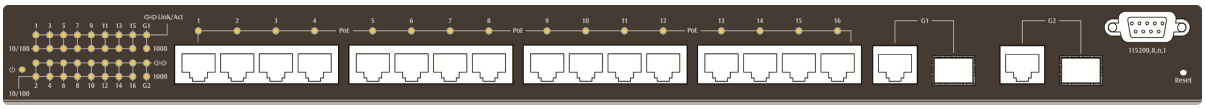
EtherWAN



EX24000 Switch

User's Guide

FastFind Links

All Rights Reserved

Disclaimer of Liability

The information contained in this document is subject to change without notice. EtherWAN is not liable for any errors or omissions contained herein or for resulting damage in connection with the information provided in this manual.

Registered Trademarks

The following words and phrases are registered Trademarks of EtherWAN Systems Inc.
EtherOS™
Ethernet to the World™

All other Trademarks are property of their respective owners.

Warranty

For details on the EtherWAN warranty replacement policy, please visit our web site at:
https://kb.etherwan.com/index.php?View=entry&EntryID=27

Products Supported by this Manual:

EX24000

Contact EtherWAN Systems

Corporate Headquarters
EtherWAN Systems Inc.
4570 E. Eisenhower Circle
Anaheim, CA 92807
Tel: (714) 779 3800
Fax: (714) 779 3806
Email: support@etherwan.com

TABLE OF CONTENTS

TABLE OF FIGURES

PREFACE

Audience

This guide is designed for the person who installs, configures, deploys, and maintains the Ethernet network. This document assumes the reader has moderate hardware, computer, and Internet skills.

Document Revision Level

This section provides a history of the revision changes to this document.

Revision	Document Version	Date	Description
A	Version 1	05/09/2014	Initial release

Changes in this Revision

N/A - this is first version of this document.

Document Conventions

This guide uses the following conventions to draw your attention to certain information.

Safety and Warnings

This guide uses the following symbols to draw your attention to certain information.

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Warning	Warnings indicate that failure to take a specified action could result in damage to the device, or could result in serious bodily injury.
	Electric Shock Hazard	This symbol warns users of electric shock hazard. Failure to take appropriate precautions such as not opening or touching hazardous areas of the equipment could result in injury or death.

Typographic Conventions

This guide also uses the following typographic conventions.

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.
Italic	Indicates a variable, which is a placeholder for actual text provided by the user or system. Angled brackets (< >) are also used to indicate variables.
`screen/code`	Indicates text that is displayed on screen or entered by the user.
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Italic font is also used to indicate variables.
[ ] square brackets	Indicates optional values.
{ } braces	Indicates required or expected values.
| vertical bar	Indicates that you have a choice between two or more options or arguments.

PRODUCT OVERVIEW

EX24000 Switch

The EX24000 Switch Provides the 16-port 10/100BASE-TX (PoE) and 2 combo Gigabit SFP ports. The EX24000 Switch is a fully managed switch.

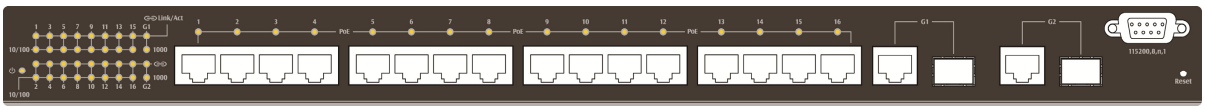


Figure 1: Front view

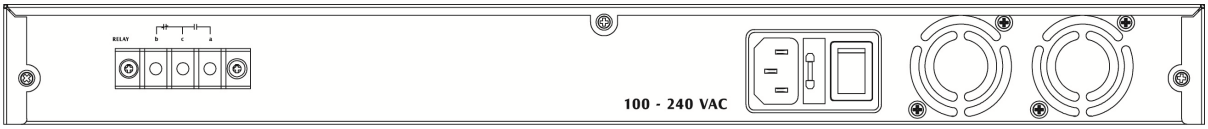


Figure 2: Back view

Product Highlights

Basic Features:

- 16 x 10/100BASE (PoE) ports
- Provides up to two combo Gigabit SFP ports
- Supports 8192 MAC addresses, Provides 2M bits memory buffer
- Store-and-forward mechanism, Full wire-speed forwarding rate
- Supports IEEE802.3af Power over Ethernet (PoE) Power Sourcing Equipment (PSE)
- Supports Max. 15.4W power for each PSE/PoE port
- RS-232 console, Telnet, SNMP V1, V2c & V3, RMON, Web Browser, and TFTP Management
- Supports Command Line Interface from RS-232 Console
- α-ring and RSTP/MSTP/STP for Ethernet redundancy
- IP Multicast Filtering
- Port-based VLAN, IEEE802.1Q VLAN Tagging and GVRP
- IEEE802.1p QoS with four priority queues
- MAC-based trunking with automatic link fail-over
- Supports IEEE802.1X Security
- Bandwidth Rate Control
- Per-port programmable MAC address locking
- Up to 24 Static Secure MAC addresses per port
- Port mirroring
- Supports NTP
- Supports IEEE802.3/802.3u/802.3ab/802.3z/802.3x
- 1000Mbps-Full-duplex, 10/100Mbps-Full/Half-duplex, Auto-Negotiation, Auto-MDI/MDIX
- Alarms for port and power failure by relay output
- Power Supply: 100~240VAC, 50~60Hz internal universal PSU
- Power consumption: 12W Max. (Without PoE)
- Power budget: 195W Max
- Push and hold the reset button for less than 10 seconds: system reboot
- Push and hold the reset button for more than 10 seconds: reset to default password
- 0°C to 45°C (32°F to 113°F) operating temperature range
- Supports Rack Mounting installation

UNPACKING AND INSTALLATION

This chapter describes how to unpack and install the EX24000 Switch

The topics covered in this chapter are:

Package Contents

When you unpack the product package, you will find the items listed below. Please inspect the contents, and report any apparent damage or missing items immediately to your authorized reseller.

- This Management Switch
- User's Manual
- External power adapter

Unpacking

Follow these steps to unpack the EX24000 Switch and prepare it for operation:

1. Open the shipping container and carefully remove the contents.
2. Return all packing materials to the shipping container and save it.
3. Confirm that all items listed in the "Package Contents" section are included in the shipment. Check each item for damage. If any item is damaged or missing, notify your authorized EtherWAN representative.

Required Equipment and Software

The following hardware and software are needed in order to manage the switch from the web interface:

- **Computer with an Ethernet Interface (RJ-45)**

  Managing the switch requires a personal computer (PC) or notebook computer equipped with a 10/100base-TX Ethernet interface and a physical RJ-45 connection. The preferred operating system for the computer is Microsoft Windows XP/Vista/7. It is possible to use Apple OSX or Linux systems as well, but, for the sake of brevity, all web configurations in this manual will be shown using Windows 7 as the underlying operating system.

- **Cat 5+ Ethernet Cables**

  An Ethernet cable of at least Category 5 rating is required to connect your computer to the switch. The cable can be configured as “straight-through” or crossover.

- **TFTP Server Software**

  Trivial file transfer protocol (TFTP) server software is needed to update the switch firmware and to upload/download configuration files to the switch. Users not performing these tasks do not need TFTP software installed. Several good TFTP servers are available for free online. The server that will be used in this manual is TFTPD32 by Philippe Jounin.

- **Web Browser Software**

  The end user can employ any of the following web browsers during switch configuration: Internet Explorer, Firefox, or Chrome. Internet Explorer is the preferred browser for EtherWAN switch configuration. If there is trouble with other browsers while attempting to program the switch, Internet Explorer should be used.

COMPUTER SETUP

The end user's management computer may need to be reconfigured prior to connecting to the switch in order to access the switch's web interface through its default IP address (See Default IP).

Management Methods and Protocols

There are several methods that can be used to manage the switch. This manual will show the details of configuring the switch using a web browser. Each section will be followed by the CLI (Command Line Interface) commands needed to achieve the same results as described in that section.

The methods available to manage the EX24000 Switch include:

- **SSH** - Secure Shell CLI that is accessible over TCP/IP networks which and is generally regarded as the most secure method of remotely accessing a device.
- **Telnet** - is like SSH in that it allows a CLI to be established across a TCP/IP network, but it does not encrypt the data stream.
- **HTTP** (Hypertext Transfer Protocol) is the most popular switch management protocol involving the use of a web browser.
- **RS232** – The EX24000 Switch is equipped with a RS232 serial port that can be used to access the switches CLI. The Serial port is DCE DB9F. A straight through serial cable is used to connect to a typical computer serial port.

Default IP

The switch's default IP address is 192.168.1.10. The user will need to modify the management computer so that it is on the same network as the switch. For example, the user could change the IP address of the management computer to 192.168.1.100 with a subnet mask of 255.255.255.0.

Login Process and Default Credentials

Once a compatible IP address has been assigned to the management computer, the user is ready to log in to the switch. To log in, type the URL http://192.168.1.10/ into the address field of the browser and hit return. The following will appear in the browser window (See Figure 3)

- The Default Login is root (case sensitive)
- There is no password by default
- Enter the login name and click the Login button

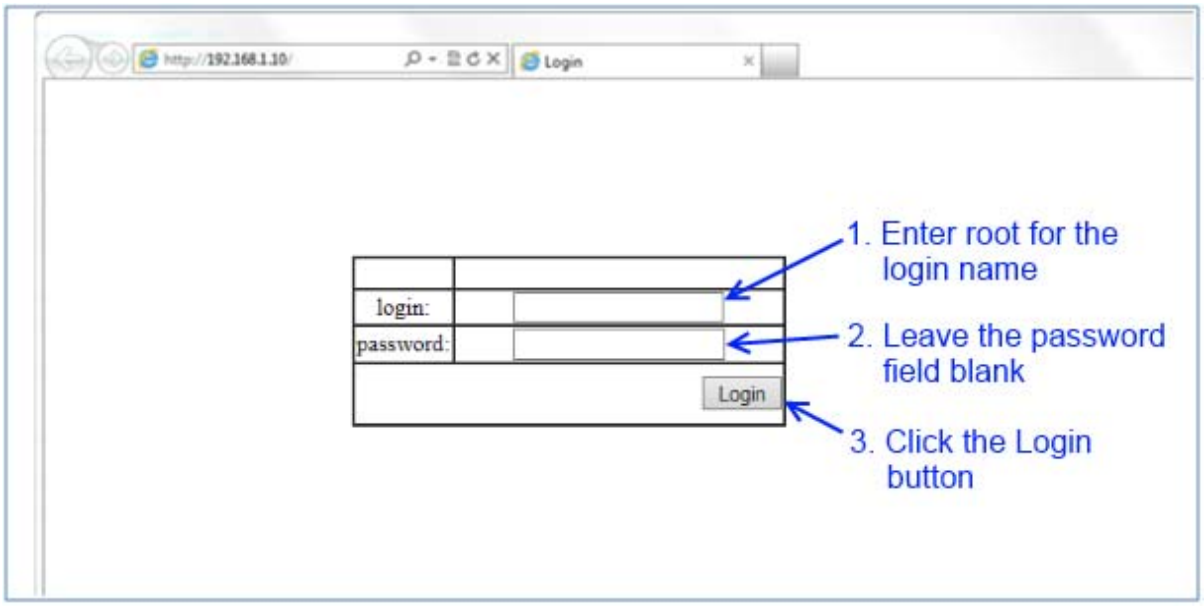


Figure 3: Login screen

SETTING THE INITIAL IP ADDRESS

Once logged in the user can now configure the switch per the network requirements. The two major addressing options are:

- Simple IP addressing
- Multiple VLAN addressing (See Add an IP to the Management VLAN on page 146).

Simple IP Addressing

A new IP address can now be assigned to the switch. From the System Information screen, go to the left hand navigation menu.

1. Click on the **+** next to **System**
2. Click on **IP address**
3. Enter the desired IP address and subnet mask in the **IP Address/Subnet Mask** fields associated with VLAN 1
4. Click the **Submit** button (See Figure 4)

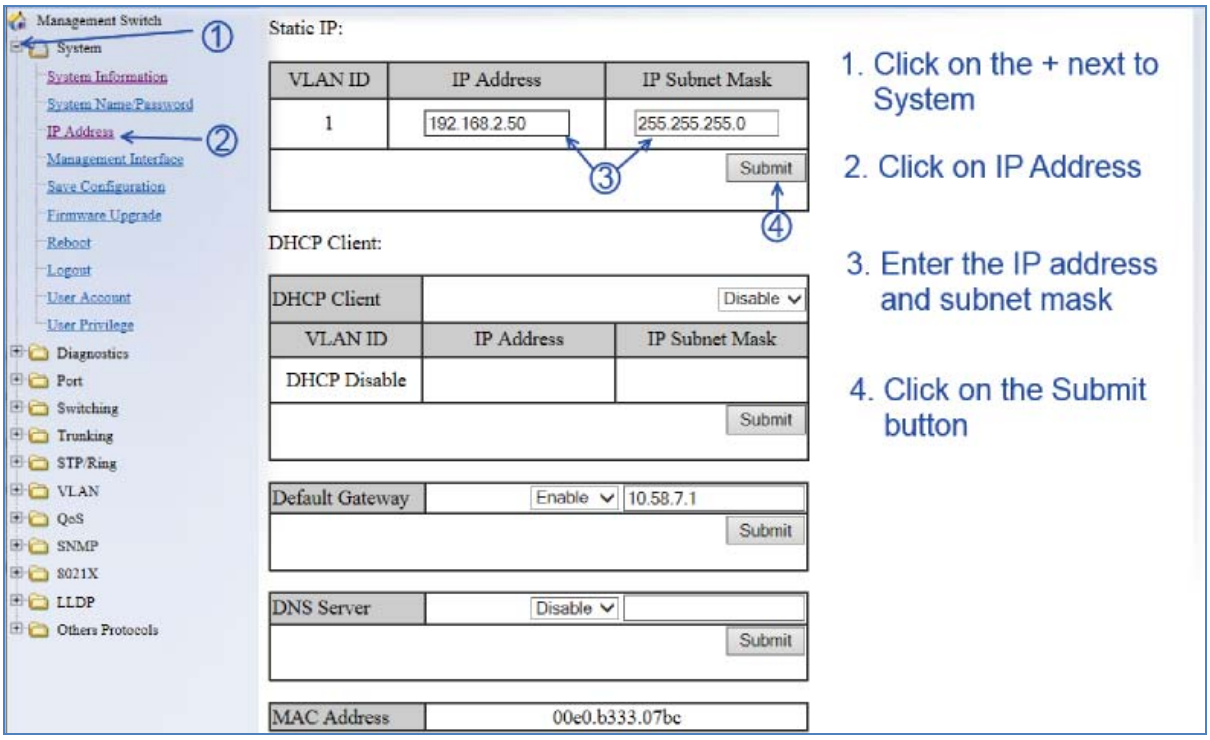


Figure 4: Assigning an IP address

Note: The user should be prepared to change the IP address of the management computer to one compatible with the new IP address assigned to the switch immediately after clicking the Submit button. If the IP address change was done in error, simply cycle the power to the switch and the default IP address will be restored.

To save the configuration changes:

5. Change the IP address of the management computer to one on the same subnet that the switch was changed to.
6. Restart your Web Browser
7. Enter the new IP address of the switch into the Browser
8. Login using the user name root
9. Click on the **+** next to **System**
10. Click on **Save configuration**
11. Click on the **Save Configuration** button (See Figure 5)

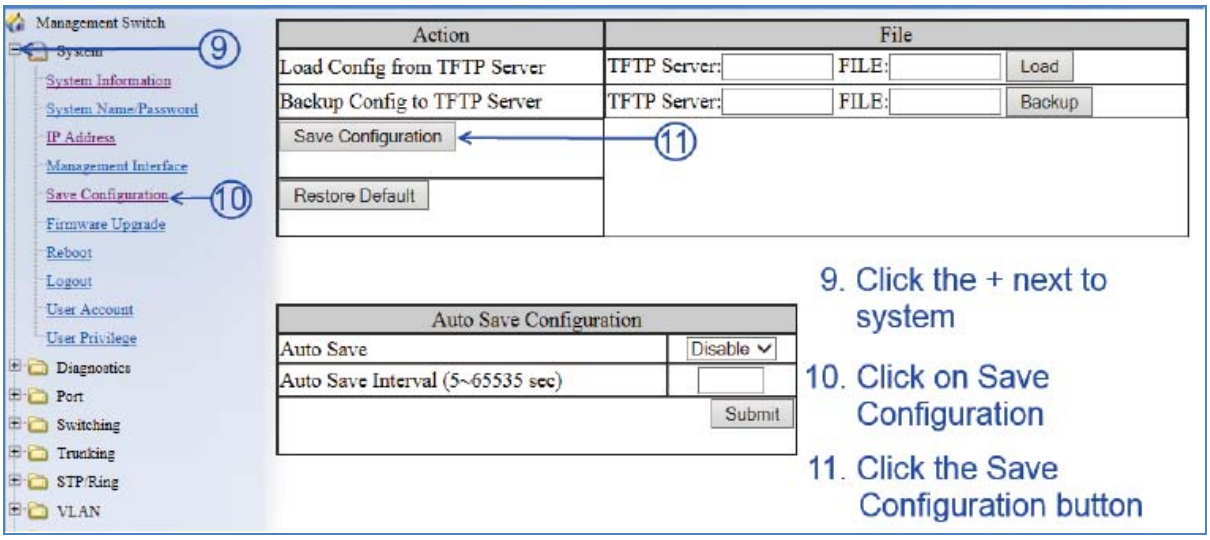


Figure 5: Saving the Configuration

CLI COMMAND USAGE

This chapter describes accessing the EX24000 Switch by using Telnet, SSH, or serial ports to configure the switch, navigating the Command Line Interface (CLI), typing keyboard shortcuts, and moving between the levels. This chapter assumes the user has a working understanding of Telnet, SSH and Terminal emulation applications.

Note: For a serial port connection use a standard DB9F to DB9M Modem Cable. The default Serial port parameters are 115200, 8 None 1, No Flow Control.

Navigating the CLI Hierarchy

The CLI is organized into a hierarchy of levels. Each level has a group of commands for a specific purpose. For example, to configure a setting for the VLAN server, one would navigate to the VLAN level, which is under the config level.

CLI Keyboard Shortcuts

Ctrl + a: place cursor at the beginning of a line

Ctrl + b: backspace one character

Ctrl + d: delete one character

Ctrl + e: place cursor at the end of the line

Ctrl + f: move cursor forward one character

Ctrl + k: delete from the current position to the end of the line

Ctrl + l: redraw the command line

Ctrl + n: display the next line in the history

Ctrl + p: display the previous line in the history

Ctrl + u: delete entire line and place cursor at start of prompt

Ctrl + w: delete one word back

CLI Command modes

Throughout this manual, each section that has CLI commands relevant to that section requires that the CLI be in a specific configuration mode. This section shows the main CLI commands to needed to enter a specific mode.

General Configuration Mode

To set the EX24000 Switch to General configuration mode, run the following commands from the CLI:

1. enable
2. configure terminal

Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#
```

MSTP Configuration Mode

To set the EX24000 Switch to General MSTP configuration mode, run the following commands from the CLI:

1. enable
2. configure terminal
3. spanning-tree mst configuration

Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#spanning-tree mst configuration
switch_a(config-mst)#
```

Interface Configuration Mode

Interface mode on the EX24000 Switch is used to configure the Ethernet ports and VLAN information. Valid interfaces are:

- **fe<port #>** - 100mb ports use fe followed by the port number. Example: **fe1**
- ***ge<port #>*** - Gigabit ports use ge followed by the port number. Example: **ge1**
- **vlan1.<vlan#>** - VLAN's use vlan. Followed by the VLAN ID. Example: **vlan1.10**

Example 1 configures 100mb port 1

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)
```

Example 2 configures VLAN ID 9

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.9
switch_a(config-if)
```

VLAN Database Configuration Mode

VLAN Database Configuration Mode on the EX24000 Switch is used to configure the VLAN settings.

Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#vlan database
switch_a(config-vlan)#
```

Saving a Configuration from the CLI

Example:

