reboot and load a customized default file on the Switch.

# 79.5 Restore Configuration

You can restore a previously saved device configuration from your computer.

Click **Maintenance** > **Maintenance** > **Restore Configuration** to display the screen as shown next. Use this screen to restore a previously saved configuration from your computer.

**Figure 545** Maintenance > Maintenance > Restore Configuration

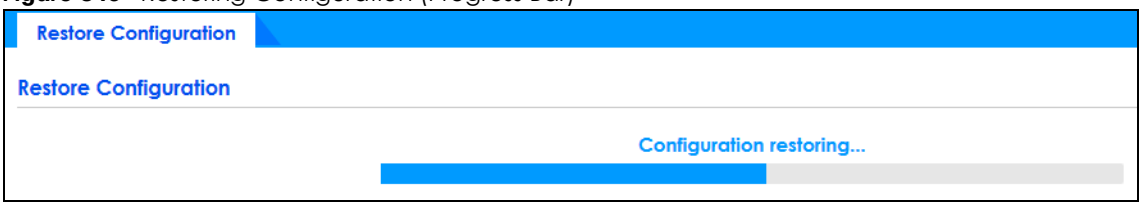



Follow the steps below to restore a previously saved configuration from your computer in this screen.

1 Click **Choose File** or **Browse** to locate the configuration file you wish to restore to the Switch.

2 Click **Restore**. The restore progress is shown.

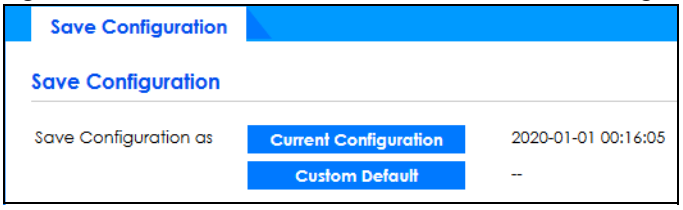
**Figure 546** Restoring Configuration (Progress Bar)




# 79.6 Save Configuration

Click **Maintenance** > **Maintenance** > **Save Configuration** to view the screen as shown next.

**Figure 547** Maintenance > Maintenance > Save Configuration



Click **Current Configuration** to save the current configuration settings permanently to the Switch. This configuration is set up according to your network environment.

Click **Custom Default** to save the current configuration settings permanently to a customized default file on the Switch.

Note: If a customized default file was not saved, clicking **Custom Default** in the **Maintenance** > **Reboot System** screen loads the factory default configuration on the Switch.

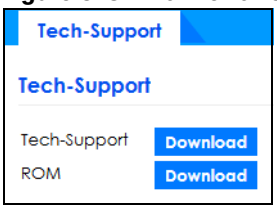
Alternatively, click **Save** on the top right-hand corner in any screen to save the configuration changes to the current configuration.

# 79.7 Tech-Support

The Tech-Support feature is a log enhancement tool that logs useful information such as CPU utilization history, memory and Mbuf (Memory Buffer) log and crash reports for issue analysis by customer support should you have difficulty with your Switch. The Tech Support menu eases your effort in obtaining reports and it is also available in CLI command by typing "Show tech-support" command.

Click **Maintenance** > **Maintenance** > **Tech-Support** to see the following screen.

**Figure 548** Maintenance > Maintenance > Tech-Support




You may need WordPad or similar software to see the log report correctly. The table below describes the fields in the above screen.

Table 333 Maintenance > Maintenance > Tech-Support

| LABEL | DESCRIPTION |
|---|---|
| Tech-Support | Click **Download** to see all the log report and system status. This log report is stored in flash memory. If the **All** log report is too large, you can download the log reports separately below. |
| ROM | Click **Download** to see the Read Only Memory (ROM) log report. This report is stored in flash memory. |

# 79.8 Port Mirroring

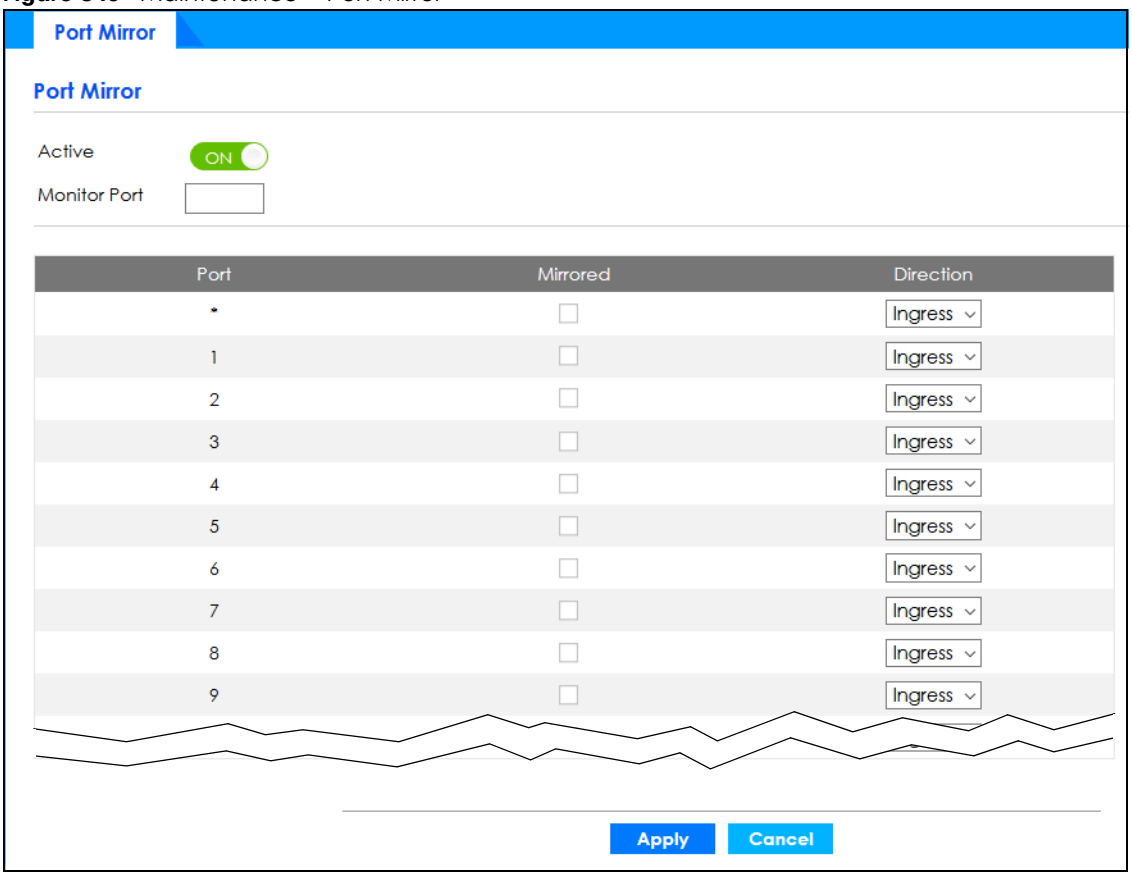
Port mirroring allows you to copy a traffic flow to a monitor port (the port you copy the traffic to) in order that you can examine the traffic from the monitor port without interference.

Use the **Port Mirror** screen to select a monitor port and specify the traffic flow to be copied to the monitor port.

Click **Maintenance** > **Port Mirror** in the navigation panel to display the **Port Mirror** screen. Use this screen

to select a monitor port and specify the traffic flow to be copied to the monitor port.

**Figure 549** Maintenance > Port Mirror




The following table describes the labels in this screen.

Table 334 Maintenance > Port Mirror

| LABEL | DESCRIPTION |
|---|---|
| Active | Select the check box to activate port mirroring on the Switch. Clear check box to disable the feature. |
| Monitor Port | The monitor port is the port you copy the traffic to in order to examine it in more detail without interfering with the traffic flow on the original ports. Enter the port number of the monitor port. |
| Port | This field displays the port number. |
| * | Settings in this row apply to all ports.<br>Use this row only if you want to make some settings the same for all ports. Use this row first to set the common settings and then make adjustments on a port-by-port basis.<br>Note: Changes in this row are copied to all the ports as soon as you make them. |
| Mirrored | Select this option to mirror the traffic on a port. |
| Direction | Specify the direction of the traffic to mirror by selecting from the drop-down list box. Choices are **Egress** (outgoing), **Ingress** (incoming) and **Both**. |
| Apply | Click **Apply** to save your changes to the Switch's run-time memory. The Switch loses these changes if it is turned off or loses power, so use the **Save** link on the top navigation panel to save your changes to the non-volatile memory when you are done configuring. |
| Cancel | Click **Cancel** to reset the fields. |

# PART III
# Troubleshooting and Appendices

# CHAPTER 80
# Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- Power, Hardware Connections, and LEDs
- Switch Access and Login
- Switch Configuration

## 80.1 Power, Hardware Connections, and LEDs

### The Switch does not turn on. None of the LEDs turn on.

1. Make sure you are using the power adapter or cord included with the Switch.
2. Make sure the power adapter or cord is connected to the Switch and plugged in to an appropriate power source. Make sure the power source is turned on.
3. Disconnect and re-connect the power adapter or cord to the Switch.
4. If the problem continues, contact the vendor.

### One of the LEDs does not behave as expected.

1. Make sure you understand the normal behavior of the LED. See Section 3.3 on page 48.
2. Check the hardware connections. See Section 3.1 on page 41.
3. Inspect your cables for damage. Contact the vendor to replace any damaged cables.
4. Disconnect and re-connect the power adapter or cord to the Switch.
5. If the problem continues, contact the vendor.

# 80.2 Switch Access and Login

## I forgot the IP address for the Switch.

1. The default in-band IP address in standalone mode is **http://DHCP-assigned IP** (when connecting to a DHCP server) or **192.168.1.1**.
2. Use the NCC (Nebula Control Center) or the ZON utility to find the IP address.
3. Use the console port to log in to the Switch.
4. Use the **MGMT** port to log in to the Switch, the default IP address of the **MGMT** port is **192.168.0.1**.
5. If this does not work, you have to reset the device to its factory defaults. See Section 4.8 on page 78.

## I forgot the user name and/or password.

1. The default user name is **admin** and the default password is **1234**.
2. If this does not work, you have to reset the device to its factory defaults. See Section 4.8 on page 78.

## I cannot see or access the **Login** screen in the Web Configurator.

1. Make sure you are using the correct IP address.
   - If you changed the IP address, use the new IP address.
   - The default in-band IP address in standalone mode is http://DHCP-assigned IP (when connecting to a DHCP server) or 192.168.1.1.
     The default in-band IP address in stacking mode is **192.168.1.1**.
   - If you changed the IP address and have forgotten it, see the troubleshooting suggestions for I forgot the IP address for the Switch.
2. Check the hardware connections, and make sure the LEDs are behaving as expected. See Section 3.3 on page 48.
3. Make sure your Internet browser does not block pop-up windows and has JavaScripts and Java enabled.
4. Make sure your computer is in the same subnet as the Switch. (If you know that there are routers between your computer and the Switch, skip this step.)
5. Reset the device to its factory defaults, and try to access the Switch with the default IP address. See Section 4.8 on page 78.

6 If the problem continues, contact the vendor, or try the advanced suggestion.

**Advanced Suggestion**

- Try to access the Switch using another service, such as Telnet. If you can access the Switch, check the remote management settings to find out why the Switch does not respond to HTTP.

## I can see the **Login** screen, but I cannot log in to the Switch.

1 Make sure you have entered the user name and password correctly. The default user name is **admin**, and the default password is **1234**. These fields are case-sensitive, so make sure [Caps Lock] is not on.

2 You may have exceeded the maximum number of concurrent Telnet sessions. Close other Telnet sessions or try connecting again later.

Check that you have enabled logins for HTTP or Telnet. If you have configured a secured client IP address, your computer's IP address must match it. Refer to the chapter on access control for details.

3 Disconnect and re-connect the cord to the Switch.

4 If this does not work, you have to reset the device to its factory defaults. See Section 4.8 on page 78.

## Pop-up Windows, JavaScripts and Java Permissions

In order to use the Web Configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

## There is unauthorized access to my Switch through telnet, HTTP and SSH.

Click the **Display** button in the **System Log** field in the **Management** > **Diagnostic** screen to check for unauthorized access to your Switch. To avoid unauthorized access, configure the secured client setting in the **Management** > **Access Control** > **Remote Management** screen for telnet, HTTP and SSH (see Section 59.6 on page 560). Computers not belonging to the secured client set cannot get permission to access the Switch.

# 80.3 Switch Configuration

I lost my configuration settings after I restart the Switch.

Make sure you save your configuration into the Switch's non-volatile memory each time you make changes. Click **Save** at the top right of the Web Configurator to save the configuration permanently. See also Section 58.2.2 on page 537 for more information about how to save your configuration.

I accidentally unplugged the Switch. I am not sure which configuration file will be loaded.

If you plug the power cable back to the Switch, it will reboot and load the configuration file that was used the last time. For example, if **Config 1** was used on the Switch before you accidentally unplugged the Switch, **Config 1** will be loaded when rebooting.

# APPENDIX A
# Customer Support

In the event of problems that cannot be solved by using this manual, you should contact your vendor. If you cannot contact your vendor, then contact a Zyxel office for the region in which you bought the device.

See *https://www.zyxel.com/homepage.shtml* and also *https://www.zyxel.com/about_zyxel/zyxel_worldwide.shtml* for the latest information.

Please have the following information ready when you contact an office.