```
switch_a>enable
switch_a#write memory
Building configuration.....
[OK]
switch_a#>
```

SYSTEM MENU

System Information

The System information link on the Left menu of the Web Configuration page takes you to a page that shows the following (see Figure 6):

- **System Name**
    - The System name is typically used by network administrators. If SNMP is enabled on the switch, the system name can be found using MIB II (RFC1213) in the sysName property.
- **Firmware Version**
    - If SNMP is enabled on the switch, the Firmware version can be found using MIB II in the sysDesc property
- **System Time**
    - System time can be change using NTP
- **MAC Address**
    - The hardware (MAC) address of the Management interface
- **Default Gateway**
    - The IP address of your networks Gateway (Typically a Router on your network)
- **DNS Server**
    - The Dynamic Name Server (DNS) for your network
- **VLAN ID**
    - One or more listings depending on the number o VLANs defined on the switch
    - Lists VLAN ID, IP address, and subnet mask of the VLAN Interface(s)
- **Current User Information**

- Lists the current the currently logged in user and their user privileges

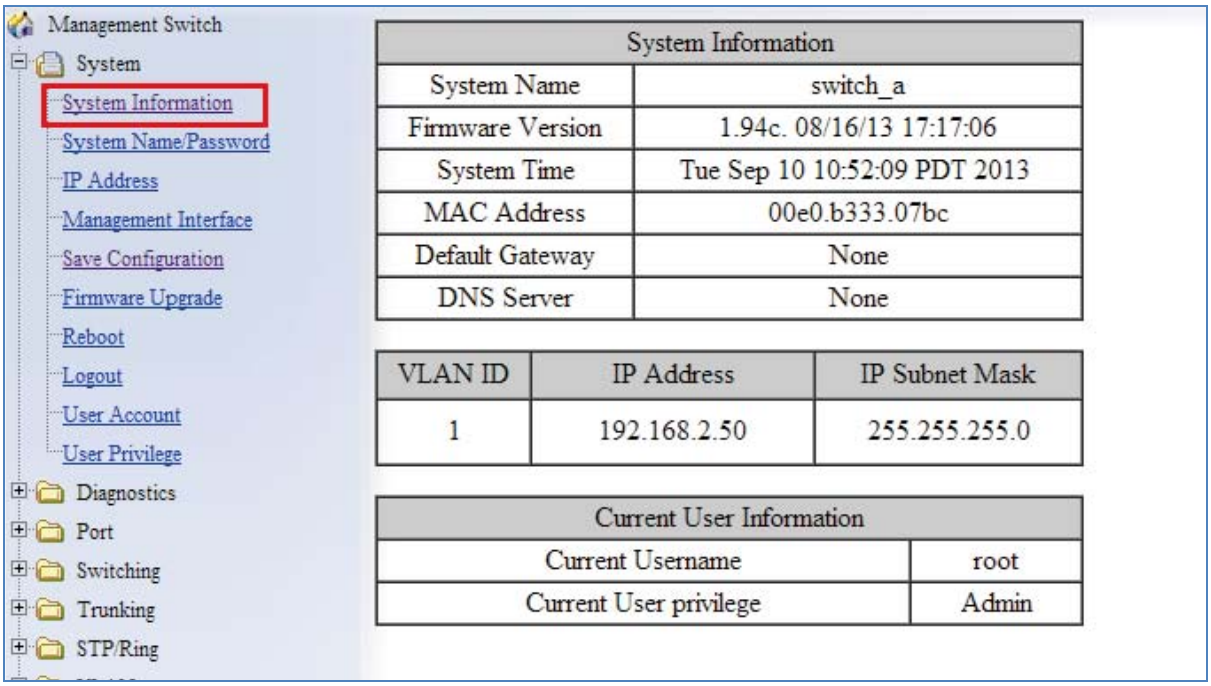


Figure 6: System Information

System Name/Password

The System name is typically used by network administrators to make it easier to document a networks infrastructure and locate equipment on large networks. If SNMP is enabled on the switch, the system name can be found using MIB II (RFC1213) in the sysName property. To change the system name:

1. Click on the **+** next to **System**.
2. Click on **System Name/Password** (see Figure 7).
3. Use your mouse to place the cursor in the **System Name** text box.
4. Replace the existing name with the name you want to assign to the switch.
5. Click on the **Update Setting** button.

By default there is no password assigned to the switch. To add or change a password:

1. Click on the **+** next to **System**.
2. Click on **System Name/Password** (see Figure 7).
3. Use your mouse to place the cursor in the **Password** text box.
4. Enter the new password.
5. Retype the password in the **Retype Password** text box.
6. Click on the **Update Setting** button below the **Retype Password** text box.

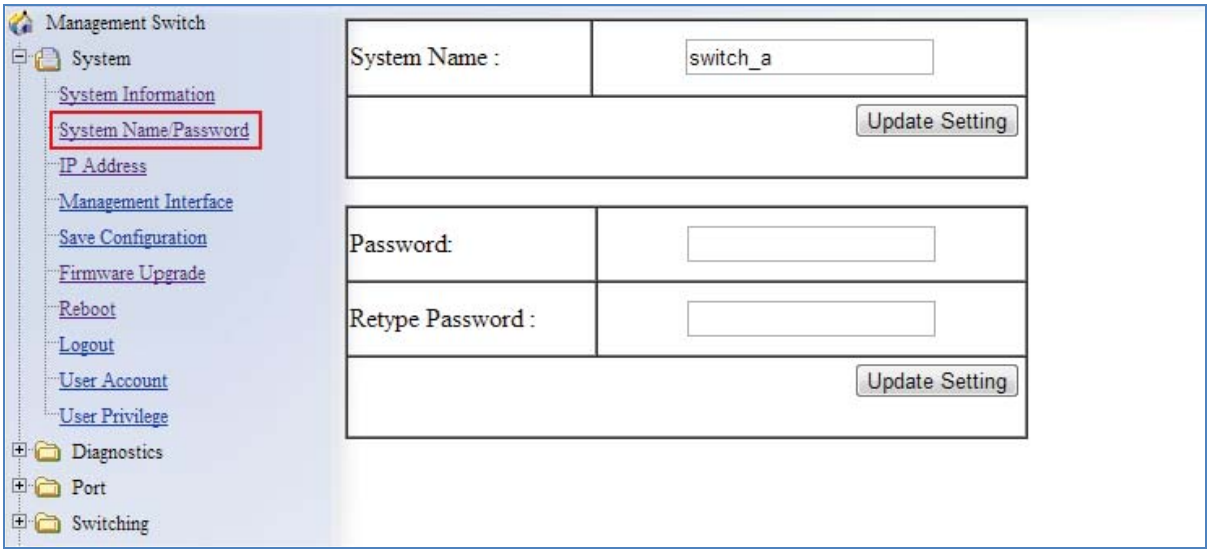


Figure 7: System Name/Password

IP Address

To navigate to the **IP Address** page:

1. Click on the **+** next to **System**
2. Click on **IP Address** (see Figure 8)

There are 4 settings on this page:

Static IP (see Simple IP Addressing)

DHCP Client

Use this to enable or disable DHCP on a VLAN.
To enable the DHCP Client:

1. Use the drop down box to enable the DHCP client on a particular VLAN
2. Click the **Submit** Button

Default Gateway

If DHCP is enabled, the gateway setting is controlled by the DHCP server. The setting will be grayed out and the gateway supplied by the DHCP server will be displayed. The default gateway setting can be used when using a Static IP address.
To enable the default gateway:

1. Use the dropdown box to enable the default gateway.
2. Type in the default gateway in the **Default Gateway** text box.
3. Click on the **Submit** button.

DNS Server

If DHCP is enabled, the DNS Server setting is controlled by the DHCP server. The setting will be grayed out and the DNS Server supplied by the DHCP server will be displayed. The DNS Server setting can be used when using a Static IP address. To enable the DNS Server:

1. Use the dropdown box to enable the DNS Server.
2. Type in the default gateway in the **Default Gateway** text box.
3. Click on the **Submit** button.

Note: After making changes to settings in the IP address section, The configuration needs to be saved using the **System/Save configuration** page (See Save Configuration)

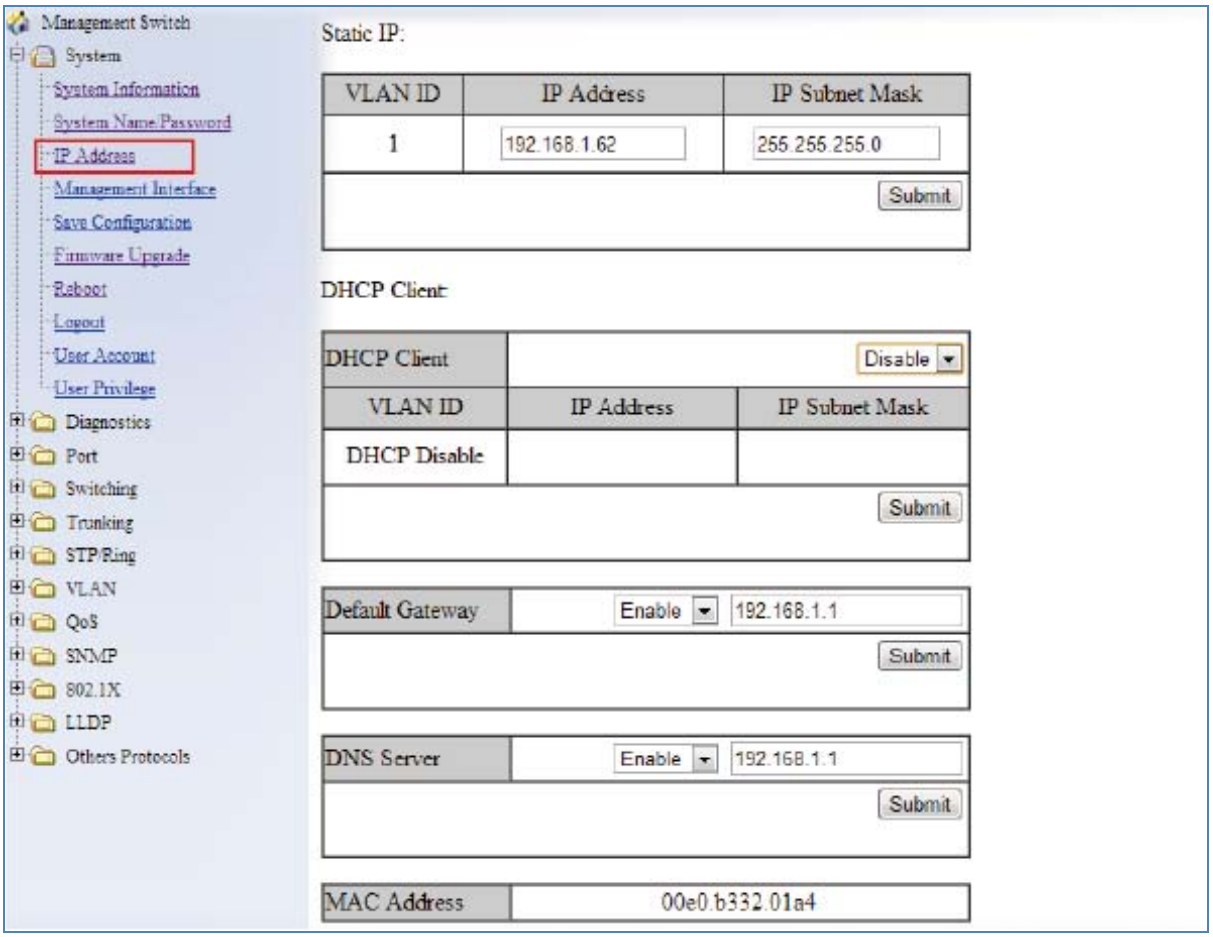


Figure 8: IP Address

Management Interface

To navigate to the **Management Interface** page:

1. Click on the **+** next to **System**
2. Click on **Management Interface**

The Management Interface configuration page has three settings that allow the user to configure the methods available to manage the EX24000 Switch.

HTTPS

HTTPS (Hypertext Transfer Protocol Secure) allows the user to determine what method, if any, is used to configure the EX24000 Switch. The default is unencrypted HTTP (see Figure 9).

To disable the Web interface:

1. Uncheck **Http** and **Https.**
2. Click on the **Update setting** button.

 Warning! Once the Submit button is pressed, the Web console will no longer function. As a safety precaution, the configuration is not saved by default. Rebooting the EX24000 Switch will restore the Web Console. To save the configuration, connect using the new IP address.

To enable the Web Interface:

1. Check **HTTP**, **HTTPS** or both
2. Click on the **Update Setting** button.
3. Save the Configuration (see Save Configuration)

Telnet

Telnet is a network protocol that allows a remote computer to log into the EX24000 Switch to access its CLI (Command Line Interface). The CLI can be access using Telnet, SSH and the serial port on the EX24000 Switch. The secure method of accessing the CLI over a network is SSH.

To enable or disable Telnet:

1. Click the **Enable** or **Disable** radio button in the Telnet section on the Management Interface page (see Figure 9 below)

2. Click on the **Update Setting** button
3. Save the Configuration (see Save Configuration)

SSH (Secure Shell)

Secure Shell or SSH is a network protocol that allows data to be exchanged using a secure channel between two networked devices such as a computer and the EX24000 Switch. SSH is disabled by default on the EX24000.

To enable or disable SSH:

1. Click the **Enable** or **Disable** radio button in the SSH section on the Management Interface page (see Figure 9)
2. Click on the **Update Setting** button
3. Save the Configuration (see Save Configuration)

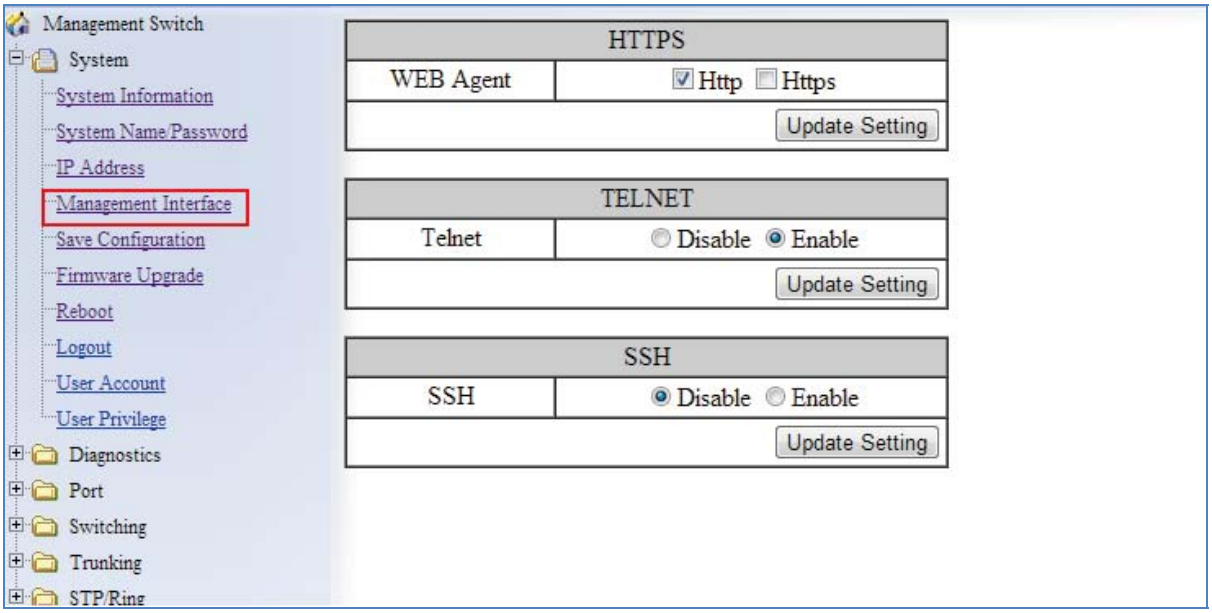


Figure 9: Management Interface

Save Configuration Page

To navigate to the **Save Configuration** page:

1. Click on the **+** next to **System**
2. Click on **Save Configuration**

The Save Configuration page contains the following configuration functions (see Figure 10):

Save Configuration

To save the currently running configuration to the flash memory on the EX24000 Switch:

1. Click the **Save Configuration** button
2. If the save is successful you will see the message:
   `Building configuration….. [OK]`

Load Configuration

This function is used to load a previously saved configuration. Backing up and loading a configuration is achieved using a TFTP server.

To load a configuration:

1. Enter the IP address of your TFTP server in the **TFTP Server** text box
2. Enter the name of the configuration file in the **FILE** text box
3. Click on the **Backup** button
4. If the file is successfully loaded the following message will be shown:
   `Success! System reboot is required!`

Backup Configuration

This function is used to backup the current configuration of the EX24000 Switch. Backing up the configuration is achieved using a TFTP server such as TFTPD32.

To backup a configuration:

1. Enter the IP address of your TFTP server in the **TFTP Server** text box
2. Enter the name of the configuration file in the **FILE** text box
3. Click on the **Backup** button
4. If the backup is successful the following message will be shown:
   `tftp <filename> to ip <ip address> success!!`

Restore Default

To restore the EX24000 to factory defaults:

1. Click on the **Restore Default** button.

Auto Save

The Auto Save function is used to set the switch to automatically save the configuration to flash. If the saved configuration is the same as the running configuration then a save is not made. The Auto Save interval is used to determine how often the running configuration is checked for changes.

To set the Auto Save function:

1. Click the dropdown box next to **Auto Save.**
2. Set the Auto Save interval (5~65535 sec)

Note: If a Firewall is running on the PC that is running the TFTP server it may need to be temporarily disabled.

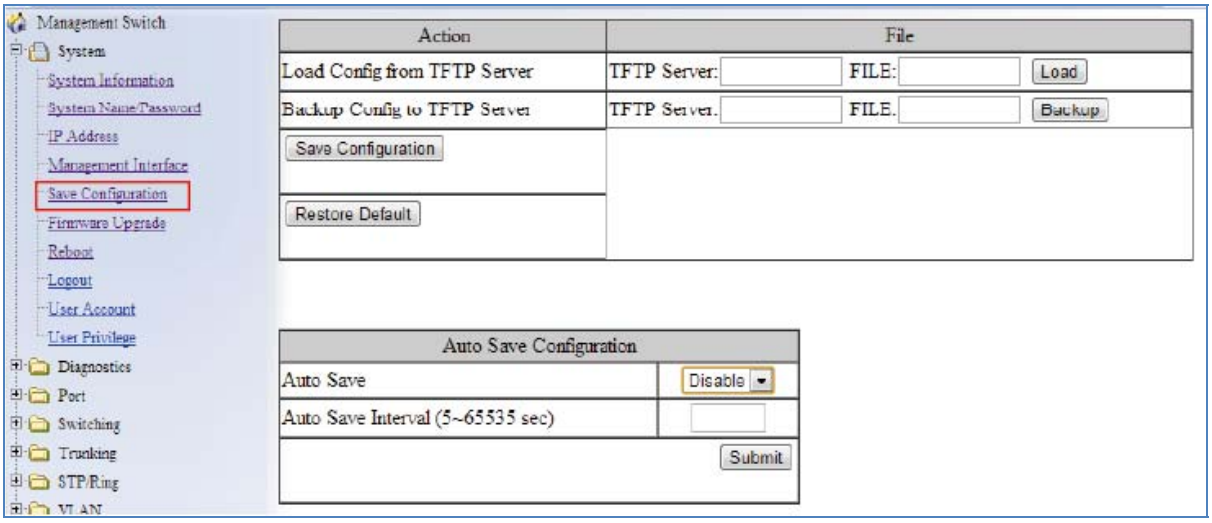


Figure 10: Save Configuration Page

Firmware Upgrade

To navigate to the **Firmware Upgrade** page:

1. Click on the **+** next to **System**
2. Click on **Firmware Upgrade**

To upgrade the firmware on the EX24000 Switch, a TFTP server is required. The firmware file for the EX24000 is in a .TGZ format. This is a compressed file; however, it does not need to be decompressed before updating the EX24000.

To update the firmware on the EX24000 Switch (see Figure 11):

1. Copy the firmware file to the correct directory for your TFTP server. The correct directory depends on your TFTP server settings
2. Enter the filename of the firmware in the **Filename** text box.
3. Enter the IP Address of your TFTP server in the **TFTP Server IP** text box.
4. Click on the **Upgrade** button.
5. During the firmware upgrade you will see the following messages. Do not reboot or unplug the switch until the final message is received.
    a. `Downloading now, please wait...`
    b. `tftp <filename>.tgz from ip <ip address> success!!`
       `Install now. This may take several minutes, please wait...`
    c. `Firmware upgrade success!`

Note: If a Firewall is running on the PC that is running the TFTP server it may need to be temporarily disabled.

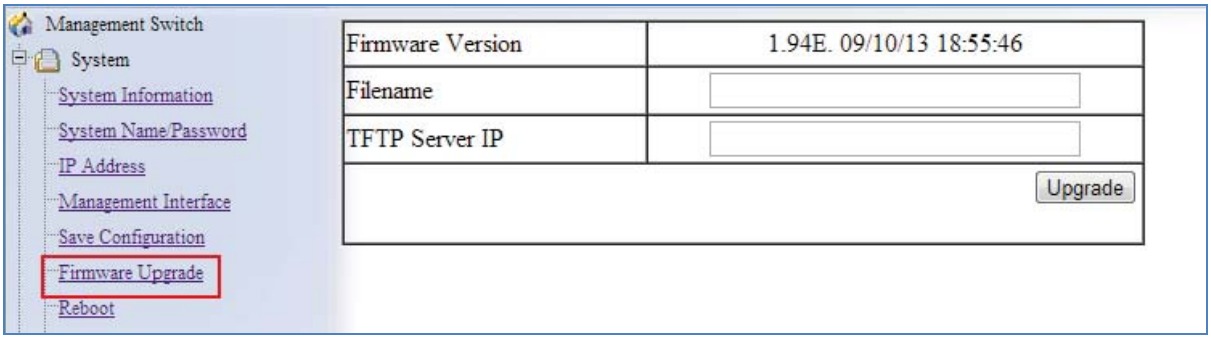


Figure 11: Firmware Upgrade Page

Reboot

To navigate to the **Reboot** page:

1. Click on the **+** next to **System**
2. Click on **Reboot**

To reboot the EX24000 Switch:

1. Click on the **Reboot** button.
2. Click OK on the popup message.

Logout

To logout of the Web Configuration Console:

1. Click on the **+** next to **System**
2. Click on **Logout**

DIAGNOSTICS

Utilization

To navigate to the **Utilization** page:

1. Click on the **+** next to **Diagnostics**.
2. Click on **Utilization**.

The **Utilization** page shows (see Figure 12):

- **CPU Utilization** – Current and Max Utilization
- **Memory Utilization** – Total, Used and Free Memory
- **Port Utilization** – Received(%), Transmit(%), RX Broadcast (Packets/s) and RX Multicast (Packets/s)

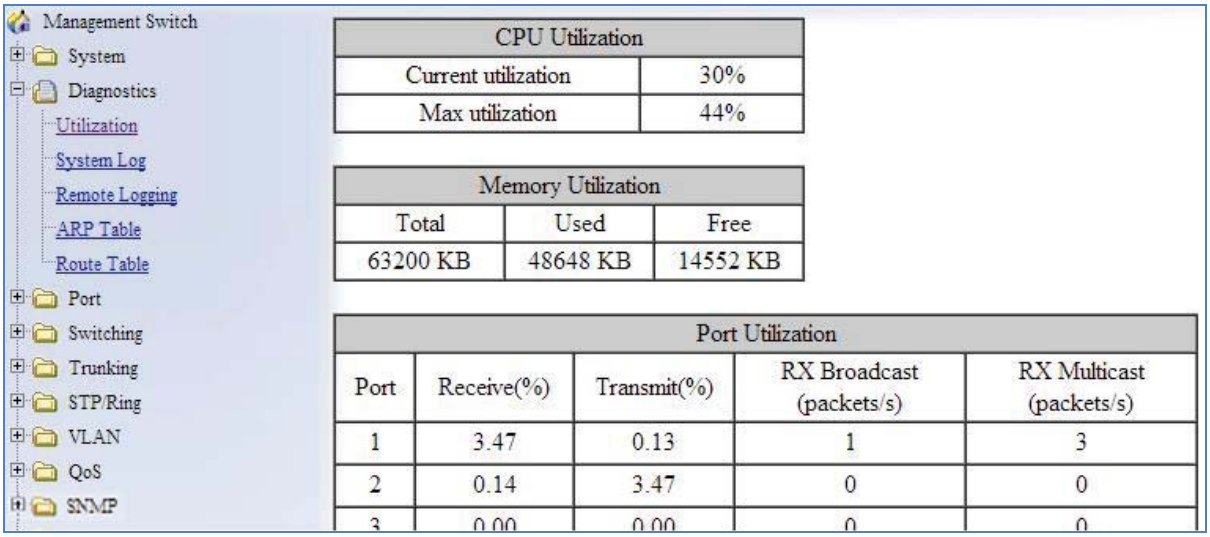


Figure 12: Utilization Page

System Log

To navigate to the **System Log** page:

1. Click on the **+** next to **Diagnostics**.
2. Click on **System Log**.

The System Log shows the data and time of port links going up or down (see Figure 13)

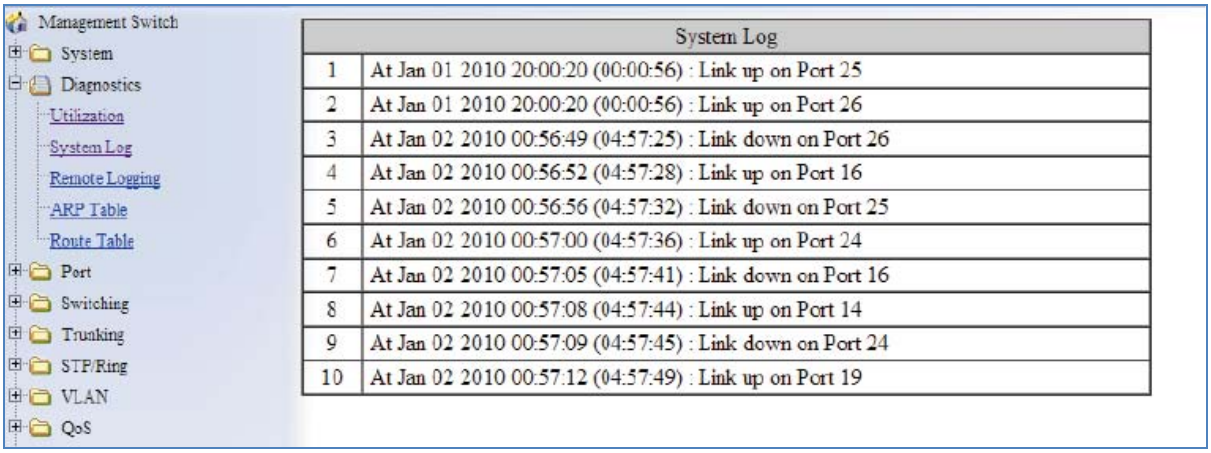


Figure 13: System Log

Remote Logging

To navigate to the **Remote Logging** page:

1. Click on the **+** next to **Diagnostics**.
2. Click on **Remote Logging**.

Remote Logging to a Syslog server allows administrators to log important system and debugging information. The Remote Logging configuration page allows reporting to a Syslog server to be enabled or disabled as well as management of a list of Syslog servers to report to (see Figure 14).

To configure the Remote Logging on the EX24000 Switch:

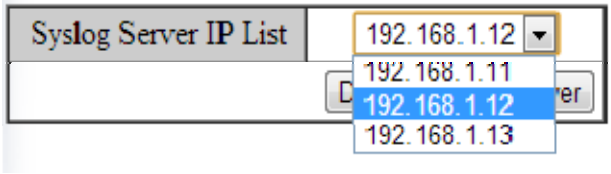
1. Click on the **Enable** or **Disable** radio button under Remote Logging.
2. Click on the **Update Setting** button.

To add a Syslog server:

1. Enter the IP Address of the Syslog Server in the **Syslog Server IP** text box.
2. Click on the **Add Syslog Server** button.

To delete a Syslog server from the list of servers currently on the switch:

1. Select the Syslog server from the Drop down box



2. Click on the **Delete Syslog Server** button

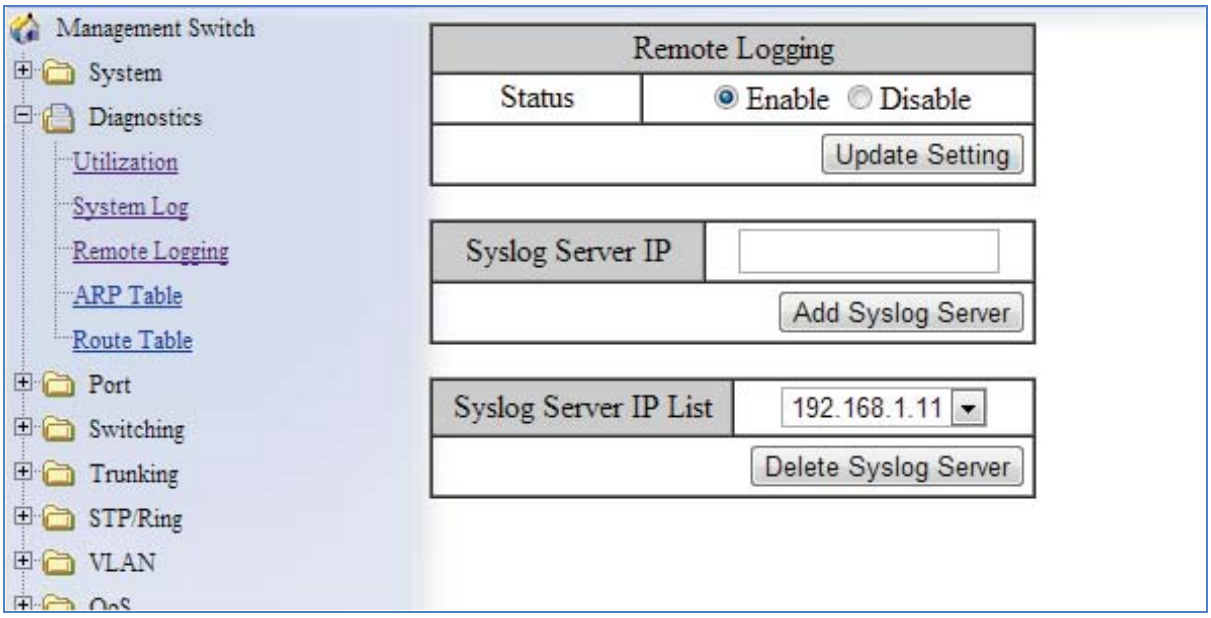


Figure 14: Remote Logging Page

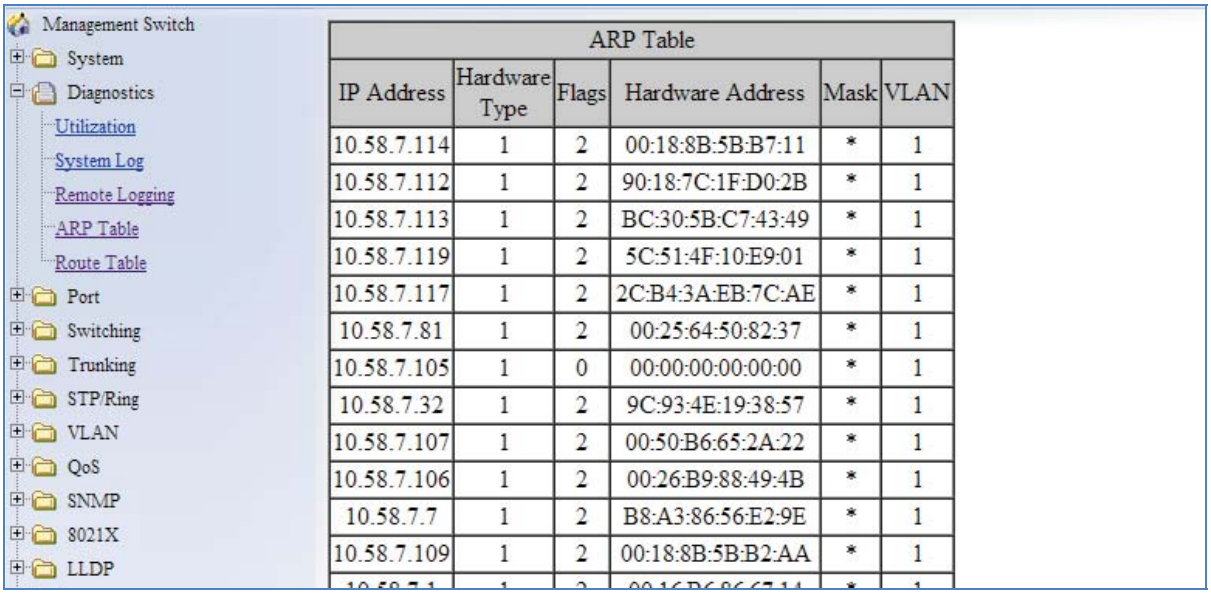
ARP Table

To navigate to the **ARP Table** page:

1. Click on the **+** next to **Diagnostics**.
2. Click on **ARP Table**.

The ARP Table page shows ARP (Address Resolution Protocol) entries that are stored in the Switches ARP Table. This is useful for System Administrators for troubleshooting purposes. The information shown is:

- **IP Address** of the listed device
- **Hardware Address** – For Ethernet devices this will always be **1**.
- **Flags**
    - **2** = Device responded to ARP Request
    - **0** = No response to ARP Request
- **Hardware Address** – MAC Address of the listed device
- **VLAN** – The VLAN that the listed device is on



ARP Table

IP Address	Hardware Type	Flags	Hardware Address	Mask	VLAN
10.58.7.114	1	2	00:18:8B:5B:B7:11	*	1
10.58.7.112	1	2	90:18:7C:1F:D0:2B	*	1
10.58.7.113	1	2	BC:30:5B:C7:43:49	*	1
10.58.7.119	1	2	5C:51:4F:10:E9:01	*	1
10.58.7.117	1	2	2C:B4:3A:EB:7C:AE	*	1
10.58.7.81	1	2	00:25:64:50:82:37	*	1
10.58.7.105	1	0	00:00:00:00:00:00	*	1
10.58.7.32	1	2	9C:93:4E:19:38:57	*	1
10.58.7.107	1	2	00:50:B6:65:2A:22	*	1
10.58.7.106	1	2	00:26:B9:88:49:4B	*	1
10.58.7.7	1	2	B8:A3:86:56:E2:9E	*	1
10.58.7.109	1	2	00:18:8B:5B:B2:AA	*	1

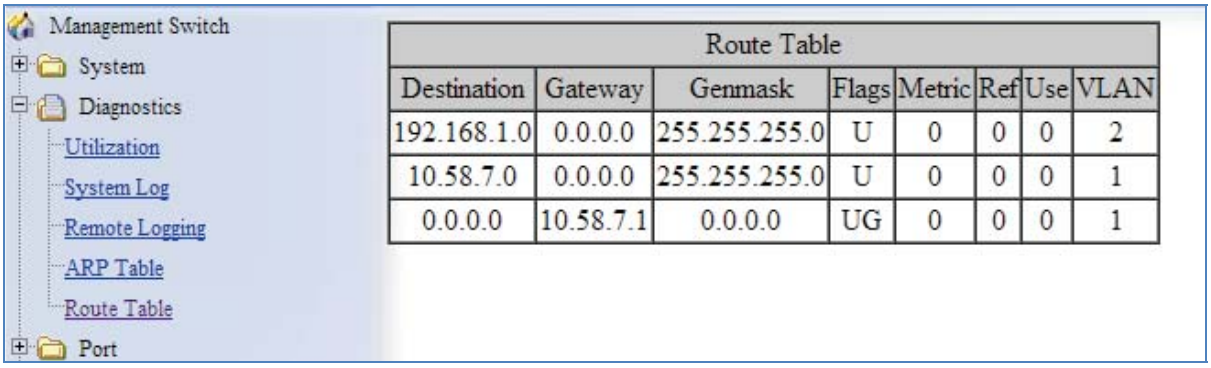
Figure 15: ARP Table

Route Table

To navigate to the **Route Table** page:

1. Click on the **+** next to **Diagnostics**.
2. Click on **Route Table**.

The Route Table lists the routes to network destinations and metrics (distances) that are associated with those routes. The Route Table contains information about the topology of the network around it.



Route Table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	VLAN
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0	2
10.58.7.0	0.0.0.0	255.255.255.0	U	0	0	0	1
0.0.0.0	10.58.7.1	0.0.0.0	UG	0	0	0	1

Figure 16: Route Table

PORT

Configuration

To navigate to the **Configuration** page:

1. Click on the **+** next to **Port**.
2. Click on **Configuration**.

Port configuration contains such useful features as flow control, port speed, and duplex settings. Some users will find these settings very valuable such as when the switch is connect to a latency-critical device such as a VOIP phone or IP camera or video multiplexor. In these cases and others the ability to alter the port settings can make the difference between a poorly responding device and one that functions without loss of data or clarity.

.The **Configuration** page shows (see Figure 17):

- **Port Number** – Current and Max Utilization
- **Link Status** – Operational State of the Port's Link (Read-Only)
- **Port Description** – User-supplied Port Description
- **Admin Setting** – Administratively Enable or Disable the Port.
- **Speed** – Speed and Duplex Settings for Port.
- **Flow Control** – State of Flow Control for the Port.

To provide a description to a port on the EX24000 Switch:

1. Click in the **Description** text box for the appropriate port.
2. Type in the description of the port.
3. Click on the **Submit** button.

To enable or disable a port on the EX24000 Switch:

1. Click on the drop-down box under Admin Setting and select either **Link Up** or **Link Down**.
2. Click on the **Submit** button.

To set the Port Speed and/or Port Duplex Settings on the EX24000 Switch:

1. Click on the drop-down box under Speed and select the desired port speed / duplex settings for that port. Please note, not all port types will have the same options. For example, 100Mb fiber ports will typically be limited to a single option of 100M/FD (100Mbps and Full Duplex) while running 1Gb UTP ports will have six options for speed/duplex.
2. Click on the **Submit** button.

To enable or disable a port's Flow Control settings on the EX24000 Switch:

1. Click on the drop-down box under Flow Control and select either Enable or Disable.
2. Click on the **Submit** button.

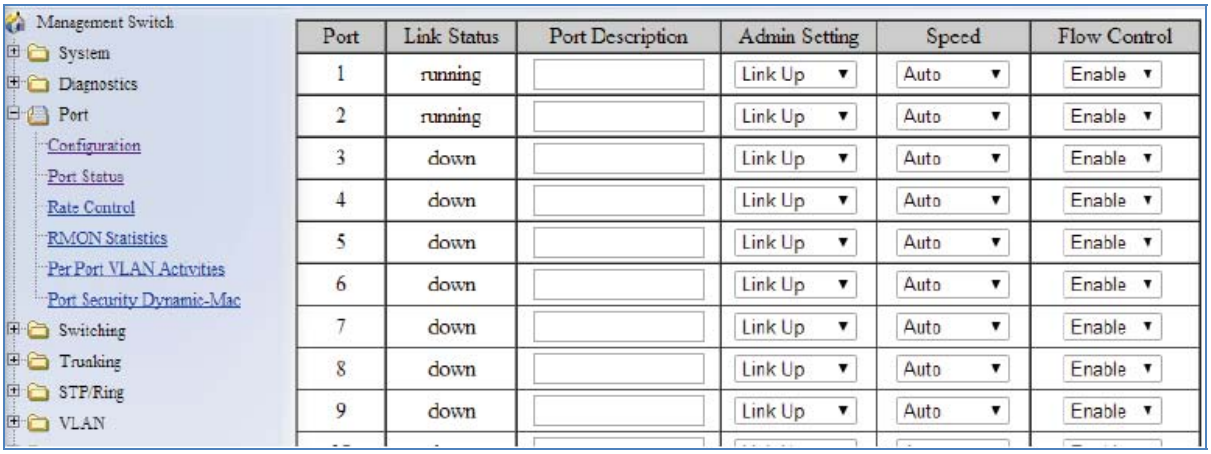


Figure 17: Port Configuration

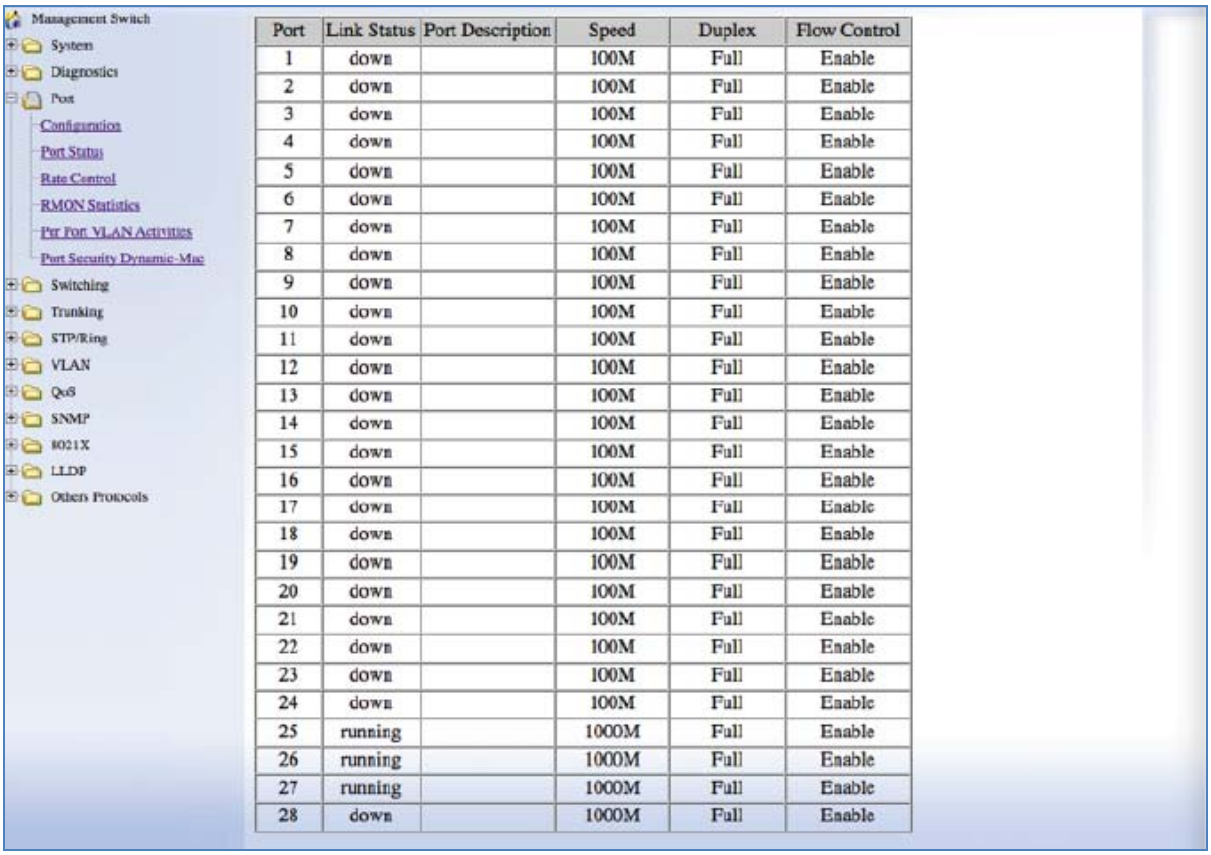
Port Status

To navigate to the **Port Status** page:

1. Click on the **+** next to **Port**.
2. Click on **Port Status**.

This page is a read-only page that lists the settings described in the previous section. It is useful if all the user intends to do is read the values of the port settings, not modify the port settings. .The Port Status page shows (see Figure 18):

- **Port Number** – Current and Max Utilization
- **Link Status** – Operational State of the Port's Link.
- **Port Description** – User-supplied Port Description
- **Admin Setting** – Administratively State of the Port.
- **Speed** – Speed and Duplex Settings for Port.
- **Flow Control** – State of Flow Control for the Port.



Port	Link Status	Port Description	Speed	Duplex	Flow Control
1	down		100M	Full	Enable
2	down		100M	Full	Enable
3	down		100M	Full	Enable
4	down		100M	Full	Enable
5	down		100M	Full	Enable
6	down		100M	Full	Enable
7	down		100M	Full	Enable
8	down		100M	Full	Enable
9	down		100M	Full	Enable
10	down		100M	Full	Enable
11	down		100M	Full	Enable
12	down		100M	Full	Enable
13	down		100M	Full	Enable
14	down		100M	Full	Enable
15	down		100M	Full	Enable
16	down		100M	Full	Enable
17	down		100M	Full	Enable
18	down		100M	Full	Enable
19	down		100M	Full	Enable
20	down		100M	Full	Enable
21	down		100M	Full	Enable
22	down		100M	Full	Enable
23	down		100M	Full	Enable
24	down		100M	Full	Enable
25	running		1000M	Full	Enable
26	running		1000M	Full	Enable
27	running		1000M	Full	Enable
28	down		1000M	Full	Enable

Figure 18: Port Status

Rate Control

To navigate to the **Rate Control** page:

1. Click on the **+** next to **Port**.
2. Click on **Rate Control**.

The Rate Control page allows the user to set the maximum throughput on a port or ports on both packets entering the port (from the connected device) or packets leaving the port.

The **Ingress** text box controls the rate of data traveling into the port while the **Egress** text box controls the rate of data leaving the port.

Note: Entries will be rounded down to the nearest acceptable rate value. If the value entered is below the lowest acceptable value then the lowest acceptable value will be used.

The Rate Control page is shown below (see Figure 19):

To provide either an ingress or egress rate control for a port on the EX24000 Switch:

1. Click in the Ingress or Egress Text Box for the appropriate port.
2. Type in the ingress/egress rate for the port according to the values listed above.
3. Click on the **Update Setting** button.

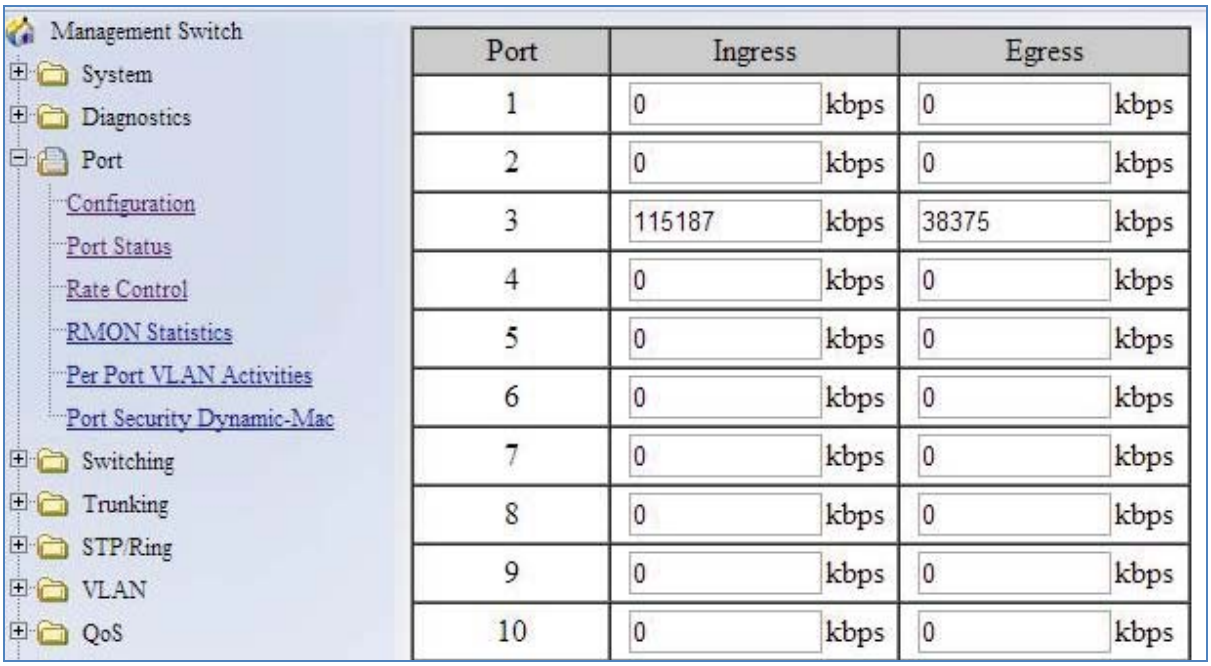


Figure 19: Rate Control

RMON Statistics

To navigate to the **RMON Statistics** page:

1. Click on the **+** next to **Port**.
2. Click on **RMON Statistics**.

RMON Statistics gives a detailed listing of the types and quantity of packets that a particular port has seen since the last reboot of the switch (see Figure 20).

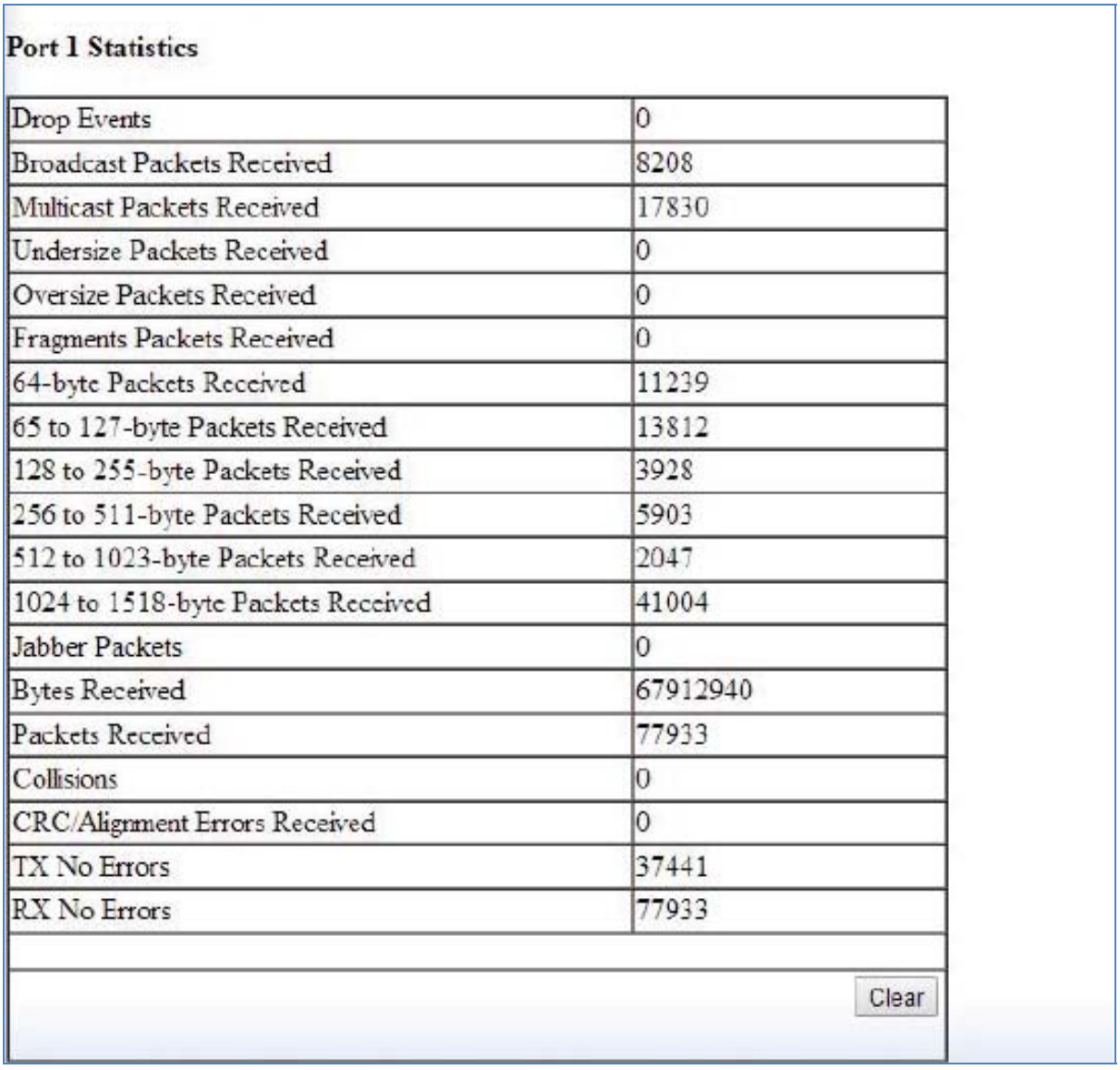
To view the RMON statistics for a particular port on the EX24000 Switch:

1. Click on the link to the port at the top of the RMON Statistics page.

To clear the RMON statistics for a particular port on the EX24000 Switch:

1. Click on the link to the port at the top of the RMON Statistics page.
2. Click on the **Clear** button at the bottom of the page.
3. The statistics for the port will update every ten seconds.

Pay particular attention to the values for CRC/Alignment errors and collisions. Nonzero values for these fields can indicate that a port speed or duplex mismatch exists on the port.



Port 1 Statistics

Drop Events	0
Broadcast Packets Received	8208
Multicast Packets Received	17830
Undersize Packets Received	0
Oversize Packets Received	0
Fragments Packets Received	0
64-byte Packets Received	11239
65 to 127-byte Packets Received	13812
128 to 255-byte Packets Received	3928
256 to 511-byte Packets Received	5903
512 to 1023-byte Packets Received	2047
1024 to 1518-byte Packets Received	41004
Jabber Packets	0
Bytes Received	67912940
Packets Received	77933
Collisions	0
CRC/Alignment Errors Received	0
TX No Errors	37441
RX No Errors	77933

Clear

Figure 20: RMON Page

Per Port VLAN Activities

To navigate to the **Per Port VLAN Activities** page:

1. Click on the **+** next to **Port**.
2. Click on **Per Port VLAN Activities**.

This is a read-only page that will allow the user to see what devices are connected to a particular port and the vlan associated with that device and port.

To clear the MAC addresses for a particular port on the EX24000 Switch (see Figure 21):

1. Click on the link to the port at the top of the Per Port VLAN Activities page.
2. Click on the **Clear MAC** button at the bottom of the page.
3. The statistics for the port will update every ten seconds.

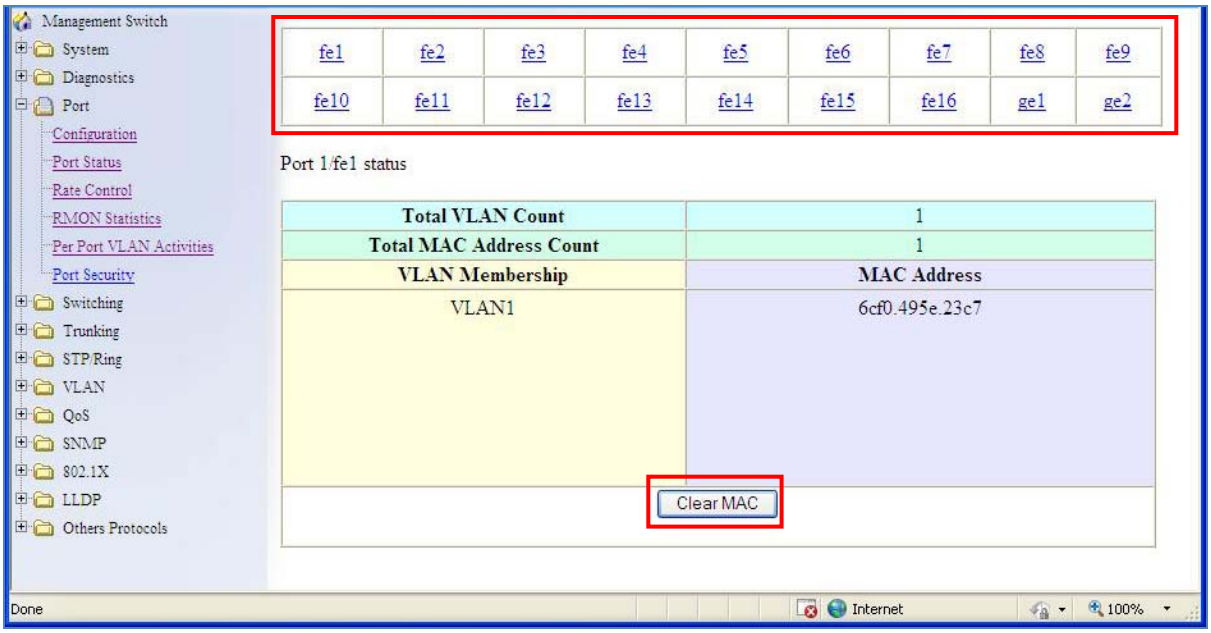


Figure 21: Port VLAN Activities

Port Security Dynamic-MAC

To navigate to the **Port Security Dynamic-MAC** page:

1. Click on the **+** next to **Port**.
2. Click on **Port Security Dynamic-MAC.**

The Port Security Dynamic-MAC submenu allows the user to control access to the ports on the switch based on the source MAC addresses of the network devices. You specify the maximum number of source MAC addresses that ports can learn. Ports that learn their maximum number of addresses discard packets that have new, unknown addresses, preventing access to the switch by any additional devices.

The Error Disable Recovery time value is a global value and represents the time that must elapse for a port to return to a normal operating state after an MAC access error is detected on that port.

To update the **Error Disable Recovery** time on the EX24000 Switch (see Figure 22):

1. Click in the **Error Disable Recovery** text box at the top of the Port Security Dynamic-MAC page.
2. Type in the desired value. Values can be from 0 to 65535 seconds. A value of 0 indicates that a port in an error condition is not to return to normal operating condition until an administrator resets the port or the switch is restarted..
3. Click on the **Update Setting** button at the bottom of the page.

To set the Dynamic MAC Security for a port on the EX24000 Switch (see Figure 22):

1. Click the **Enable** checkbox for the port or ports that are to be protected.
2. Type in a value for the **Max-Counts** field for the protected ports. This is the number of dynamically learned MAC addresses that can be accommodated by the port. For example, if the **Max-Counts** field is set to five, the port can learn up to five MAC addresses.
3. Select a Violation action from the **Violation** drop-down menu. The options are::
    a. **Shutdown** – When an unknown MAC address arrives at the port, the port is disabled and a SNMP trap is generated.
    b. **Restrict** – The port discard those frames that have unknown MAC addresses and an SNMP trap is generated when a packet with an unknown MAC address shows up on the port.
    c. **Protect** – The port discards those frames that have unknown MAC addresses.
4. Click on the **Submit** button.

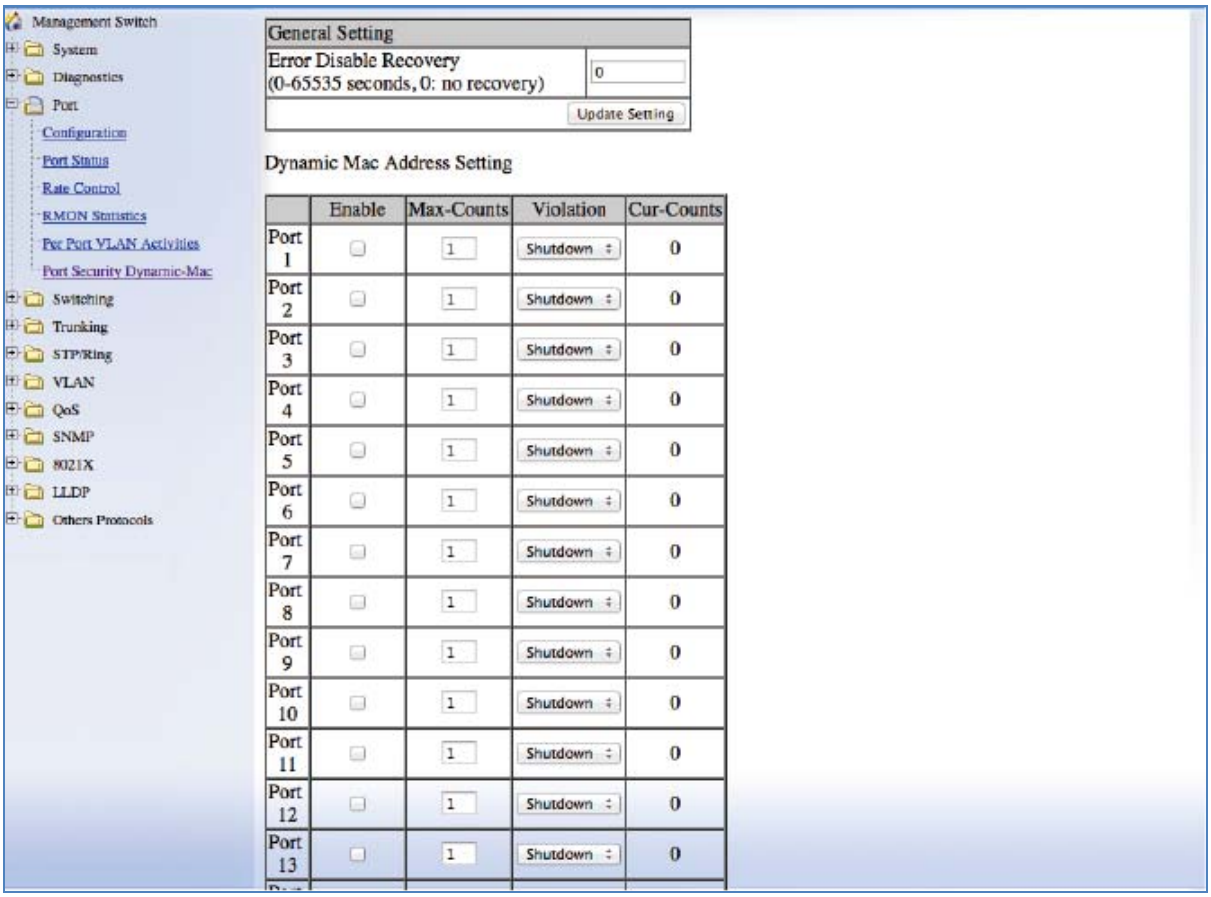


Figure 22: Port Security

Port Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Setting the Port Description

To provide a description of a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **description <*description text*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#description A_Port_Description
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enable or Disable a Port

To administratively enable or disable a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
shutdown
no shutdown

Usage Example 1: Disabling a port:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#shutdown
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Usage Example 2: Enabling a port:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#no shutdown
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting the Port Speed

To set the port speed for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **bandwidth <*1-10000000000 bits*>** (usable units : k, m, g)

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#bandwidth 100m
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting Port Duplex

To set the duplex for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **duplex <*full* | *half* | *auto*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#duplex full
switch_a(config)#q
```

```
switch_a(config)#q
switch_a#
```

Enable or Disable Port FlowControl

To enable or disable flowcontrol for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **flowcontrol on**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#flowcontrol on
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Display Port Status

To display the port status for a port use the CLI commands below:

CLI Command Mode: **Privileged Exec Mode**

CLI Command Syntax: **show interface <*ifname*>**

Usage Example:

```
switch_a>enable
switch_a#show interface fe1
```

Setting a Ports Rate Control

To set a ports rate control use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **rate-control <*ingress* | *egress*> value <*value in kbps*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)#rate-control ingress value 100000
```

```
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Display a Ports RMON Statistics

To display a ports RMON statistics use the CLI commands below:

CLI Command Mode: **Privileged Exec Mode**

CLI Command Syntax: **show interface statistics <*interface name*>**

Usage Example:

```
switch_a>enable
switch_a#show interface statistics fe1
switch_a#
```

Display a Ports VLAN Activities

To display a port's VLAN activities use the CLI commands below:

CLI Command Mode: **Privileged Exec Mode**

CLI Command Syntax: **show bridge interface <*interface name*>**

Usage Example:

```
switch_a>enable
switch_a#show bridge interface fe1
switch_a#
```

Setting Dynamic MAC Port Security

To set Dynamic MAC port security use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **port-security dynamic-mac enable**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)# port-security dynamic-mac enable
switch_a(config)#q
```

```
switch_a(config)#q
switch_a#
```

To set Dynamic MAC maximum number of addresses use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **port-security dynamic-mac maximum <*value*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)# port-security dynamic-mac maximum 32
switch_a(config)#q
switch_a(config)#q
switch_a#
```

SWITCHING

Bridging

To learn MAC addresses, a switch reads all packets that it detects on the LAN or on the local VLAN, looking for MAC addresses of sending nodes. It places these addresses into its Ethernet Switching table, along with the interface on which the traffic was received and the time when the address was learned. When the switch receives traffic on an interface, it searches the Ethernet switching table for the MAC address of the destination. If the MAC address is not found, the traffic is flooded out all of the other interfaces associated with the VLAN. If traffic is received on an interface that is associated with VLAN 1 and there is no entry in the Ethernet switching table for VLAN 1, then the traffic is flooded to all access and trunk interfaces that are members of VLAN 1.

Flooding allows the switch to learn about destinations that are not yet in its Ethernet switching table. If a certain destination MAC address is not in the Ethernet switching table, the switch floods the traffic to all interfaces except the interface on which it was received. When the destination node receives the flooded traffic, it sends an acknowledgment packet back to the switch, allowing the switch to learn the MAC address of the node and to add the address to its Ethernet switching table.

The switch uses a process called aging to keep the Ethernet switching table current. For each MAC address in the Ethernet switching table, the switch records a timestamp of when the information about the network node was learned. Each time the switch detects traffic from a MAC address that is in its Ethernet switching table, it updates the timestamp of that MAC address. A timer on the switch periodically checks the timestamp, and if it is older than the value set for **mac-table-aging-time**, the switch removes the node's MAC address from the Ethernet switching table. This aging process ensures that the switch tracks only active MAC addresses on the network and that it is able to flush out from the Ethernet switching table MAC addresses that are no longer available.

The user can configure:

- How long MAC addresses remain in the Ethernet switching table
- Add a MAC address permanently to the switching table
- Prevent a MAC address from ever being registered in the switching table.

To navigate to the **Bridging** page:

1. Click on the **+** next to **Switching**.

2. Click on **Bridging.**

Aging Time

The Aging Time value is a global value and represents the time that a networked device's MAC address will live in the switch's memory before being removed. The default value is 300s (5 minutes) (see Figure 23).

To update the Aging Time value on the EX24000 Switch:

1. Click in the Error Disable Recovery text box at the top of the Port Security Dynamic-MAC page.
2. Type in the desired value. Values can be from **0 to 65535 seconds**. A value of **0** indicates that the port is not to return to normal operating condition until an administrator resets the port or the switch is restarted.
3. Click on the **Update Setting** button.

Port Isolation

The **Port Isolation** setting is a **per port value**. Port Isolation can be used to isolate a port or ports so that only the isolated ports can communicate with one another (see Figure 23).

To update the Port Isolation value for a port on the EX24000 Switch:

1. Click on the **Port Isolation** drop-down box for the port to be isolated.
2. Select the value **enable** on the Port Isolation drop-down box.
3. Click on the **Update Setting** button.
4. Repeat as necessary for all ports that are to be isolated.

Block Multicast

The Block Multicast setting is a per port value. Block Multicast is a straight-forward description of a feature that is used to block multicast traffic from accessing a port (see Figure 23).

To update the **Block Multicast** value for a port on the EX24000 Switch:

1. Click on the **Block Multicast** drop-down box for the port to be isolated.
2. Select the value **enable** on the Block Multicast drop-down box.
3. Click on the **Update Setting** button.
4. Repeat as necessary for all ports that are to have multicast traffic blocked.

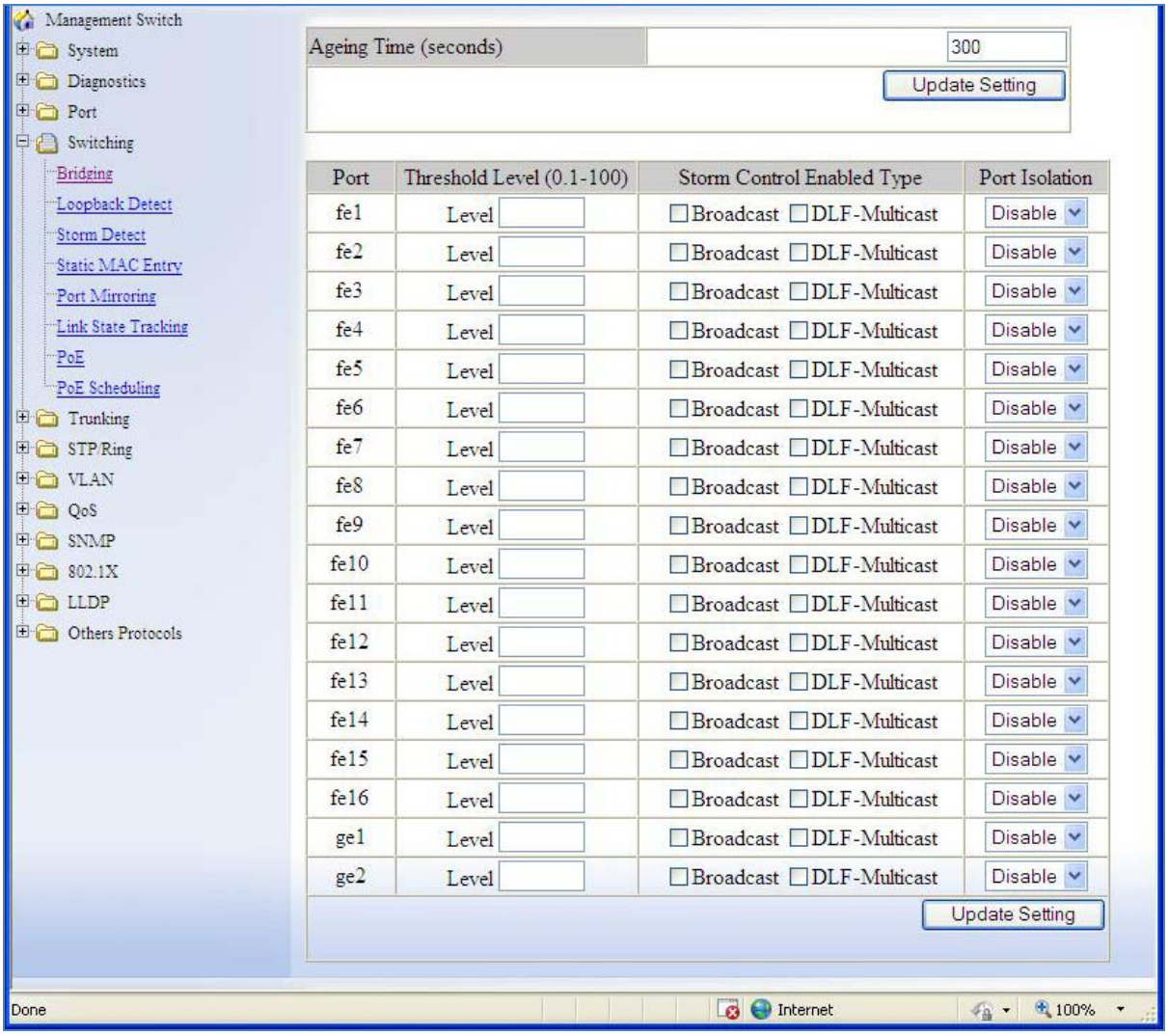


Figure 23: Bridging

Loopback Detect

Loopback detection is quite simply the ability of the switch to detect when a port on the switch has been connected directly (or “looped back”) to another port on the switch. This configuration would likely lead to a broadcast storm on the switch which would cause network performance to suffer. Loopback detection offers the ability of the switch to detect this condition and shutdown the loop-backed port before any disruption of network traffic occurs.

To navigate to the **Loopback Detect** page:

1. Click on the **+** next to **Switching**.
2. Click on **Loopback Detect.**

Enabling Loopback Detection (Global)

To globally enable the **Loopback Detect** feature of the EX24000 Switch (see Figure 24):

1. Click on the **Loopback Detect** drop-down box.
2. Select **Enable** from the drop down list.
3. Click on the **Update Setting** button.