### Required Information

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

## Corporate Headquarters (Worldwide)

### Taiwan

- Zyxel Communications Corporation
- http://www.zyxel.com

## Asia

### China

- Zyxel Communications (Shanghai) Corp.
  Zyxel Communications (Beijing) Corp.
  Zyxel Communications (Tianjin) Corp.
- https://www.zyxel.com/cn/zh/

### India

- Zyxel Technology India Pvt Ltd.
- https://www.zyxel.com/in/en/

### Kazakhstan

- Zyxel Kazakhstan
- https://www.zyxel.kz

### Korea

- Zyxel Korea Corp.
- http://www.zyxel.kr

### Malaysia

- Zyxel Malaysia Sdn Bhd.
- http://www.zyxel.com.my

### Pakistan

- Zyxel Pakistan (Pvt.) Ltd.
- http://www.zyxel.com.pk

### Philippines

- Zyxel Philippines
- http://www.zyxel.com.ph

### Singapore

- Zyxel Singapore Pte Ltd.
- http://www.zyxel.com.sg

### Taiwan

- Zyxel Communications Corporation
- https://www.zyxel.com/tw/zh/

### Thailand

- Zyxel Thailand Co., Ltd.
- https://www.zyxel.com/th/th/

### Vietnam

- Zyxel Communications Corporation-Vietnam Office
- https://www.zyxel.com/vn/vi

## Europe

### Belarus

- Zyxel BY
- https://www.zyxel.by

### Belgium

- Zyxel Communications B.V.
- https://www.zyxel.com/be/nl/

- https://www.zyxel.com/be/fr/

### Bulgaria

- Zyxel България
- https://www.zyxel.com/bg/bg/

### Czech Republic

- Zyxel Communications Czech s.r.o
- https://www.zyxel.com/cz/cs/

### Denmark

- Zyxel Communications A/S
- https://www.zyxel.com/dk/da/

### Estonia

- Zyxel Estonia
- https://www.zyxel.com/ee/et/

### Finland

- Zyxel Communications
- https://www.zyxel.com/fi/fi/

### France

- Zyxel France
- https://www.zyxel.fr

### Germany

- Zyxel Deutschland GmbH
- https://www.zyxel.com/de/de/

### Hungary

- Zyxel Hungary & SEE
- https://www.zyxel.com/hu/hu/

### Italy

- Zyxel Communications Italy
- https://www.zyxel.com/it/it/

### Latvia

- Zyxel Latvia
- https://www.zyxel.com/lv/lv/

### Lithuania

- Zyxel Lithuania
- https://www.zyxel.com/lt/lt/

### Netherlands

- Zyxel Benelux
- https://www.zyxel.com/nl/nl/

### Norway

- Zyxel Communications
- https://www.zyxel.com/no/no/

### Poland

- Zyxel Communications Poland
- https://www.zyxel.com/pl/pl/

### Romania

- Zyxel Romania
- https://www.zyxel.com/ro/ro

### Russia

- Zyxel Russia
- https://www.zyxel.com/ru/ru/

### Slovakia

- Zyxel Communications Czech s.r.o. organizacna zlozka
- https://www.zyxel.com/sk/sk/

### Spain

- Zyxel Communications ES Ltd.
- https://www.zyxel.com/es/es/

### Sweden

- Zyxel Communications
- https://www.zyxel.com/se/sv/

### Switzerland

- Studerus AG
- https://www.zyxel.ch/de
- https://www.zyxel.ch/fr

### Turkey

- Zyxel Turkey A.S.
- https://www.zyxel.com/tr/tr/

### UK

- Zyxel Communications UK Ltd.
- https://www.zyxel.com/uk/en/

### Ukraine

- Zyxel Ukraine
- http://www.ua.zyxel.com

## South America

### Argentina

- Zyxel Communications Corporation
- https://www.zyxel.com/co/es/

### Brazil

- Zyxel Communications Brasil Ltda.
- https://www.zyxel.com/br/pt/

### Colombia

- Zyxel Communications Corporation
- https://www.zyxel.com/co/es/

### Ecuador

- Zyxel Communications Corporation
- https://www.zyxel.com/co/es/

### South America

- Zyxel Communications Corporation
- https://www.zyxel.com/co/es/

## Middle East

### Israel

- Zyxel Communications Corporation
- http://il.zyxel.com/

### Middle East

- Zyxel Communications Corporation
- https://www.zyxel.com/me/en/

## North America

### USA

- Zyxel Communications, Inc. – North America Headquarters
- https://www.zyxel.com/us/en/

## Oceania

### Australia

- Zyxel Communications Corporation
- https://www.zyxel.com/au/en/

## Africa

### South Africa

- Nology (Pty) Ltd.
- https://www.zyxel.com/za/en/

# APPENDIX B
# Common Services

The following table lists some commonly-used services and their associated protocols and port numbers. For a comprehensive list of port numbers, ICMP type or code numbers and services, visit the IANA (Internet Assigned Number Authority) web site.

- **Name**: This is a short, descriptive name for the service. You can use this one or create a different one, if you like.
- **Protocol**: This is the type of IP protocol used by the service. If this is **TCP/UDP**, then the service uses the same port number with TCP and UDP. If this is **User-Defined**, the **Port(s)** is the IP protocol number, not the port number.
- **Port(s)**: This value depends on the **Protocol**. Please refer to RFC 1700 for further information about port numbers.
  - If the **Protocol** is **TCP**, **UDP**, or **TCP/UDP**, this is the IP port number.
  - If the **Protocol** is **USER**, this is the IP protocol number.
- **Description**: This is a brief explanation of the applications that use this service or the situations in which this service is used.

Table 335 Commonly Used Services

| NAME | PROTOCOL | PORT(S) | DESCRIPTION |
|---|---|---|---|
| AH (IPSEC_TUNNEL) | User-Defined | 51 | The IPSEC AH (Authentication Header) tunneling protocol uses this service. |
| AIM/New-ICQ | TCP | 5190 | AOL's Internet Messenger service. It is also used as a listening port by ICQ. |
| AUTH | TCP | 113 | Authentication protocol used by some servers. |
| BGP | TCP | 179 | Border Gateway Protocol. |
| BOOTP_CLIENT | UDP | 68 | DHCP Client. |
| BOOTP_SERVER | UDP | 67 | DHCP Server. |
| CU-SEEME | TCP<br>UDP | 7648<br>24032 | A popular videoconferencing solution from White Pines Software. |
| DNS | TCP/UDP | 53 | Domain Name Server, a service that matches web names (for example www.zyxel.com) to IP numbers. |
| ESP (IPSEC_TUNNEL) | User-Defined | 50 | The IPSEC ESP (Encapsulation Security Protocol) tunneling protocol uses this service. |
| FINGER | TCP | 79 | Finger is a UNIX or Internet related command that can be used to find out if a user is logged on. |
| FTP | TCP<br>TCP | 20<br>21 | File Transfer Program, a program to enable fast transfer of files, including large files that may not be possible by email. |
| H.323 | TCP | 1720 | NetMeeting uses this protocol. |
| HTTP | TCP | 80 | Hyper Text Transfer Protocol – a client or server protocol for the world wide web. |