Changing the Loopback Detect Action

To change the action that the switch takes when a loopback condition is detected (see Figure 24):

1. Choose an action from the **Loopback Detect Action** dropdown list. The available options are **None** and **Error Disable**.
2. Click on the **Update Setting** button.

Changing the Loopback Detect Recovery Time

To change the length of time that the **Loopback Detect Action** will stay in effect (see Figure 24):

1. Enter a value in the text box next to **Error Disable Recovery**. Valid values range from **0 to 65535 seconds**.

2. Click on the **Update Setting** button.

Changing the Polling Interval

To change the polling interval of the Loopback Detect function (see Figure 24):

1. Enter a value in the text box next to **Interval**. Valid values range from **1 to 65535** seconds.
2. Click on the **Update Setting** button.

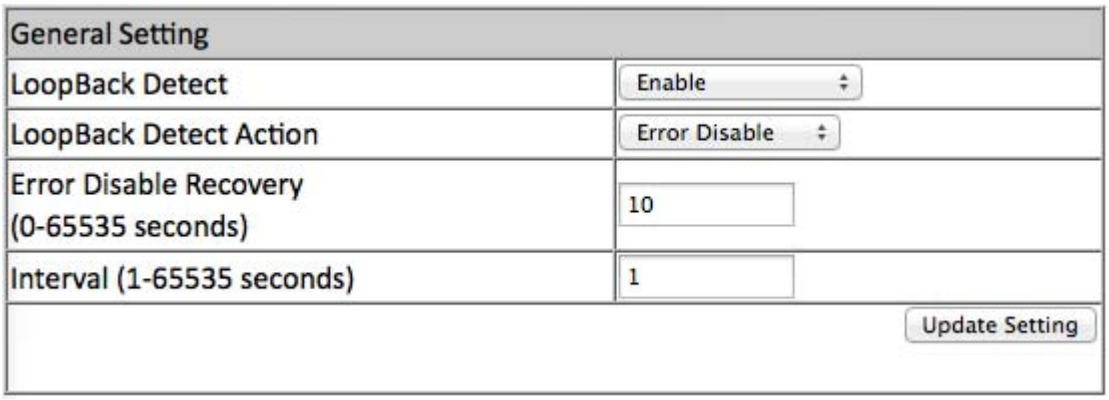
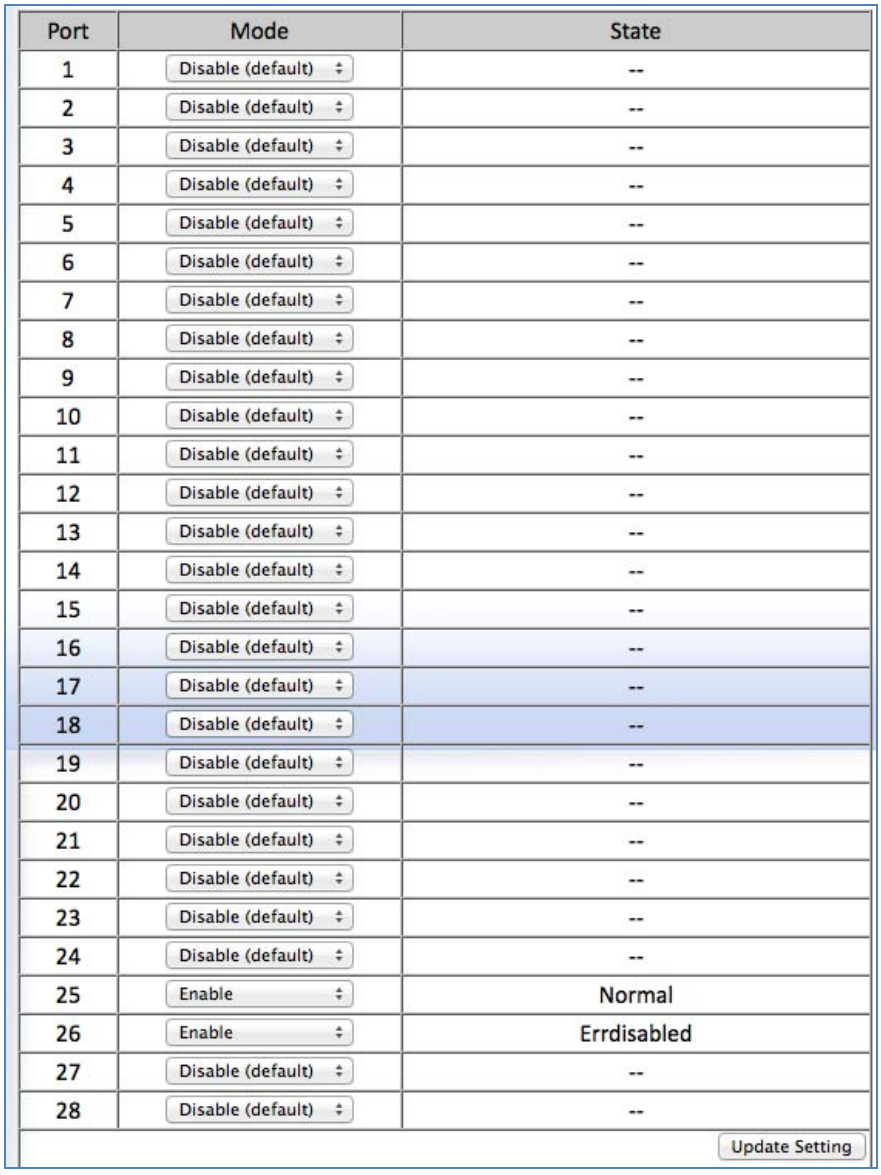


Figure 24: Loopback Detection

Enabling Loopback Detection (Per Port)

To enable **Loopback Detection** for a particular port or ports on the EX24000 switch (see Figure 25):

1. Select the value **Enable** from the **Mode** drop down list for a port on the Loopback Detect page.
2. Click on the **Update Setting** button.



Port	Mode	State
1	Disable (default)	--
2	Disable (default)	--
3	Disable (default)	--
4	Disable (default)	--
5	Disable (default)	--
6	Disable (default)	--
7	Disable (default)	--
8	Disable (default)	--
9	Disable (default)	--
10	Disable (default)	--
11	Disable (default)	--
12	Disable (default)	--
13	Disable (default)	--
14	Disable (default)	--
15	Disable (default)	--
16	Disable (default)	--
17	Disable (default)	--
18	Disable (default)	--
19	Disable (default)	--
20	Disable (default)	--
21	Disable (default)	--
22	Disable (default)	--
23	Disable (default)	--
24	Disable (default)	--
25	Enable	Normal
26	Enable	Errdisabled
27	Disable (default)	--
28	Disable (default)	--

Update Setting

Figure 25:Loopback Detection (port)

Storm Detect

This feature allows the user to regulate the reception rate of broadcast and multicast packets on a port-by-port basis. This setting can be useful in allowing a user to prevent a switch port from being overwhelmed with broadcast or multicast traffic (see Figure 26).

To navigate to the **Storm Detect** page:

1. Click on the **+** next to **Switching**.
2. Click on **Storm Detect.**

Enabling Storm Detect Configuration (Global)

To globally enable the **Storm Detect Configuration** feature of the EX24000 Switch (see Figure 26):

1. Click on the **Loopback Detect Configuration** drop-down box.
2. Select **Enable** from the drop down list.
3. Click on the **Submit** button.

Changing the Storm Detect Interval

To change the interval of the Storm Detect function (see Figure 26):

1. Enter a value in the text box next to **Interval**. Valid values range from **2 to 65535** seconds.
2. Click on the **Submit** button.

Changing the Storm Detect Error Disable Recovery Time

To change the length of time that the **Storm Detect Error Disable Recovery** will stay in effect (see Figure 26):

1. Enter a value in the text box next to **Error Disable Recovery**. Valid values range from **0 to 65535 seconds**.
2. Click on the **Submit** button.

To update the Storm Detect by utilization (%) of a port on the EX24000 Switch:

1. Click in the **By Utilization** text box for a particular port.
2. Type in the desired value. Values can be from **0 to 100**. This value is a percentage of allowable storm traffic for this port. Once this percentage of traffic is exceeded, all storm traffic beyond this percentage is dropped.
3. Click on the **Submit** button.

To update the Storm Detect by Broadcast (or Multicast + Broadcast) packets per second of a port on the EX24000 Switch:

1. Click on the **Loopback Detect By Broadcast / Multicast + Broadcast Packets Per Second** drop-down box.
2. Select **BC** (Broadcast) or **MC-BC** (Multicast + Broadcast) from the drop down list.
3. Click in the **By Broadcast / Multicast + Broadcast Packets Per Second** text box for a particular port.
4. Type in the desired value. Values can be from **0 to 100000**. This value is an allowable Broadcast (or Multicast + Broadcast) packets per second for this port. Once this value of traffic is exceeded, all Broadcast (or Multicast + Broadcast) traffic beyond this value is dropped.
5. Click on the **Submit** button.

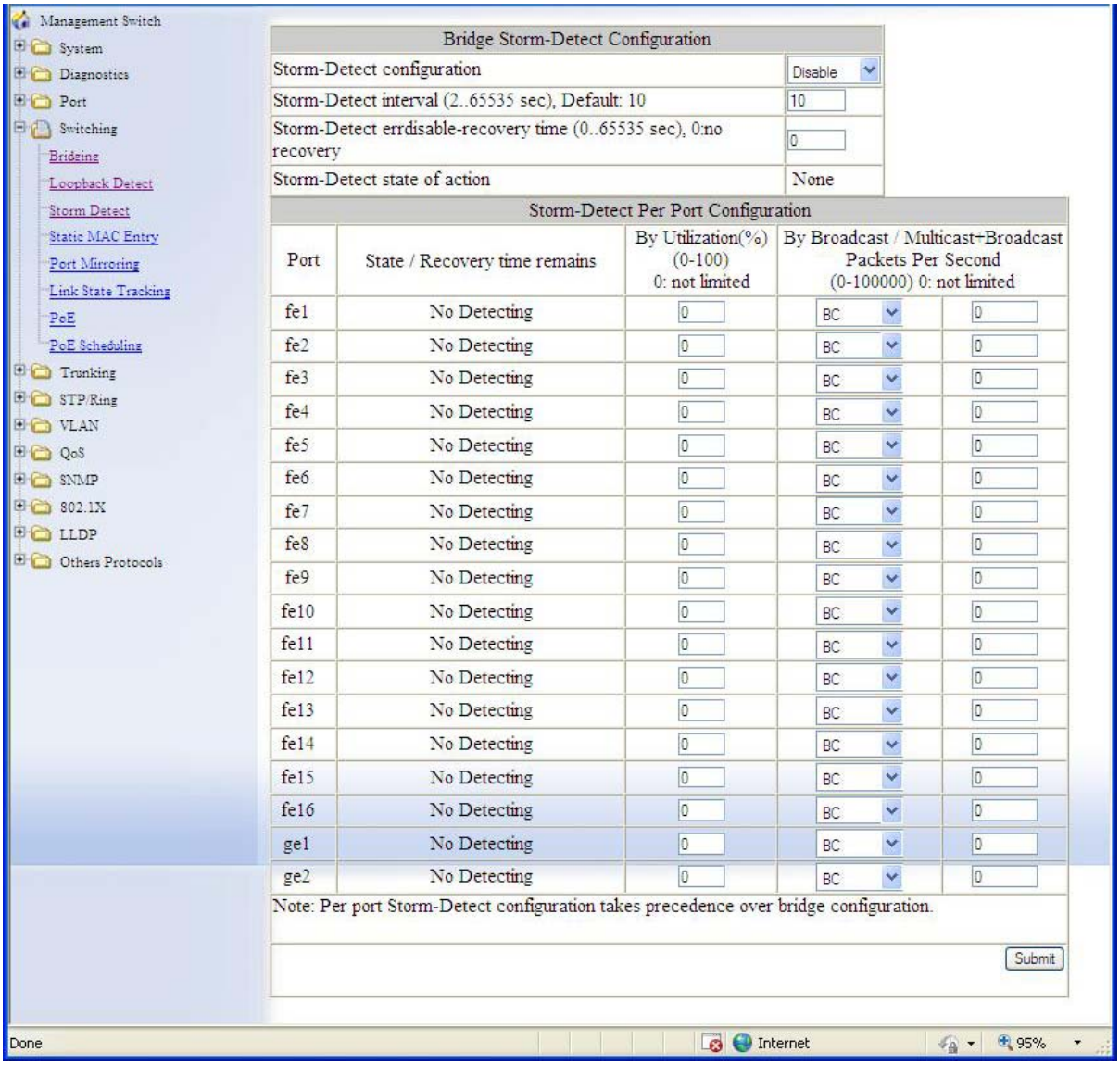


Figure 26: Storm Detect

Static MAC Entry

Occasionally, it may be useful to specify a MAC address on a particular port and VLAN rather than adjusting the ageing time for the entire switch. Alternatively, it is also possible and even desirable to prevent a MAC address from ever being registered with a switch. These features are offered under the **Static MAC Entry** menu.

To navigate to the **Static MAC Entry** menu:

1. Click on the **+** next to **Switching**.
2. Click on **Static MAC Entry.**

Adding a Static MAC Address to a Port

To add a static MAC entry for a particular port (see Figure 27):

1. Enter the MAC address for end the corresponding port's text box. The format of the MAC address should be in the form **aaaa:bbbb:cccc**).
2. Select the VLAN that this MAC address is associated with from the **VLAN ID** drop down list for the port.
3. Click on the **Submit** button.

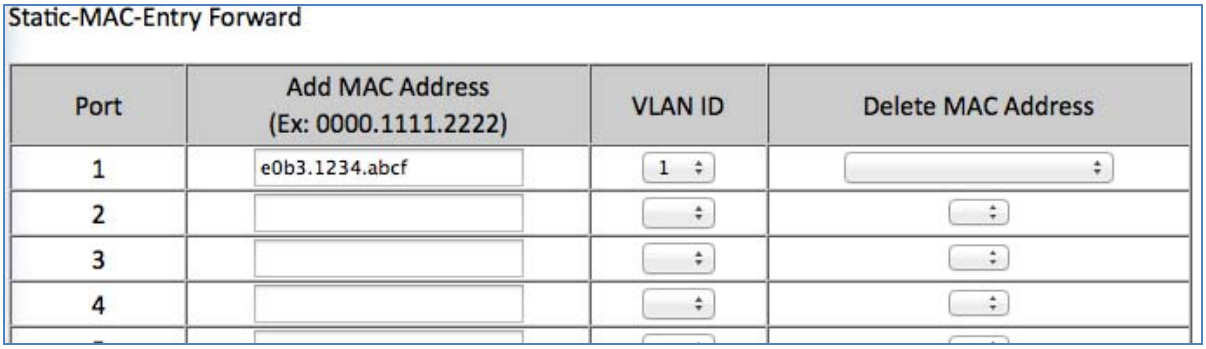


Figure 27: MAC Static Entry

Removing a Static MAC Address from a Port

To remove a static MAC entry for a particular port (see Figure 28):

1. For a particular port, select the MAC address to be deleted from the **Delete MAC Address** drop down box.
2. Click on the **Submit** button.

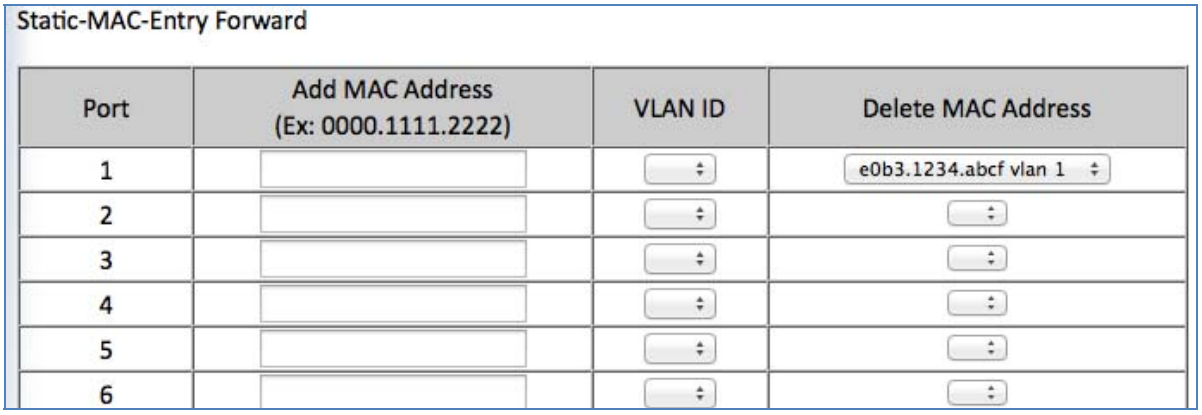


Figure 28: Removing a Static MAC

Adding a MAC to the Static-MAC-Entry Discard Table

To add a MAC address to the **Static-MAC-Entry Discard** table (see Figure 29):

1. Enter a MAC address in the form “0000.1234.abdc” in the **Add MAC Address** text box of the **Static-MAC-Entry-Discard** section.
2. Select the VLAN associated with the MAC address.
3. It should be noted that while static MAC address for forwarding are associated with the switch on a per-port basis. Static MAC discards are associated with the switch for all ports.
4. Click on the **Submit** button.

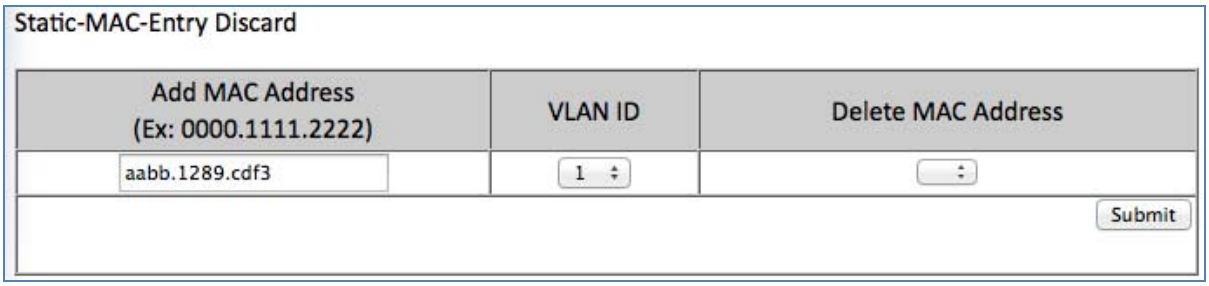


Figure 29: Adding a MAC – Static-MAC-Entry Table

Removing a MAC address from the Static-MAC-Entry Discard Table

To remove a MAC address from the **Static-MAC-Entry Discard** table (see Figure 30):

1. From the drop down box underneath **Delete MAC Address**, select the MAC address to be deleted.
2. Click on the **Submit** button.

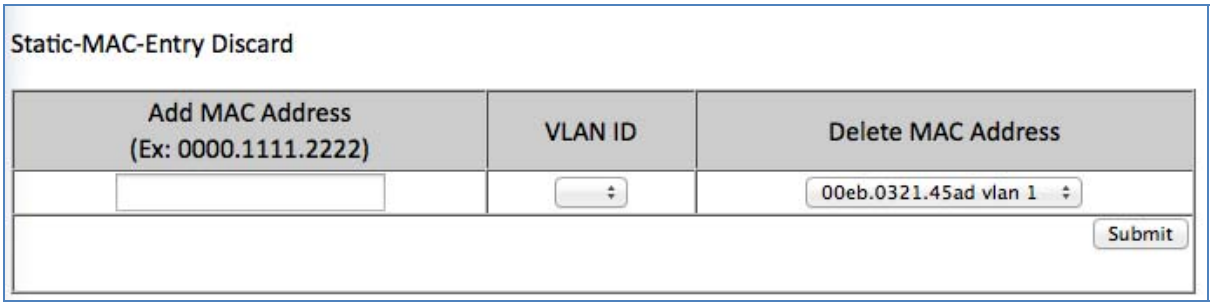


Figure 30: Deleting a MAC – Static-MAC-Entry Table

Port Mirroring

Port mirroring allows network traffic from one port to be copied or mirrored to another port. This is a very useful troubleshooting feature in that all data from one port is sent to another port which is attached to a computer or other network device that is configured to capture packets. This enables a network administrator or technician to see the traffic that is entering or leaving a particular port without disrupting normal network operations on the port that is being mirrored.

To navigate to the **Port Mirroring** menu:

1. Click on the **+** next to **Switching**.
2. Click on **Port Mirroring.**

To configure port mirroring for a port or ports on the EX24000 switch (see Figure 31):

1. Select the port or ports that traffic is to be mirrored from under the **Mirror From** column.
2. Select the destination port under the **Mirror To** drop down box.
3. Select the type of traffic that should be mirrored from the **Mirror Mode** drop down box. The available options are:
    a. TX – transmit only
    b. RX – Receive Only
    c. TX/RX – Transmit and Receive.
4. Click on the **Submit** button.

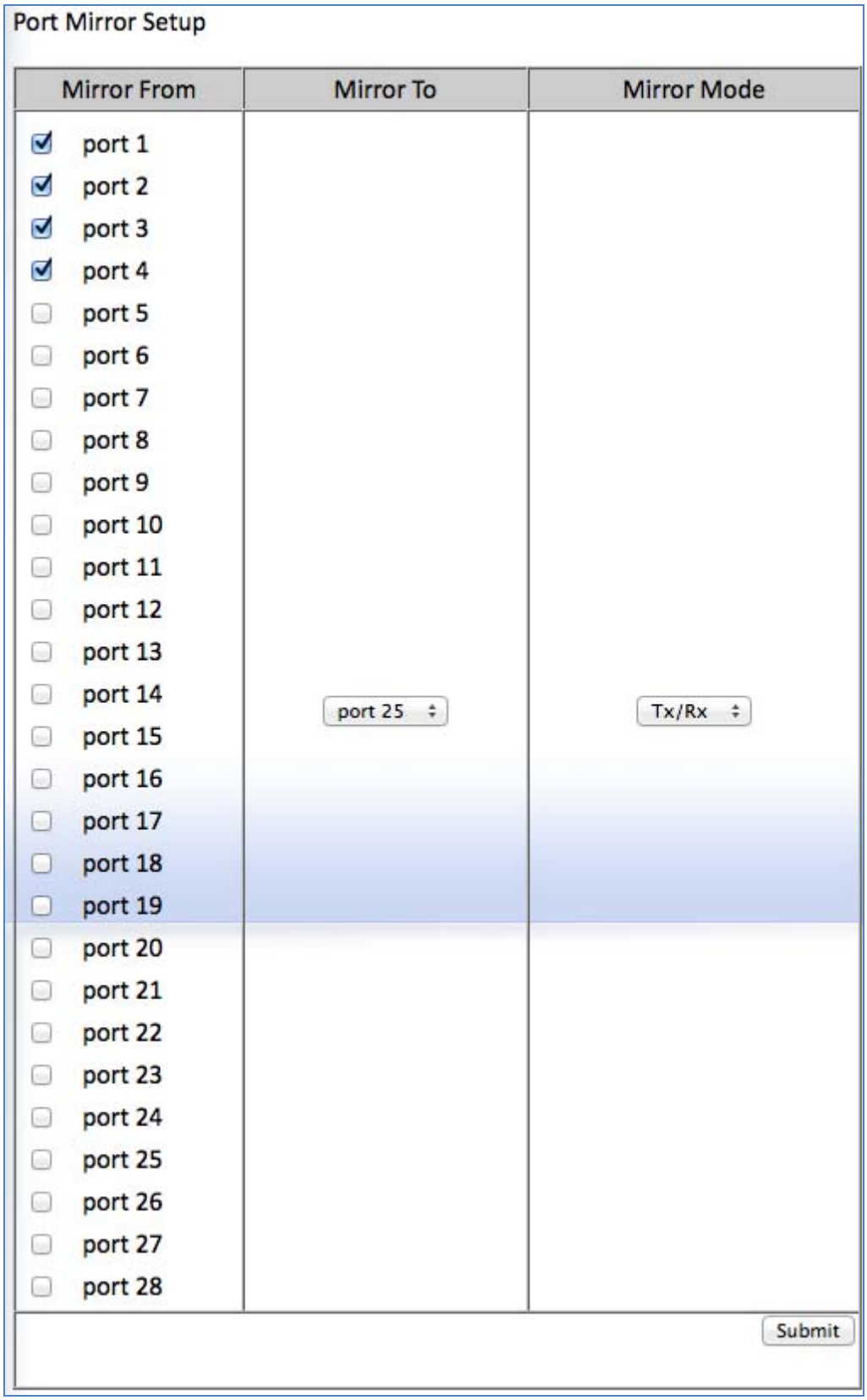


Figure 31: Port Mirroring

To disable port mirroring for a port or ports on the EX24000 switch (see Figure 32):

1. Under the **Current Settings** section, the current port mirroring configuration should be displayed.
2. Click on the **Delete** button.

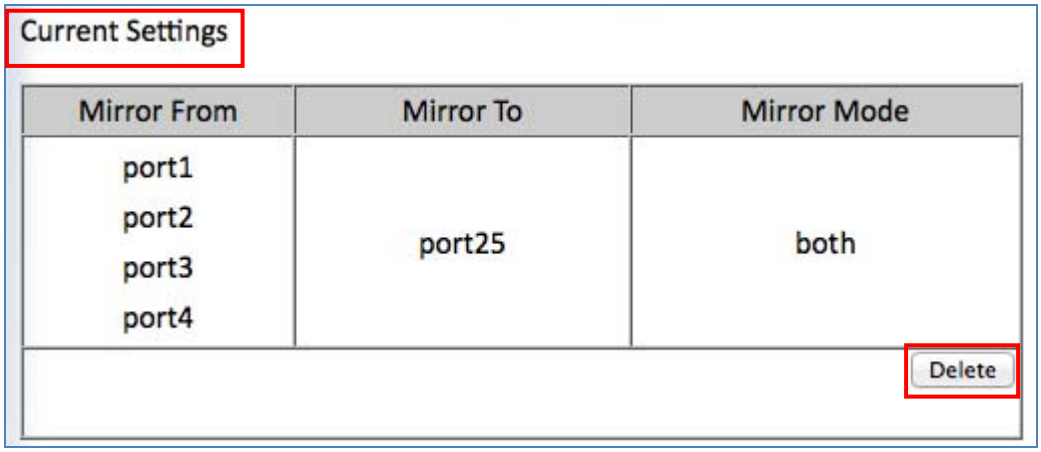


Figure 32: Disabling Port Mirroring

Link State Tracking

Link-state tracking binds the link state of multiple interfaces. Link-state tracking provides redundancy in the network when used with server network interface card (NIC) adapter teaming or bonding. When the server network adapters are configured in a primary or secondary relationship known as teaming and the link is lost on the primary interface, connectivity transparently changes to the secondary interface.

To navigate to the **Link State Tracking** menu:

1. Click on the **+** next to **Switching**.
2. Click on **Link State Tracking.**

Enable/Disable Link State Tracking

To enable Link State Tracking for a particular group on the EX24000 Switch (see Figure 33):

1. Under **Group Setting**, click the check box of the Link State groups that are to be enabled (or disabled).
2. Click on **Update Setting.**

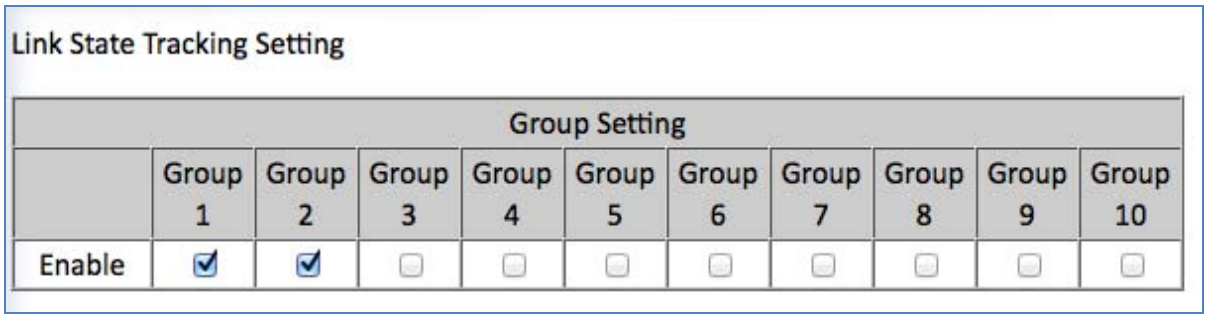


Figure 33: Link State Tracking

Port Settings

To configure individual ports for a Link State group on the EX24000 switch (see Figure 34):

1. Under **Port Setting**, select the Link State Group that the port will belong to from the Group drop down box
2. Select if the port is upstream or downstream from the Up/Down Stream)drop down box.
3. Click on **Update Setting.**

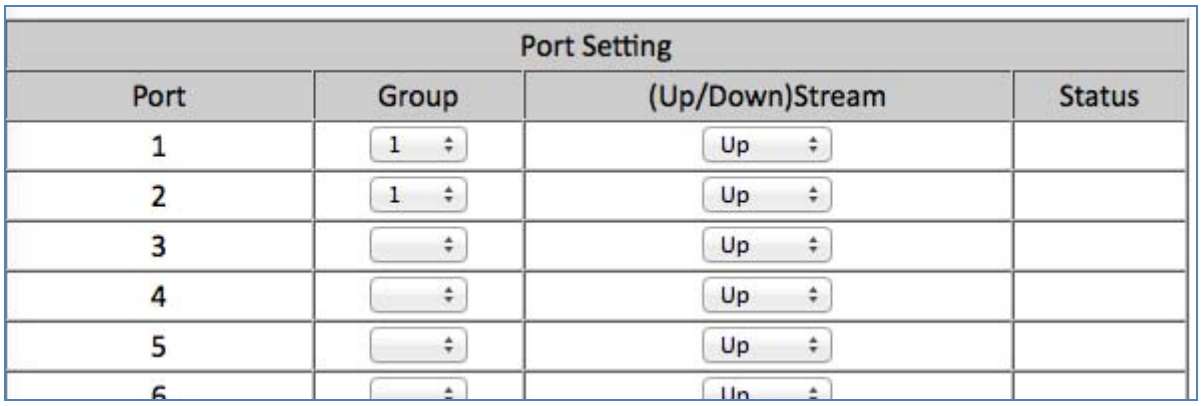


Figure 34: Link State Tracking – Port Settings

PoE

To navigate to the **PoE** page:

1. Click on the **+** next to **Switching**.
2. Click on **PoE.**

Changing the System Power Budget (Global)

To change the **System Power Budget** (see Figure 35):

1. Enter a value in the text box next to **System Power Budget**.
2. Click on the **Submit** button.

Enabling Enable Mode (Per Port)

To enable **Enable Mode** for a particular port or ports on the EX24000 switch (see Figure 35):

1. Select the value **Enable** from the **Enable Mode** drop down list for a port on the PoE page.
2. Click on the **Submit** button.

Changing the Fixed Power Limit (Per Port)

To change the **Fixed Power Limit** (see Figure 35):

1. Enter a value in the text box next to **Fixed Power Limit**.
2. Click on the **Submit** button.

Enabling Power Priority (Per Port)

To enable **Power Priority** for a particular port or ports on the EX24000 switch (see Figure 35):

1. Select the value from the **Power Priority** drop down list for a port on the PoE page.
2. Click on the **Submit** button.

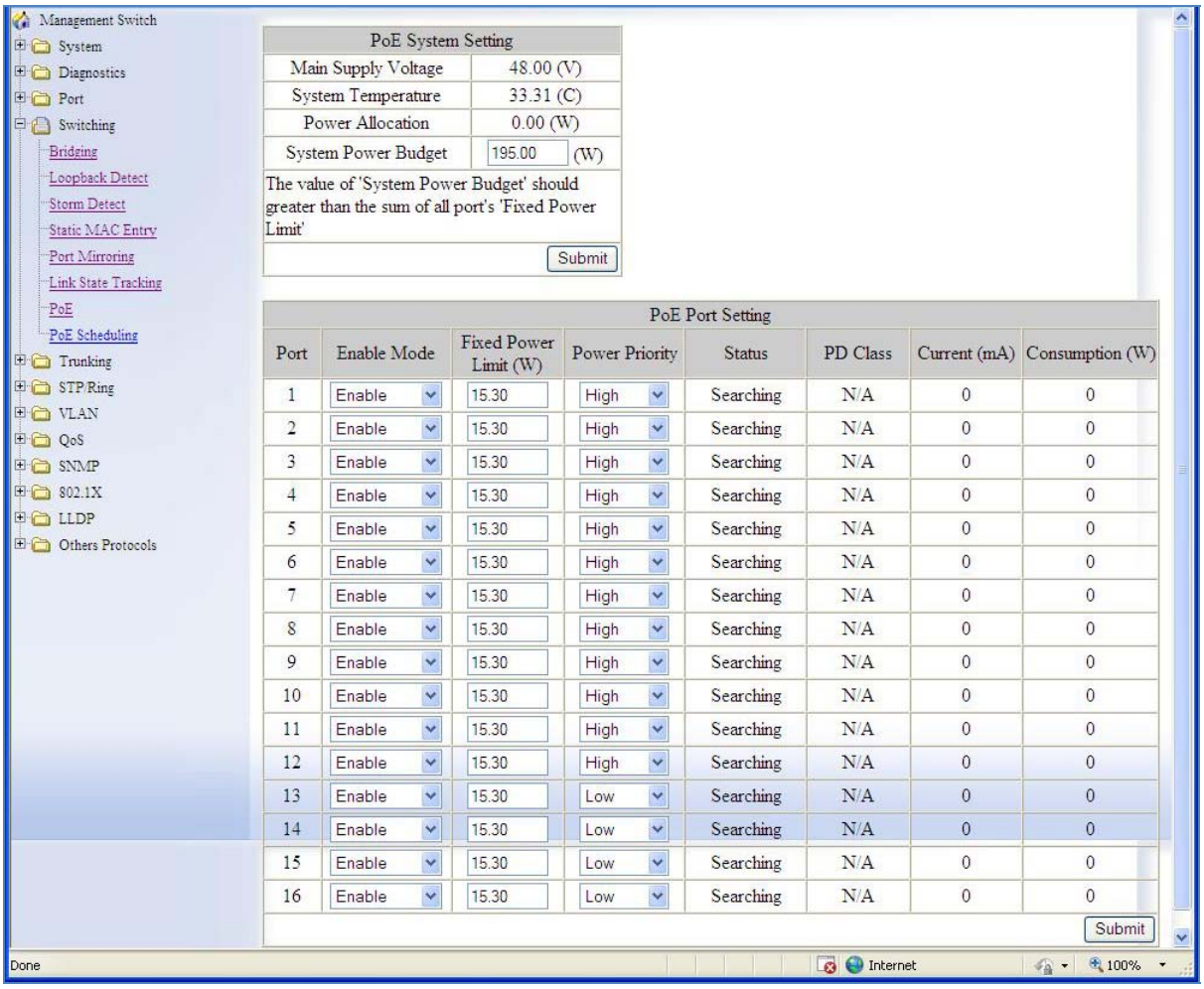


Figure 35: PoE

PoE Scheduling

To navigate to the **PoE Scheduling** page:

1. Click on the **+** next to **Switching**.
2. Click on **PoE Scheduling.**

Enabling PoE Scheduling (Per Port)

To enable **PoE Scheduling** for a particular port or ports on the EX24000 switch (see Figure 36):

1. Select the port from the **Port** drop down list for a port on the PoE Scheduling page.

2. Check time box from Sunday to Saturday.
3. Click on the **Submit** button.

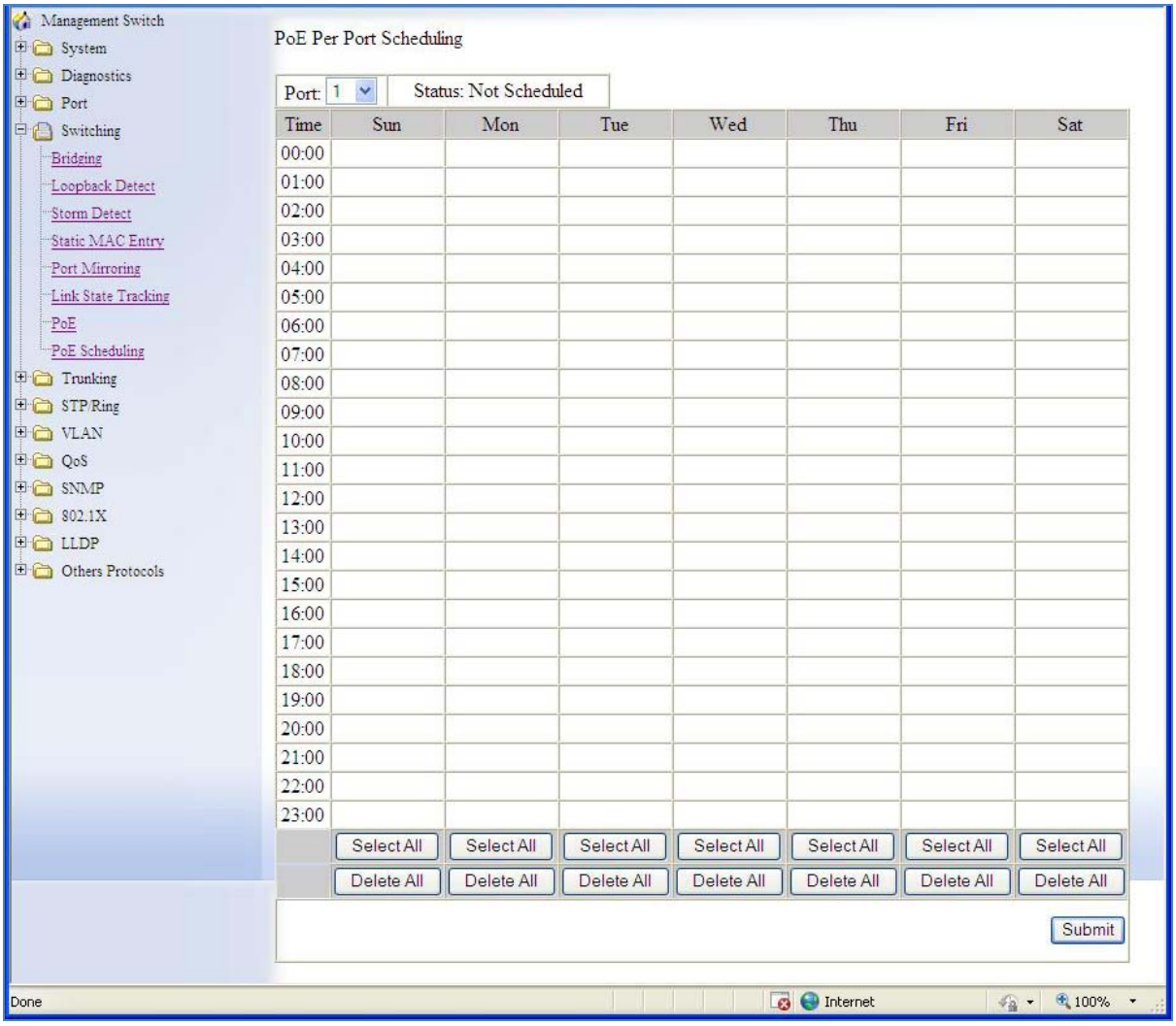


Figure 36: PoE Scheduling

Switch Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Setting the Aging Time Value

To update the **Aging Time** value on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 ageing-time** (time in ms)

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 ageing time 300
switch_a(config)#q
switch_a#
```

Enabling Port Isolation

To enable **Port Isolation** for a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **port-isolation enable**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#configure interface fe1
switch_a(config)#port-isolation enable
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling Block Multicast

To enable **Block Multicast** for a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **switchport block multicast**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#configure interface fe1
switch_a(config)#switchport block multicast
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting Storm Detect by Utilization

To set the percentage for the **Storm Detect by Utilization** of a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **storm-detect utilization <*0-100*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#configure interface fe1
switch_a(config-if)#storm-detect utilization 10
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Enabling Loopback Detect (Global)

To enable **Loopback Detect** on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: General Configuration Mode

CLI Command Syntax: bridge 1 loopback-detect <enable | disable>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 loopback-detect enable
switch_a(config)#q
switch_a#
```

Setting the Loopback Detect Action

To set the action for **Loopback Detect** on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: General Configuration Mode

CLI Command Syntax: bridge 1 loopback-detect action <err-disable | none>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 loopback-detect action err-disable
switch_a(config)#q
switch_a#
```

Setting the Loopback Detect Recovery Time

To set the recovery time for **Loopback Detect** on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 loopback-detect errdisable-recovery *<0-65535>***

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 loopback-detect errdisable-recovery 30
switch_a(config)#q
switch_a#
```

Setting the Loopback Detect Polling Interval

To set the polling interval for **Loopback Detect** on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 loopback-detect interval *<1-65535>***

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 loopback-detect interval 5
switch_a(config)#q
switch_a#
```

Enabling Loopback Detect (Port)

To enable **Loopback Detection** on a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **loopback-detect enable**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# loopback-detect enable
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Adding a MAC Address for Static-MAC-Entry Forwarding

To add a MAC address for **Static-MAC-Entry Forwarding** for a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
bridge 1 address <*mac address*> forward <*interface*> vlan <*vlan id*>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# bridge 1 address 00e0.abcd.1245 forward fe1 vlan 1
switch_a(config)#q
switch_a#
```

Adding a MAC Address for Static-MAC-Entry Discarding

To add a MAC address for **Static-MAC-Entry Discarding** for a port on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 address <*mac address*> discard vlan <*vlan id*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# bridge 1 address 00e0.abcd.1245 discard vlan 1
switch_a(config)#q
switch_a#
```

Configuring Port Mirroring

To configure a port for Port Mirroring on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **mirror interface <*interface*> direction <*both* | *tx* | *rx*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface ge1
switch_a(config)# mirror interface fe1 direction both
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling a Link State Tracking Group

To enable a **Link State Tracking** Group on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **link state track <*group* #>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# link state track 4
switch_a(config)#q
switch_a#
```

Assigning a Port to a Link State Tracking Group

To assign a port to a Link State Tracking group on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **link state group <*group* #> <*upstream* | *downstream*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# link state group 4 downstream
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting the System Power Budget

To update the **Sysem Power Budget** value on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **poe system-power-budget <LEVEL>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# poe system-power-budget 246
switch_a(config)#q
switch_a#
```

TRUNKING

Overview

Port Trunking refers to the use of multiple network connections in parallel to increase the link speed beyond the limits of any one single cable or port. This is commonly called link aggregation. These aggregated links may be used to interconnect switches or to connect high-capacity servers to a network.

The EtherWAN EX24000 Switch supports up to six trunks for 100Mbps ports and up to two gigabit trunks. Each 100Mbps trunk can be composed of up to eight 100Mbps ports while each gigabit trunk can support up to four gigabit ports.

There are two popular types of port trunking, static and link aggregation control protocol (LACP). We will take a minute to discuss both types of trunking and why one would want to use them.

Static Channel Trunking

Originally specified in the IEEE802.3AD specification and now in the IEEE 802.1AX2008 specification, this type of trunking is the most basic and easiest to understand. It simply is the aggregation of two or more Ethernet links to form a virtual link equivalent in bandwidth to the sum of its individual links. For example, if one had four 100Mbps Ethernet links composing a single static channel, the overall bandwidth of the static channel would be 400Mbps.

Prioritization of data through the channel is simple as well. When one of the links of the channel becomes saturated the excess data spills over into the remaining channels. For example, if one were sending a constant stream of data at 250Mbps through a static channel composed of 4 individual 100Mbps links, the first two links of the channel would be completely saturated while the half of the third channel would be utilized and none of the forth channel would be used.

Link Aggregation Control Protocol

Within the IEEE specification, the Link Aggregation Control Protocol (LACP) provides a method to control the bundling of several physical ports together to form a single logical channel. LACP allows a network device to negotiate an automatic bundling of links by sending LACP packets to the peer (directly connected device that also implements LACP). This means that both sides of the LACP channel must be configured for LACP which implies both devices must support it.

LACP also has a couple of very important advantages over static channel:

- Failover when a link fails and there is (for example) a media converter between the devices which means that the peer will not see the link down. With static link aggregation the peer would continue sending traffic down the link causing it to be lost.
- The device can confirm that the configuration at the other end can handle link aggregation. With Static link aggregation a cabling or configuration mistake could go undetected and cause undesirable network behavior.

Port Trunking

To navigate to the **Port Trunking** menu:

1. Click on the **+** next to **Trunking**.
2. Click on **Port Trunking.**

To create a static trunk consisting of 100Mbps ports (see Figure 37):

1. Click on the checkbox for each desired port in a particular trunk.
2. Click on the **Submit** button.

To create a static trunk consisting of 1000Mbps ports (see Figure 37):

1. In the **GE Trunking** section, click on the checkbox for each desired port in a particular trunk.
2. Click on the **Submit** button.

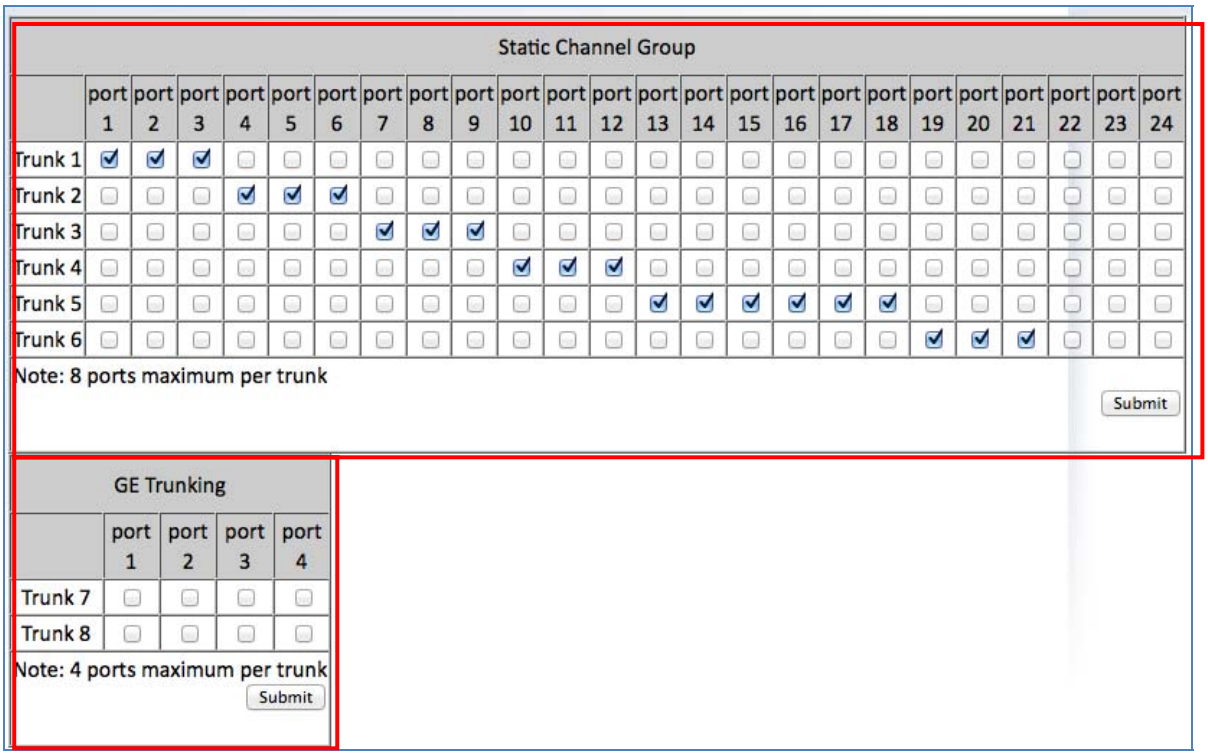


Figure 37: Port Trunking

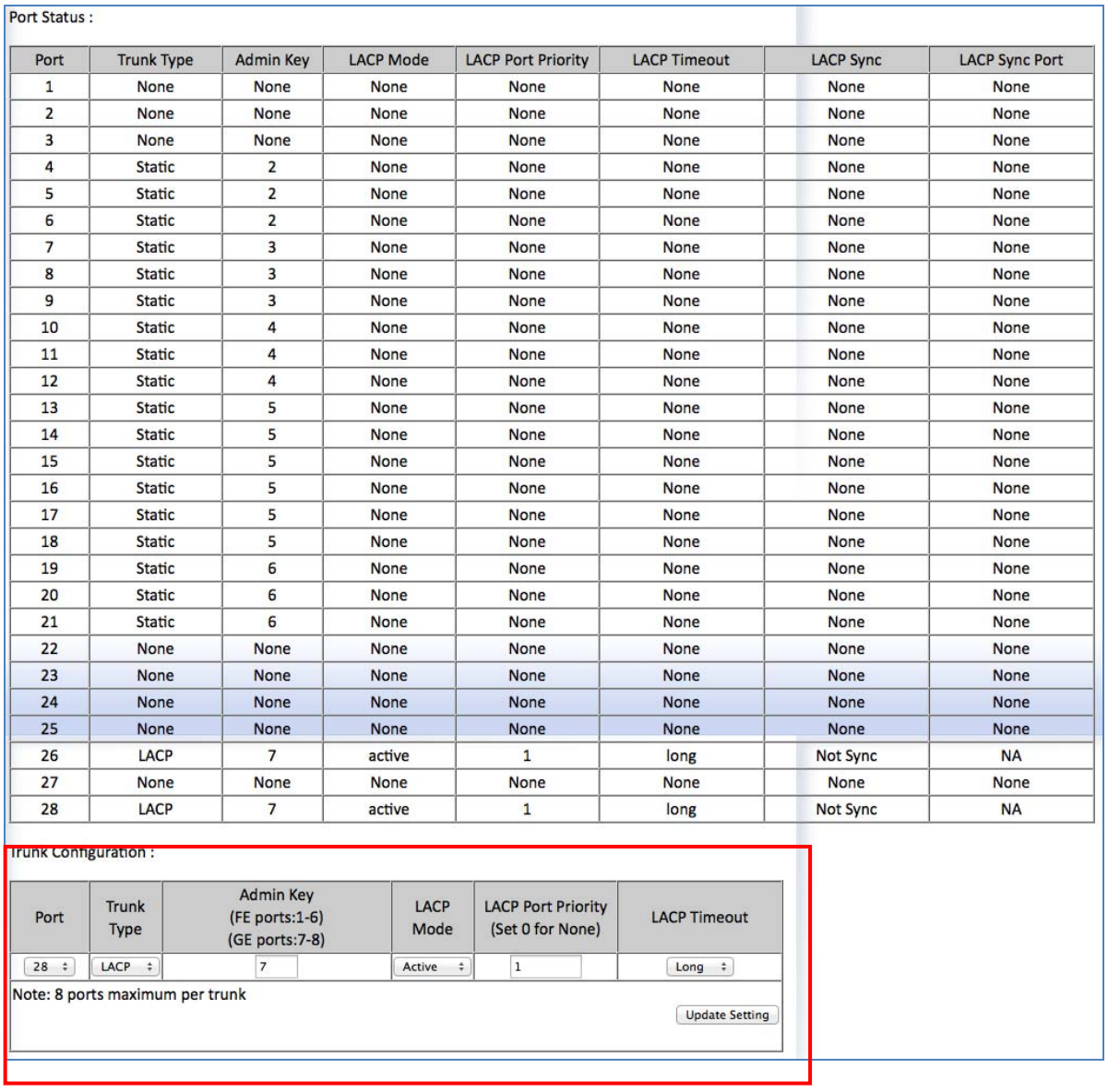
LACP Trunking

To navigate to the **LACP Trunking** menu:

1. Click on the **+** next to **Trunking**.
2. Click on **LACP Trunking.**

To create a LACP trunk (see Figure 38):

1. In the **Trunk Configuration** section, select a port in the LACP trunk.
2. Select **LACP** from the Trunk Type dropdown box for this port.
3. Enter an admin key for this port in the **Admin Key** textbox. 100Mbps ports admin keys must be between 1-6 and 1Gbps ports must be between 7-8.
4. Select the LACP Mode to either **Active** or **Passive**.
5. Enter a value in the **Port Priority** textbox.
6. Select a Timeout value of **Short** or **Long**.
7. Click on the **Submit** button.
8. Repeat steps 1-7 for each additional port that is to be used in the trunk.



Port Status :

Port	Trunk Type	Admin Key	LACP Mode	LACP Port Priority	LACP Timeout	LACP Sync	LACP Sync Port
1	None	None	None	None	None	None	None
2	None	None	None	None	None	None	None
3	None	None	None	None	None	None	None
4	Static	2	None	None	None	None	None
5	Static	2	None	None	None	None	None
6	Static	2	None	None	None	None	None
7	Static	3	None	None	None	None	None
8	Static	3	None	None	None	None	None
9	Static	3	None	None	None	None	None
10	Static	4	None	None	None	None	None
11	Static	4	None	None	None	None	None
12	Static	4	None	None	None	None	None
13	Static	5	None	None	None	None	None
14	Static	5	None	None	None	None	None
15	Static	5	None	None	None	None	None
16	Static	5	None	None	None	None	None
17	Static	5	None	None	None	None	None
18	Static	5	None	None	None	None	None
19	Static	6	None	None	None	None	None
20	Static	6	None	None	None	None	None
21	Static	6	None	None	None	None	None
22	None	None	None	None	None	None	None
23	None	None	None	None	None	None	None
24	None	None	None	None	None	None	None
25	None	None	None	None	None	None	None
26	LACP	7	active	1	long	Not Sync	NA
27	None	None	None	None	None	None	None
28	LACP	7	active	1	long	Not Sync	NA

Trunk Configuration :

Port	Trunk Type	Admin Key (FE ports:1-6) (GE ports:7-8)	LACP Mode	LACP Port Priority (Set 0 for None)	LACP Timeout
28	LACP	7	Active	1	Long

Note: 8 ports maximum per trunk

Update Setting

Figure 38: LACP Trunking

Trunking Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Adding an Interface to a Static Trunk

To add an interface to a static trunk on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
static-channel-group <*static channel*> (1-6 for 100Mbps, 7-8 for 1Gbps ports)

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config)#static-channel-group 1
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Adding an Interface to a LACP Trunk

To add an interface to a LACP trunk on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
channel-group <*LACP Channel*> mode <*active* | *passive*>
(LACP Channel is 1-6 for 100Mbps, 7-8 for 1Gbps ports)

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config)# channel-group 2 mode passive
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting the LACP Port Priority

To set the port priority for an interface attached to a LACP trunk on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lacp port-priority <1 - 65535>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config)# lacp port-priority 1
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Setting the LACP Timeout

To set the timeout for an interface attached to a LACP trunk on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lacp timeout *<long | short>***

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config)# lacp timeout long
switch_a(config)#q
switch_a(config)#q
switch_a#
```

STP/RING PAGE – OVERVIEW

Choosing the Spanning Tree Protocols

The Spanning Tree algorithm works by designating a single switch (The Root Bridge) in the network, as the root or the parent to all the switches. All the switches in the network will use the same algorithm to form unique paths all the way back to the Root Bridge. Some switches establish a blocking point (a port on a switch) somewhere along the path to prevent a loop. There are 3 versions of the Spanning Tree protocol, STP, RSTP, MSTP, and they are all backwards compatible with each other.

Spanning Tree Protocol (STP)

This is the original Spanning Tree protocol, and it has been supersede by both the RSTP and MSTP protocol. It is based on a network with a maximum diameter of no more than 17 switches. It uses timers to synchronize any changes in the network topology, and this could take minutes. It is not recommended that you use this version of the Spanning Tree protocol.

Rapid Spanning Tree protocol (RSTP)

The RSTP protocol is the new enhanced version of the original STP protocol. It uses an enhanced negotiation mechanism to directly synchronize any topology changes between switches; it no longer uses timers as in the original STP protocol, which results in a faster re-convergence time. The maximum allowed network diameter for the RSTP protocol is 40 switches.

Multiple Spanning Tree Protocol (MSTP)

The MSTP protocol extends the RSTP protocol by simultaneously running multiple instances of the Spanning Tree Protocol and mapping different VLANs to each instance, thus providing load balance across multiple switches. The MSTP protocol accomplishes this by creating new extended sections within the RSTP protocol, called Regions. Each region runs its own instance of the Spanning Tree Protocol. Within each Region, the MSTP protocol can accommodate a network diameter of up to 40 switches. There can be a maximum of 40 Regions in a single MSTP network.

 **Note:** If a faster recovery time is required, EtherWAN's proprietary α-Ring provides a recovery time of <15MS with up to 250 switches. See STP/Ring Page - Alpha Ring on page 123 for more information.

STP/RING PAGE - CONFIGURING RSTP

Global Configuration Page

To navigate to the **STP/Ring Global Configuration** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Global Configuration**.

Enabling the RSTP Protocol

RSTP is enabled by Default. If RSTP has been disabled and you wish to enable it (see Figure 39):

1. Click the dropdown box next to **Spanning Tree** Protocol and choose **Enable**.
2. Click on the dropdown box next to **STP Version** and select **RSTP**.
3. Click on the **Update Setting** button.

Additional Global Configuration page settings

- **Bridge Priority** – Bridge Priority is used to set the Root and backup Root Bridge. For more details see The Root Bridge & Backup Root Bridge.
    - Default is 32768. Range is 0 to 61440.
- **Hello Time** – This tells how often a BPDU (Bridge Protocol Data Unit) is sent (see Bridge Protocol Data Units). Default is 2 seconds. Range is 1 to 10 seconds.
- **Max Age** – Default is 20. Hop count limit for BPDU packets (see Setting the MAX Age, Forward Delay and Hello Timer),
- **Forward Delay -** Default is 15 sec.

Note: Bridge Protocol Data Units (BPDUs) are frames that contain information about the Spanning tree protocol (STP). Switches send BPDUs using a unique MAC address from its origin port and a multicast address as destination MAC (01:80:C2:00:00:00). There are three kinds of BPDUs:

- Configuration BPDU, used by Spanning Tree Protocol to provide information to all switches.
- TCN (Topology change), tells about changes in the topology.
- TCA (Topology change Acknowledgment), confirm the reception of the TCN.

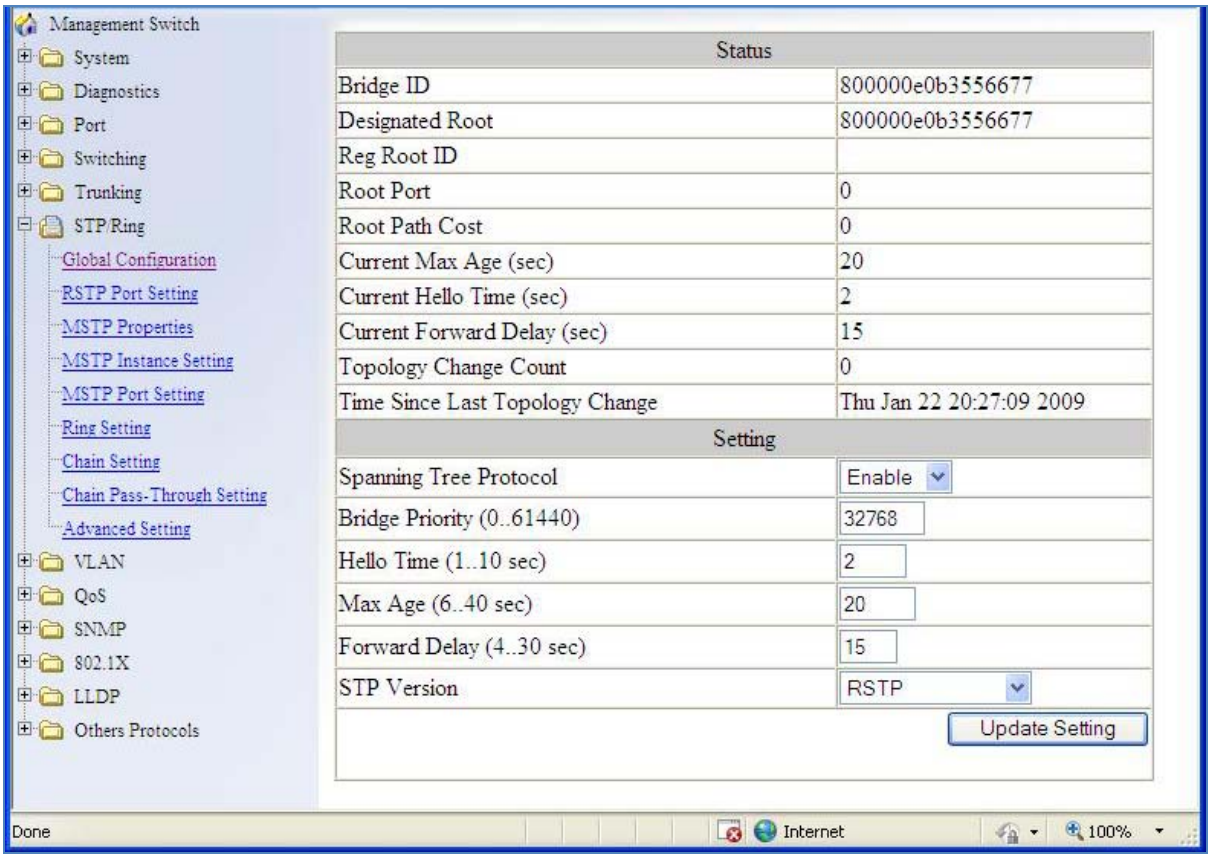


Figure 39: STP/Ring Global Configuration

The Root Bridge & Backup Root Bridge

To configure the Spanning Tree protocol on your network, you will need to setup a Root Bridge and Backup Root Bridge. In order to configure a switch to be the Root Bridge of a Spanning Tree network, you have to make sure that the Bridge Priority (which is the most significant 4 bits of the Bridge ID) of the switch is the lowest among any of the switches on the network. Similarly for the Backup Root Bridge, it must have the next lowest Bridge Priority of all the switches.

Note: Since the **Bridge Priority** is the most significant 4 bit of the Bridge ID, the lowest **Bridge Priority** will always be the Root Bridge and the second lowest **Bridge Priority** will be the Backup Root Bridge. If all switches have the same **Bridge Priority**, then The 12 bit System ID or MAC Address (if the system ID's are the same) will be used to determine the Root and Backup Root Bridge (See 如下).

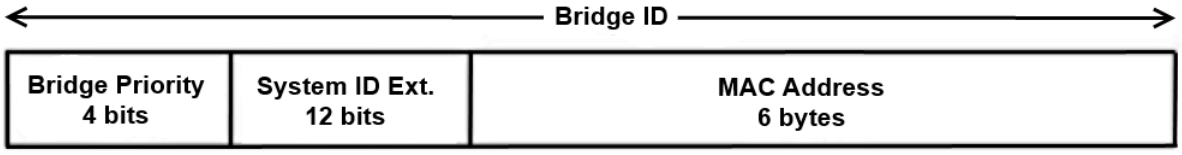


Figure 40: Bridge ID

Bridge ID is a concatenation of 3 values: a 4 bit Bridge Priority (most significant), a 12 bit System ID (less significant), and the 48 bit MAC address of the local switch (least significant).

Setting the Root Bridge and Backup Root Bridge

To navigate to the **STP/Ring Global Configuration** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Global Configuration**.

To set the Bridge Priority:

1. Enter the **Bridge Priority ID** in the text box to the right of **Bridge Priority (0..61440)**
2. Click on the **Update Setting** button.

Note: The valid values for this parameter are from 0 to 61440, in increments of 4096; you will see this value reflected in the first hexadecimal digit of the **Bridge ID** field after you click the **Update Setting** button (See Figure 41). Set this value to be less than any other switch on the network, in order to make this switch the Root Switch. To set a

Backup Root Bridge set the **Bridge ID** to be between the **Root Bridge** and the rest of the network switches.

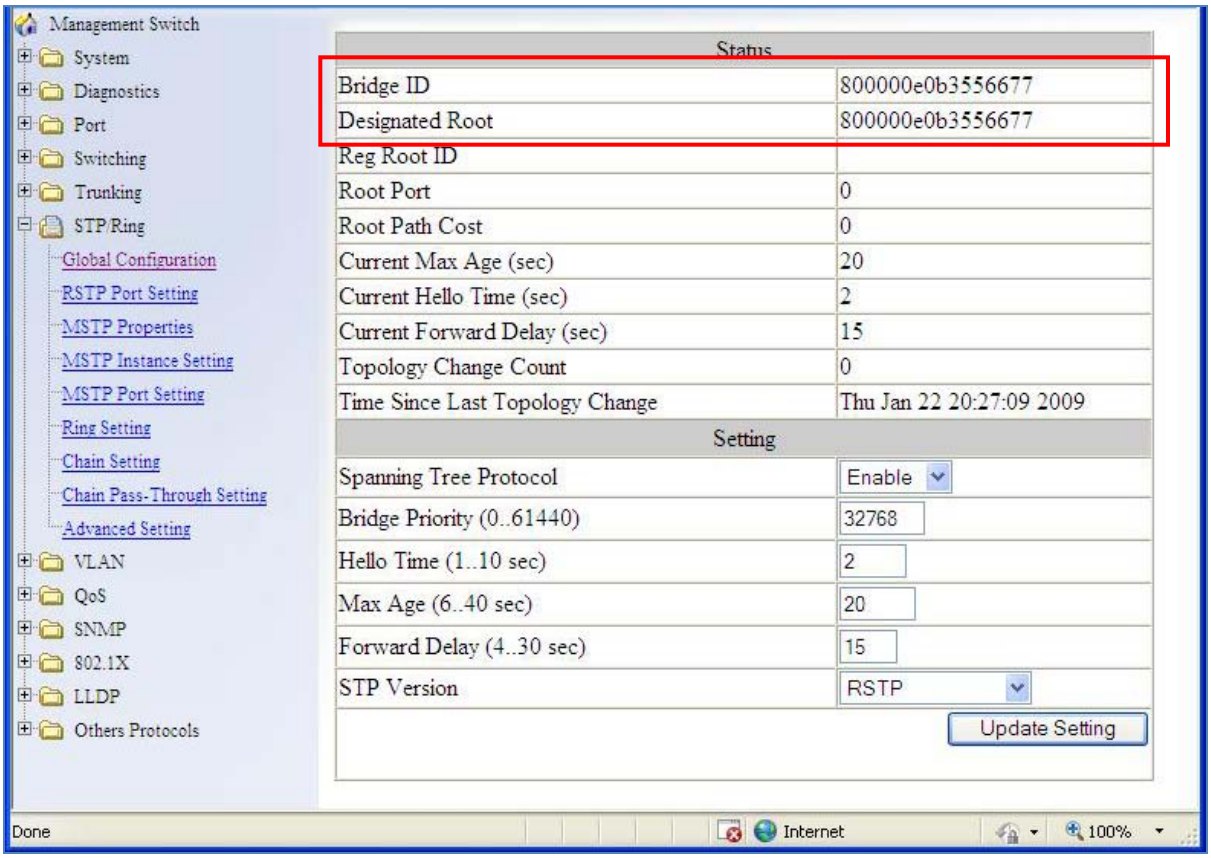


Figure 41: Bridge ID Display

Setting the MAX Age, Forward Delay and Hello Timer

To navigate to the **STP/Ring Global Configuration** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Global Configuration**.

The Network Diameter

The Diameter of a network depends on the type of topology your network uses. In a ring topology, the Network Diameter is the total number of switches in a network minus the Root Bridge. In a star topology, the Network Diameter is the maximum number of hops to get from Root Bridge to the switch that is the most hops away. the In the RSTP protocol, the **Max Age** parameter is used as a hop count limit on how far the Spanning Tree protocol packet can propagate throughout the network topology, therefore, it must be configured with a value that is greater than the network diameter.

Relationship between Max Age, Forward Delay and Hello Time

The following rules must be followed when setting the **Max Age**, **Forward Delay** and **Hello Timer**:

- Max Age >= 2 × (Hello Time + 1.0 second)
- 2 × (Forward Delay – 1.0 second) >= Max Age

To change the **Max Age**, **Forward Delay** and **Hello Timer** (see Figure 42):

1. Enter the **Max Age** in the text box to the right of Max Age (6..40 sec) label.
2. Enter the **Hello Time** in the text box to the right of the Hello Time (1..10 sec) label.
3. Enter the **Forward Delay** in the text box to the right of the Forward Delay (4..30 sec) label.
4. Click on the **Update Setting** button.
5. Save the configuration (see the Save Configuration Page)

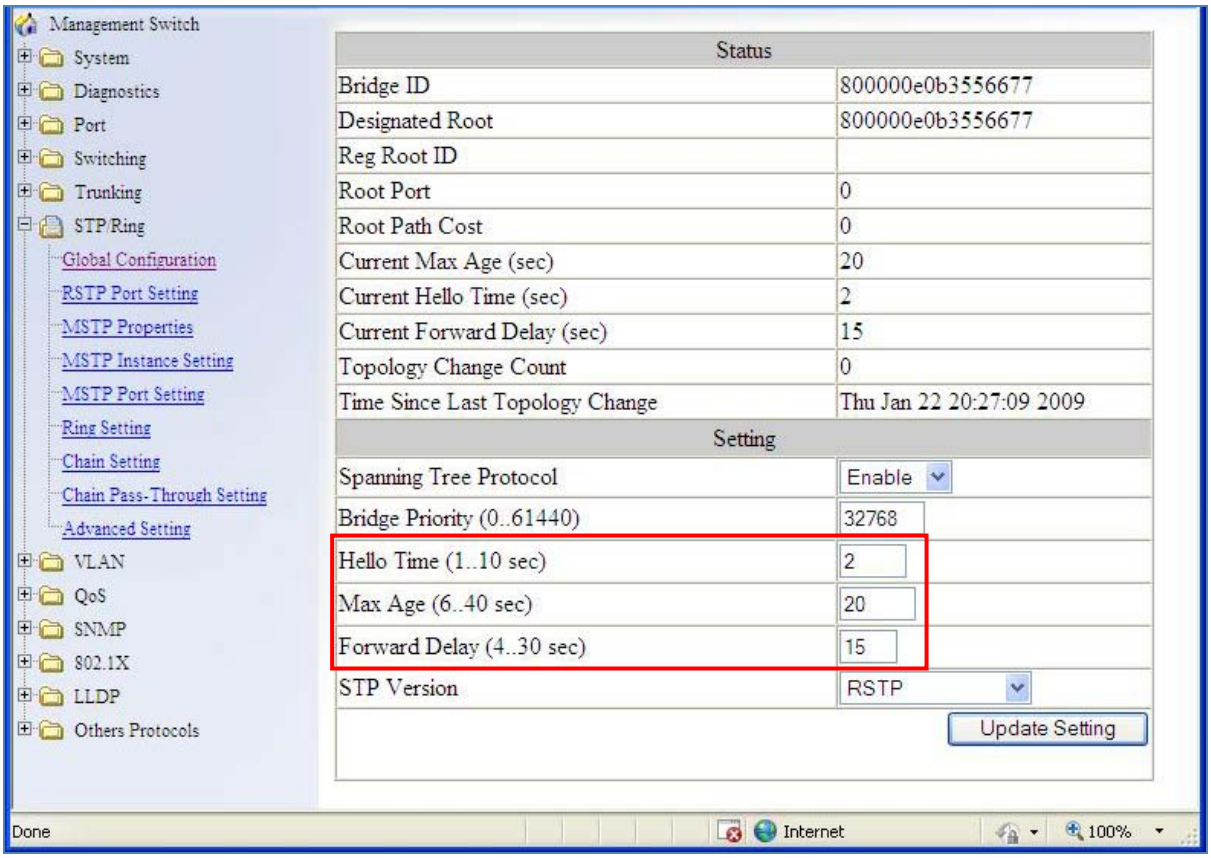


Figure 42: Max Age, Hello Timer & Forward Delay

RSTP Port Setting Page

To navigate to the **STP/Ring RSTP Port Setting** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **RSTP Port Setting.**

Spanning Tree Port Roles

In a stable RSTP topology, each port on a switch can function in any one of 4 different Spanning Tree port roles. These Spanning Tree port roles are (see Figure 43):

- Root Port
- Designated Port
- Alternate Port
- Backup Port

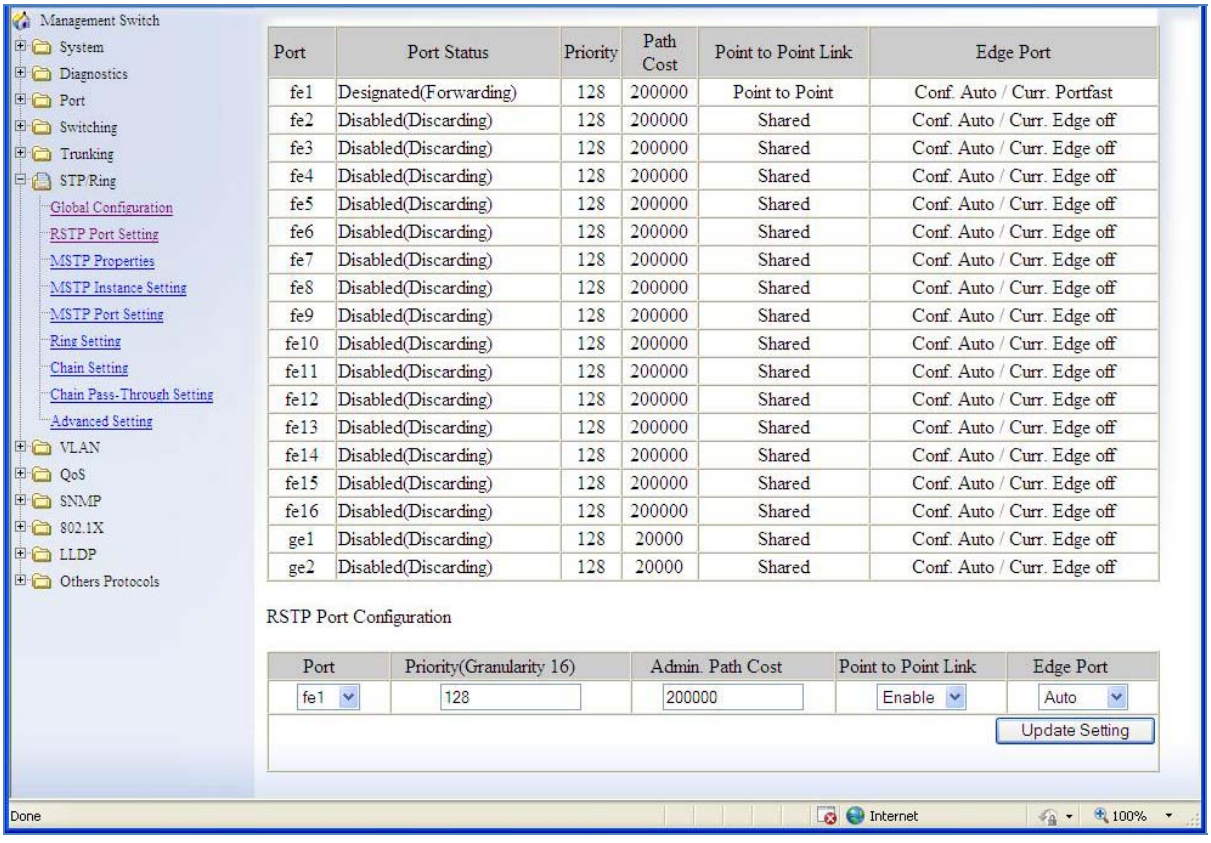


Figure 43: Spanning Tree Port Roles

Path Cost & Port Priority

By default, each port on a Spanning Tree switch will be assigned a **Path Cost** based on the port's transmission speed according to the IEEE standard below:

Link speed	Recommended value
Less than or equal 100Kb/s	200,000,000
1 Mb/s	20,000,000
10 Mb/s	2,000,000
100 Mb/s	200,000
1 Gb/s	20,000
10 Gb/s	2,000
100 Gb/s	200
1 Tb/s	20
10 Tb/s	2

By default each port on a Spanning Tree switch will be assigned a Port Priority of 128, according to the IEEE standard. This Port Priority is part of the Port ID, which is a concatenation of 2 values: Port Priority (4 bits) + Interface ID (12 bits) (see 如下)

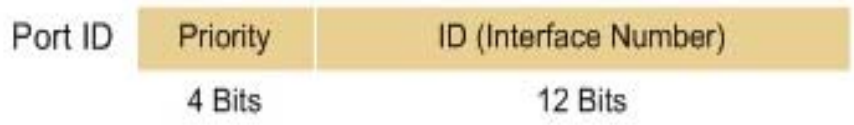


Figure 44: Port ID

Port Priority is part of the Port ID, which is a concatenation of 2 values: Port Priority (4 bits) + Interface ID (12 bits).

The default values will work fine in most scenarios; however, there are times when you may need to adjust these values manually in order to influence the location of the Alternate Port, the Root Port or the Backup Port.

To adjust the Port Priority value or the Path Cost value on a port:

1. Choose the correct port from the drop down list under **Port** (see 如下)
2. Enter the proper value under the **Priority (Granularity 16)**
    a. The Port Priority range is between 0 and 240 in multiples of 16.
3. Enter the proper value under the **Admin. Path Cost** text entry box.
    a. The Path Cost range is between 1 and 200,000,000.
4. Click on the **Update Setting** button
5. Save your configuration (see the Save Configuration Page).

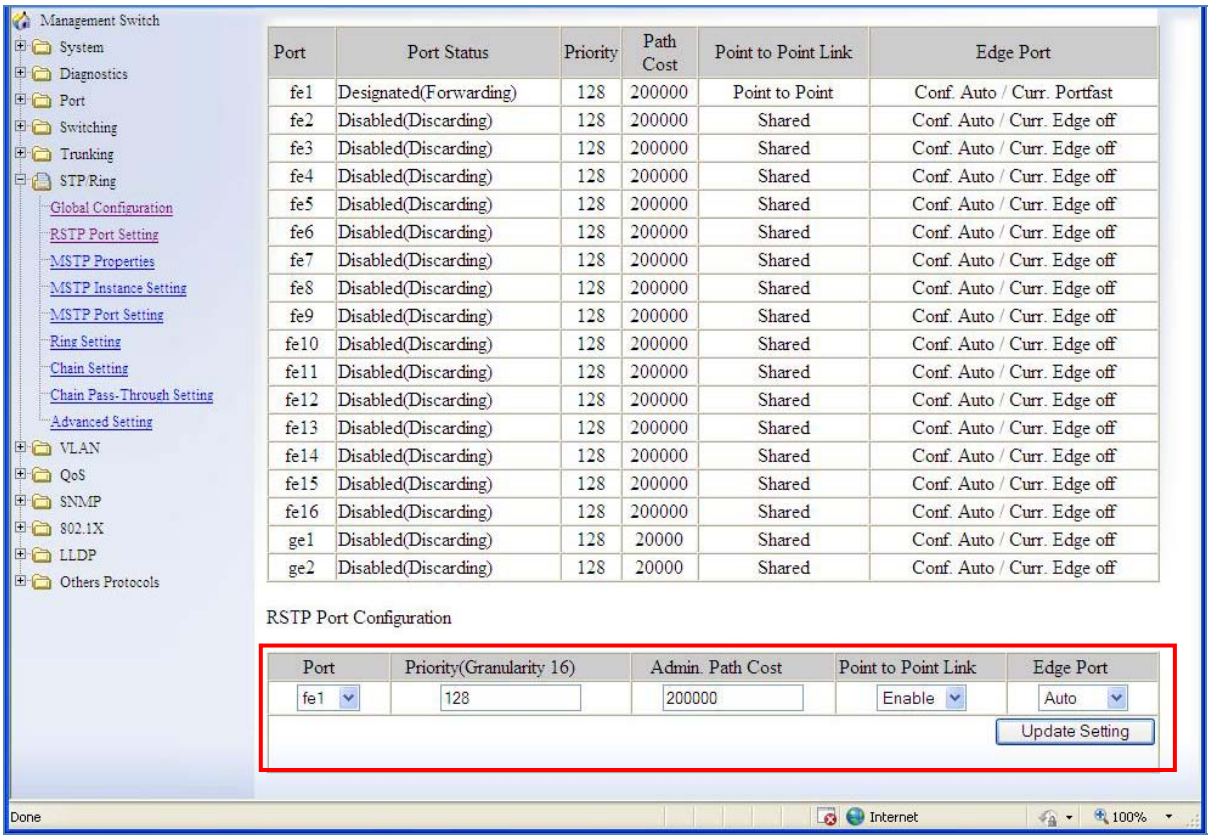


Figure 45: Port Priority and Path Cost

Point to Point Link

By default, RSTP will assume any full-duplex link as a **Point to Point Link**, but if the switch detects that the neighbor switch is not running the RSTP protocol, it will assume the port to be a **Shared Port**. You can force a port to be a **Shared Port**, if you know in advance that there will be more than one switch connecting to this link (through an unmanaged switch, for example), or if you know in advance that the other switch on this link will be running the older STP protocol.

To manually force a port to be a **Shared Port** or a **Point to Point Link:**

1. Choose the correct port from the drop down list under **Port**, and choose **Enable** or **Disable** under **Point to Point Link** (see Figure 45).
2. Click on the **Update Setting** button.
3. Save the configuration (see the Save Configuration Page)

Edge Port

By enabling the **Edge Port** feature on a port, the switch will stop reacting to any linkup event on this port, and will not send out any Topology Change notification to the neighbor bridges.

1. Choose the correct port from the drop down list under **Port**, and choose **Enable** or **Disable** under **Edge Port** (see Figure 45).
2. Click on the **Update Setting** button.
3. Save the configuration (see the Save Configuration Page)

RSTP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Enabling the Spanning Tree Protocol

To enable the Spanning Tree function on a switch, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
no bridge shutdown 1
bridge 1 protocol rstp vlan-bridge

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#no bridge shutdown 1
switch_a(config)#bridge 1 protocol rstp vlan-bridge
switch_a(config)#q
switch_a#
```

Bridge Priority, Max Age, Forward Delay, and Hello Time

To configure the Bridge Priority, Max Age, Forward Delay, and Hello Time of a Spanning Tree Bridge, please use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
bridge 1 priority *<0-61440>*
bridge 1 max-age *<6-40>*
bridge 1 forward-time *<4-30>*
bridge 1 hello-time *<1-10>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 priority 4096
switch_a(config)#bridge 1 max-age 20
switch_a(config)#bridge 1 forward-time 15
switch_a(config)#bridge 1 hello-time 2
```

```
switch_a(config)#q
switch_a#
```

Modifying the Port Priority and Path Cost

To modify the Port Priority and Path Cost on a switch, use the below CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
bridge-group 1 path-cost <*1-200000000*>
bridge-group 1 priority <*0-240*>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#bridge-group 1 path-cost 200000
switch_a(config-if)#bridge-group 1 priority 128
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Manually Setting a Port to be a Shared or Point to Point Link

To manually force a port to be a **shared** link or **Point-to-point** link, use the below CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
spanning-tree link-type point-to-point
spanning-tree link-type shared