Table 335 Commonly Used Services (continued)

| NAME | PROTOCOL | PORT(S) | DESCRIPTION |
|---|---|---|---|
| HTTPS | TCP | 443 | HTTPS is a secured http session often used in e-commerce. |
| ICMP | User-Defined | 1 | Internet Control Message Protocol is often used for diagnostic or routing purposes. |
| ICQ | UDP | 4000 | This is a popular Internet chat program. |
| IGMP (MULTICAST) | User-Defined | 2 | Internet Group Multicast Protocol is used when sending packets to a specific group of hosts. |
| IKE | UDP | 500 | The Internet Key Exchange algorithm is used for key distribution and management. |
| IRC | TCP/UDP | 6667 | This is another popular Internet chat program. |
| MSN Messenger | TCP | 1863 | Microsoft Networks' messenger service uses this protocol. |
| NEW-ICQ | TCP | 5190 | An Internet chat program. |
| NEWS | TCP | 144 | A protocol for news groups. |
| NFS | UDP | 2049 | Network File System – NFS is a client or server distributed file service that provides transparent file sharing for network environments. |
| NNTP | TCP | 119 | Network News Transport Protocol is the delivery mechanism for the USENET newsgroup service. |
| PING | User-Defined | 1 | Packet INternet Groper is a protocol that sends out ICMP echo requests to test whether or not a remote host is reachable. |
| POP3 | TCP | 110 | Post Office Protocol version 3 lets a client computer get e-mail from a POP3 server through a temporary connection (TCP/IP or other). |
| PPTP | TCP | 1723 | Point-to-Point Tunneling Protocol enables secure transfer of data over public networks. This is the control channel. |
| PPTP_TUNNEL (GRE) | User-Defined | 47 | PPTP (Point-to-Point Tunneling Protocol) enables secure transfer of data over public networks. This is the data channel. |
| RCMD | TCP | 512 | Remote Command Service. |
| REAL_AUDIO | TCP | 7070 | A streaming audio service that enables real time sound over the web. |
| REXEC | TCP | 514 | Remote Execution Daemon. |
| RLOGIN | TCP | 513 | Remote Login. |
| RTELNET | TCP | 107 | Remote Telnet. |
| RTSP | TCP/UDP | 554 | The Real Time Streaming (media control) Protocol (RTSP) is a remote control for multimedia on the Internet. |
| SFTP | TCP | 115 | Simple File Transfer Protocol. |
| SMTP | TCP | 25 | Simple Mail Transfer Protocol is the message-exchange standard for the Internet. SMTP enables you to move messages from one email server to another. |
| SNMP | TCP/UDP | 161 | Simple Network Management Program. |
| SNMP-TRAPS | TCP/UDP | 162 | Traps for use with the SNMP (RFC:1215). |

Table 335 Commonly Used Services (continued)

| NAME | PROTOCOL | PORT(S) | DESCRIPTION |
|---|---|---|---|
| SQL-NET | TCP | 1521 | Structured Query Language is an interface to access data on many different types of database systems, including mainframes, midrange systems, UNIX systems and network servers. |
| SSH | TCP/UDP | 22 | Secure Shell Remote Login Program. |
| STRM WORKS | UDP | 1558 | Stream Works Protocol. |
| SYSLOG | UDP | 514 | Syslog allows you to send system logs to a UNIX server. |
| TACACS | UDP | 49 | Login Host Protocol used for (Terminal Access Controller Access Control System). |
| TELNET | TCP | 23 | Telnet is the login and terminal emulation protocol common on the Internet and in UNIX environments. It operates over TCP/IP networks. Its primary function is to allow users to log into remote host systems. |
| TFTP | UDP | 69 | Trivial File Transfer Protocol is an Internet file transfer protocol similar to FTP, but uses the UDP (User Datagram Protocol) rather than TCP (Transmission Control Protocol). |
| VDOLIVE | TCP | 7000 | Another videoconferencing solution. |

# APPENDIX C
# IPv6

## Overview

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to 3.4 x $10^{38}$ IP addresses.

## IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address `2001:0db8:1a2b:0015:0000:0000:1a2f:0000`.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So `2001:0db8:1a2b:0015:0000:0000:1a2f:0000` can be written as `2001:db8:1a2b:15:0:0:1a2f:0`.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So `2001:0db8:0000:0000:1a2f:0000:0000:0015` can be written as `2001:0db8::1a2f:0000:0000:0015`, `2001:0db8:0000:0000:1a2f::0015`, `2001:db8::1a2f:0:0:15` or `2001:db8:0:0:1a2f::15`.

## Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as "/x" where x is a number. For example,

```
2001:db8:1a2b:15::1a2f:0/32
```

means that the first 32 bits (`2001:db8`) is the subnet prefix.

## Link-local Address

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a "private IP address" in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10. The link-local unicast address format is as follows.

Table 336 Link-local Unicast Address Format

| | | |
|---|---|---|
| 1111 1110 10 | 0 | Interface ID |
| 10 bits | 54 bits | 64 bits |

## Global Address

A global address uniquely identifies a device on the Internet. It is similar to a "public IP address" in IPv4. A global unicast address starts with a 2 or 3.

## Unspecified Address

An unspecified address (0:0:0:0:0:0:0:0 or ::) is used as the source address when a device does not have its own address. It is similar to "0.0.0.0" in IPv4.

## Loopback Address

A loopback address (0:0:0:0:0:0:0:1 or ::1) allows a host to send packets to itself. It is similar to "127.0.0.1" in IPv4.

## Multicast Address

In IPv6, multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A multicast address allows a host to send packets to all hosts in a multicast group.

Multicast scope allows you to determine the size of the multicast group. A multicast address has a predefined prefix of ff00::/8. The following table describes some of the predefined multicast addresses.

Table 337 Predefined Multicast Address

| MULTICAST ADDRESS | DESCRIPTION |
|---|---|
| FF01:0:0:0:0:0:0:1 | All hosts on a local node. |
| FF01:0:0:0:0:0:0:2 | All routers on a local node. |
| FF02:0:0:0:0:0:0:1 | All hosts on a local connected link. |
| FF02:0:0:0:0:0:0:2 | All routers on a local connected link. |
| FF05:0:0:0:0:0:0:2 | All routers on a local site. |
| FF05:0:0:0:0:0:1:3 | All DHCP severs on a local site. |

The following table describes the multicast addresses which are reserved and cannot be assigned to a multicast group.

Table 338 Reserved Multicast Address

| MULTICAST ADDRESS |
|---|
| FF00:0:0:0:0:0:0:0 |
| FF01:0:0:0:0:0:0:0 |
| FF02:0:0:0:0:0:0:0 |
| FF03:0:0:0:0:0:0:0 |
| FF04:0:0:0:0:0:0:0 |
| FF05:0:0:0:0:0:0:0 |
| FF06:0:0:0:0:0:0:0 |
| FF07:0:0:0:0:0:0:0 |
| FF08:0:0:0:0:0:0:0 |
| FF09:0:0:0:0:0:0:0 |
| FF0A:0:0:0:0:0:0:0 |
| FF0B:0:0:0:0:0:0:0 |
| FF0C:0:0:0:0:0:0:0 |
| FF0D:0:0:0:0:0:0:0 |
| FF0E:0:0:0:0:0:0:0 |
| FF0F:0:0:0:0:0:0:0 |

## Subnet Masking

Both an IPv6 address and IPv6 subnet mask compose of 128-bit binary digits, which are divided into eight 16-bit blocks and written in hexadecimal notation. Hexadecimal uses 4 bits for each character (1 – 10, A – F). Each block's 16 bits are then represented by 4 hexadecimal characters. For example, FFFF:FFFF:FFFF:FFFF:FC00:0000:0000:0000.