Usage Example 1: Setting port 1 to be point-to-point:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#spanning-tree link-type point-to-point
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Usage Example 2: Setting port 1 to be shared:

```
switch_a>enable
switch_a#configure terminal
```

```
switch_a(config)#interface fe1
switch_a(config-if)#spanning-tree link-type shared
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Enabling/Disabling a port to be an Edge Port

To manually enable or disable a port to be an **Edge Port**, use the following CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
spanning-tree spanning-tree edgeport
no spanning-tree spanning-tree edgeport

Usage Example 1: Enabling edge port on port 1:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#spanning-tree edgeport
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Usage Example 2: Disabling edge port on port 1:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#no spanning-tree edgeport
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

STP/RING PAGE - CONFIGURING MSTP

The MSTP protocol adds a new concept called a **Region** to the Spanning Tree algorithm. Unlike RSTP and STP, inside each MSTP Region, there can be more than one instance of Spanning Tree Protocol running simultaneously. The MSTP protocol can then map multiple VLANs to each instance of Spanning Tree protocol to provide load balancing among the switches. Between Regions, the MSTP runs a single instance of Spanning Tree similar to, and is backward compatible with, the RSTP protocol.

Global Configuration Page

Enabling the MSTP Protocol

Navigate to the **STP/Ring Global Configuration** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Global Configuration**.
3. Verify that the Spanning Tree Protocol is enabled (see Figure 46), if not, choose **Enabled** from the **Spanning Tree Protocol** drop down list.
4. Choose **MSTP** in the **STP Version** drop down list.
5. Click on the **Update Setting** button.
6. Save the configuration (see the Save Configuration Page).

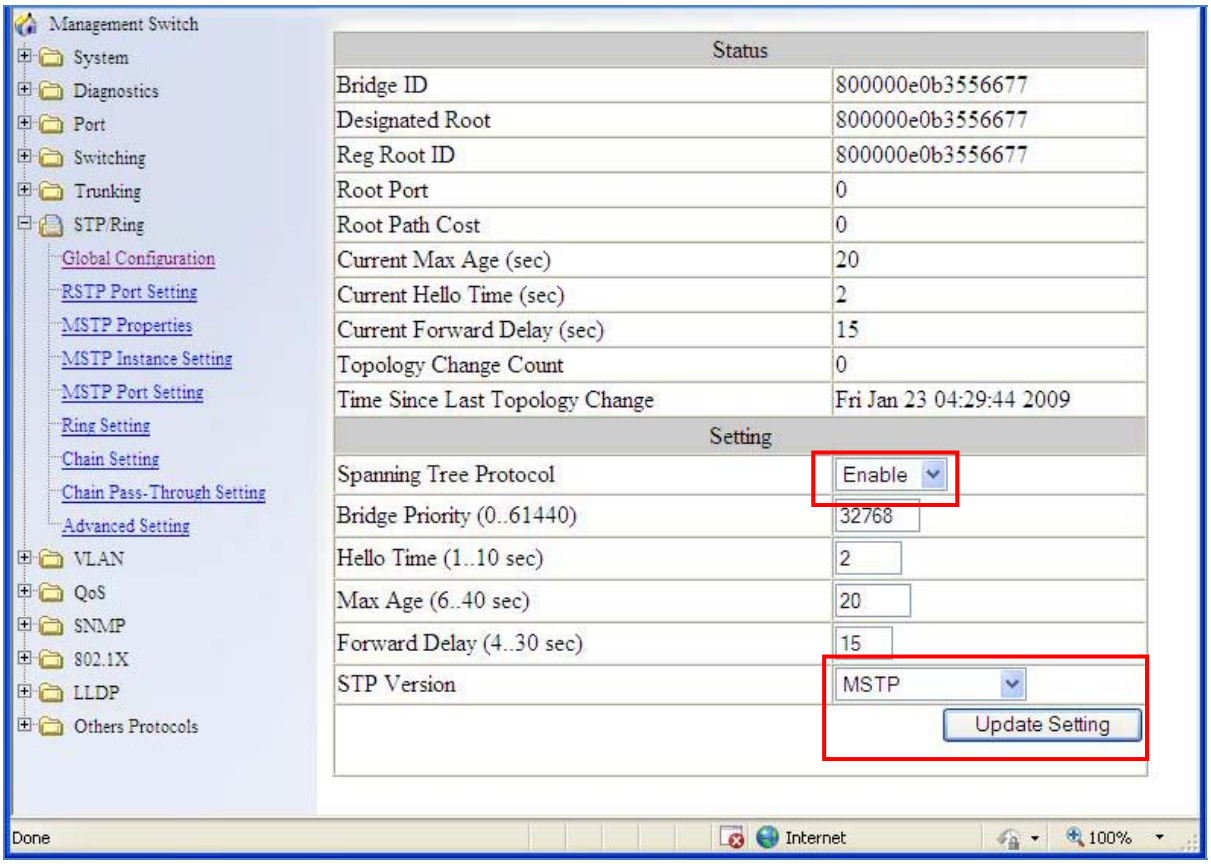


Figure 46: Enabling MSTP

The CIST Root Bridge & Backup CIST Root Bridge

In order to configure a switch to be the CIST Root Bridge of a Spanning Tree network, you just have to make sure that the Bridge Priority (which is the most significant 4 bits of the Bridge ID) of the switch is the lowest among any of the switches on the network. Similarly for the Backup CIST Root Bridge, it must have the next lowest Bridge Priority of all the switches. This Bridge ID is a concatenation of 3 values: a 4 bit Bridge Priority (most significant), a 12 bit System ID (less significant), and the 48 bit MAC address of the local switch (least significant) (see 如下).

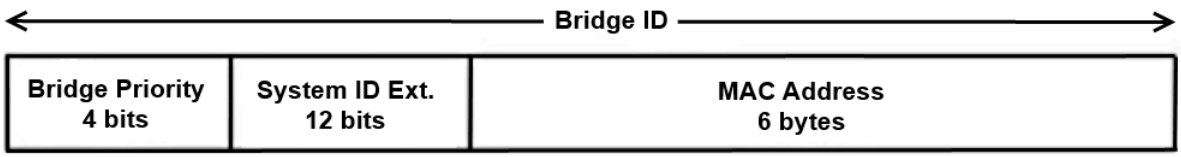


Figure 47: Bridge ID

Setting Bridge Priority

To set the Bridge Priority:

1. Enter the **Bridge Priority ID** in the text box to the right of **Bridge Priority (0..61440)**
2. Click on the **Update Setting** button.

Note: The valid values for this parameter are from 0 to 61440, in increments of 4096; you will see this value reflected in the first hexadecimal digit of the **Bridge ID** field after you click the **Update Setting** button (See Figure 48). Set this value to be less than any other switch on the network, in order to make this switch the Root Switch. To set a **Backup Root Bridge** set the **Bridge ID** to be between the **Root Bridge** and the rest of the network switches.

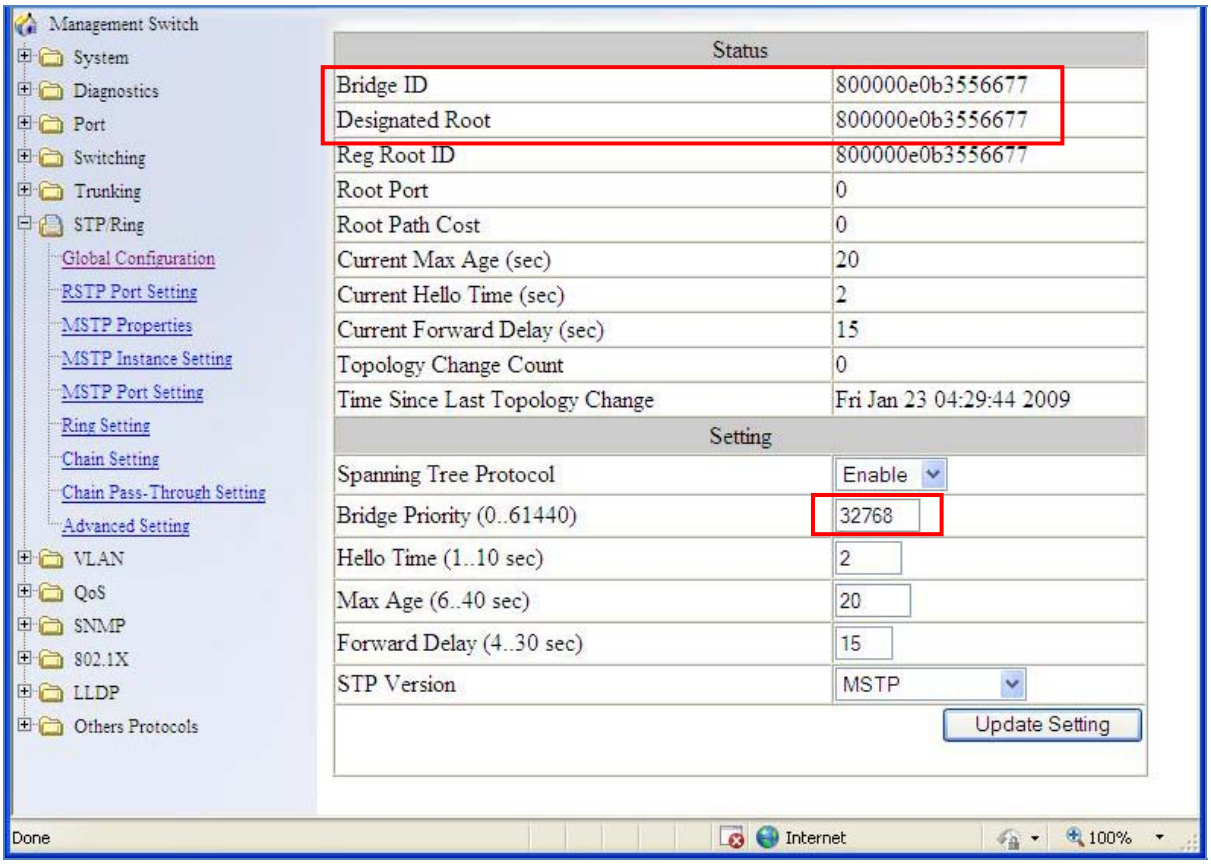


Figure 48: Bridge ID Display

Configuring the CST Network Diameter

When using MSTP, the **Max Age** parameter is used for the CST (Common Spanning Tree) topology simply as a hop count limit on how far the Spanning Tree protocol packet can propagate throughout the CST topology, therefore, the Max Age must be configured with a value that is greater than the network diameter of the CST topology. The Max Age parameter will need to be configured correctly on both the CIST Root Bridge as well as on the Backup CIST Root Bridge (in the event when the CIST Root Bridge fails).

Setting the MAX Age, Forward Delay and Hello Timer

Navigate to the **STP/Ring Global Configuration** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Global Configuration**.

Relationship between Max Age, Forward Delay and Hello Time

The following rules must be followed when setting the **Max Age**, **Forward Delay** and **Hello Timer**:

- Max Age >= 2 × (Hello Time + 1.0 second)
- 2 × (Forward Delay – 1.0 second) >= Max Age

To change the **Max Age**, **Forward Delay** and **Hello Timer** (see Figure 49):

1. Enter the **Max Age** in the text box to the right of Max Age (6..40 sec) label.
2. Enter the **Hello Time** in the text box to the right of the Hello Time (1..10 sec) label.
3. Enter the **Forward Delay** in the text box to the right of the Forward Delay (4..30 sec) label.
4. Click on the **Update Setting** button.
5. Save the configuration (see the Save Configuration Page)

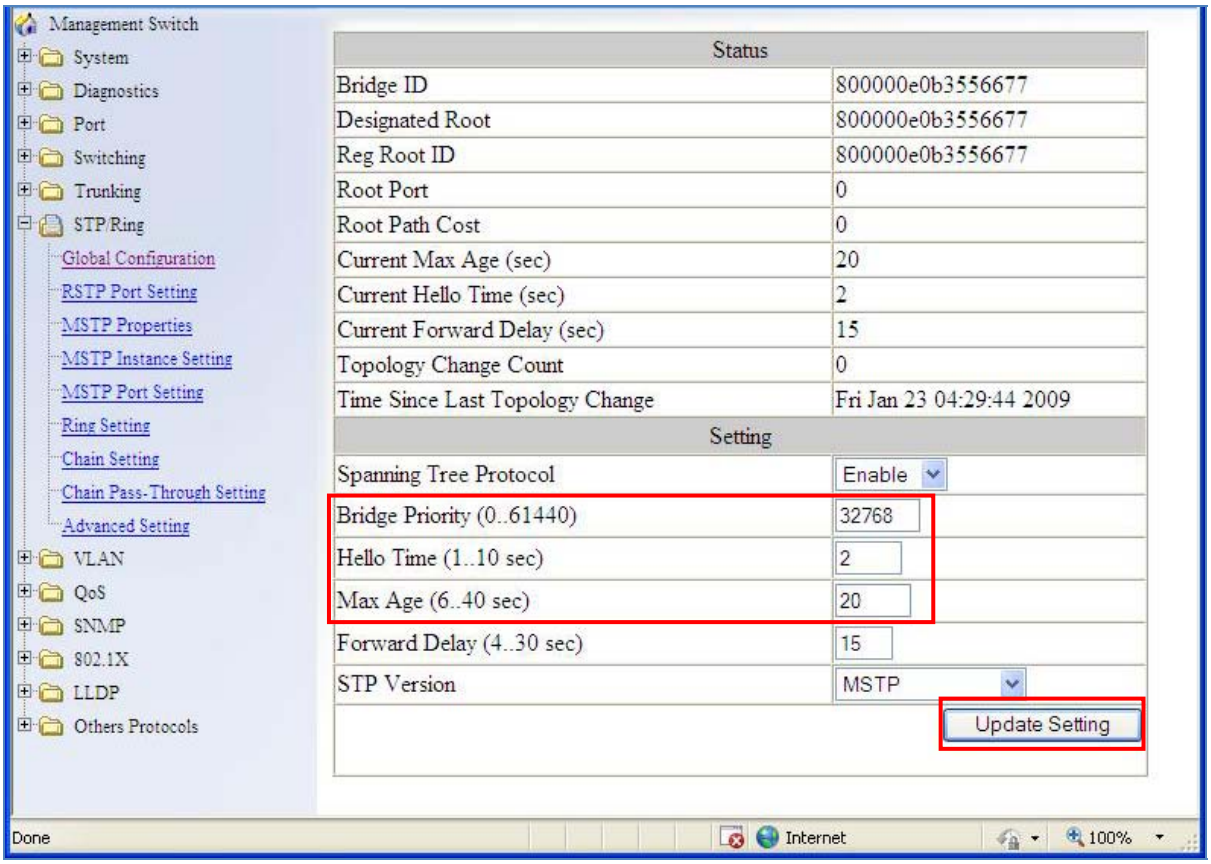


Figure 49: Max Age, Hello Timer & Forward Delay

MSTP Properties Page

Configuring an MSTP Region

In order to form a MSTP Region, the switches that will be connected together to form the MSTP Region must have the same values for the configuration parameters listed below. Two of the parameters can be configured directly, the third parameter (Configuration Digest) will be automatically calculated by the switch based on the **VLAN** to **MSTI (Multiple Spanning Tree Instance)** mapping. The **VLAN** to **MSTI** instance mapping must be the same for all the switches within the same **MSTP Region** (see MSTP Instance Setting Page

Setting an MSTP Instance).

- Region name
- Revision level
- Configuration Digest

To navigate to the **STP/Ring MSTP Properties** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Properties.**

To configure both the MSTP Regional Configuration Name and the Revision Level for each of the switches located in the same MSTP Region (see 如下):

1. Enter the **Region Name** of the Region that the switch will belong to in the **Region Name** text entry box,
2. Enter the **Revision Level** value for the corresponding Region in the **Revision Level** text entry box,
3. Click on the **Update Setting** button.
4. Save the configuration (see the Save Configuration Page)

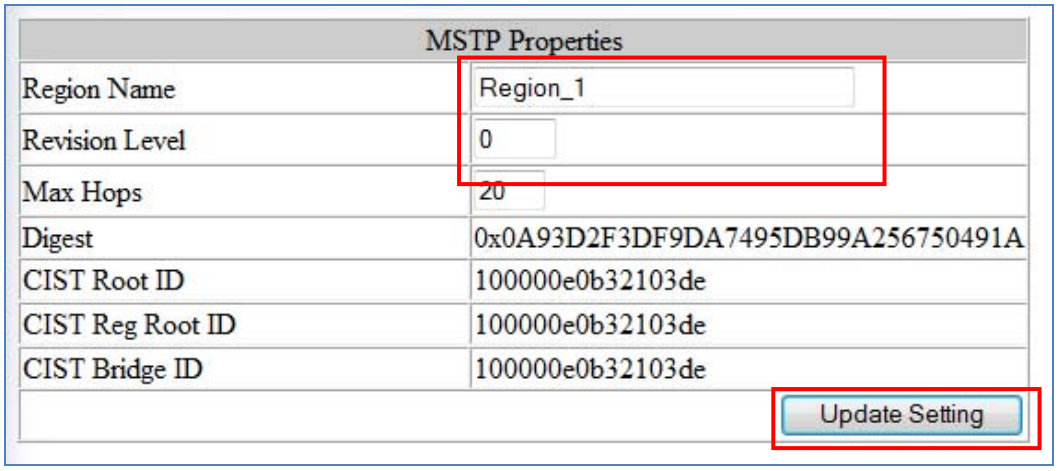


Figure 50: MSTP Region and Revision Level

Configuring the IST Network Diameter

To navigate to the **STP/Ring MSTP Properties** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Properties.**

In the MSTP protocol, the **Max Hops** parameter is used for the **IST** (Internal Spanning Tree) and the **MSTI** (Multiple Spanning Tree Instance) topology as a hop count limit on how far the Spanning Tree protocol packet can propagate inside of a MSTP Region, therefore, it must be configured with a value that is greater than the network diameter of the **IST/MSTI** topology. The **Max Hops** parameters should be configured correctly on the CIST Root and the Backup CIST Root switch and on all of the Boundary switches of a MSTP Region (if there are multiple Regions within your MSTP network).

Follow the steps below to configure the **Max Hops** parameter:

1. Enter the desired hop count in the text entry box next to **Max Hops**
2. Click on the **Update Setting** button (see 如下).
3. Save the configuration (see the Save Configuration Page)

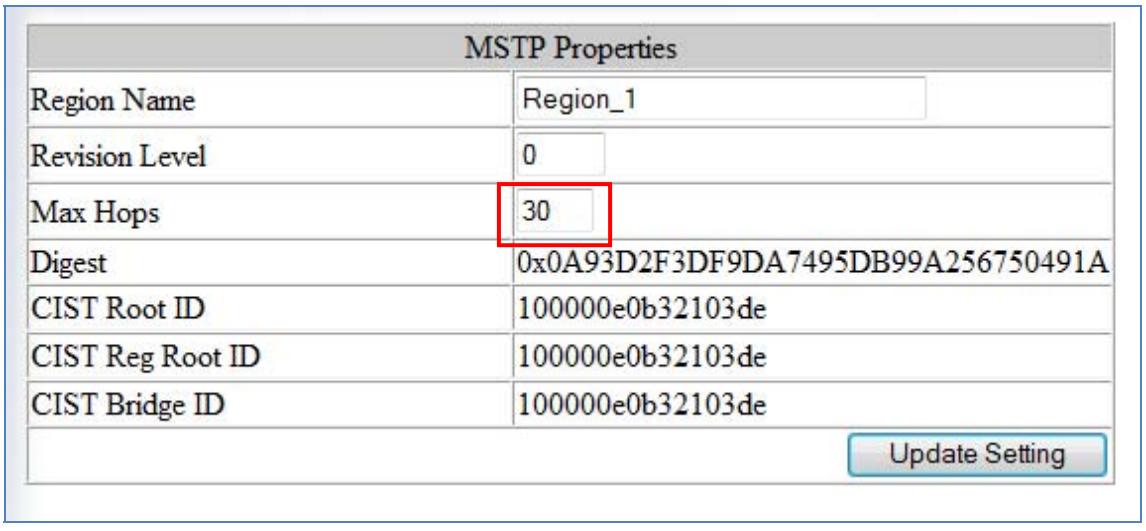


Figure 51: MSTP Properties – Max Hops

MSTP Instance Setting Page

Setting an MSTP Instance

Navigate to the **STP/Ring MSTP Instance Setting** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Instance Setting.**

To create the Spanning Tree instances to be run inside a MSTP Region and its VLAN mappings, follow the below steps.

1. Click on the **VLAN Instance Configuration** button (see Figure 52),
2. Choose the **VLAN** that you want to map to a MSTI instance from the **VLAN ID** drop down box (see Figure 53).
3. Enter the **Instance ID** that you want the VLAN to map to In the text entry box next to **Instance ID (1..15)**.
4. Click on the **Update Settings** button.
5. Save the configuration (see the Save Configuration Page)

Note: You can enter a new instance number here, which is how a new MSTI instance is created. You can use an existing MSTI instance if it has already been created on another switch.

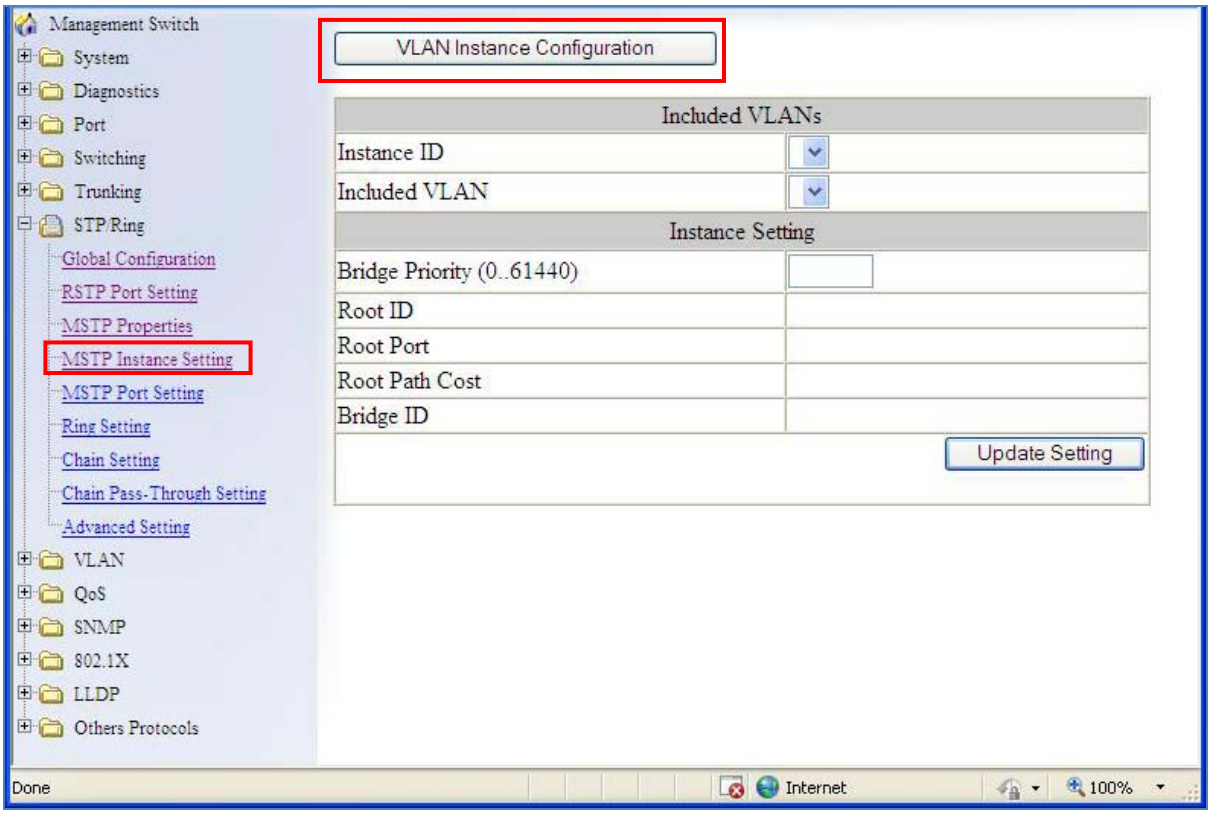


Figure 52: VLAN Instance Configuration

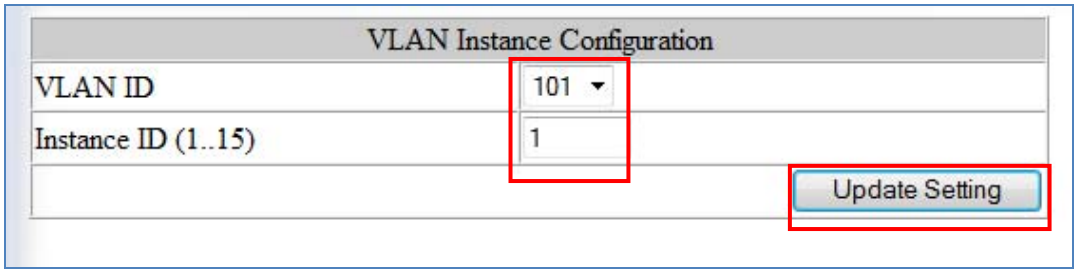


Figure 53: VLAN Instance ID

Modifying MSTP parameters for load balancing

To navigate to the **STP/Ring MSTP Instance Setting** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Instance Setting.**

To load balance switches within a MSTP Region, set different switches within the MSTP Region to be the Root Bridge for different MSTI instances. A Root Bridge in a particular MSTI instance is called a MSTI Regional Root Bridge.

To designate a specific switch in a MSTP Region to be the Root Bridge in a specific MSTI instance, the bridge priority must be set to be the lowest number of all the switches in a particular MSTI instance.

To set the bridge priority on the switch for a specific MSTI Instance (see Figure 54):

1. Choose the particular instance in the **Instance ID** drop down list for which the switch will be a MSTI Regional Root Bridge;
2. Enter the desired value in the **Bridge Priority** text box
3. Click on the **Update Setting** button. The valid values for this parameter are from 0 to 61440, in increments of 4096.
4. Save the configuration (see the Save Configuration Page)

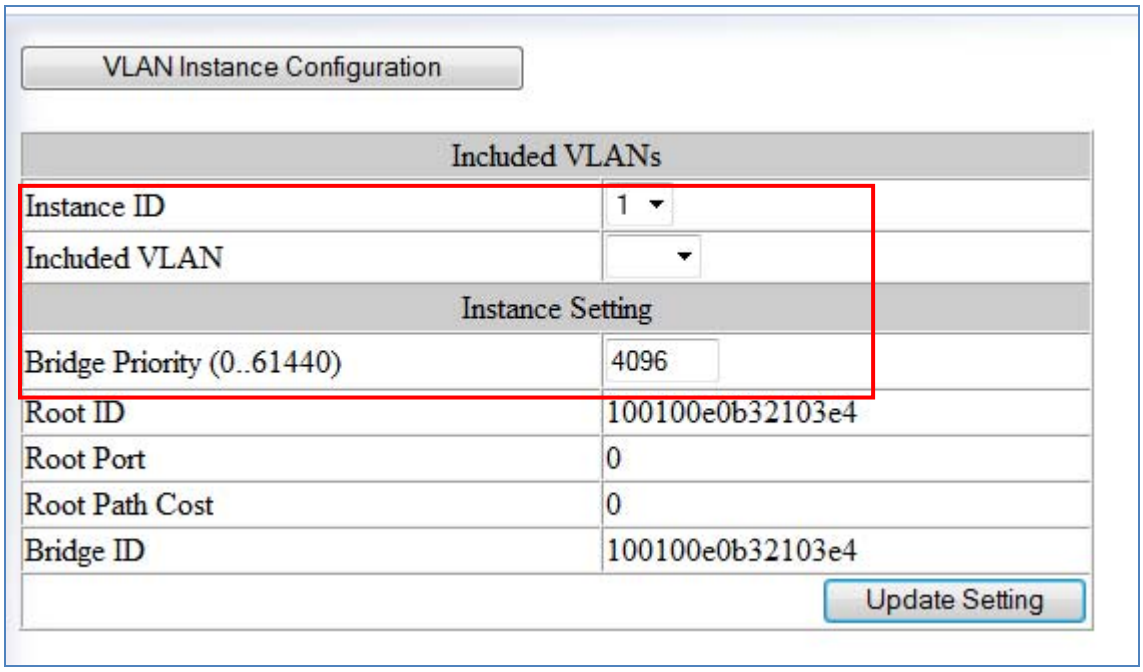


Figure 54: Setting the MSTI Regional Root Bridge

MSTP Port Setting page

Adjusting the blocking port in a MSTP network

To navigate to the **STP/Ring MSTP Port Setting** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Port Setting.**

You can adjust the location of the blocking port in a MSTP network by modifying the **Port Priority** and the **Path Cost** of the ports on the switch. Modifying the **Port Priority** adjusts the blocking port between two switches. Modify the **Port Cost** adjusts the location of the blocking port in a MSTP loop.

To modify the Port Priority and the Path Cost of the ports on a MSTP switch for the MSTI instance only, please follow the below steps:

1. Choose the correct MSTI Spanning Tree instance from the drop down list under **Instance ID** (see Figure 55).
2. Choose the correct port number from the drop down list under **Port**, and enter the proper value under the **Priority** and the **Admin. Path Cost** text box,
3. Click on the **Update Setting** button (see Figure 55).
4. Save the configuration (see the Save Configuration Page)

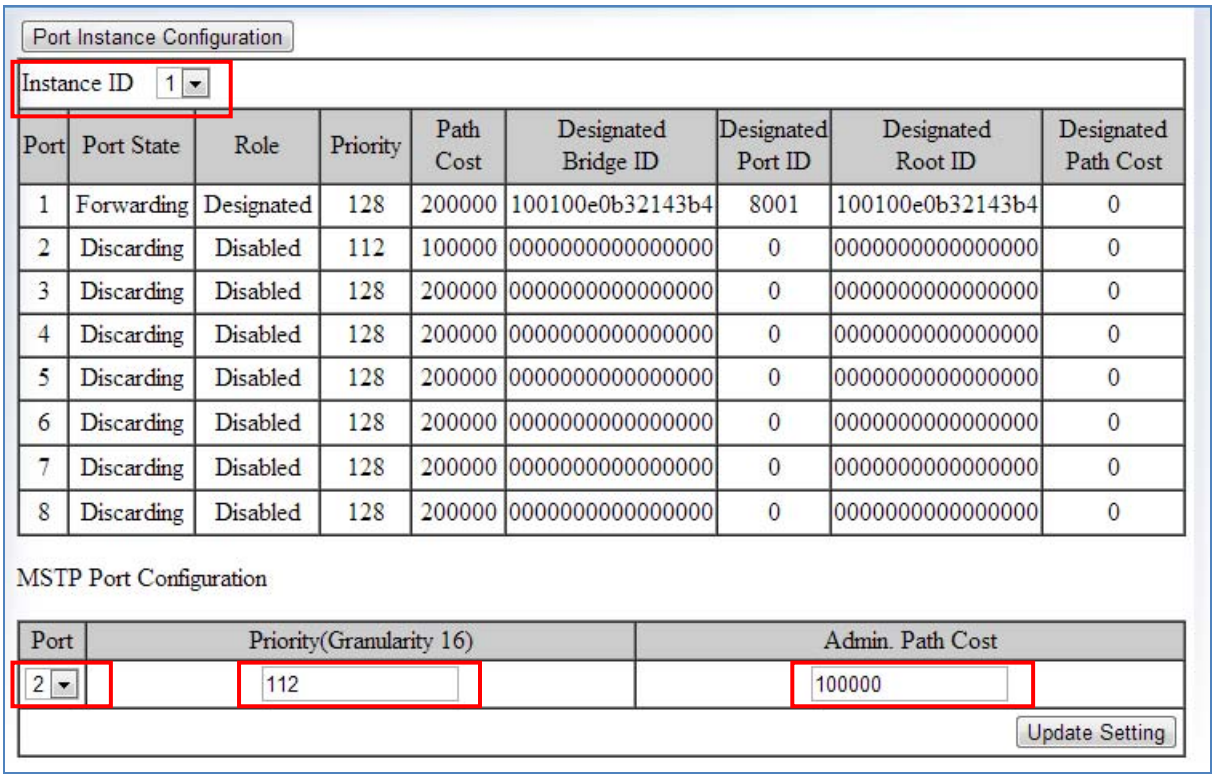


Figure 55: Port Cost & Priority

MSTI Instance Port Membership

To navigate to the **STP/Ring MSTP Port Settings** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **MSTP Port Setting.**

If changes have been made to the port membership of a VLAN, you must also reconfigure the MSTI port membership for the MSTI instance that the VLAN maps to.

To reconfigure the MSTI instance port membership:

1. Click on the **Port Instance Configuration** button (see Figure 56)
2. Choose the correct MSTI instance from the drop down list next to **Instance ID** (see Figure 57).
3. Check the box next to all the ports that should be part of this instance
4. Click on the **Update Setting** button.
5. Save the configuration (see the Save Configuration Page)

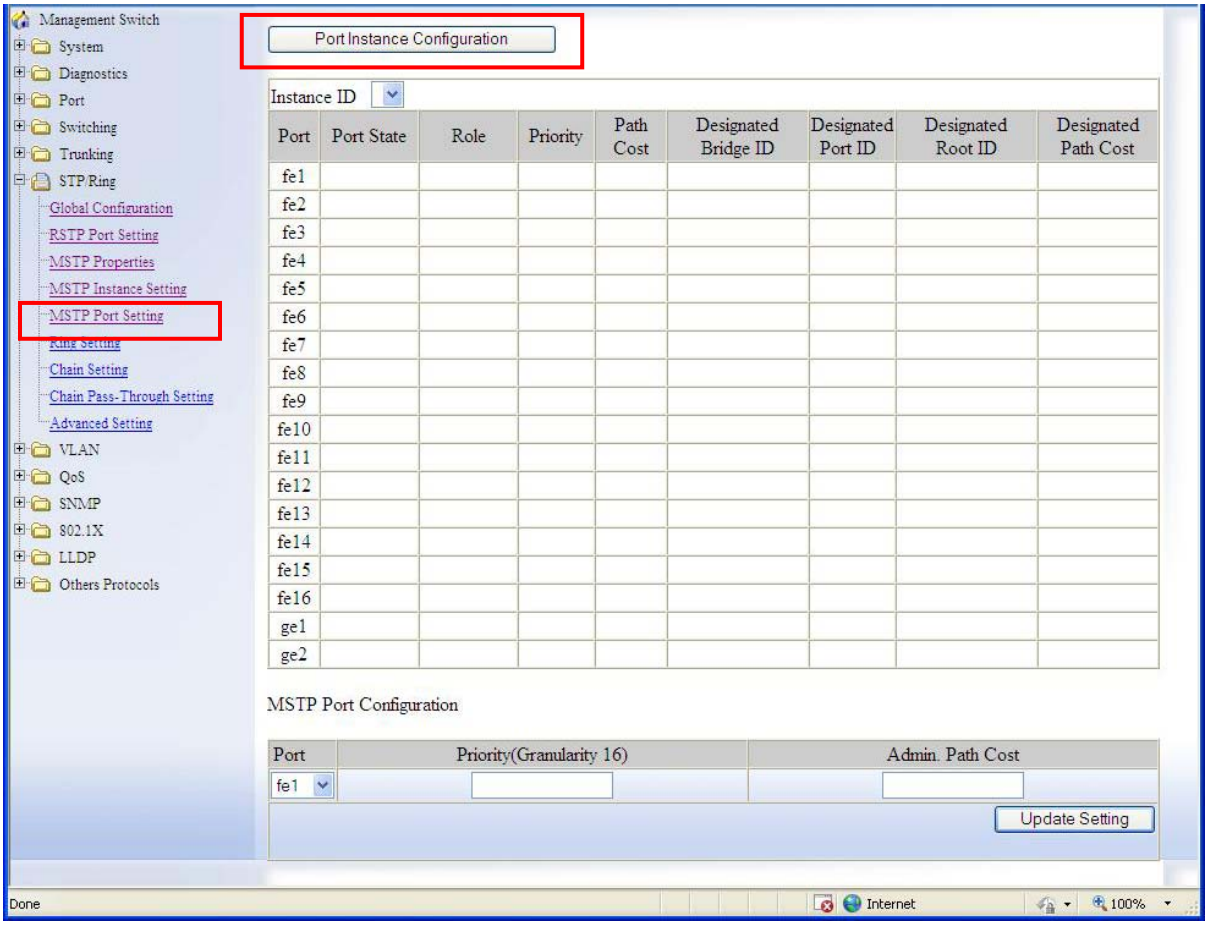


Figure 56: Port Instance Configuration

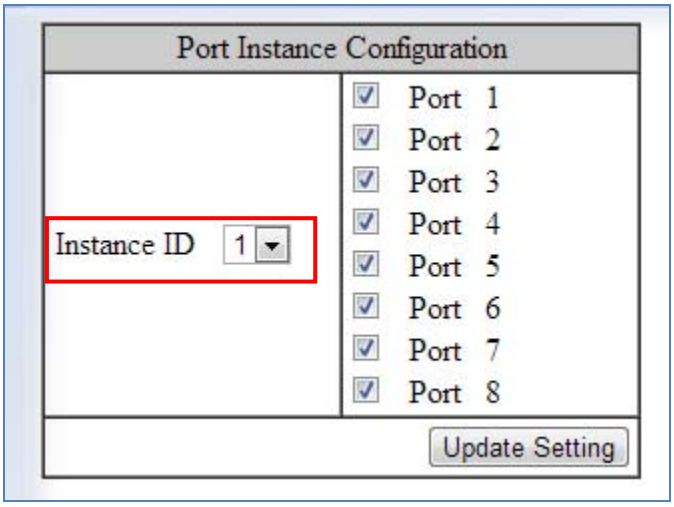


Figure 57: Port Instance - Adding Ports

MSTP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Enabling Spanning Tree for MSTP

To enable the Spanning Tree function on a switch use the below CLI commands.:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
no bridge shutdown 1
bridge 1 protocol mstp

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#no bridge shutdown 1
switch_a(config)#bridge 1 protocol mstp
switch_a(config)#q
switch_a#
```

Bridge Priority, Max Age, Forward Delay, and Hello Time

To configure the CIST Bridge Priority, Max Age, Forward Delay, and Hello Time of a Spanning Tree Bridge, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
bridge 1 priority *<0-61440>*
bridge 1 max-age *<6-40>*
bridge 1 forward-time *<4-30>*
bridge 1 hello-time *<1-10>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 priority 4096
switch_a(config)#bridge 1 max-age 20
switch_a(config)#bridge 1 forward-time 15
switch_a(config)#bridge 1 hello-time 2
```

```
switch_a(config)#q
switch_a#
```

IST MAX Hops

To configure the IST Max Hops parameter on a switch, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 max-hops <*1-40*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 max-hops 20
switch_a(config)#q
switch_a#
```

MSTP Regional Configuration Name and the Revision Level

To configure both the MSTP Regional Configuration Name and the Revision Level on a switch, use the following CLI commands:

CLI Command Mode: **MSTP Configuration Mode**

CLI Command Syntax:
bridge 1 region <*region_name*>
bridge 1 revision <*revision_number*>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#spanning-tree mst configuration
switch_a(config-mst)#bridge 1 region R1
switch_a(config-mst)#bridge 1 revision 0
switch_a(config-mst)#q
switch_a(config)#q
switch_a#
```

Creating an MSTI Instance

To create a MSTI instance and map it to a VLAN, use the following CLI commands:

CLI Command Mode: **MSTP Configuration Mode**

CLI Command Syntax: **bridge 1 instance <*1-15*> vlan <*vlan_ID*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#spanning-tree mst configuration
switch_a(config-mst)#bridge 1 instance 1 vlan 10
switch_a(config-mst)#q
switch_a(config)#q
switch_a#
```

Setting MSTI Priority

To set the MSTI priority of a switch in a MSTP Region, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 instance <*1-15*> priority <*0-61440*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 instance 1 priority 0
switch_a(config)#q
switch_a#
```

Modifying CIST Port Priority and Port Path Cost

To modify the CIST Port Priority and CIST Port Path Cost on a switch, use the below CLI commands:

CLI Command Mode: **Interface Configuration Mode (port)**

CLI Command Syntax:
bridge-group 1 path-cost <*1-200000000*>;
bridge-group 1 priority <*0-240*>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#bridge-group 1 path-cost 200000
switch_a(config-if)#bridge-group 1 priority 128
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

To modify the MSTI Port Priority and MSTI Port Path Cost for an Instance on a switch, please use the below CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
bridge-group 1 instance *<1-15>* path-cost *<1-200000000>*
bridge-group 1 instance *<1-15>* priority *<0-240>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)# bridge-group 1 instance 1 path-cost 20000
switch_a(config-if)# bridge-group 1 instance 1 priority 128
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Adding a Port to an MSTI Instance

To add a port to a MSTI instance (this port must be a member port of the VLAN that is mapped to the MSTI instance), please use the below CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **bridge-group 1 instance <*1-15*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#bridge-group 1 instance 1
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

STP/RING PAGE - ALPHA RING

Alpha Ring Setting Page

To navigate to the **STP/Ring α-Ring Settings** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **α-Ring Setting.**

EtherWAN α-Ring Technology

The α-Ring protocol was designed and developed by EtherWAN to overcome traditional STP and RSTP's inability to provide fast network recovery and minimize packet loss caused by link failure. Among the advantages of α-Ring are:

- **High-speed Recovery** – Less than 15 milliseconds
- **Flexibility for Network Deployment** – Coexistence with STP, RSTP and MSTP
- **Ring Coupling** – Smaller rings coupled together to increase network efficiency

Implementing a Simple α-Ring

1. Change the **Ring State** to **Enabled**
2. Click on the **Update Setting** button.

Next, the ports that will be used to connect this switch to the α-Ring need to be assigned to provide the connection redundancy (see Figure 58).

1. Change **Ring Port 1** to the port you will be using for the first redundant connection

2. Change **Ring Port 2** to the port you will be using for the second redundant connection.
3. Click on the **Update Setting** button.
4. Save the configuration (see the Save Configuration Page)

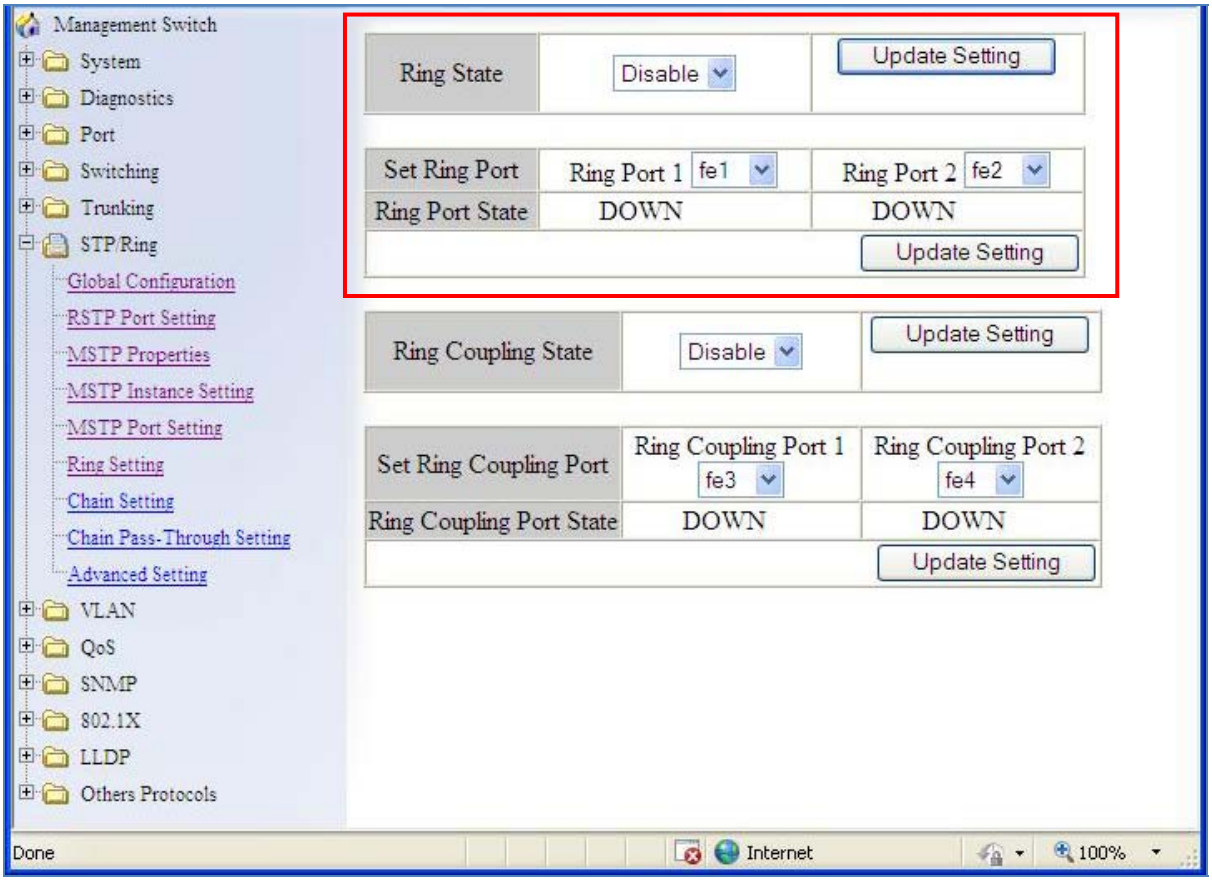


Figure 58: α-Ring Settings

Connecting two α-Ring Networks together

To navigate to the **STP/Ring α-Ring Settings** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **α-Ring Setting.**

As additional switches are added to a network, it may become necessary to connect multiple α-Ring networks together. This is called **Ring-coupling** and uses two additional Ethernet ports on the switch. To setup Ring-coupling (see Figure 59):

1. Change the **Ring-coupling** state to **Enable.**
2. Click on the **Update Setting** button next to the Ring-coupling state.
3. Choose the desired port from the dropdown list under **Ring Coupling Port 1**
4. Choose the desired port from the dropdown list under **Ring Coupling Port 2**
5. Click on the **Update Setting** button.
6. Save the configuration (see the Save Configuration Page)

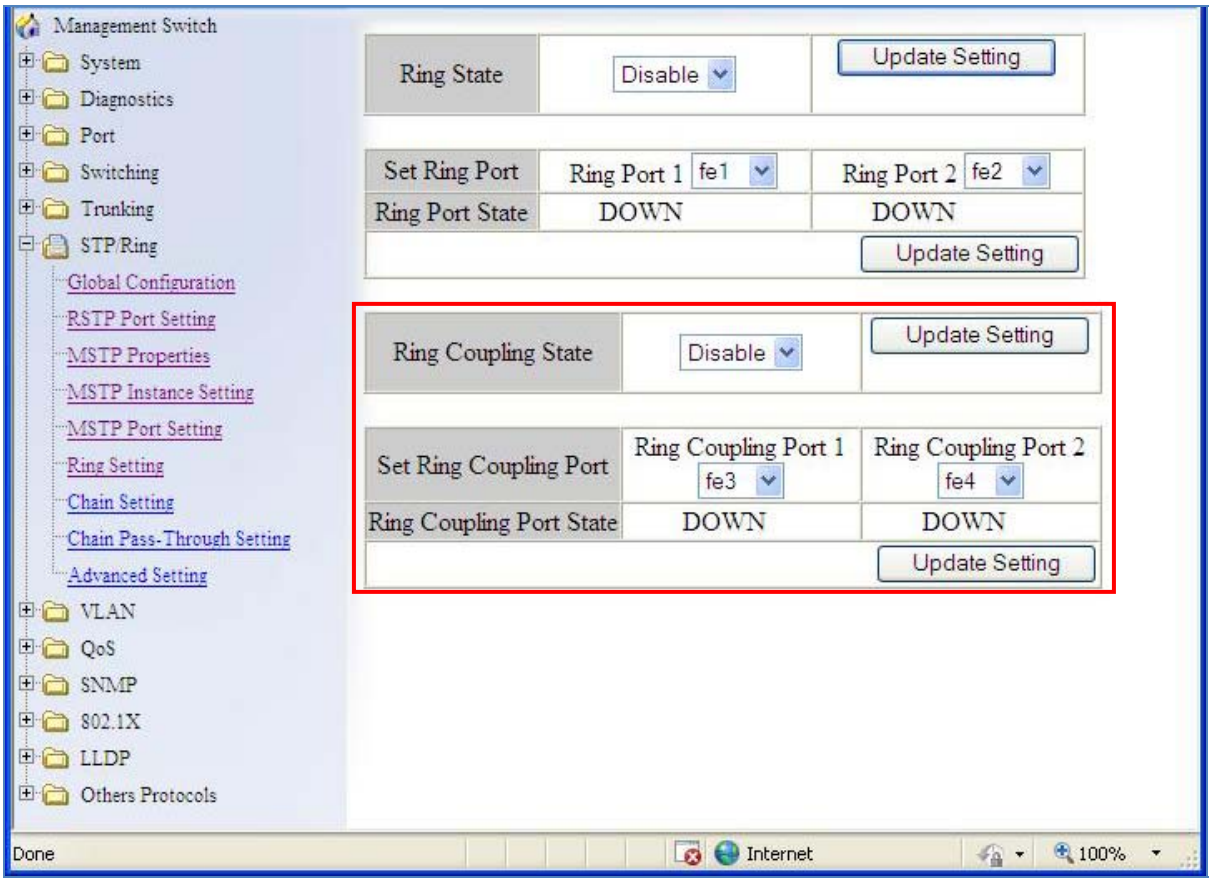


Figure 59: Ring Coupling

Chain Setting Page

To navigate to the **STP/Ring Chain Settings** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Chain Setting.**

Chain Protocol

To enable or disable Chain Protocol settings for a port on the EX24000 Switch:

1. Click on the check box under Chain Protocol to select Enable.
2. Click on the **Submit** button.

VLAN (Global)

To set the VLAN for Chain Protocol on the EX24000 Switch. The VLAN ID value can be from 1 to 4094. Default VLAN ID is 1.

1. Click in the **VLAN** text box for Chain Protocol.
2. Type in the VLAN ID for Chain Protocol.
3. Click on the **Submit** button.

Priority (Global)

To set the Priority value for Chain Protocol on the EX24000 Switch. The Priority value can be from 0 to 255. Default Priority is 128.

1. Click in the **Priority** text box for Chain Protocol.
2. Type in the Priority value for Chain Protocol.
3. Click on the **Submit** button.

Timeout Count (Global)

To set the Timeout Count for Chain Protocol on the EX24000 Switch. The Timeout Count value can be from 3 to 255. Default Timeout Count is 5.

1. Click in the **Timeout Count** text box for Chain Protocol.
2. Type in the Timeout Count value for Chain Protocol.
3. Click on the **Submit** button.

Enabling Storm Control (Broadcast and Multicast) (Global)

To globally enable the **Storm Control** feature of the EX24000 Switch:

1. Click on the **Storm Control** drop-down box.
2. Select **Enable** from the drop down list.
3. Click on the **Submit** button.

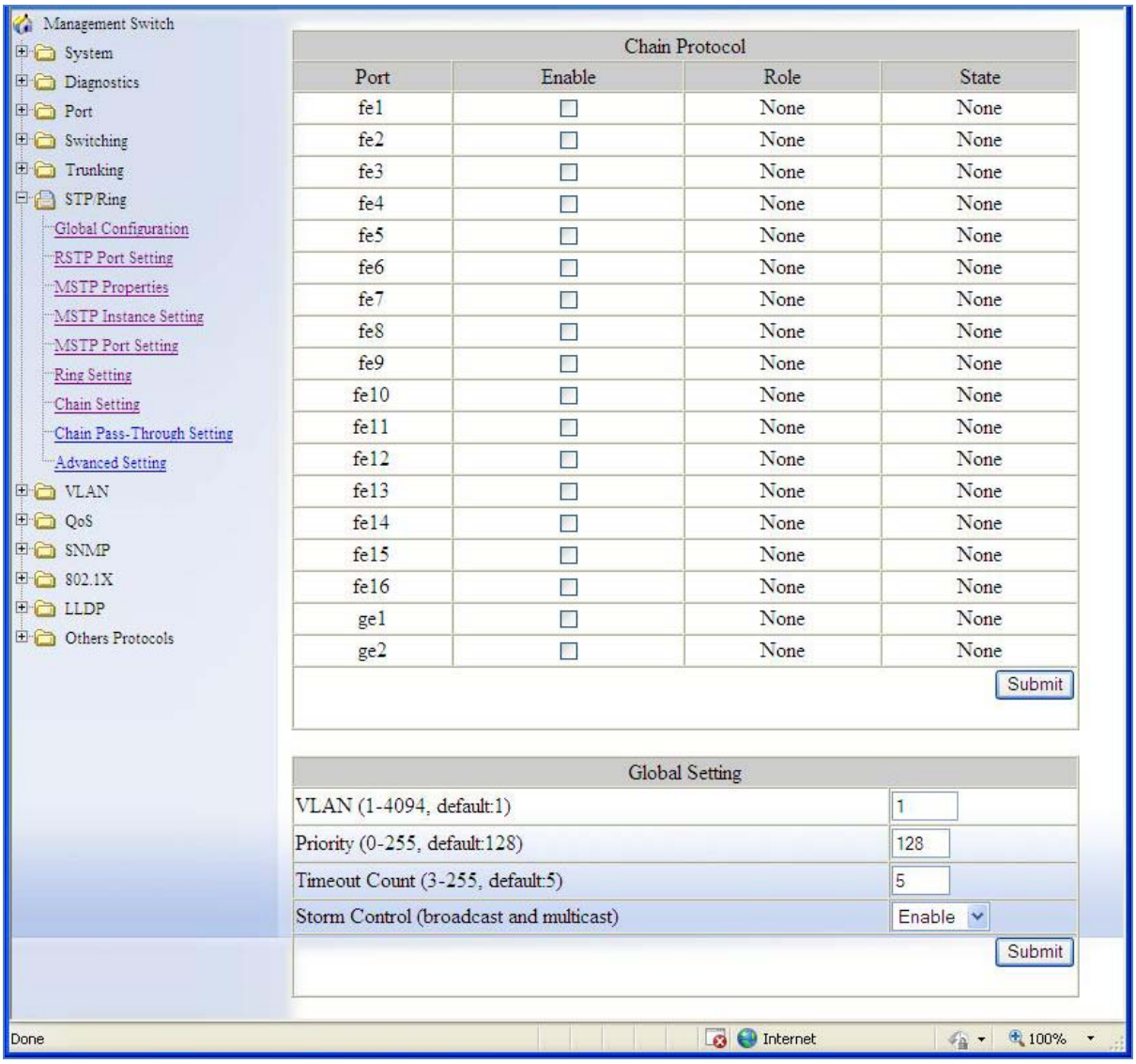


Figure 60: Chain Settings

Chain Pass-Through Setting Page

To navigate to the **STP/Ring Chain Pass-Through Settings** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Chain Pass-Through Setting.**

Implementing a Chain Pass-Through

1. Change **Chain Pass-Through Port 1** to the port you will be using for the first Chain Pass-Through connection
2. Change **Chain Pass-Through Port 2** to the port you will be using for the second Chain Pass-Through connection.
3. Click on the **Update Setting** button.
4. Save the configuration (see the Save Configuration Page)

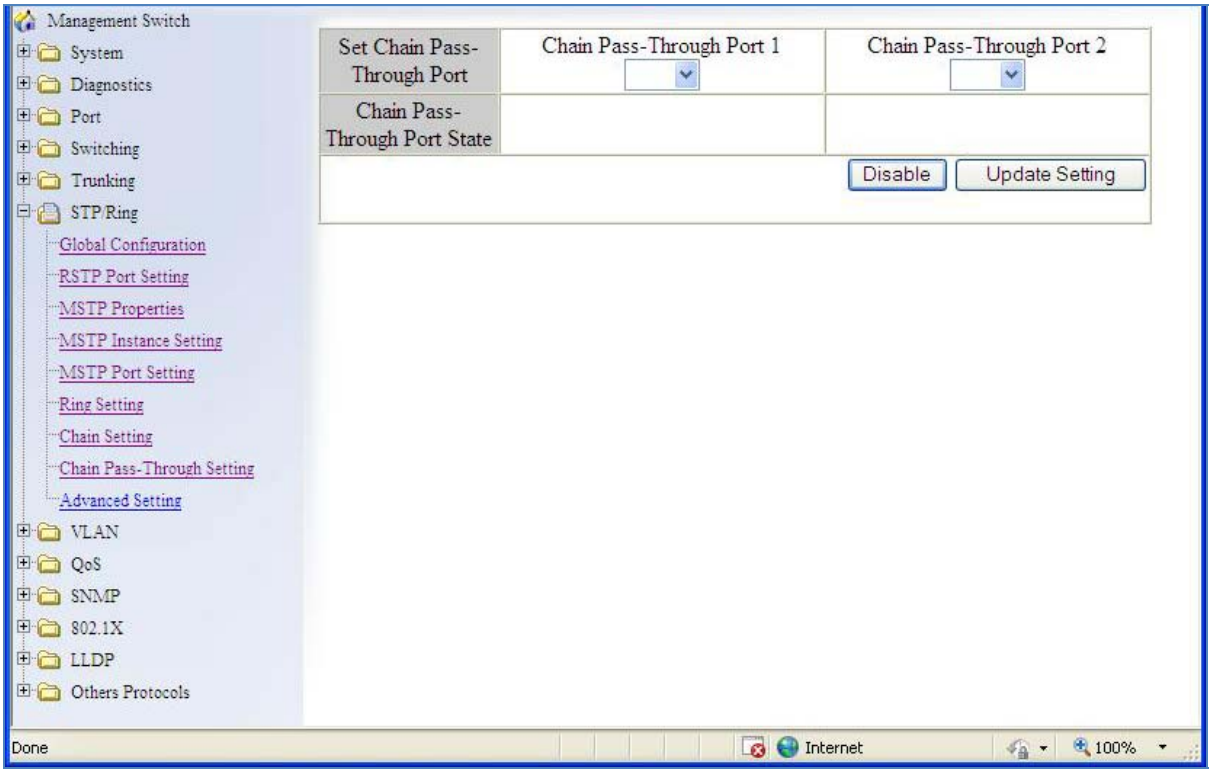


Figure 61: Chain Pass-Through Settings

Advanced Setting

To navigate to the **STP/Ring Advanced Setting** page:

1. Click on the **+** next to **STP/Ring**.
2. Click on **Advanced Setting.**

Advanced Bridge Configuration

The Advanced Setting Page contain several settings to determine how the switch will handle BPDU packets.

- **Bridge bpdu-guard configuration -** When the BPDU Guard feature is set for a bridge, all portfast-enabled ports of the bridge that have **bpdu-guard** set to default shut down the port on receiving a BPDU. In this case, the BPDU is not processed.
- **Error disable timeout configuration –** Enabling this allows a Disabled port to re-enable itself automatically after the specified Interval.
- **Interval –** Default is 300 seconds. This is the length of time a port will remain disabled after shutting down due to the **bpdu-guard**.

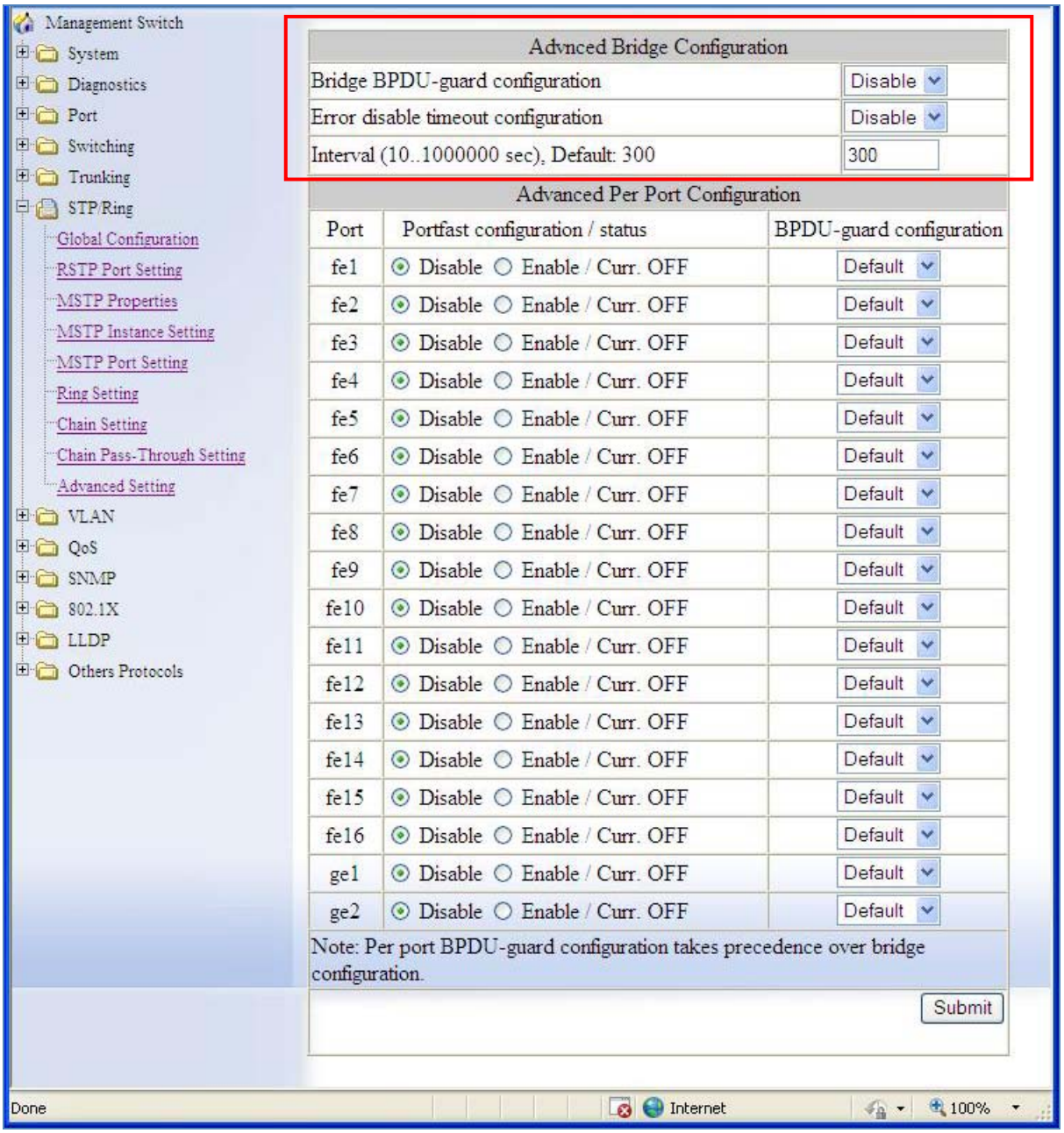


Figure 62: Advanced Bridge Configuration

Advanced Per Port Configuration

- **Portfast Configuration / status –** Enabling this for Edge ports (ports connecting to an end device as opposed to another switch) protect the
- **BPDU-Guard Configuration –** When set to **Default** the port will default to the Advanced Bridge Configuration settings. **Enable** or **Disable** to override the Bridge BPDU-Guard

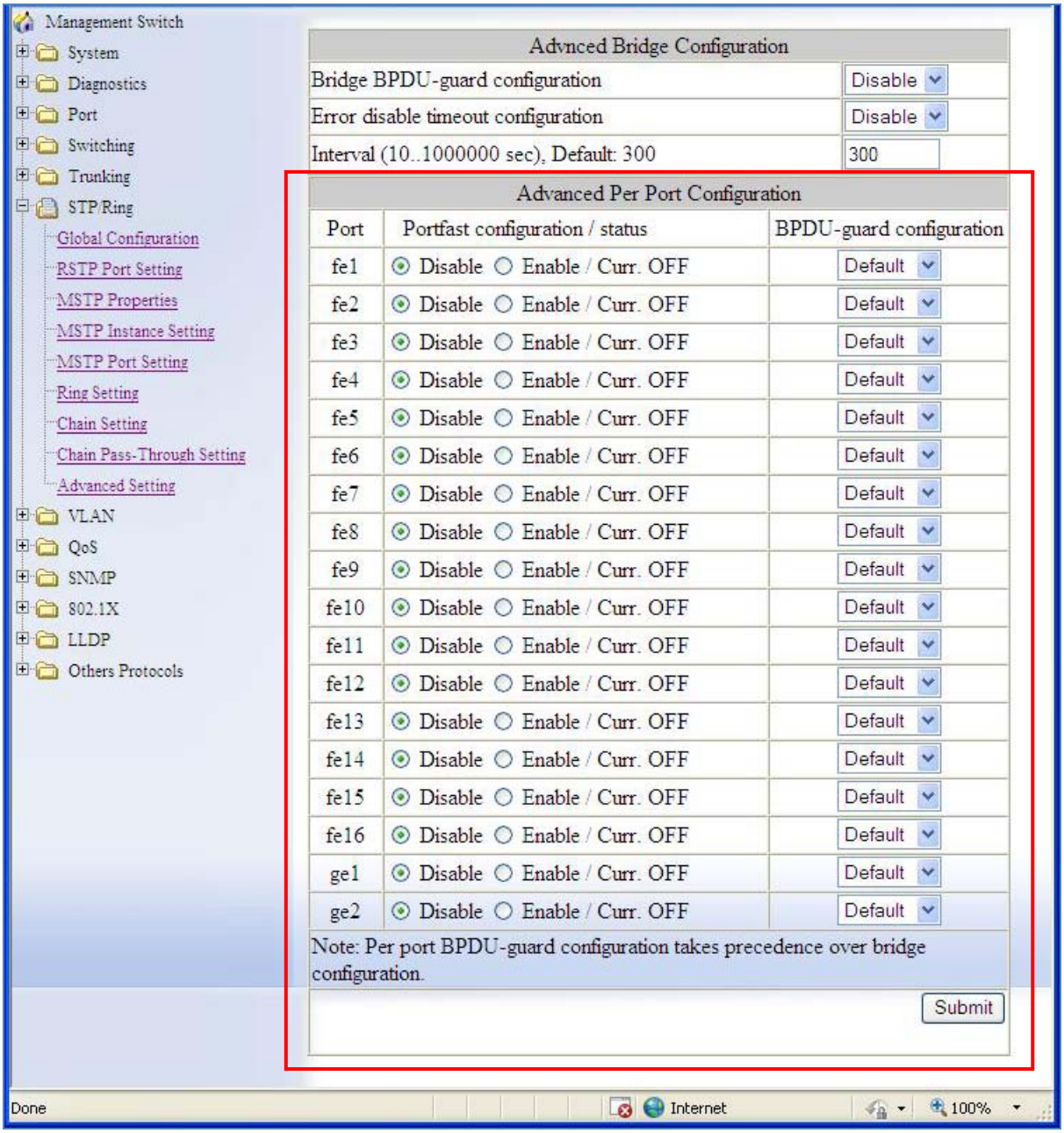


Figure 63: Advanced Per Port Configuration

Configuring Spanning Tree Advanced Settings using CLI commands

For more information on CLI command usage see CLI Command Usage.

Enabling BPDU Guard Globally

To enable the BPDU Guard feature **globally** on the switch use the below CLI commands (for more information on CLI command usage and typographic conventions please click here):

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **bridge 1 spanning-tree portfast bpdu-guard**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# bridge 1 spanning-tree portfast bpdu-guard
switch_a(config)#q
switch_a#
```

Enabling BPDU Guard on a Port

To enable the BPDU Guard feature on a **individual** switch port use the CLI commands below:

CLI Command Mode: **Switch-Port Interface Configuration Mode**

CLI Command Syntax:
spanning-tree portfast;
spanning-tree portfast bpdu-guard enable

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#spanning-tree portfast
switch_a(config-if)#spanning-tree portfast bpdu-guard enable
switch_a(config-if)#q
```

```
switch_a(config)#q
switch_a#
```

Enabling BPDU Guard Error Disable-timeout

To enable the BPDU Guard Error Disable-timeout feature on a switch port, and set the timeout interval, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
bridge 1 spanning-tree errdisable-timeout enable
bridge 1 spanning-tree errdisable-timeout interval 300

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#bridge 1 spanning-tree errdisable-timeout enable
switch_a(config)#bridge 1 spanning-tree errdisable-timeout interval
300
switch_a(config)#q
switch_a#
```

VLAN

Port Based VLAN vs. Tagged Based VLAN

The EX24000 Switch can be configured to operate in one of two VLAN modes: Port based VLAN mode or Tagged based VLAN mode. In Port based VLAN mode, packets from different VLANs can only be segregated from one another while within a single switch, but not when the packets travel to other switches in the network. The VLAN association rule for all incoming packets in Port based VLAN mode is determined only by the VLAN ID that is associated with the port when a packet enters the switch.

In Tagged based VLAN mode, traffic from different VLANs can be segregated from one another even after it travels to another switch. This is done by “tagging” (inserting information inside a packet) a packet with the VLAN ID that the packet belongs to when the packet exits the switch. The VLAN association rule for incoming packets in Tag based VLAN mode can either be based on the VLAN ID that is assigned to the port (PVID) when a packet enters the switch (in the event when the packet does not contain a VLAN ID), or it can be determined from the packet itself (when the packet does contains a VLAN ID).

Configuring VLANs in Port Based VLAN Mode

Enabling Port Based VLAN

To navigate to the **VLAN Mode Setting** page:

1. Click on the **+** next to **VLAN**.
2. Click on **VLAN Mode Setting.**

To enable Port Based VLAN on the switch:

1. Select Port-based VLAN from the dropdown box (see 如下)
2. Click on the **Submit** button.
3. Save the configuration (see the Save Configuration Page)

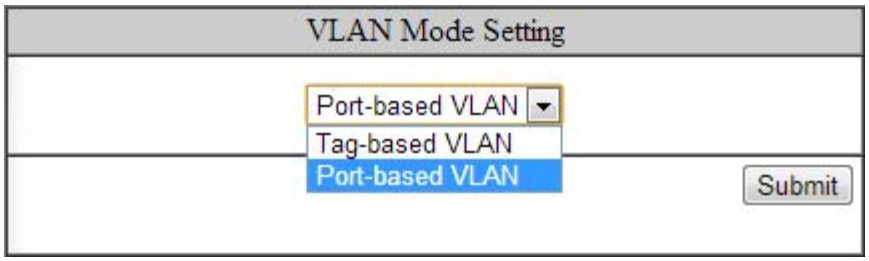


Figure 64: Port Based VLAN

Port Based VLAN Configuration Examples

To navigate to the **Port Based VLAN** page:

1. Click on the **+** next to **VLAN**.
2. Click on **Port Based VLAN.**

In Port Based VLAN mode, you can configure a port to be a member for a single VLAN or multiple VLANs. By default, all the ports on the switch are all members of a single VLAN (VLAN 1).

如下 is an example on how to configure two groups of ports, with each port being a member of a single VLAN. Since no ports are members of more than one VLAN, the ports in different groups cannot communicate with each other.

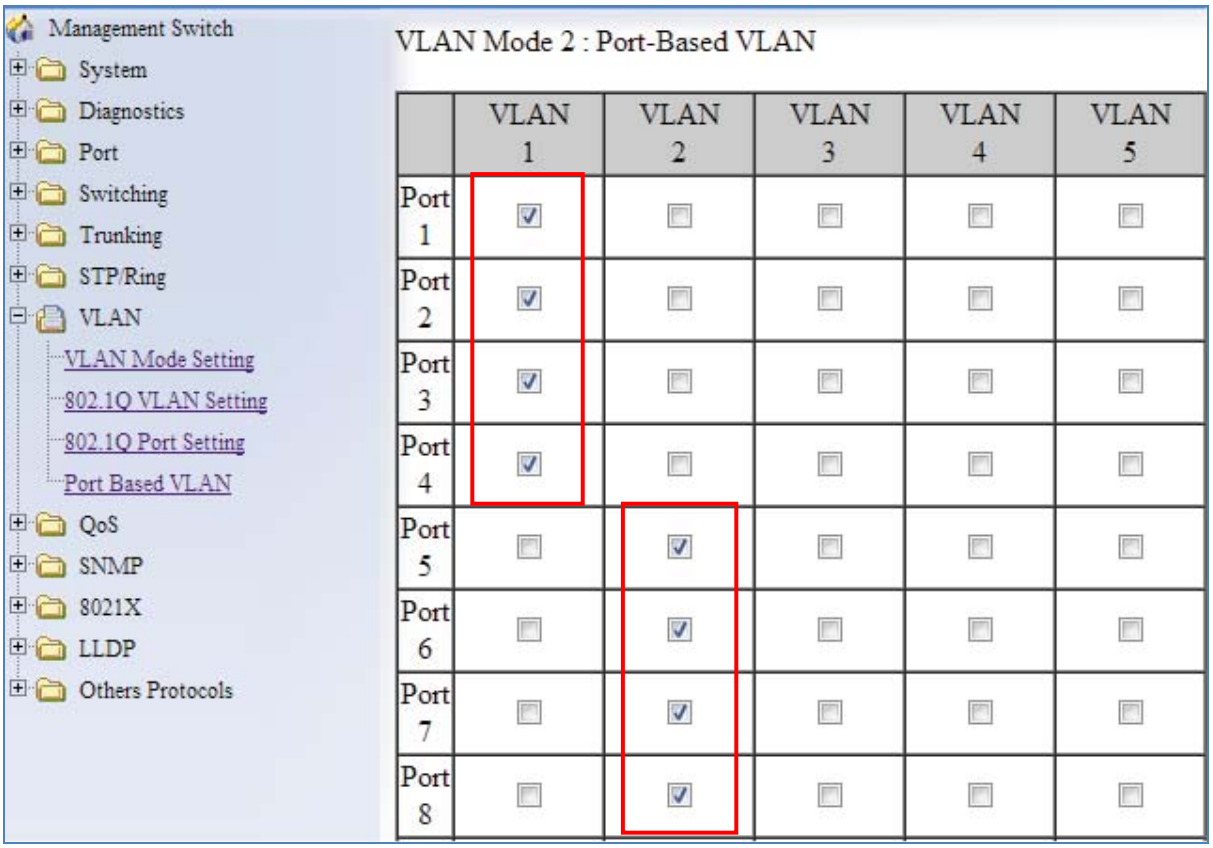


Figure 65: Port Based VLAN – Example 1

In the example 如下, ports 1 through 6 are all on their own VLAN and cannot communicate with each other. Port 7 and 8 are members of all 6 VLANS and therefore can communicate with all ports that are in any of the VLANs that they share membership with.

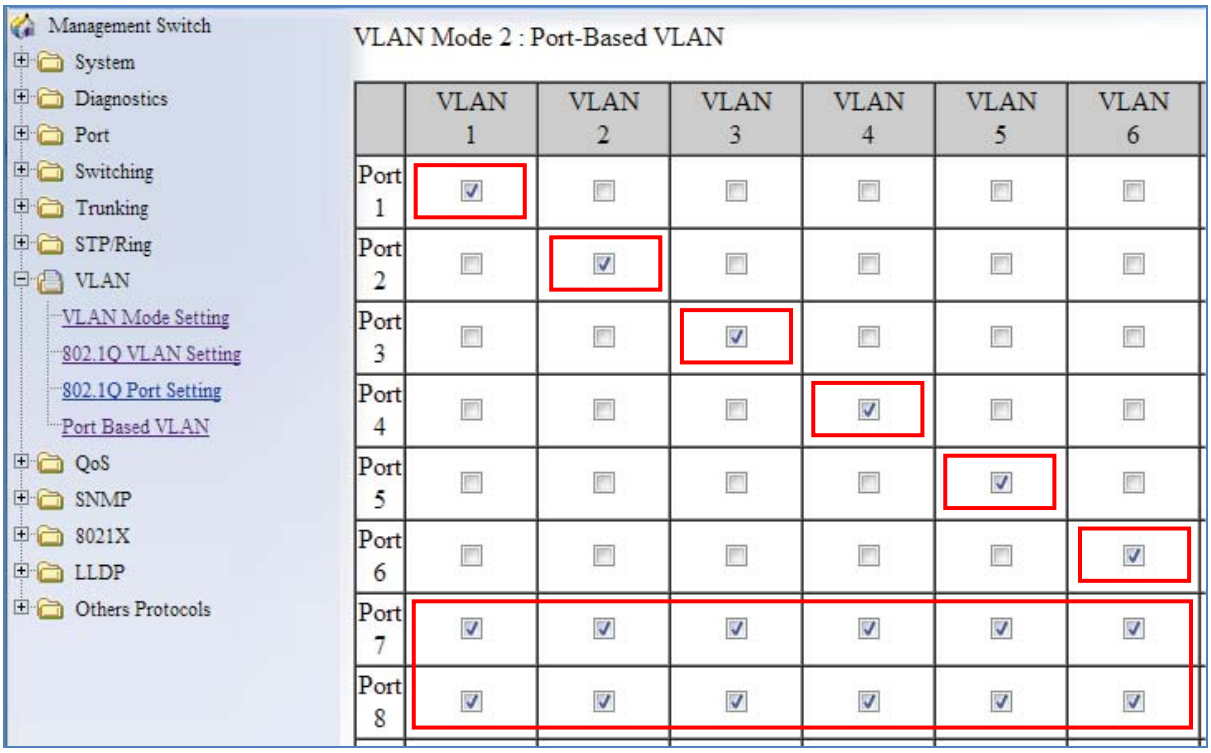


Figure 66: Port Based VLAN – Example 2

To add or remove ports from a specific VLAN:

1. Select or deselect the checkbox to the right of the Port and below the VLAN ID for the port you want to add or remove from a VLAN.
2. Click on the **Submit** button.
3. Save the configuration (see the Save Configuration Page)

Port Based VLAN Configuration Examples using CLI Commands

To configure port based VLANs use the following CLI commands (for more information on CLI command usage see CLI Command Usage)

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **switchport portbase add vlan <1 – 16>**

Usage Example (to add a port to a single VLAN):

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#switchport portbase add vlan 1
```

```
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Usage Example (to add a port to multiple VLANs):

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#switchport portbase add vlan 1
switch_a(config-if)#switchport portbase add vlan 2
switch_a(config-if)#switchport portbase add vlan 3
switch_a(config-if)#switchport portbase add vlan 4
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

VLAN Configuration in 802.1Q Tag Based VLAN Mode

General Overview

802.1Q VLAN configuration consists of the following four elements:

1. Creating all VLANs in the VLAN database.
2. Configuring an incoming untagged packet's VLAN association rule: this is accomplished by configuring the PVID setting on each individual port.
3. Configuring the ports that are associated with a VLAN to allow the packets that belong to that VLAN to exit and enter the switch through that port.
4. Configuring the tag action on the outgoing packets for each VLAN, that is to say, deciding on whether or not an outgoing packet will be tagged with the VLAN number that the packet belongs to.

All ports on the EX24000 Switch can be configured with different Port Types that have different tagging restrictions as defined below.

- **Access Port** - If a port is configured to be an Access Port, then this port can only be a member of a single VLAN based on the Access Port's **PVID VLAN** setting, and this port's outgoing packets cannot be modified to contain a VLAN Tag.
- **Trunk Port** - If a port is configured to be a Trunk Port, then this port can be a member of multiple VLANs. This port's outgoing packets will be automatically modified to contain a VLAN tag of the VLAN that the packet belongs to, with the exception of the PVID VLAN on that port. The PVID VLAN on a Trunk Port will not be automatically modified to contain a VLAN tag of the PVID VLAN.
- **Hybrid Port** - A Hybrid Port has no restriction on it. If a port is configured to be a Hybrid Port, then this port can be a member of multiple VLANs, and this port's outgoing packets can be configured to be either with or without a VLAN tag of the VLAN that the packet belongs to, including the PVID VLAN of the Hybrid Port.

For all three types of ports above, if an incoming packet contains a VLAN tag, then the packet's VLAN association rule will be based on the VLAN Tag.

Enabling 802.1Q Tagged Based VLAN

To navigate to the **VLAN Mode Setting** page:

1. Click on the **+** next to **VLAN**.
2. Click on **VLAN Mode Setting.**

To enable 802.1Q Tagged Based VLAN on the switch:

1. Select **Tag-based VLAN** from the dropdown box (see 如下)
2. Click on the **Submit** button.
3. Save the configuration (see the Save Configuration Page)

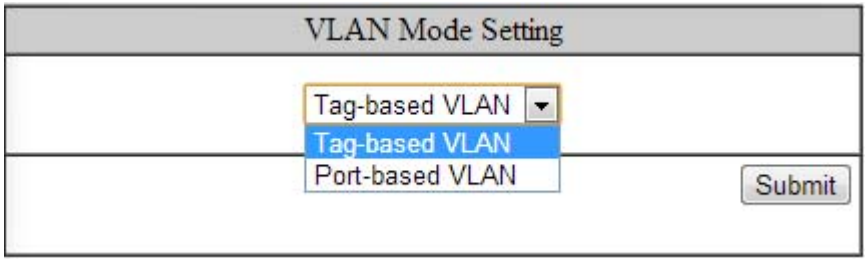


Figure 67: Tag-based VLAN

Configuring 802.1Q VLAN Database

To navigate to the **802.1Q VLAN Setting** page:

1. Click on the **+** next to **VLAN**.
2. Click on **802.1Q VLAN Setting.**

To configure the 802.1Q VLAN Database, please do the following:

1. Click on the **Add VLAN** button (see Figure 68).

Figure 68: Add VLAN

2. Enter the **VLAN ID**.
3. Enter the **VLAN Name**.
4. Select **Attach** or **Detach** for the **CPU Port.**
    a. Attaching the CPU to a VLAN is typically done on the Management VLAN.
5. Select the ports to be a member of the VLAN (see Configuring the VLAN Egress (outgoing) Member Ports)
6. Click on **Submit** button.
7. Repeat for all the VLANs that are needed.
8. Save the configuration (see the Save Configuration Page)

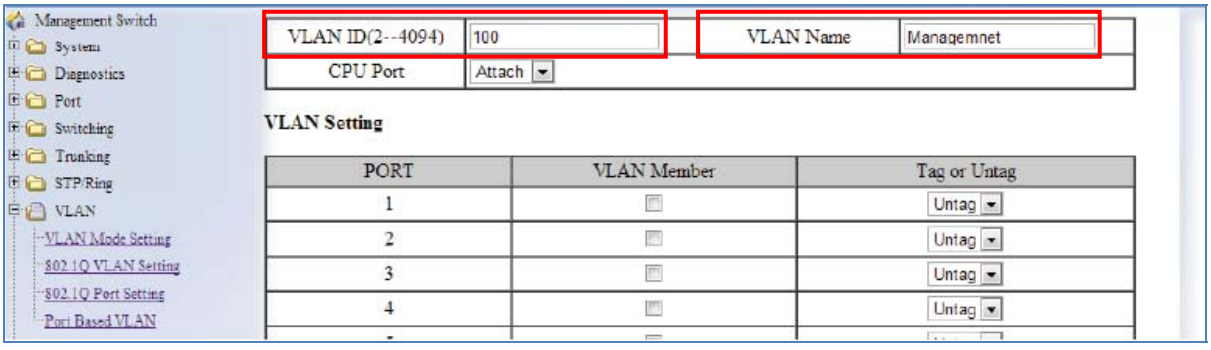


Figure 69: Add VLAN Page

802.1Q Tag Based VLAN Configuration Examples Using CLI Commands

Configuring a 802.1Q VLAN

To configure a 802.1Q VLAN on a switch use the following CLI commands (for more information on CLI command usage see CLI Command Usage)

CLI Command Mode: **VLAN Database Configuration Mode**

CLI Command Syntax: **switchport portbase add vlan <1 – 16> vlan <1 – 4094> bridge 1 name VLAN NAME state enable**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#vlan database
switch_a(config-vlan)#vlan 100 bridge 1 name Management state enable
switch_a(config-vlan)#vlan 200 bridge 1 name Accounting state enable
switch_a(config-vlan)#vlan 300 bridge 1 name Sales state enable
switch_a(config-vlan)#q
switch_a(config)#q
switch_a#
```

Configuring an IP Address for a Management VLAN

To configure the IP address for the management VLAN use the following CLI commands

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **ip address IP_ADDRESS/PREFIX [e.g. 10.0.0.1/24]**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.100
switch_a(config-if)#ip address 192.168.100.10/24
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Removing an IP Address from a Management VLAN

To removed an IP address from a management VLAN use the following CLI commands

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **no ip address**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.100
switch_a(config-if)#no ip address
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Configuring an Access Port

To configure an Access Port use the following CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **switchport mode access**

CLI Command Syntax: **switchport access vlan <1 – 4094>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if)#switchport mode access
switch_a(config-if)#switchport access vlan 100
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Configuring a Trunk Port

To configure a Trunk Port use the following CLI commands:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **switchport mode trunk**

CLI Command Syntax: **switchport trunk allowed vlan add 100,200,300**

CLI Command Syntax: **switchport trunk native vlan 1**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe7
switch_a(config-if)#switchport mode trunk
switch_a(config-if)#switchport trunk allowed vlan add 100,200,300
switch_a(config-if)#switchport trunk native vlan 1
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Add an IP to the Management VLAN

To navigate to the **System/IP Address** page:

1. Click on the **+** next to **System**.
2. Click on **IP Address.**

To add an IP for a Management VLAN:

1. Enter the **IP address** and **subnet mask** for the management VLAN
2. Click on the **Submit** button (see 如下).
3. Save the configuration (see the Save Configuration Page)

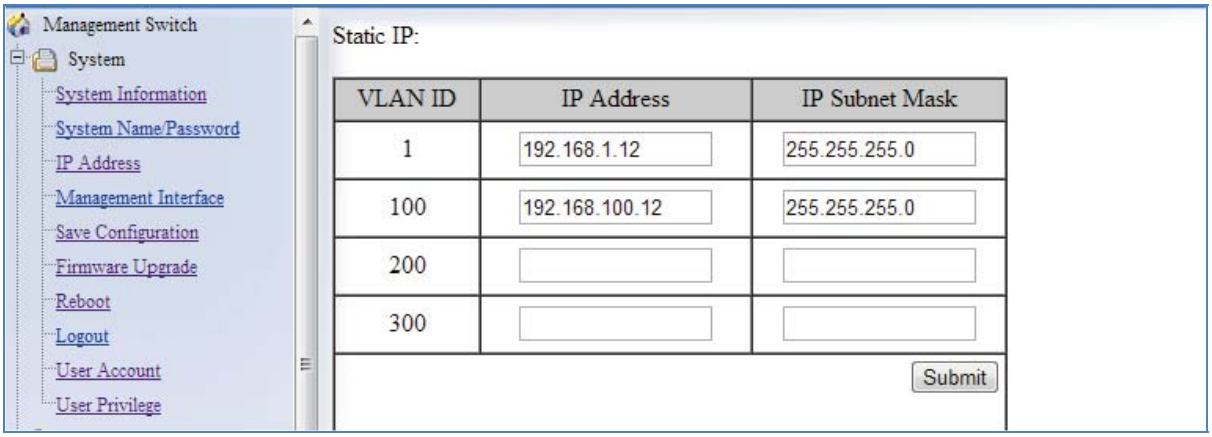


Figure 70: Management VLAN IP Address

To delete an IP from a VLAN (the default VLAN, for an example):

1. Delete the IP and the subnet mask of the default VLAN and leave it as blank
2. Click on the **Submit** button.

Warning: Before completing the above steps, make sure that you have already set up another management IP on another VLAN, and have set up a port properly for accessing that VLAN.

Configuring the Port Type and the PVID setting

To navigate to the **802.1Q Port Setting** page:

1. Click on the **+** next to **VLAN**.
2. Click on **802.1Q Port Setting.**

To configure the proper port type and the PVID setting for each switch port:

1. Choose the port type for each port in the drop-down list (see General Overview for port type details).
2. Enter the **PVID VLAN** for each port (see below).
3. Enter the **Priority Level** (optional).
4. Click on the **Update Setting** button.
5. Save the configuration (see the Save Configuration Page)

Warning: Modifying the Port Type using the Web GUI will cause that switch port to lose all its current VLAN membership and become a member port for the PVID VLAN only. You will lose your current connection to the switch, should you choose to modify the PVID of the port that connects your Computer to the switch.

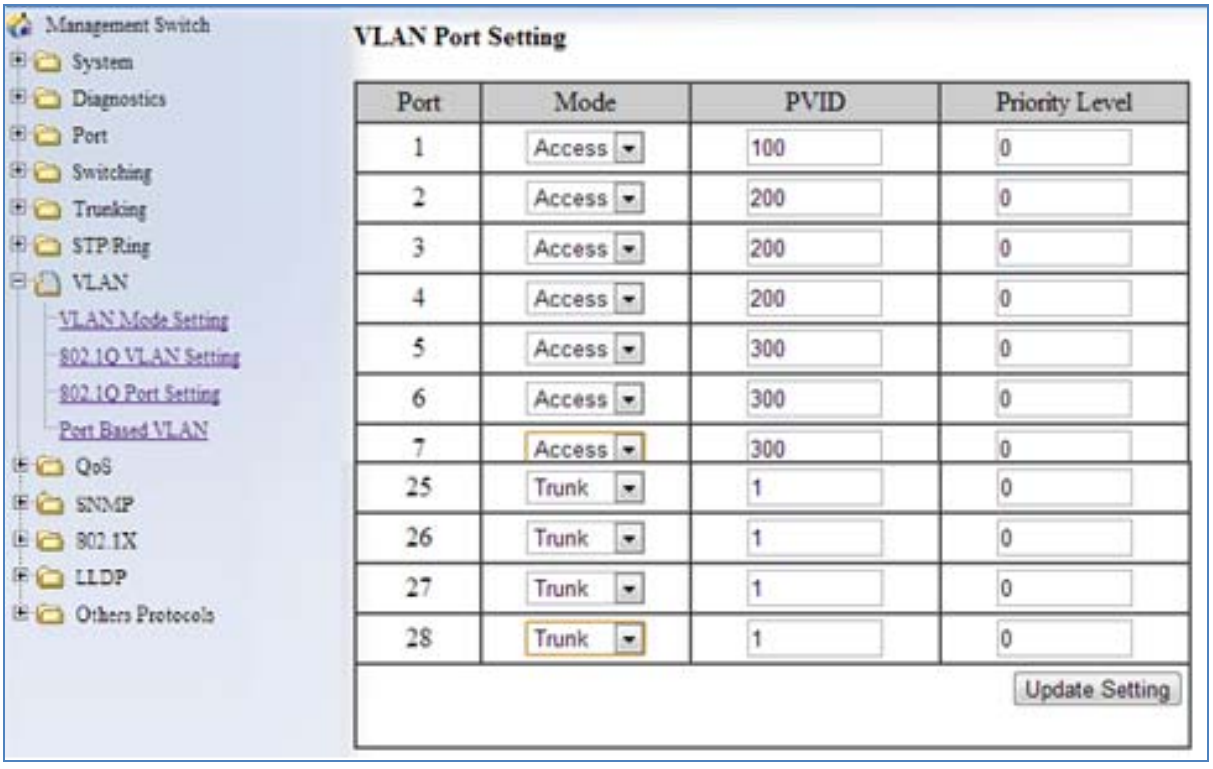


Figure 71: VLAN Port Setting

Configuring the VLAN Egress (outgoing) Member Ports

To navigate to the **802.1Q VLAN Setting** page:

1. Click on the **+** next to **VLAN**.
2. Click on **802.1Q VLAN Setting.**

To configure the egress member ports for each VLAN:

1. Click on the VLAN link that you want to configure (see 如下).

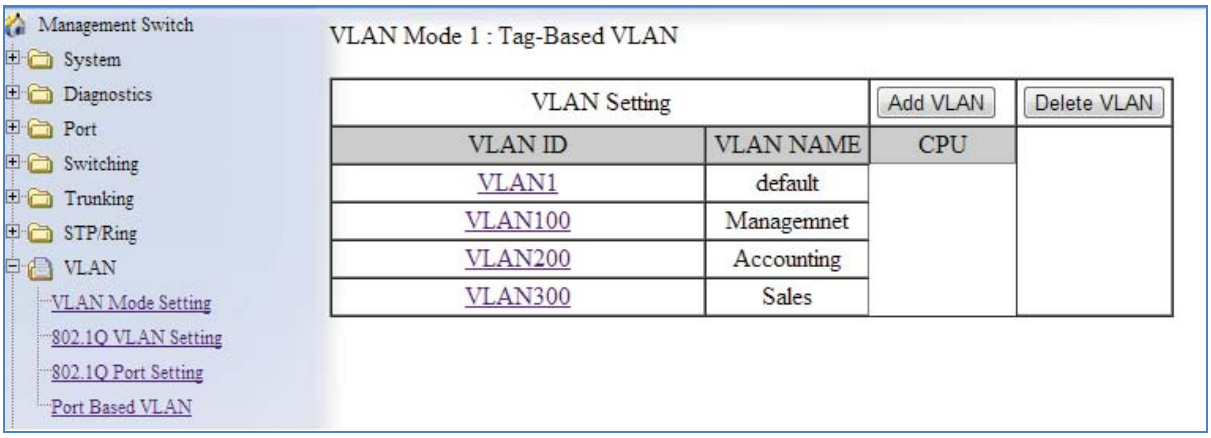


Figure 72: VLAN Links

2. Check the check box next to the port number that should be the egress member port for this VLAN
3. Click on the **Submit** button (see Figure 73).

Note: If an egress member port for a VLAN has the PVID set on that port to be the same as the VLAN, then that port will automatically be configured as an egress member port for the VLAN by the switch. If a check box is not checked and is grayed out, it is because that port is an Access Port with the PVID set to be a different VLAN than the current VLAN.

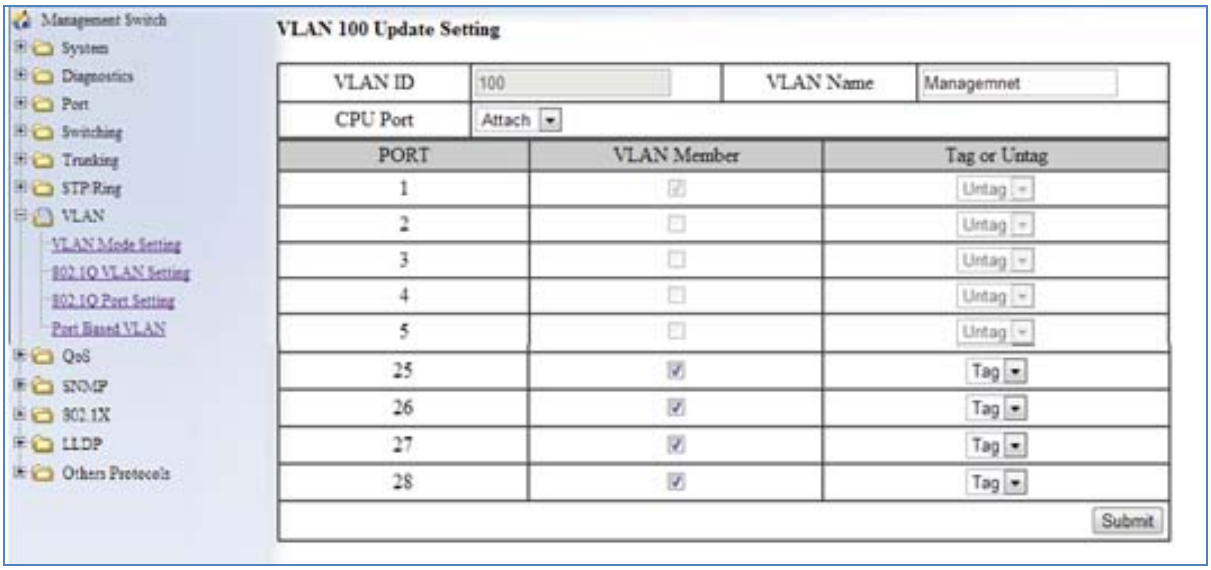


Figure 73: VLAN Ports

If any of the egress member ports are Hybrid ports, you must also configure the Tag action on this port (see Figure 74).

4. Select the correct **Tag** option in the drop down list under **Tag or Untag** for this port.
5. Click on the **Submit** button.

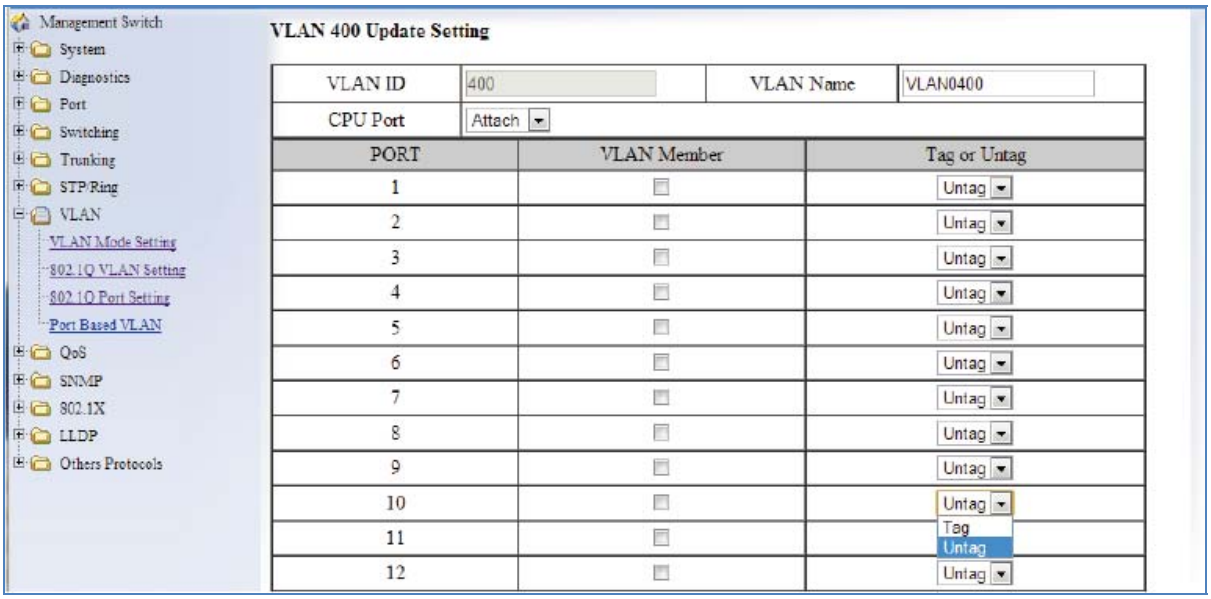


Figure 74: Tag or Untag ports

QOS

QoS (Quality of Service) refers to several related aspects of computer networks that allow the transport of traffic with special requirements. In particular, technology has been developed to allow computer networks to become as useful as telephone networks for audio conversations, as well as supporting new applications with even stricter service demands. Beyond the audio applications that QoS was originally intended, data traffic such as video or real-time information can benefit from QoS.

QoS as it pertains to the EX24000 Switch can be broken down into two types, CoS and DCSP. CoS or **Class of Service** operates at Layer 2 and was developed by an IEEE working group in the 1990s. CoS uses a 3-bit field called the **Priority Code Point** (PCP) within an Ethernet frame header when using VLAN tagged frames as defined by IEEE 802.1Q. It specifies a priority value between 0 and 7, inclusive that can be used by QoS disciplines to differentiate traffic. Although this technique is commonly referred to as IEEE 802.1p, there is no standard or amendment by that name published by the IEEE. Rather the technique is incorporated into the IEEE 802.1Q standard which specifies the tag inserted into an Ethernet frame.

Eight different classes of service are available as expressed through the 3-bit PCP field in an IEEE 802.1Q header added to the frame. The way traffic is treated when assigned to any particular class is undefined and left to the implementation. The IEEE however has made some broad recommendations:

PCP	Priority	Acronym	Traffic Types
1	0 (lowest)	BK	Background
1	1	BE	Best Effort
2	2	EE	Excellent Effort
3	3	CA	Critical Applications
4	4	VI	Video, < 100 ms latency and jitter
5	5	VO	Voice, < 10 ms latency and jitter
6	6	IC	Internetwork Control
7	7 (highest)	NC	Network Control

The above recommendations are implemented in the EX24000's 802.1p submenu.

DSPC or **Diffserv Code Point** uses the first 6 bits in the ToS field of the IP(v4) packet header. This type of QoS is primarily useful if the QoS needs to pass through a router or routers. We will touch on DSPC briefly later in this section.

Global Configuration Page

Web GUI Interface

To navigate to the **QoS Global Configuration** page (see 如下):

1. Click on the **+** next to **QoS**.
2. Click on **Global Configuration**.

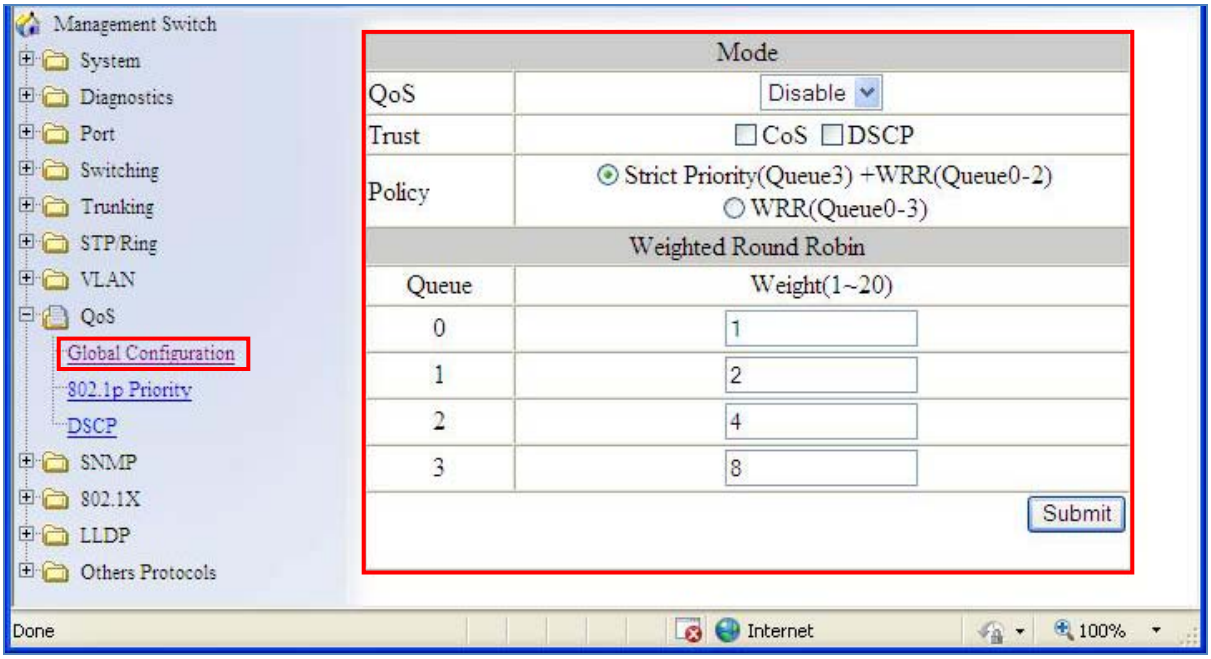


Figure 75: Global Configuration

To Enable the QoS settings:

1. Enable QoS, by selecting the drop-down box to the right of the QoS option.
2. Choose CoS and/or DSCP next to the Trust option.
3. Select the desired option next to Policy:
    a. **Strict Priority (Queue0-3)** – Packets must be emptied from the queues in order. Starting with queue 3 and ending with queue 0, the packets in each queue must be completely emptied before the next queue's packets are considered for transmission.
    b. **WRR (Queue 0 – 3)** – each queue is allowed to discharge a certain number of packets (according to the WRR weights in the Weighted Round Robin section) before moving to the next queue.

4. Enter the **Weight** for each queue in the Weight Round Robin section
5. Click on the **Submit** button.
6. Save the configuration (see the Save Configuration Page)

Note: Weighted Round Robin – There are four text fields, one for each queue (0 – 3). A number from 1 to 20 can be assigned for each queue. This number is used with **WRR** policy and is the value of the number of packets that must be emptied from the queue before the next queue is considered. By default, these values are:

Queue	Weight
0	1
1	2
2	4
3	8

QoS Global Configuration using the CLI Interface

This section gives information on Command line commands related to QoS and assumes the user has a working knowledge of connecting to the switch using Telnet, SSH or the Serial port.. Telnet is enabled by default. To enable or disable Telnet or SSH see the Management Interface section.

For more information on CLI command usage see CLI Command Usage.

Enabling/Disabling QoS

To get to the CLI level to configure QoS:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax:
mls qos enable
no mls qos

Usage Example – Enabling QoS:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)# mls qos enable
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Usage Example – Disabling QoS:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#int fe1
switch_a(config-if)# no mls qos
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enable/Disable QoS Trust

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
mls qos trust <*cos/dscp*>
no qos trust

Usage Example – Enable QoS Trust:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# mls qos trust cos
switch_a(config)#q
switch_a#
```

Usage Example – Disable QoS Trust:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# no mls qos trust
switch_a(config)#q
switch_a#
```

Configuring the Egress Expedite Queue

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
priority-queue strict
priority-queue out
no priority-queue out
mls qos <*WRR_WTS*> (4 values separated by spaces. Range is 1-20 (See the Usage Example).

Usage Example – Enable QoS Strict Priority (Queue 0-3):

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# priority-queue strict
switch_a(config)#q
switch_a#
```

Usage Example – Enable QoS Strict Priority (Queue 3) + WWR (Queue 0-2):

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# priority-queue out
switch_a(config)#q
switch_a#
```

Usage Example – Disable QoS Strict Priority:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# no priority-queue out
switch_a(config)#q
switch_a#
```

Usage Example – The following example specifies the bandwidth ratios of the four transmit queues, starting with queue 0, on the switch. WRR_WTS Weighted Round Robin (WRR) weights for the 4 queues (4 values separated by spaces). Range is 1-20.