## Interface ID

In IPv6, an interface ID is a 64-bit identifier. It identifies a physical interface (for example, an Ethernet port) or a virtual interface (for example, the management IP address for a VLAN). One interface should have a unique interface ID.

## EUI-64

The EUI-64 (Extended Unique Identifier) defined by the IEEE (Institute of Electrical and Electronics Engineers) is an interface ID format designed to adapt with IPv6. It is derived from the 48-bit (6-byte) Ethernet MAC address as shown next. EUI-64 inserts the hex digits fffe between the third and fourth bytes of the MAC address and complements the seventh bit of the first byte of the MAC address. See the following example.

Table 339

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MAC** | 00 | : | 13 | : | 49 | : 12 | : | 34 | : | 56 | |

Table 340

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EUI-64** | 02 | : | 13 | : | 49 | : | FF | : | FE | : 12 | : | 34 | : | 56 |

## DHCPv6

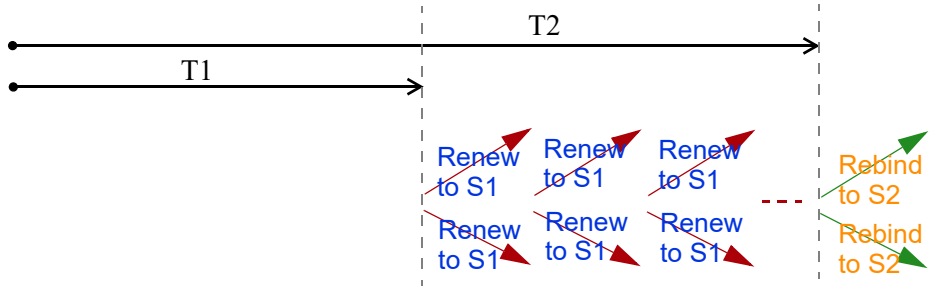
The Dynamic Host Configuration Protocol for IPv6 (DHCPv6, RFC 3315) is a server-client protocol that allows a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. DHCPv6 servers and clients exchange DHCP messages using UDP.

Each DHCP client and server has a unique DHCP Unique IDentifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. It should not change over time even after you reboot the device.

## Identity Association

An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. The DHCP client uses the IA assigned to an interface to obtain configuration from a DHCP server for that interface. Each IA consists of a unique IAID and associated IP information.
The IA type is the type of address in the IA. Each IA holds one type of address. IA_NA means an identity association for non-temporary addresses and IA_TA is an identity association for temporary addresses. An IA_NA option contains the T1 and T2 fields, but an IA_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA_NA before the lifetimes expire. After T1, the client sends the server (**S1**) (from which the addresses in the IA_NA were obtained) a Renew message. If the time T2 is reached and the server does not respond, the client sends a Rebind message to any available server (**S2**). For an IA_TA, the

client may send a Renew or Rebind message at the client's discretion.




## DHCP Relay Agent

A DHCP relay agent is on the same network as the DHCP clients and helps forward messages between the DHCP server and clients. When a client cannot use its link-local address and a well-known multicast address to locate a DHCP server on its network, it then needs a DHCP relay agent to send a message to a DHCP server that is not attached to the same network.

The DHCP relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCP server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

## Prefix Delegation

Prefix delegation enables an IPv6 router to use the IPv6 prefix (network address) received from the ISP (or a connected uplink router) for its LAN. The Switch uses the received IPv6 prefix (for example, 2001:db2::/48) to generate its LAN IP address. Through sending Router Advertisements (RAs) regularly by multicast, the Switch passes the IPv6 prefix information to its LAN hosts. The hosts then can use the prefix to generate their IPv6 addresses.

## ICMPv6

Internet Control Message Protocol for IPv6 (ICMPv6 or ICMP for IPv6) is defined in RFC 4443. ICMPv6 has a preceding Next Header value of 58, which is different from the value used to identify ICMP for IPv4. ICMPv6 is an integral part of IPv6. IPv6 nodes use ICMPv6 to report errors encountered in packet processing and perform other diagnostic functions, such as "ping".

## Neighbor Discovery Protocol (NDP)

The Neighbor Discovery Protocol (NDP) is a protocol used to discover other IPv6 devices and track neighbor's reachability in a network. An IPv6 device uses the following ICMPv6 messages types:

- Neighbor solicitation: A request from a host to determine a neighbor's link-layer address (MAC address) and detect if the neighbor is still reachable. A neighbor being "reachable" means it responds to a neighbor solicitation message (from the host) with a neighbor advertisement message.
- Neighbor advertisement: A response from a node to announce its link-layer address.
- Router solicitation: A request from a host to locate a router that can act as the default router and

forward packets.

- Router advertisement: A response to a router solicitation or a periodical multicast advertisement from a router to advertise its presence and other parameters.

## IPv6 Cache

An IPv6 host is required to have a neighbor cache, destination cache, prefix list and default router list. The Switch maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Switch configures a link-local address automatically, and then sends a neighbor solicitation message to check if the address is unique. If there is an address to be resolved or verified, the Switch also sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Switch uses a router solicitation message to query for a router and receives a router advertisement message, it adds the router's information to the neighbor cache, prefix list and destination cache. The Switch creates an entry in the default router list cache if the router can be used as a default router.

When the Switch needs to send a packet, it first consults the destination cache to determine the next hop. If there is no matching entry in the destination cache, the Switch uses the prefix list to determine whether the destination address is on-link and can be reached directly without passing through a router. If the address is onlink, the address is considered as the next hop. Otherwise, the Switch determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Switch looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor cache or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

## Multicast Listener Discovery

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.

MLD filtering controls which multicast groups a port can join.

## MLD Messages

A multicast router or switch periodically sends general queries to MLD hosts to update the multicast forwarding table. When an MLD host wants to join a multicast group, it sends an MLD Report message for that address.

An MLD Done message is equivalent to an IGMP Leave message. When an MLD host wants to leave a multicast group, it can send a Done message to the router or switch. The router or switch then sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

## Example – Enabling IPv6 on Windows XP/2003/Vista

By default, Windows XP and Windows 2003 support IPv6. This example shows you how to use the `ipv6 install` command on Windows XP or 2003 to enable IPv6. This also displays how to use the `ipconfig` command to see auto-generated IP addresses.

```
C:\>ipv6 install
Installing...
Succeeded.

C:\>ipconfig

Windows IP Configuration


Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . . : 10.1.1.46
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
        IP Address. . . . . . . . . . . . : fe80::2d0:59ff:feb8:103c%4
        Default Gateway . . . . . . . . . : 10.1.1.254
```

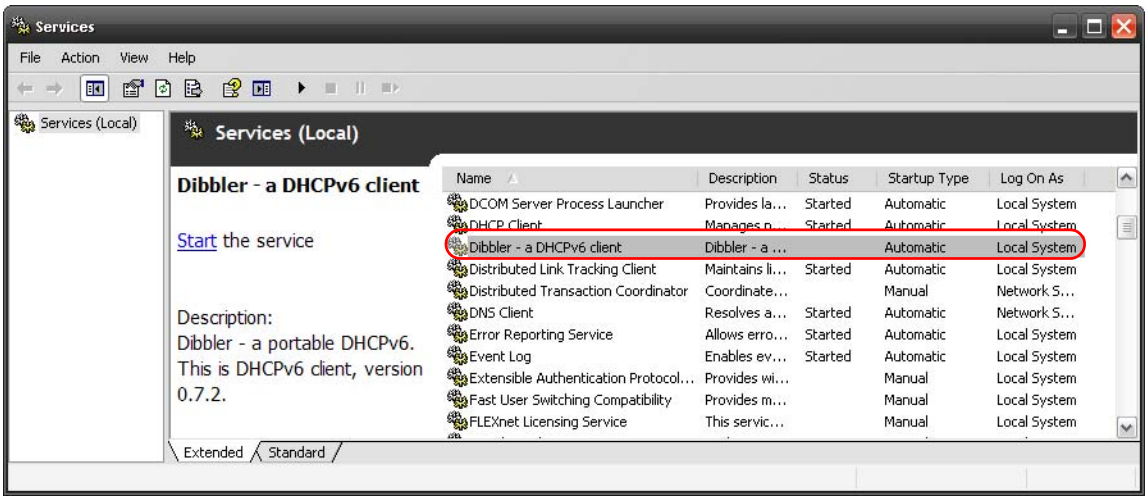
IPv6 is installed and enabled by default in Windows Vista. Use the `ipconfig` command to check your automatic configured IPv6 address as well. You should see at least one IPv6 address available for the interface on your computer.

## Example – Enabling DHCPv6 on Windows XP

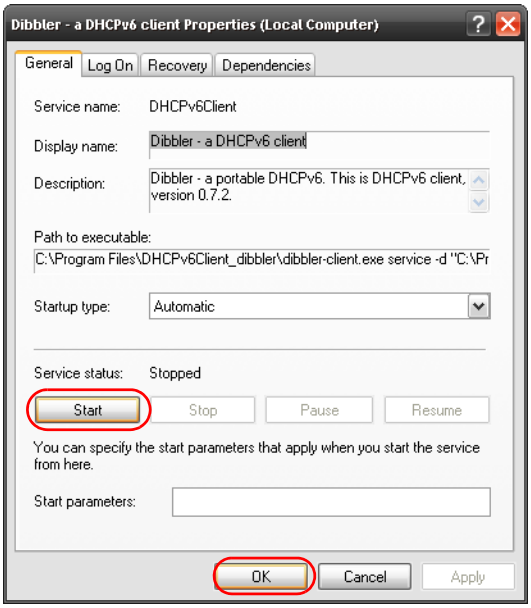
Windows XP does not support DHCPv6. If your network uses DHCPv6 for IP address assignment, you have to additionally install a DHCPv6 client software on your Windows XP. (Note: If you use static IP addresses or Router Advertisement for IPv6 address assignment in your network, ignore this section.)

This example uses Dibbler as the DHCPv6 client. To enable DHCPv6 client on your computer:

1. Install Dibbler and select the DHCPv6 client option on your computer.
2. After the installation is complete, select **Start** > **All Programs** > **Dibbler-DHCPv6** > **Client Install as service**.
3. Select **Start** > **Control Panel** > **Administrative Tools** > **Services**.
4. Double click **Dibbler – a DHCPv6 client**.




5 Click **Start** and then **OK**.




Now your computer can obtain an IPv6 address from a DHCPv6 server.

## Example – Enabling IPv6 on Windows 7

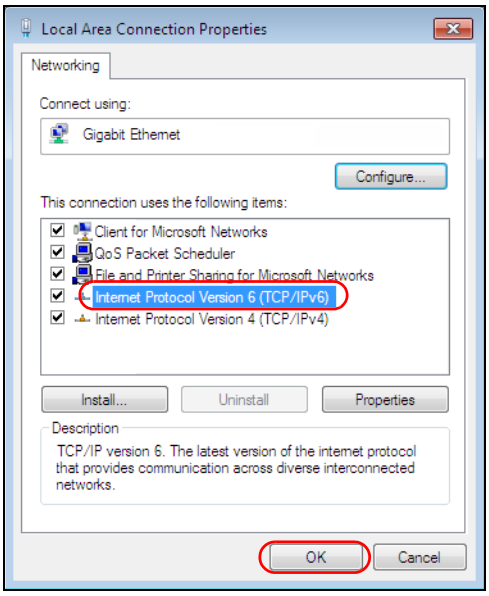
Windows 7 supports IPv6 by default. DHCPv6 is also enabled when you enable IPv6 on a Windows 7 computer.

To enable IPv6 in Windows 7:

1 Select **Control Panel** > **Network and Sharing Center** > **Local Area Connection**.

2 Select the **Internet Protocol Version 6 (TCP/IPv6)** check box to enable it.

3 Click **OK** to save the change.




4 Click **Close** to exit the **Local Area Connection Status** screen.

5 Select **Start** > **All Programs** > **Accessories** > **Command Prompt**.

6 Use the `ipconfig` command to check your dynamic IPv6 address. This example shows a global address (2001:b021:2d::1000) obtained from a DHCP server.

```
C:\>ipconfig

Windows IP Configuration


Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2001:b021:2d::1000
   Link-local IPv6 Address . . . . . : fe80::25d8:dcab:c80a:5189%11
   IPv4 Address. . . . . . . . . . . : 172.16.100.61
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::213:49ff:feaa:7125%11
                                       172.16.100.254
```

## Example – Enabling IPv6 on Windows 10

Windows 10 supports IPv6 by default. DHCPv6 is enabled when you enable IPv6 on a Windows 10 PC.