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#mls qos 1 2 4 8
switch_a(config)#q
switch_a#
```

802.1p Priority Page

Web GUI Interface

To navigate to the **QoS 802.1p Priority** page (see Figure 76):

1. Click on the **+** next to **QoS**.
2. Click on **802.1p Priority**.

The 802.1p Priority page allows a user to assign the queues to VLAN priorities (see Global Configuration Page for more information on queues).

Each VLAN priority is expressed as the three-bit PCP field in the 802.1Q header discussed previously. The values shown above are the default values with the higher VLAN priorities corresponding to the higher priority queues.

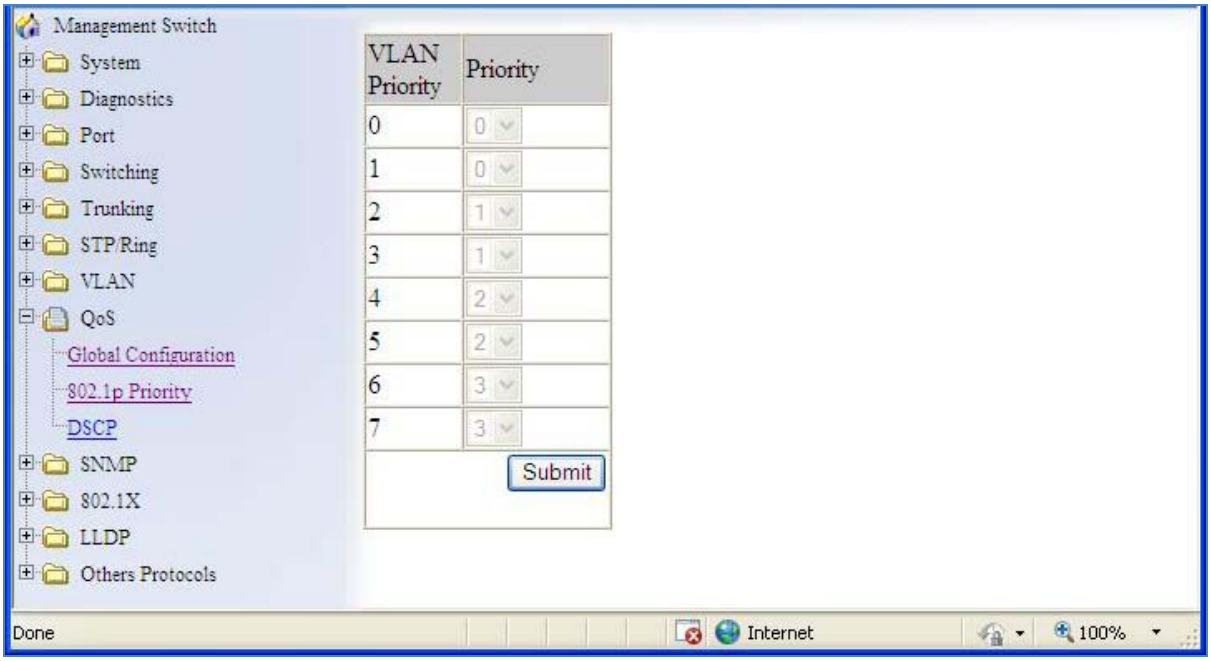


Figure 76: 802.1p Priority

By default, the higher priority queue 3 are assigned to VLAN priorities 6 and 7, queue 2 assigned to VLAN priorities 4 and 5; queue 1 assigned to VLAN priorities 2 and 3; and finally, queue 0 assigned to VLAN priorities 0 and 1.

After making any changes on the page, click on the **Submit** button to ensure that the changes are stored.

802.1p Priority Submenu – CLI Interface

For more information on CLI command usage see CLI Command Usage.

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
wrr-queue cos-map <*QUEUE_ID*> <*COS_VALUE*>

Queue ID. Range is 0-3.
COS_VALUE CoS values. Up to 8 values (separated by spaces).

Usage Example The following example shows mapping CoS values 0 and 1 to queue 1 on the switch:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#wrr-queue cos-map 1 0 1
switch_a(config)#q
switch_a#
```

DSCP Page – HTTP Interface

The DSCP submenu is much like the 802.1p submenu except there are many more DSCP priorities to choose from and they are all assigned to the lowest-priority queue, 0. For each DSCP priority, the user can change the value of the queue to between 0 and 3. See Figure 3 for more information:

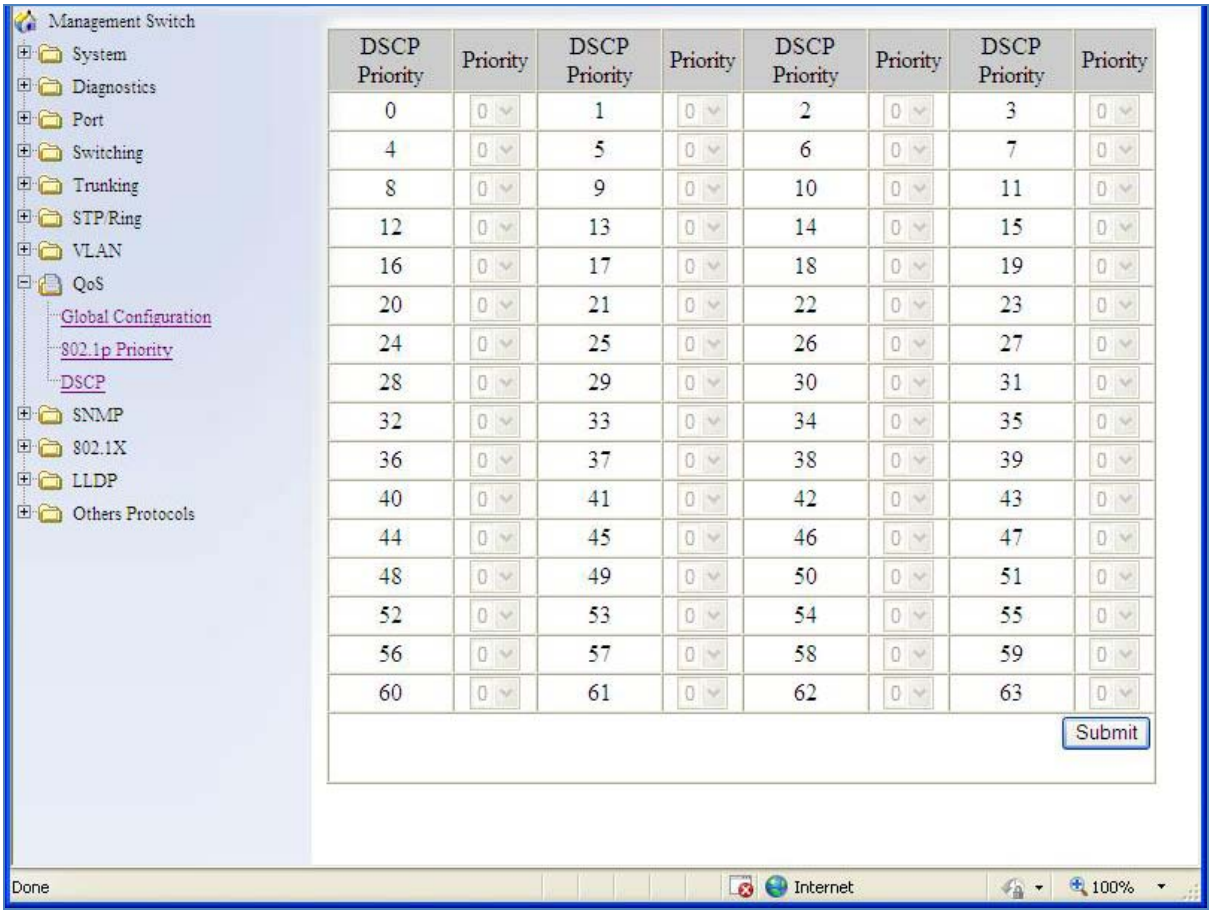


Figure 77: DSCP

If the user changes any values on this page, clicking on the **Submit** button allows them to take effect.

DSCP Submenu – CLI Interface

For more information on CLI command usage see CLI Command Usage.

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
mls qos map dscp-queue <dscp_value> to <queue_ID>
dscp_value: Up to 8 values (separated by spaces). Range is 0-63.
queue_ID: Range is 0-3.

Usage Example The following example shows mapping DSCP values 0 to 3 to queue 1 on the switch:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# mls qos map dscp-queue 0 1 2 3 to 1
switch_a(config)#q
switch_a#
```

QoS Interface Commands – CLI Interface

For more information on CLI command usage see CLI Command Usage.

To assign a VLAN Priority to an Interface:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **user-priority *<0-7>***

Usage Example The following example shows mapping DSCP values 0 to 3 to queue 1 on the switch:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface fe1
switch_a(config-if) user-priority 4
switch_a(config)#q
switch_a(config)#q
switch_a#
```

SNMP

SNMP is a TCP/IP application layer network management protocol that allows any TCP/IP device to be managed across a TCP/IP network. It is based on the client-server paradigm. The server (called a SNMP Agent) runs a process on the managed device that listens for a client's (a network management software running on a computer, usually called a NMS, short for Network Management Station) polling requests to fetch or to set a data item on the managed device. The SNMP Agent can also send alert messages (called Traps) to a NMS automatically, based on the occurrence of certain events on the device that the Agent resides.

SNMP General Settings

To navigate to the **SNMP General Settings** page:

1. Click on the **+** next to **SNMP**.
2. Click on **SNMP General Settings**.

To configure the general settings for the SNMP feature (see Figure 78):

1. The SNMP server on the switch can be enabled or disabled by selecting the appropriate choice from the dropdown list next to SNMP Status.
2. Enter a short description (up to 256 characters) into the text entry box next to Description, for the purpose of switch identification.
3. Enter a name into the text entry box next to Location, for the purpose of identifying the location of the switch.
4. Enter a name (up to 256 characters) into the text entry box next to Contact, to identify the entity that is responsible for this switch.
5. Enter a trap community name (up to 256 characters) into the text entry box next to any one of the 5 Trap community name entry boxes from Trap Community Name 1 to Trap Community Name 5.
    a. Community names identify the SNMP Trap community group that the traps on this switch should be sending to. The identical Trap community names should also be set on the NMS hosts that will be receiving the traps. Each name defined corresponds with the **Trap host IP address** entry box with the same number. For example, **Trap Community Name 1** corresponds with **Trap Host 1 IP Address**.

6. Enter an IP address, for the NMS host(s) that should be receiving traps from this switch, into the text entry box next to any one of the 5 Trap host IP address entry boxes from **Trap Host 1 IP Address to Trap Host 5 IP Address**
7. Enable or disable the link down trap by selecting the appropriate choice from the drop-down list next to **Link Down Trap**. This will allow or stop the switch from sending a trap to the identified trap community groups when any port on the switch moves from the link up state to the link down state.

8. Enable or disable the link up trap by selecting the appropriate choice from the drop-down list next **Link Up Trap**. This will allow or stop the switch from sending a trap to the identified trap community groups when any port on the switch moves from the link down state to the link up state.

9. Enable or disable the MAC notification trap by selecting the appropriate choice from the drop-down list next to **MAC Notification Trap**. This will allow or stop the switch from sending a trap to the identified trap community groups anytime there is a change in the MAC table on certain selected ports of the switch.

10. Set the interval between the MAC notification traps that you want the switch to send by entering the interval (in number of seconds from 1 to 65535) into the text entry box next to **MAC Notification Interval (1 to 65535 seconds)**.

11. Set the size of the MAC notification history table by entering the total number of records (from 1 to 500) that the switch will keep for user to review at any one time into the text entry box next to **MAC Notification History Size (1 to 500)**.

12. Select which ports on the switch for which traps should be sent when there is a new MAC address added to the MAC table for the port, by checking the appropriate check boxes for these ports in the **MAC Notification Added** section.

13. Select which ports on the switch for which traps should be sent when there is a MAC address being removed from the MAC table for the port, by checking the appropriate check boxes for these ports in the **MAC Notification Removed** section.

14. Click on the **Update** button after you have finished the configuration of the SNMP Server (Agent) General Settings.

15. Save the configuration (see the Save Configuration Page)

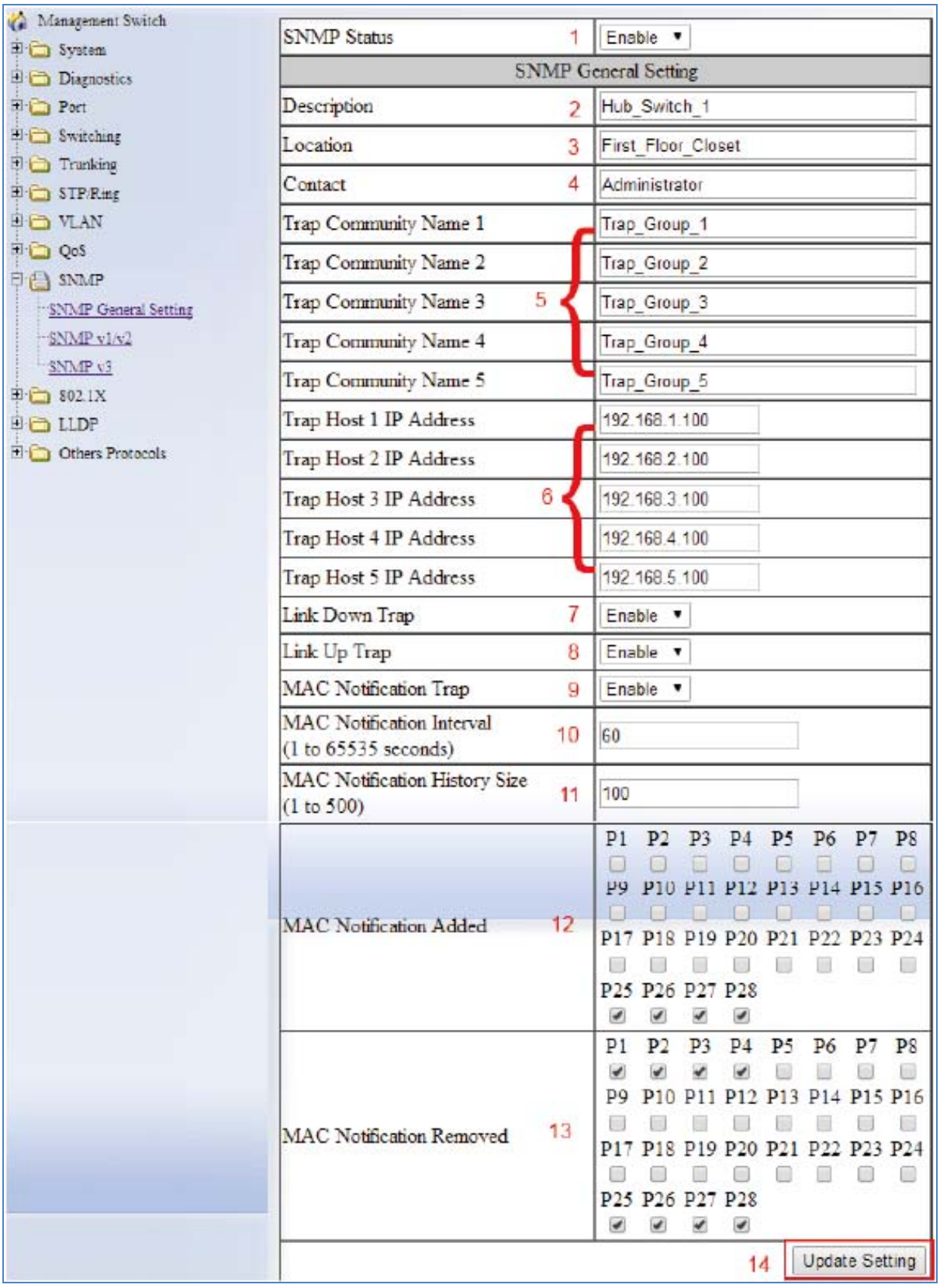


Figure 78: SNMP General Settings

Configuring SNMP v1 & v2 Community Groups

To navigate to the **SNMP v1/v2** page:

1. Click on the **+** next to **SNMP**.
2. Click on **SNMP v1/v2**.

To configure the SNMP v1 & v2 community groups (see Figure 79):

1. Enter the SNMP community name into the text entry box next to **Get Community Name**. This will allow the NMS to poll status information from the switch (read only).
2. Enter the SNMP community name, into the text entry box next to **Set Community Name**. This will allow a NMS to change the status of a data item in the switch.
3. Click on the **Update Setting** button after you have finished the configuration.
4. Save the configuration (see the Save Configuration Page)

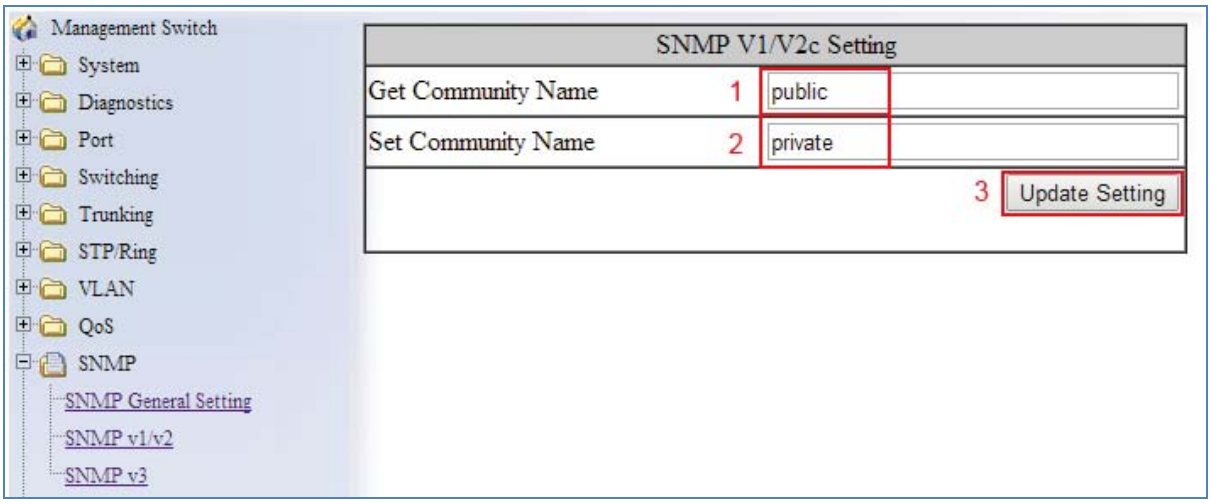


Figure 79: Community Name V1/V2c

Configuring SNMP v3 Users

To navigate to the **SNMP v3** page:

1. Click on the **+** next to **SNMP**.
2. Click on **SNMP v3**.

Adding SNMP v3 Users to the switch

1. Click on the **Add User** button. See 如下.

Figure 80: Add User

2. Next, select the desired authentication/privacy protocols from the drop-down list next to “NMP Version, according to the chart below (also see Figure 81):
    a. **SNMPv3 No-Auth** = Only user name match is required for SNMP access to the switch. No user authentication or data encryption will be used.
    b. **SNMPv3 Auth-MD5** = User authentication will be required using the MD5 hashing algorithm, but no data encryption will be used.
    c. **SNMPv3 Auth-SHA** = User authentication will be required using the SHA-1 hashing algorithm, but no data encryption will be used.

d. **SNMPv3 Priv Auth-MD5** = User authentication will be required using the MD5 hashing algorithm, and in addition, all data in protocol message will be encrypted using 56-bit DES encryption algorithm.

e. **SNMPv3 Priv Auth-SHA** = User authentication will be required using the SHA-1 hashing Algorithm, and in addition, all data in protocol message will be encrypted using 56-bit DES encryption algorithm.

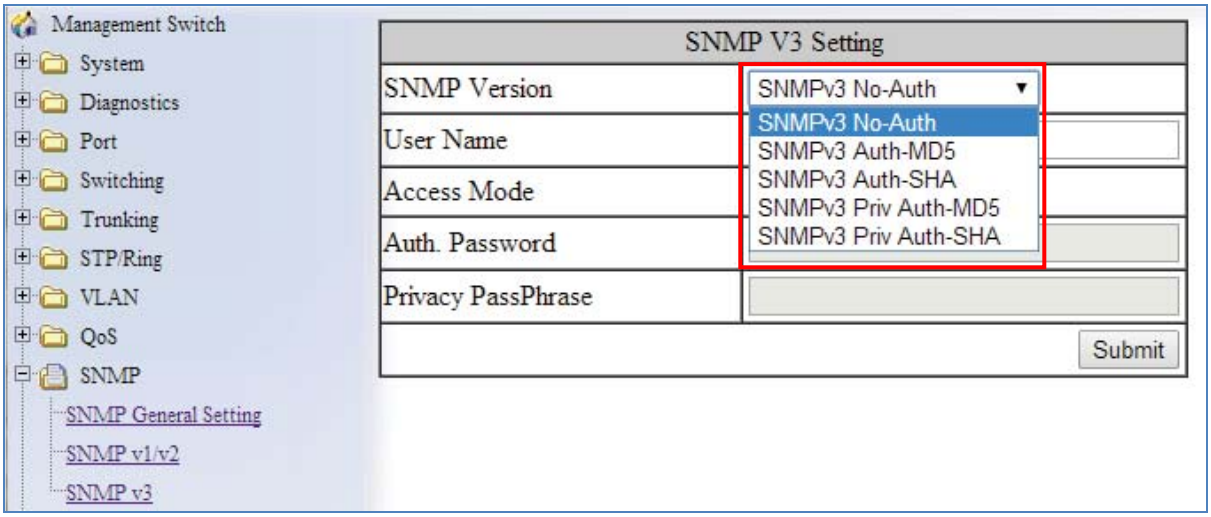


Figure 81: SNMP v3 Settings

3. Next, enter the desired username in the text entry box next to **User Name**.
4. Next, please select the desired access authorization for the user from the drop-down list next to **Access Mode**. See Figure 82.

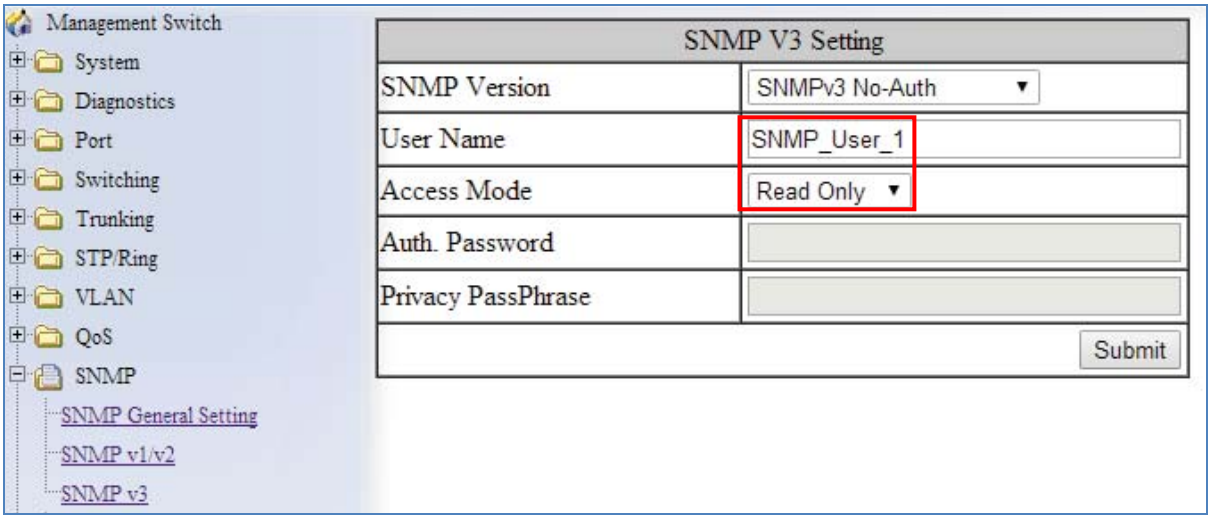


Figure 82: User name & Access Mode

5. Next, if authentication is required for this user, and you have chosen an authentication protocol, then the text entry box next to **Auth. Password** will have been enabled. Enter a password for this user inside this text entry box. See Figure 83.

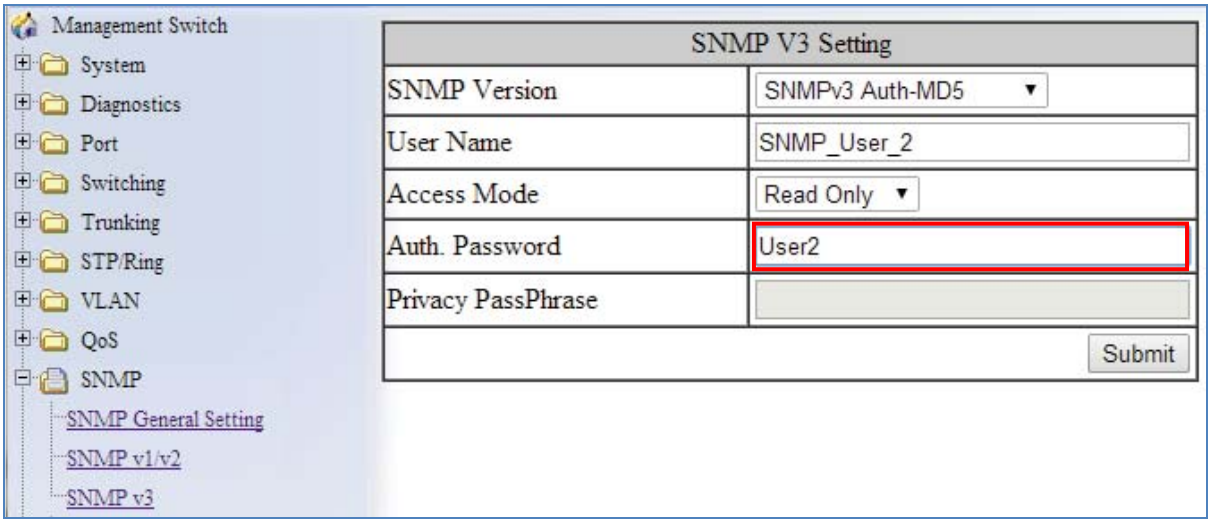


Figure 83: Auth Password

6. Next, if both authentication and privacy are required for this user, and you have chosen both an authentication and privacy protocol, then the text entry box next to **Privacy PassPhrase** will have been enabled. Enter a pass phrase inside this text entry box, as part of the key used to encrypt the protocol message for this user. See Figure 84.

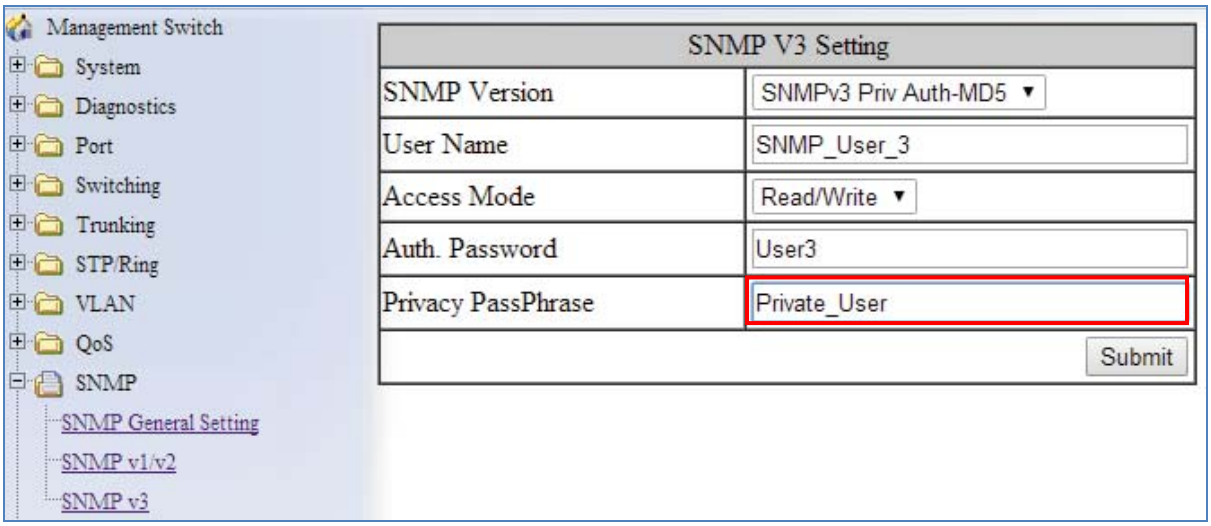


Figure 84: Privacy PassPhrase

Deleting SNMP v3 Users from the switch

1. Go to SNMP → SNMP v3, you should see a list of previously configured users. Next, click on the **Delete User** button. See 如下.

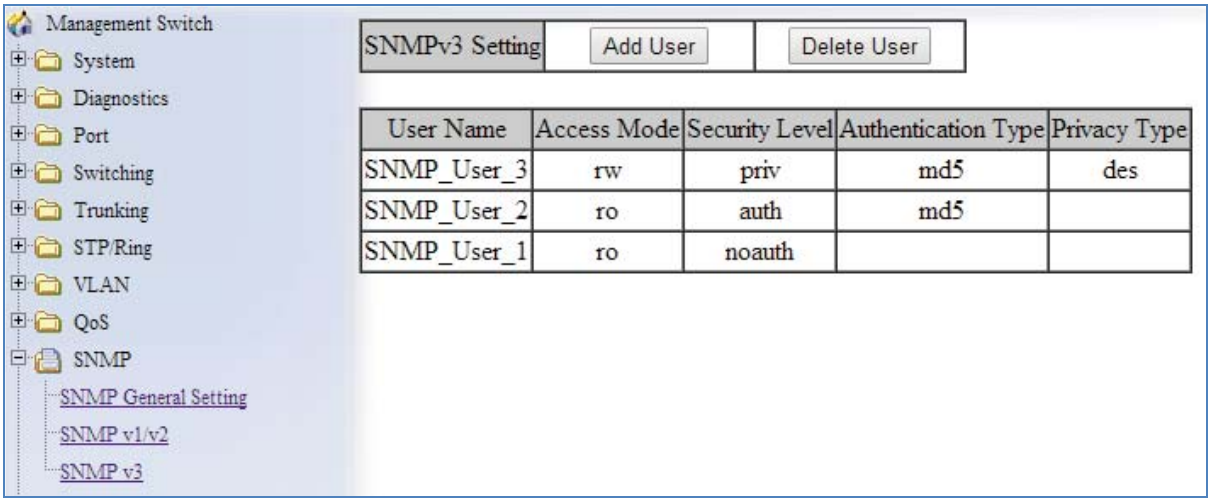


Figure 85: Delete User

2. Next, select the user that you wish to delete from the drop-down list next to **Select User Name**.
3. Click on the **Submit** button. See 如下.

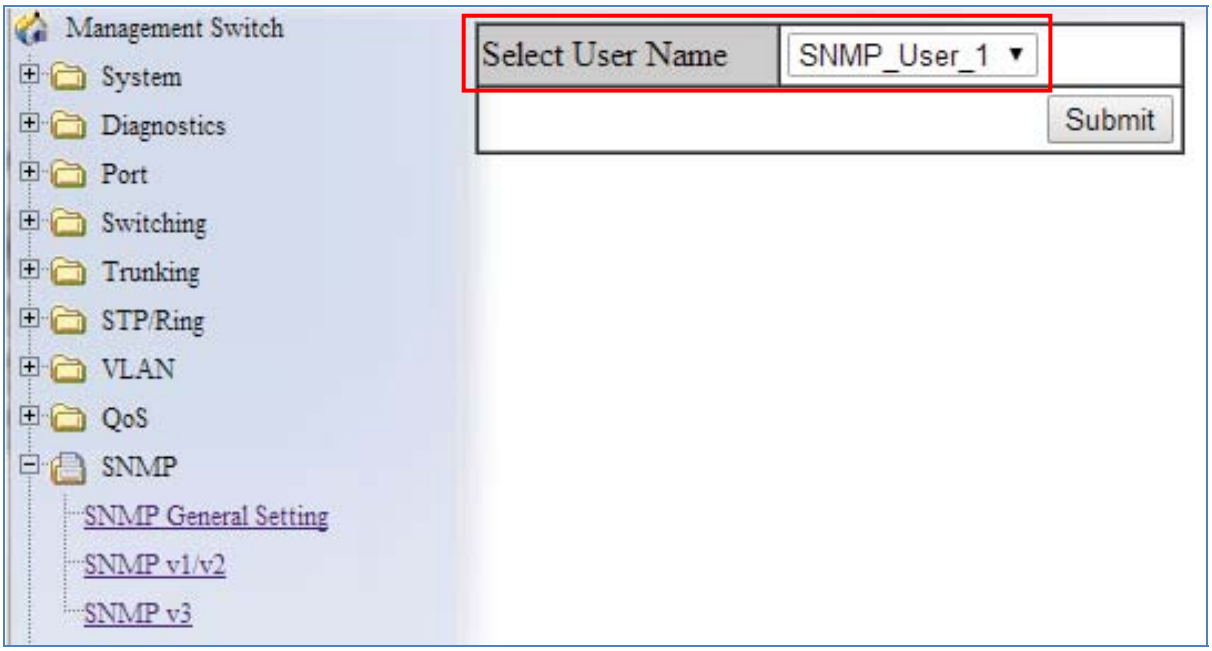


Figure 86: Select User

SNMP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Enabling SNMP and configuring general settings

To enable the SNMP feature of the switch, and configure its general settings (Description, Location, and Contact information), you must use the below CLI commands. (for more information on CLI command usage and typographic conventions please click here):

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
snmp-server enable
snmp-server description ***<1 -256 characters>***
snmp-server location ***<1 -256 characters>***
snmp-server contact ***<1 -256 characters>***

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)# snmp-server enable
switch_a(config)# snmp-server description Hub_Switch_1
switch_a(config)# snmp-server location First_Floor_Closet
switch_a(config)# snmp-server contact Administrator
switch_a(config)#q
switch_a#
```

Configuring SNMP Traps

To configure the Trap features of the SNMP protocol on the switch, you use the following CLI commands:

CLI Command Mode:
General Configuration Mode
Interface Configuration Mode

CLI Command Syntax:
snmp-server trap-community 1 *<1 -256 characters >*
snmp-server trap-community 2 *<1 -256 characters >*
snmp-server trap-community 3 *<1 -256 characters >*
snmp-server trap-community 4 *<1 -256 characters >*
snmp-server trap-community 5 *<1 -256 characters >*
snmp-server trap-ipaddress 1 *<IP Address>*
snmp-server trap-ipaddress 2 *<IP Address>*
snmp-server trap-ipaddress 3 *<IP Address>*
snmp-server trap-ipaddress 4 *<IP Address>*
snmp-server trap-ipaddress 5 *<IP Address>*
snmp-server trap-type enable linkDown
snmp-server trap-type enable linkup
snmp-server trap-type enable mac-notification
snmp-server mac-notification interval *<1 to 65535 seconds>*
snmp-server mac-notification history-size *<1 to 500 entries>*
snmp-server trap mac-notification added
snmp-server trap mac-notification removed

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)# snmp-server trap-community 1 Trap_Group_1
switch_a(config)# snmp-server trap-community 2 Trap_Group_2
switch_a(config)# snmp-server trap-community 3 Trap_Group_3
switch_a(config)# snmp-server trap-community 4 Trap_Group_4
switch_a(config)# snmp-server trap-community 5 Trap_Group_5
switch_a(config)# snmp-server trap-ipaddress 1 192.168.1.100
switch_a(config)# snmp-server trap-ipaddress 2 192.168.2.100
switch_a(config)# snmp-server trap-ipaddress 3 192.168.3.100
switch_a(config)# snmp-server trap-ipaddress 4 192.168.4.100
switch_a(config)# snmp-server trap-ipaddress 5 192.168.5.100
switch_a(config)# snmp-server trap-type enable linkDown
switch_a(config)# snmp-server trap-type enable linkup
switch_a(config)# snmp-server trap-type enable mac-notification
switch_a(config)# snmp-server mac-notification interval 60
switch_a(config)# snmp-server mac-notification history-size 100
switch_a(config)#interface fe1
switch_a(config-if)#snmp-server trap mac-notification added
switch_a(config-if)#snmp-server trap mac-notification removed
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

Configuring SNMP v1 & v2 Community Groups

To configure the SNMP v1 & v2 community groups to make the SNMP feature more secure, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
snmp-server enable
snmp-server community get *<1 -256 characters>*
snmp-server community set *<1 -256 characters>*

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)# snmp-server community get public
switch_a(config)# snmp-server community set private
switch_a(config)#q
switch_a#
```

Adding SNMP v3 Users

To add SNMP v3 Users to the switch and maximize the security for the SNMP feature, you must use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
snmp-server v3-user <username> <ro|rw> noauth
snmp-server v3-user <username> <ro|rw> auth <md5|sha> <password>
snmp-server v3-user <username> <ro|rw> priv <md5|sha> <password> des <pass_phrase>

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)# snmp-server v3-user SNMP_User_1 ro noauth
switch_a(config)# snmp-server v3-user SNMP_User_2 ro auth md5 User2
switch_a(config)# snmp-server v3-user SNMP_User_3 rw priv md5 User3
des Private_User
```