To enable IPv6 in Windows 10:

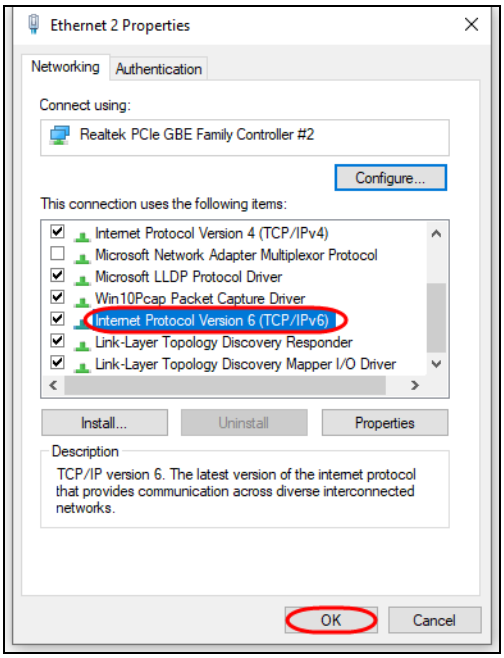
1 Select **Control Panel** > **Network and Sharing Center**.

2 On the left side of the **Network and Sharing Center**, select **Change adapter settings**.

3 Right-click your network connection and select **Properties**.

4 Select the **Internet Protocol Version 6 (TCP/IPv6)** check box to enable it.

5 Click **OK** to save the changes for the selected network adapter.




6 Click **OK** to exit the selected network adapter **Properties** screen.

## Example – Enabling DHCPv6 on Windows 10

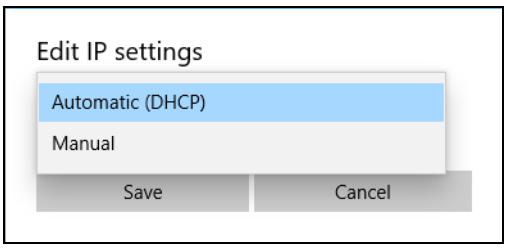
Windows 10 supports DHCPv6 by default. To enable DHCPv6 client on your computer:

1 Select **Start** > **Settings** > **Network & Internet**.

2 On the left side of the **Network & Internet**, select **Ethernet**. Then select the Ethernet network you are connected to.

3 Under **IP assignment**, select **Edit**.

4 Under **Edit IP settings**, select **Automatic (DHCP)** or **Manual**. Then click **Save**.




- When you select **Automatic (DHCP)**, the IP address settings and DNS server address setting are set automatically by your router.
- When you select **Manual**, you can manually set your IP address settings and DNS server address.

Now your computer can obtain an IPv6 address from a DHCPv6 server.

# APPENDIX D
# Legal Information

## Copyright

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### Disclaimer

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## Regulatory Notice and Statement

### United States of America

The following information applies if you use the product within USA area.

US Importer: Zyxel Communications, Inc, 1130 North Miller Street Anaheim, CA92806-2001, https://www.zyxel.com/us/en/

#### Federal Communications Commission (FCC) EMC Statement

- This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

  (1) This device may not cause harmful interference.

  (2) This device must accept any interference received, including interference that may cause undesired operations.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### Canada

The following information applies if you use the product within Canada area.

#### Innovation, Science and Economic Development Canada ICES statement

CAN ICES-3 (A)/NMB-3(A)

### European Union

The following information applies if you use the product within the European Union.

#### CE EMC statement

WARNING: This equipment is compliant with Class A of EN55032. In a residential environment this equipment may cause radio interference.

### List of National Codes

| COUNTRY | ISO 3166 2 LETTER CODE | COUNTRY | ISO 3166 2 LETTER CODE |
|---|---|---|---|
| Austria | AT | Liechtenstein | LI |
| Belgium | BE | Lithuania | LT |
| Bulgaria | BG | Luxembourg | LU |
| Croatia | HR | Malta | MT |
| Cyprus | CY | Netherlands | NL |
| Czech Republic | CR | Norway | NO |
| Denmark | DK | Poland | PL |
| Estonia | EE | Portugal | PT |
| Finland | FI | Romania | RO |
| France | FR | Serbia | RS |
| Germany | DE | Slovakia | SK |
| Greece | GR | Slovenia | SI |
| Hungary | HU | Spain | ES |
| Iceland | IS | Sweden | SE |
| Ireland | IE | Switzerland | CH |
| Italy | IT | Turkey | TR |
| Latvia | LV | United Kingdom | GB |

## Safety Warnings

- To avoid possible eye injury, do NOT look into an operating fiber-optic module's connector.
- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do NOT obstruct the device ventilation slots as insufficient airflow may harm your device. For example, do not place the device in an enclosed space such as a box or on a very soft surface such as a bed or sofa.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. Only qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this device before servicing or disassembling.
- Do NOT remove the plug and connect it to a power outlet by itself; always attach the plug to the power adaptor first before connecting it to a power outlet.
- Do NOT allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Please use the provided or designated connection cables/power cables/adaptors. Connect it to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe). If the power adaptor or cord is damaged, it might cause electrocution. Remove it from the device and the power source, repairing the power adapter or cord is prohibited. Contact your local vendor to order a new one.
- Do NOT use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE, DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTION. Dispose them at the applicable collection point for the recycling of electrical and electronic device. For detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the store where you purchased the product.
- Use ONLY power wires of the appropriate wire gauge for your device. Connect it to a power supply of the correct voltage.
- Fuse Warning! Replace a fuse only with a fuse of the same type and rating.
- The POE (Power over Ethernet) devices that supply or receive power and their connected Ethernet cables must all be completely indoors.
- The following warning statements apply, where the disconnect device is not incorporated in the device or where the plug on the power supply cord is intended to serve as the disconnect device,

  – For PERMANENTLY CONNECTED DEVICES, a readily accessible disconnect device shall be incorporated external to the device;

  – For PLUGGABLE DEVICES, the socket-outlet shall be installed near the device and shall be easily accessible.
- This device must be grounded by qualified service personnel. Never defeat the ground conductor or operate the device in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.
- If your device has an earthing screw (frame ground), connect the screw to a ground terminal using an appropriate AWG ground wire. Do this before you make other connections.
- If your device has no earthing screw, but has a 3-prong power plug, make sure to connect the plug to a 3-hole earthed socket.
- When connecting or disconnecting power to hot-pluggable power supplies, if offered with your system, observe the following guidelines:

  – Install the power supply before connecting the power cable to the power supply.

  – Unplug the power cable before removing the power supply.

  – If the system has multiple sources of power, disconnect power from the system by unplugging all power cables from the power supply.

- CLASS 1 LASER PRODUCT (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products).

- PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11. (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products)

- APPAREIL À LASER DE CLASS 1 (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products).
- PRODUIT CONFORME SELON 21 CFR 1040.10 ET 1040.11. (for products with mini-GBIC slots or laser products, such as fiber-optic transceiver and GPON products)

## Important Safety Instructions

1 Warning! Energy Hazard. Remove all metal jewelry, watches, and so on from your hands and wrists before serving this device.

2 Caution! The RJ-45 jacks are not used for telephone line connection.

3 Hazardous Moving Parts. Keep body parts away from fan blades.

4 Hot Surface. Do not touch.

1 Avertissement: Risque de choc électrique. Retirer tout bijoux en métal et votre montre de vos mains et poignets avant de manipuler cet appareil.

2 Attention: Les câbles RJ-45 ne doivent pas être utilisés pour les connections téléphoniques.

3 Mobilité des pièces détachées. S'assurer que les pièces détachées ne sont pas en contact avec les pales du ventilateur.

4 Surface brûlante. Ne pas toucher.

## Environment Statement

### European Union – Disposal and Recycling Information

The symbol below means that according to local regulations your product and/or its battery shall be disposed of separately from domestic waste. If this product is end of life, take it to a recycling station designated by local authorities. At the time of disposal, the separate collection of your product and/or its battery will help save natural resources and ensure that the environment is sustainable development.

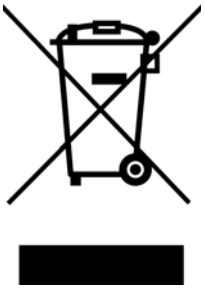
Die folgende Symbol bedeutet, dass Ihr Produkt und/oder seine Batterie gemäß den örtlichen Bestimmungen getrennt vom Hausmüll entsorgt werden muss. Wenden Sie sich an eine Recyclingstation, wenn dieses Produkt das Ende seiner Lebensdauer erreicht hat. Zum Zeitpunkt der Entsorgung wird die getrennte Sammlung von Produkt und/oder seiner Batterie dazu beitragen, natürliche Ressourcen zu sparen und die Umwelt und die menschliche Gesundheit zu schützen.

El símbolo de abajo indica que según las regulaciones locales, su producto y/o su batería deberán depositarse como basura separada de la doméstica. Cuando este producto alcance el final de su vida útil, llévelo a un punto limpio. Cuando llegue el momento de desechar el producto, la recogida por separado éste y/o su batería ayudará a salvar los recursos naturales y a proteger la salud humana y medioambiental.

Le symbole ci-dessous signifie que selon les réglementations locales votre produit et/ou sa batterie doivent être éliminés séparément des ordures ménagères. Lorsque ce produit atteint sa fin de vie, amenez-le à un centre de recyclage. Au moment de la mise au rebut, la collecte séparée de votre produit et/ou de sa batterie aidera à économiser les ressources naturelles et protéger l'environnement et la santé humaine.

Il simbolo sotto significa che secondo i regolamenti locali il vostro prodotto e/o batteria deve essere smaltito separatamente dai rifiuti domestici. Quando questo prodotto raggiunge la fine della vita di servizio portarlo a una stazione di riciclaggio. Al momento dello smaltimento, la raccolta separata del vostro prodotto e/o della sua batteria aiuta a risparmiare risorse naturali e a proteggere l'ambiente e la salute umana.

Symbolen innebär att enligt lokal lagstiftning ska produkten och/eller dess batteri kastas separat från hushållsavfallet. När den här produkten når slutet av sin livslängd ska du ta den till en återvinningsstation. Vid tiden för kasseringen bidrar du till en bättre miljö och mänsklig hälsa genom att göra dig av med den på ett återvinningsställe.



**台灣**

以下訊息僅適用於產品銷售至台灣地區

- 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。」

安全警告 – 為了您的安全，請先閱讀以下警告及指示：

- 請勿將此產品接近水、火焰或放置在高溫的環境。
- 避免設備接觸
  – 任何液體 - 切勿讓設備接觸水、雨水、高濕度、污水腐蝕性的液體或其他水份。
  – 灰塵及污物 - 切勿接觸灰塵、污物、沙土、食物或其他不合適的材料。
- 雷雨天氣時，不要安裝，使用或維修此設備。有遭受電擊的風險。
- 切勿重摔或撞擊設備，並勿使用不正確的電源變壓器。
- 若接上不正確的電源變壓器會有爆炸的風險。
- 請勿隨意更換產品內的電池。
- 如果更換不正確之電池型式，會有爆炸的風險，請依製造商說明書處理使用過之電池。
- 請將廢電池丟棄在適當的電器或電子設備回收處。
- 請勿將設備解體。
- 請勿阻礙設備的散熱孔，空氣對流不足將會造成設備損害。
- 請插在正確的電壓供給插座 ( 如：北美 / 台灣電壓 110V AC，歐洲是 230V AC)。
- 假若電源變壓器或電源變壓器的纜線損壞，請從插座拔除，若您還繼續插電使用，會有觸電死亡的風險。
- 請勿試圖修理電源變壓器或電源變壓器的纜線，若有毀損，請直接聯絡您購買的店家，購買一個新的電源變壓器。
- 請勿將此設備安裝於室外，此設備僅適合放置於室內。
- 請勿隨一般垃圾丟棄。
- 請參閱產品背貼上的設備額定功率。
- 請參考產品型錄或是彩盒上的作業溫度。
- 設備必須接地，接地導線不允許被破壞或沒有適當安裝接地導線，如果不確定接地方式是否符合要求可聯繫相應的電氣檢驗機構檢驗。
- 如果您提供的系統中有提供熱插拔電源，連接或斷開電源請遵循以下指導原則：
  – 先連接電源線至設備連，再連接電源。
  – 先斷開電源再拔除連接至設備的電源線。
  – 如果系統有多個電源，需拔除所有連接至電源的電源線再關閉設備電源。
- 產品沒有斷電裝置或者採用電源線的插頭視為斷電裝置的一部分，以下警語將適用：
  – 對永久連接之設備，在設備外部須安裝可觸及之斷電裝置；
  – 對插接式之設備，插座必須接近安裝之地點而且是易於觸及的。

## About the Symbols

Various symbols are used in this product to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meaning of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand the contents.

### Explanation of the Symbols

| SYMBOL | EXPLANATION |
|---|---|
| | Alternating current (AC):<br>AC is an electric current in which the flow of electric charge periodically reverses direction. |
| | Direct current (DC):<br>DC if the unidirectional flow or movement of electric charge carriers. |
| | Earth; ground:<br>A wiring terminal intended for connection of a Protective Earthing Conductor. |
| | Class II equipment:<br>The method of protection against electric shock in the case of class II equipment is either double insulation or reinforced insulation. |

## Viewing Certifications

Go to http://www.zyxel.com to view this product's documentation and certifications.

## Zyxel Limited Warranty

Zyxel warrants to the original end user (purchaser) that this product is free from any defects in material or workmanship for a specific period (the Warranty Period) from the date of purchase. The Warranty Period varies by region. Check with your vendor and/or the authorized Zyxel local distributor for details about the Warranty Period of this product. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, Zyxel will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of Zyxel. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

### Note

Repair or replacement, as provided under this warranty, is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose. Zyxel shall in no event be held liable for indirect or consequential damages of any kind to the purchaser.

To obtain the services of this warranty, contact your vendor. You may also refer to the warranty policy for the region in which you bought the device at http://www.zyxel.com/web/support_warranty_info.php.

## Registration

Register your product online at www.zyxel.com to receive email notices of firmware upgrades and related information.

## Trademarks

ZyNOS (Zyxel Network Operating System) and ZON (Zyxel One Network) are registered trademarks of Zyxel Communications, Inc. Other trademarks mentioned in this publication are used for identification purposes only and may be properties of their respective owners.

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