```
switch_a(config)#q
switch_a#
```

IEEE 802.1X

EtherWAN switches support the IEEE 802.1X protocol to provide port based security on a switch port against unauthorized access. In order for this protocol to work, two additional components are required; an EAP (Extensible Authentication Protocol) compatible RADIUS server to authenticate a client station that is trying to gain access to the network through a port on the switch, and an 802.1X client software (known as the “Supplicant” software) used on the end device to communicate with the RADIUS server for the purposes of authenticating the end device that is trying to gain access to the network through the switch port.

When an end device is initially connected to a port on the EtherWAN switch where the 802.1X protocol is enabled on the port, the switch will only pass 802.1X authentication traffic (known as EAPOL traffic) on that port between the Supplicant on the end device and the RADIUS server, and will not allow any other traffic to pass. After the initial connection, the EtherWAN switch will request authentication credentials from the Supplicant in the end device that has just connected to the port. After the switch receives the proper authentication credentials from the Supplicant in the end device, the switch will sent the credentials to the EAP compatible RADIUS server that’s configured in the switch for the purpose of authenticating the end device. If the end device is successfully authenticated by the RADIUS server, the RADIUS server will sent an “Access-Accept” message to the switch; at this point the EtherWAN switch will inform the Supplicant in the end device of the successful authentication and open up the port for all network traffic to pass.

Configuring 802.1X from the GUI system

To navigate to the **802.1X / Radius Configuration** page:

1. Click on the **+** next to **802.1X**
2. Click on **Radius Configuration**

Enabling Radius

By default, the 802.1X function is globally disabled on the EtherWAN switch. If you want to use the 802.1X port based security on a port, you must enable it globally on the switch first, and then enable it on a per port basis.

To enable the 802.1X function globally on the switch:

1. Choose **enable** from the drop down list next to **Radius Status**
2. Click on the **Update Setting** button. (See Figure 87)

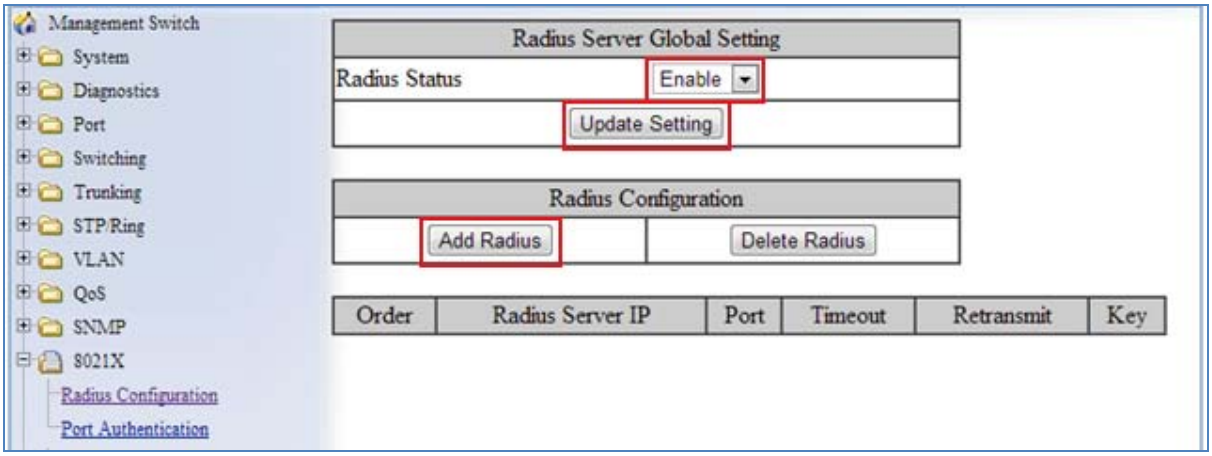


Figure 87: Enable Radius

Adding a Radius Server

Next, you will need to configure the settings that the switch will need in order to connect to a RADIUS server.

1. Click on the **Add Radius** button (see 如上).
2. Next, enter the IP address of the RADIUS server that the switch will use in order to authenticate in the text entry box next to **Radius Server IP** (see Figure 88).
3. Enter the password for RADIUS server in the text entry box next to **Secret Key**.
4. Optionally, the UDP port number for the RADIUS server (if it is different from the standard default 1812) can be changed. To do this, enter the port number in the text entry box next to **Radius Server Port**.
5. Next, you can choose to configure the minimum time that the switch must wait, before it is allowed to retransmit a message to the RADIUS server due to no response. To do this, enter the number of seconds that the switch must wait (between 1 and 1000 seconds) into the text entry box next to **Timeout <1-1000>** .

6. Next, you can choose to configure the maximum number of times that the switch can attempt to retransmit a message to the RADIUS server. To do this, please enter a number (from 1 to 100) into the text entry box next to **Retransmit**.

7. Click on the **Submit** button.

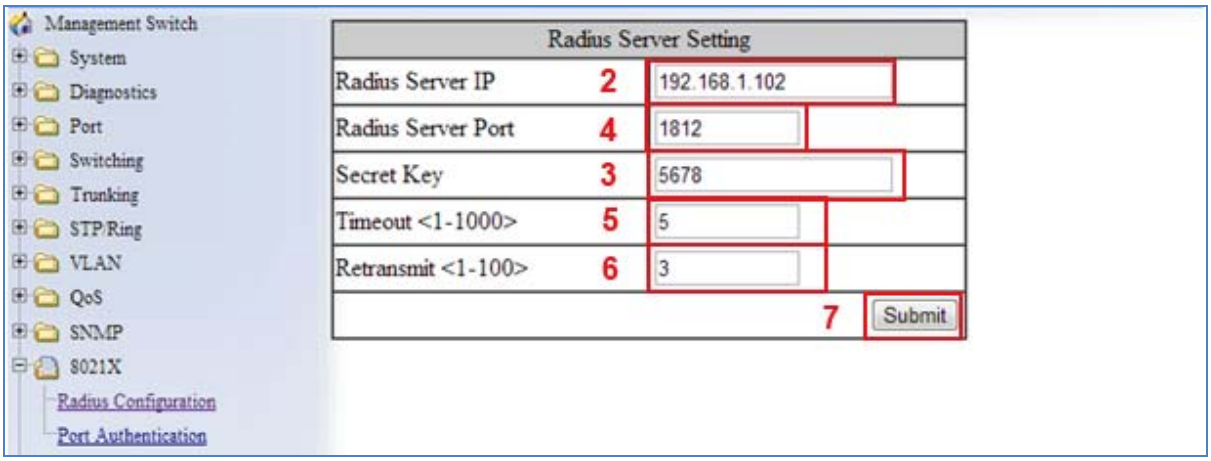


Figure 88: Radius Setup

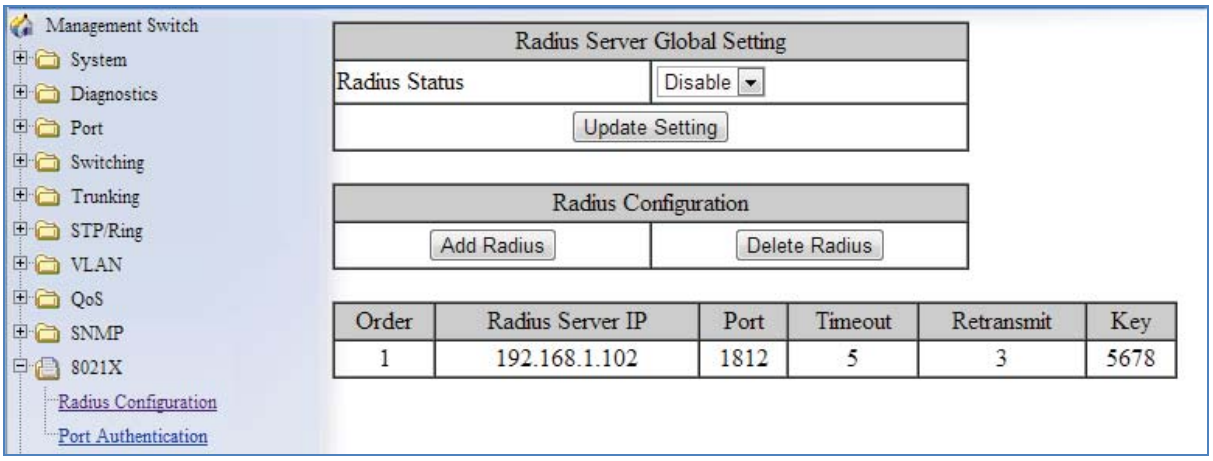


Figure 89: Resulting Radius Server Setup

Enabling 802.1X on a Port

After the 802.1X port based security is enabled globally, you must enable it locally on the port.

To navigate to the **802.1X / Port Authentication** page:

1. Click on the **+** next to **802.1X**

2. Click on **Port Authentication**

To enable 802.1X on a port (see Figure 90):

1. Choose the desired port from the drop-down list next to **Interface**, to have the 802.1X feature applied to that port.
2. Next, make sure **Enabled** is selected from the drop-down list next to **Authentication State**, this will enable the 802.1X function on the previously selected port.
3. Next, make sure that the choice **Auto** is selected in the drop-down list next to **Port Control**; this will allow the port to use 802.1X to authentic the end station.
    a. If you choose to have the port to be always unauthorized or to be always authorized, you can choose the appropriate choice in the drop-down list.
4. Next, you can choose to have the end station to be re-authenticated periodically. To do this, choose **Enabled** in the drop-down list next to **Periodic Re-authentication**.
5. After you have enabled periodic re-authentication, you must also configure the time period interval for the re-authentication of the end station. To do this, enter the number of seconds (1-4294967295), in to the text entry box next to **Re-authentication Period**.
6. Next, **Update Setting** button in order to activate all the configured settings (see the below screenshot)

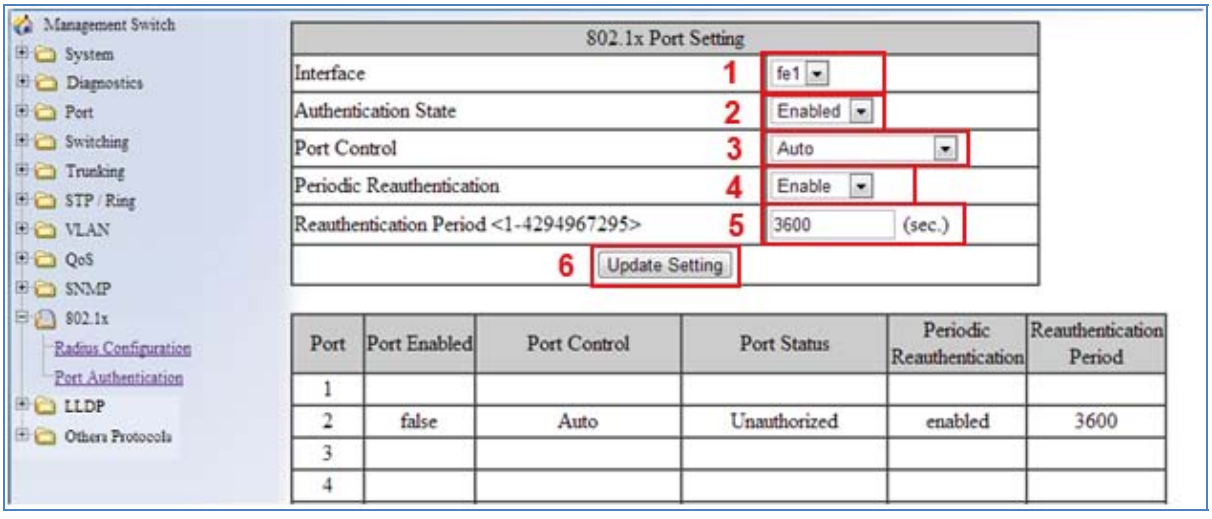


Figure 90: Enabling 802.1X on a Port

LLDP

LLDP is a network discovery protocol that defines a method for network access devices using Ethernet connectivity to advertise information about devices to peer devices on the same physical LAN and store information about the network. It allows a device to learn higher layer management reachability and connection endpoint information from adjacent devices.

Using LLDP, a device is able to advertise its own identification information, its capabilities and media-specific configuration information, as well as learn the same information from the devices connected to it. LLDP advertises this information over Logical Link-Layer Control frames and the information received from other agents in IEEE-defined Management Information Bases (MIB) modules.

LLDP significantly aids in the deployment of any network device that supports the protocol. As a media independent protocol intended to be run on all IEEE 802 devices, LLDP may be used to discover routers, bridges, repeaters, WLAN APs, IP telephones, network camera or any LLDP-enabled device, regardless of manufacturer. Since LLDP runs over the data-link layer only, a switch running one network layer protocol can discover and learn about an access device running a different network layer protocol.

LLDP General Settings

To navigate to the **LLDP General Settings** page:

1. Click on the **+** next to **LLDP**.
2. Click on **General Settings.**

Enable/Disable LLDP

To enable LLDP on the EX24000 Switch:

1. Select Enable or Disable from the Drop Down box in the **LLDP** field of the LLDP Transmit Settings box (see Figure 91)
2. Click on the **Update Settings** button.
3. Save the configuration (see the Save Configuration Page)

Holdtime Multiplier

The Holdtime multiplier for transmit TTL is used to compute the actual time-to-live (TTL) value used in an LLDP frame. The TTL value is the length of time the receiving device should maintain the information in its MIB. To compute the TTL value, the system multiplies the LLDP transmit (TX) interval by the holdtime multiplier. For example, if the LLDP transmit (TX) interval is 30 and the holdtime multiplier for TTL is 4, then the value 120 is encoded in the TTL field in the LLDP header.

To adjust the Holdtime multiplier:

1. Enter a numeric value between 2 and 10 (default is 4) in the Holdtime Multiplier text box.
2. Click on the **Update Settings** button.

The TX Interval setting adjusts the time that LLDP information is transmitted by the switch. Values can range from 5 to 32768 seconds (default is 30 seconds).

To adjust the TX Interval setting (see Figure 91):

1. Enter a numeric value between 5 and 32768 (default is 30) in the TX Interval text box.
2. Click on the **Update Settings** button.
3. Save the configuration (see the Save Configuration Page)

Global TLV Setting

The global TLV (Time – Length – Value) settings are advertised by the switch to other LLDP devices. The TLVs supported by the EX24000 are (see Figure 91):

- Port Description
- System Name
- System Description
- System Capabilities
- Management Address
- Port VLAN ID
- MAC/PHY Configuration/Status
- Port And Protocol VLAN ID
- VLAN Name
- Protocol Identity
- Power Via MDI
- Link Aggregation
- Maximum Frame Size

To enable specific TLVs for the EX24000:

1. Select the check box for each TLV that is to be enabled or select the checkbox for the **All** option which will enable all TLVs for the switch.
2. Click on the **Update Settings** button.
3. Save the configuration (see the Save Configuration Page)

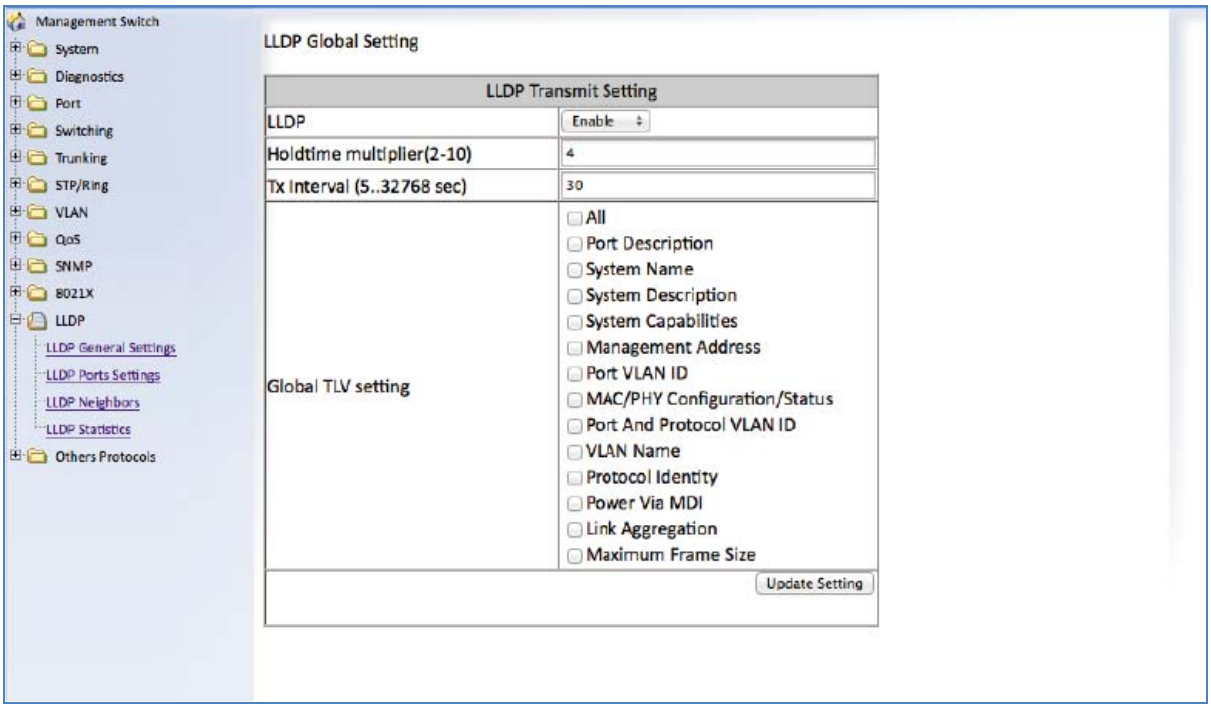


Figure 91: LLDP Global Settings

LLDP Ports Settings

LLDP Ports Settings allows the individual ports on the switch to be configured for LLDP independently of one another. Each port can be configured to transmit LLDP information, receive LLDP information, and notify (via SNMP or Syslog) if there are changes in the LLDP information received from neighboring devices.

To navigate to the **LLDP Port Settings** page:

1. Click on the **+** next to **LLDP**.
4. Click on **LLDP Ports Settings** (see Figure 92)

Enabling LLDP transmission for a specific Port

To enable the transmission of LLDP information for a specific port:

1. Select Enable from the Drop Down box under the Transmit field for each port for which the transmission of LLDP information should be enabled.
2. Click on the **Submit** button.

Enabling LLDP Reception for a specific Port

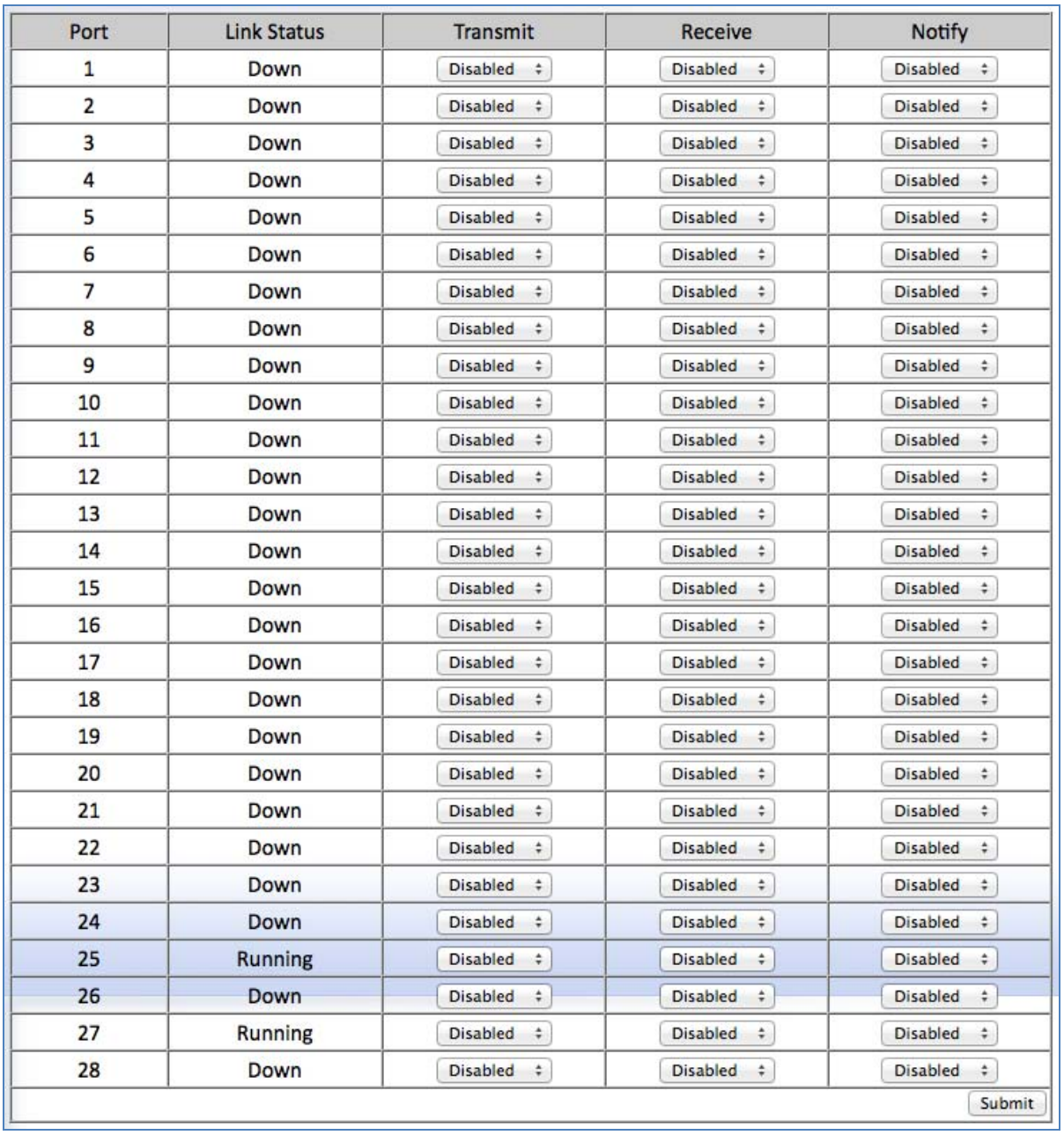
To enable the reception of LLDP information for a specific port:

1. Select Enable from the Drop Down box under the Receive field for each port for which the reception of LLDP information should be enabled.
2. Click on the **Submit** button.

Enabling Notifications

To enable notification whenever a port receives changed LLDP information:

1. Select Enable from the Drop Down box under the Notify field for each port that should send a notification whenever received LLDP information changes.
2. Click on the **Submit** button
3. Save the configuration (see the Save Configuration Page) after making changes shown on this page.



Port	Link Status	Transmit	Receive	Notify
1	Down	Disabled	Disabled	Disabled
2	Down	Disabled	Disabled	Disabled
3	Down	Disabled	Disabled	Disabled
4	Down	Disabled	Disabled	Disabled
5	Down	Disabled	Disabled	Disabled
6	Down	Disabled	Disabled	Disabled
7	Down	Disabled	Disabled	Disabled
8	Down	Disabled	Disabled	Disabled
9	Down	Disabled	Disabled	Disabled
10	Down	Disabled	Disabled	Disabled
11	Down	Disabled	Disabled	Disabled
12	Down	Disabled	Disabled	Disabled
13	Down	Disabled	Disabled	Disabled
14	Down	Disabled	Disabled	Disabled
15	Down	Disabled	Disabled	Disabled
16	Down	Disabled	Disabled	Disabled
17	Down	Disabled	Disabled	Disabled
18	Down	Disabled	Disabled	Disabled
19	Down	Disabled	Disabled	Disabled
20	Down	Disabled	Disabled	Disabled
21	Down	Disabled	Disabled	Disabled
22	Down	Disabled	Disabled	Disabled
23	Down	Disabled	Disabled	Disabled
24	Down	Disabled	Disabled	Disabled
25	Running	Disabled	Disabled	Disabled
26	Down	Disabled	Disabled	Disabled
27	Running	Disabled	Disabled	Disabled
28	Down	Disabled	Disabled	Disabled

Submit

Figure 92: LLDP Ports Settings

LLDP Neighbors

LLDP Neighbors is a read-only page (see Figure 93) that will display all the LLDP capable devices detected by the switch. The following information about connected LLDP-enabled devices is displayed in a tabular format. The columns displayed are:

- **Port** – The local switch port to which the remote device is connected.
- **Chassis ID** – The MAC address of the remote device.
- **Port ID** – The port number of the remote device.
- **IP Address** – The management IP address of the remote device.
- **TTL** – Time to Live, the amount time remaining before the remote device's LLDP is aged-out from the switch.

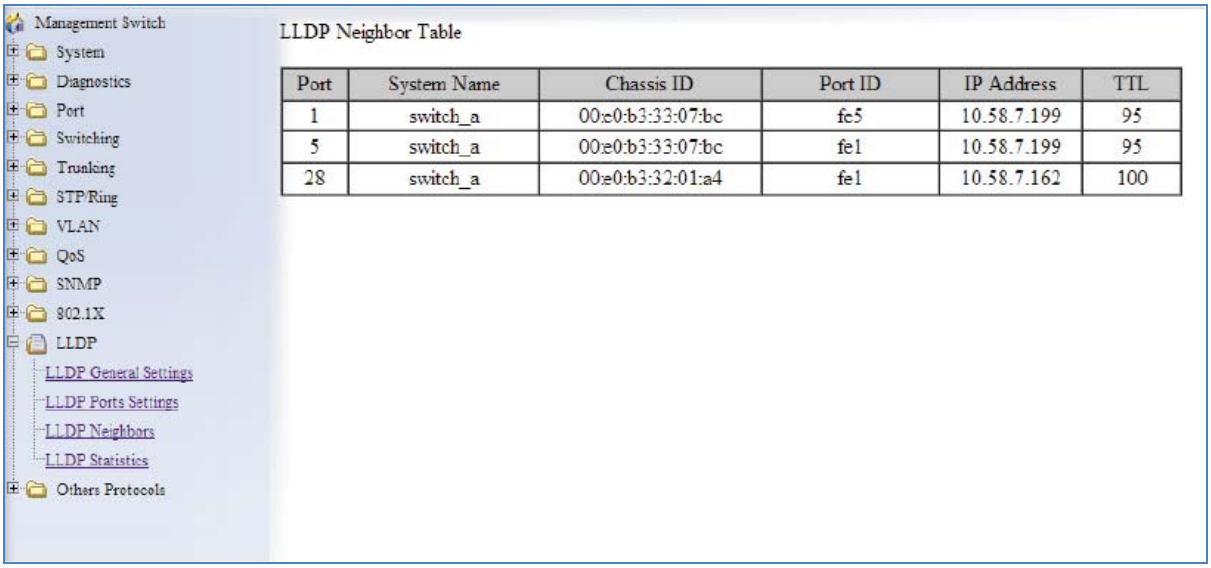


Figure 93: LLDP Neighbors

LLDP Statistics

This is a read-only page (see Figure 94) that displays LLDP device statistics and LLDP statistics on a per-port basis. The information collected on this page includes:

- Port – switch port number.
- TX Total – Total LLDP packets sent.
- RX Total – Total LLDP packets received.
- Discards – Number of LLDP packets discarded.
- Errors – LLDP errors.
- Ageout – LLDP information that has been aged out by the switch.
- TLV Discards – TLV information discarded
- TLV Unknown – TLV information that is unknown

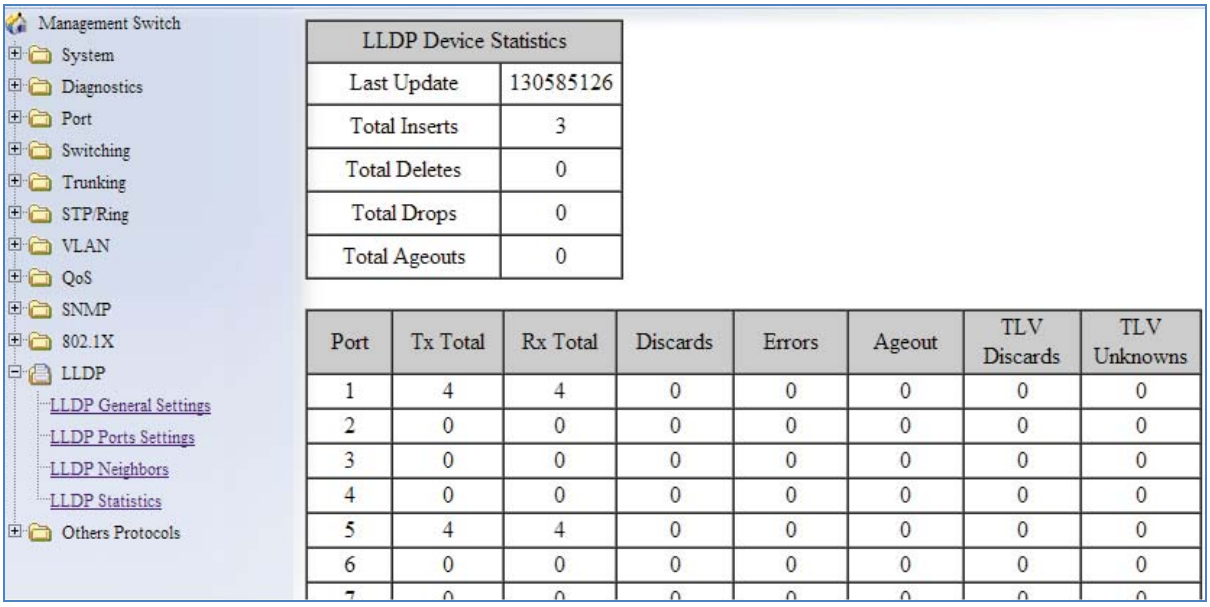


Figure 94: LLDP Statistics

LLDP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

Enable/Disable LLDP

To enable or disable LLDP on the EX24000 switch use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
lldp enable
no lldp enable

Usage Example – Enabling LLDP:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#lldp enable
switch_a(config)#q
switch_a#
```

Usage Example – Disabling LLDP:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#no lldp enable
switch_a(config)#q
switch_a#
```

LLDP Holdtime Multiplier

To modify LLDP holdtime multiplier use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **lldp holdtime multiplier <*1-10*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#lldp holdtime multiplier 4
switch_a(config)#q
switch_a#
```

LLDP Transmit Interval

To modify LLDP Transmit Interval use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **lldp txinterval <*5-32768*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# lldp txinterval 30
switch_a(config)#q
switch_a#
```

Enable/Disable Global LLDP TLVs

To enable or disable global LLDP TLVs use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **lldp tlv-global <*TLV*>**

TLV Parameters

TLV Parameters	Description
port-descr	Port Description
sys-name	System Name TLV
sys-descr	System Description TLV
sys-cap	System Capabilities
mgmt-addrs	Management Address
port-vlan-id	Port VLAN ID
mac-phy	MAC/PHY Configuration/Status
port-and-protocol	Port And Protocol VLAN ID
vlan-name	VLAN Name
protocol-identity	Protocol Identity
link-aggregation	(Link Aggregation
max-frame	Maximum Frame Size

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# lldp tlv-global mgmt-addrs
switch_a(config)#q
switch_a#
```

Enabling LLDP Transmit on a Port

To enable LLDP Transmit for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lldp tx-pkt**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# lldp tx-pkt
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling LLDP Receive on a Port

To enable LLDP Receive for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lldp rcv-pkt**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# lldp rcv-pkt
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling LLDP Notify

To enable LLDP Notify for a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lldp notification**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# lldp notification
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling Transmission of the Management IP

To enable the transmission of the management IP address through a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lldp mgmt-ip vlan <*vlan id*>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# lldp mgmt-ip vlan 1
switch_a(config)#q
switch_a(config)#q
switch_a#
```

Enabling Specific TLV's on a Port

To enable specific TLVs on a port use the CLI commands below:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **lldp tlv-select <TLV ID>** (see TLV Parameters on page 188)

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a#interface fe1
switch_a(config)# lldp tlv-select mgmt-addrs
switch_a(config)#q
switch_a(config)#q
switch_a#
```

OTHER PROTOCOLS

GVRP

Defined in IEEE 802.1Q, GVRP is a protocol used to dynamically create VLANs on a switch. Any IEEE 802.1Q compliant switch must implement this protocol.

To navigate to the **Other Protocols / GVRP** page (see Figure 95):

1. Click on the **+** next to **Other Protocols**.
2. Click on **GVRP**.

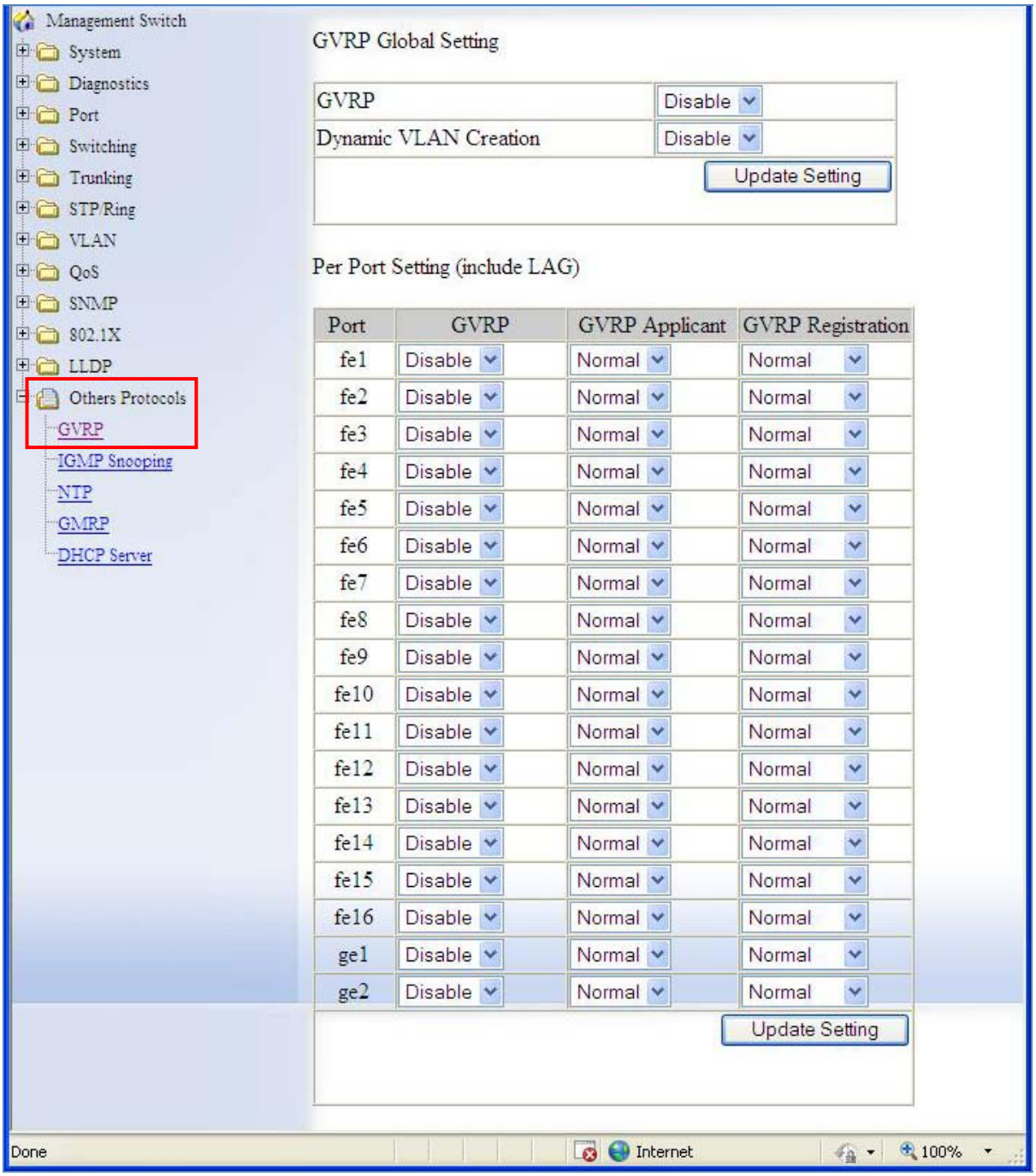


Figure 95: GVRP

General Overview

To enable the GVRP protocol on your network, you must make sure that the switches in your network are configured with the minimum requirements for each type of switches listed below:

For the **Access Switches** at the edge of the network, below are the minimum requirements:

- All of the user VLANs have been created in the VLAN Database.
- The IP address for the Management VLAN has been configured.
- The appropriate Port Type (Access or Trunk) and the PVID have been configured for all the ports of the switch.
- All the member Trunk ports for all the user VLANs have been configured.
- The GVRP protocol has been globally enabled, and GVRP is locally enabled on the Trunk Ports as well.

For the **Distribution Switches** in the core of the network, below are the minimum requirements:

- The Management VLAN has been created in the VLAN Database.
- The IP address for the Management VLAN has been configured.
- The appropriate Port Type (Access or Trunk) and the PVID have been configured for all the ports of the switch.
- The GVRP protocol has been globally enabled and GVRP is locally enabled on the Trunk Ports as well.
- The Dynamic VLAN Creation feature has been enabled.

Enabling the GVRP Protocol at the Global Level

To enable the GVRP protocol globally on a distribution switch (see Figure 96):

1. Under **GVRP Global Setting**, choose the **Enable** option from the drop-down list next to **GVRP**.
2. Choose the **Enable** option from the drop-down list next to **Dynamic VLAN Creation**.
3. Click on the **Update Setting** button.

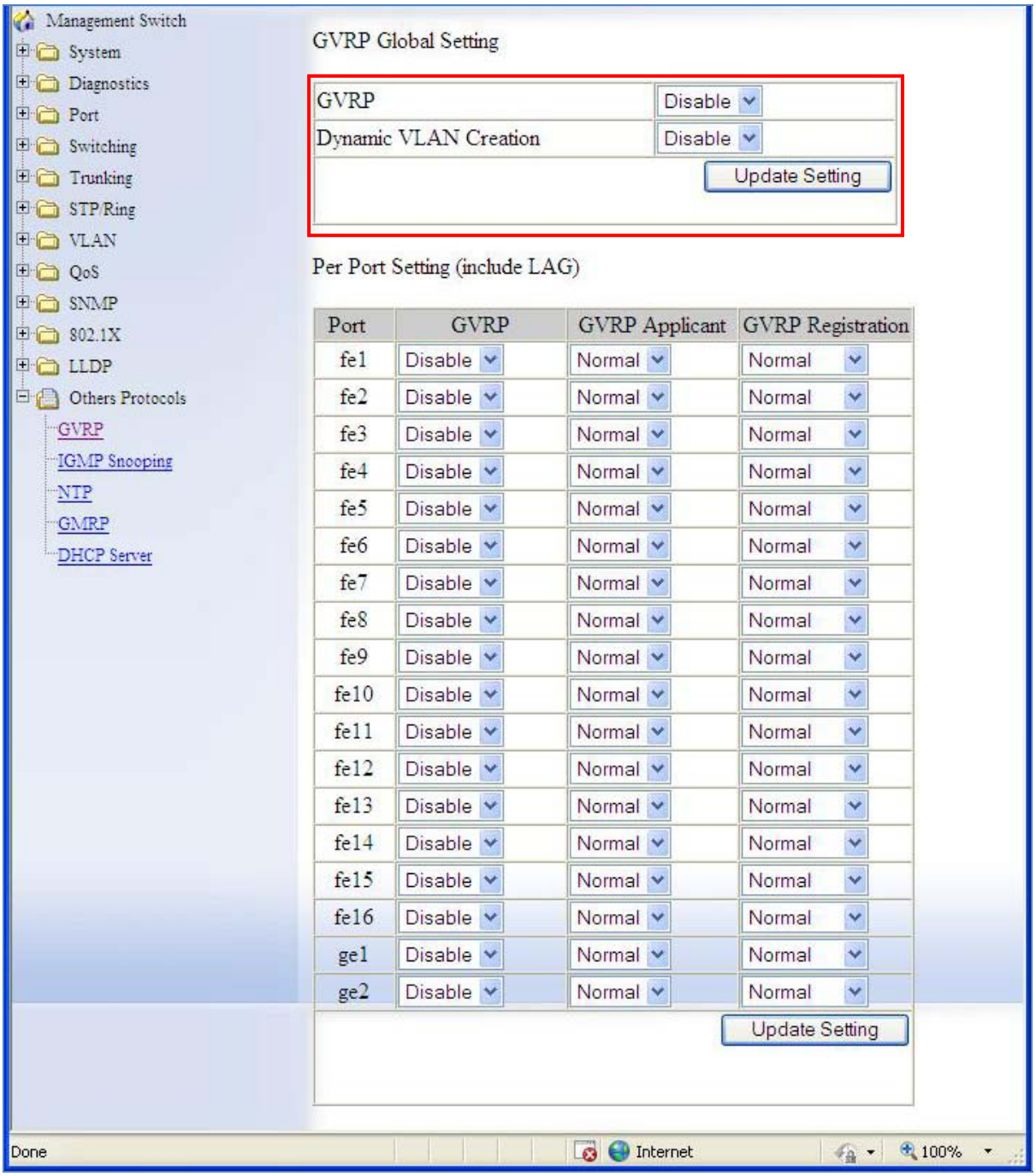


Figure 96: GVRP Configuration Distribution Switch

To enable the GVRP protocol globally on an **Access Switch** (see Figure 97):

1. Under **GVRP Global Setting**, choose the **Enable** option from the drop-down list next to **GVRP**.
2. Click on the **Update Setting** button.

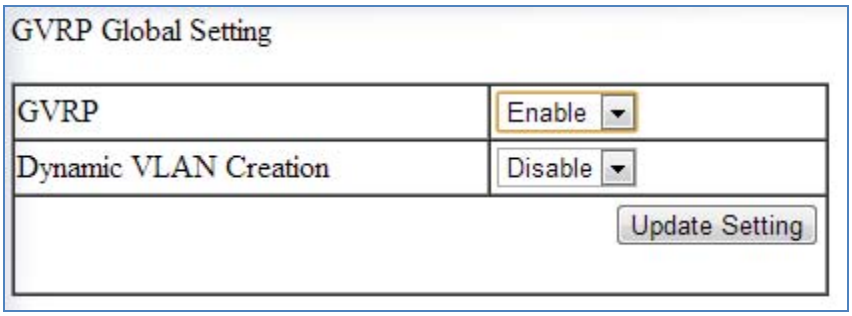


Figure 97: GVRP Configuration Access Switch

Enabling the GVRP Protocol at the Port Level

To navigate to the **Other Protocols / GVRP** page (see Figure 95):

1. Click on the **+** next to **Other Protocols**.
2. Click on **GVRP**.

To enable the GVRP protocol locally at the port level, for both the Access switch and the Distribution switch, apply the following procedures to all the Trunk Ports of the switch:

1. For all the Trunk Ports under the **Per Port Setting (include LAG)** section, choose the **Enable** option from the drop-down list under the **GVRP** column.
2. For all the Trunk Ports under the **Per Port Setting (include LAG)** section, choose the **Active** or **Normal** option from the drop-down list under the **GVRP Applicant** column.
    - **Active** - Use this option if you want to run the GVRP protocol on that Trunk Port even if it is blocked by the STP protocol.
    - **Normal** – Use this option if you do not wish to run the GVRP protocol on a Trunk Port when it is being blocked by the STP protocol.
3. For all the Trunk Ports under the **Per Port Setting (include LAG)** section, choose the **Enable** option from the drop-down list under the **GVRP Registration** column.
4. Click on the **Update Setting** button.
5. Save the configuration (see the Save Configuration Page)

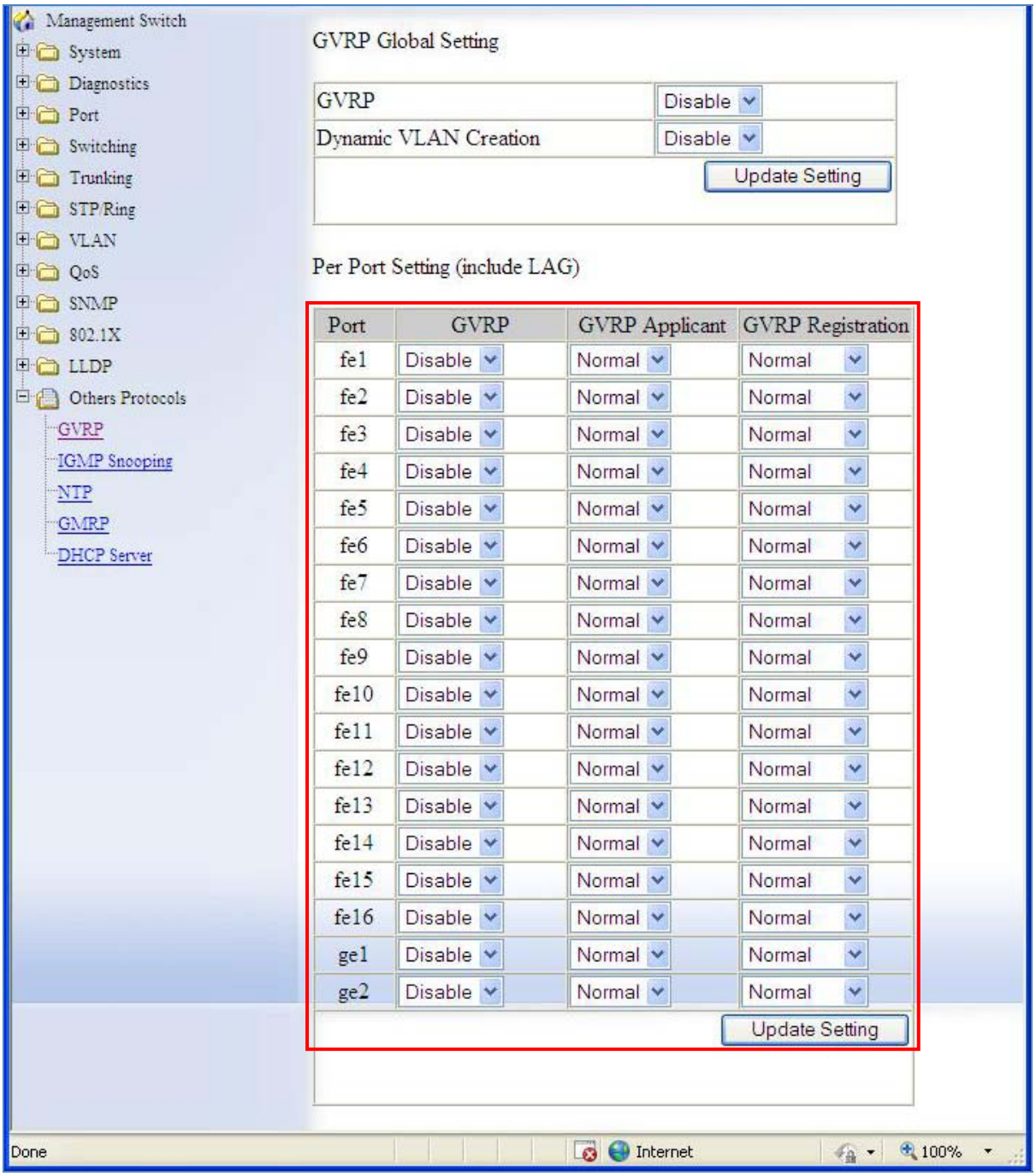


Figure 98: GVRP Per Port Settings

GVRP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

To enable or disable GVRP globally on the EtherWAN switch, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gvrp enable bridge 1
set gvrp disable bridge 1

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set gvrp enable bridge 1
switch_a(config)# set gvrp disable bridge 1
switch_a(config)#q
switch_a#
```

To enable the dynamic VLAN creation feature of GVRP on the EtherWAN switch, you must use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **set gvrp dynamic-vlan-creation disable bridge 1**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set gvrp dynamic-vlan-creation disable bridge 1
switch_a(config)#q
switch_a#
```

To enable or disable GVRP locally on a port on the EtherWAN switch, you must use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set port gvrp enable <port id>
set port gvrp disable <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set port gvrp enable fe1
switch_a(config)# set port gvrp disable fe1
switch_a(config)#q
switch_a#
```

By default, when GVRP is enabled on a port the **Applicant** runs in Normal mode, which means that the GVRP protocol will not send out any PDUs from a port if the port is being blocked by STP. When you enable the GVRP Applicant to run in Active mode on a port, the GVRP protocol will continue to send PDUs from a port even if the port is being blocked by STP.

The GVRP **Applicant** can be set to run in Normal or Active mode on a port by issuing the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gvrp applicant state normal <port id>
set gvrp applicant state active <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set gvrp applicant state normal fe1
switch_a(config)# set gvrp applicant state active fe1
switch_a(config)#q
switch_a#
```

When you enable GVRP on a port, the **Registrar** is enabled on the port by default. You can enable or disable the GVRP **Registrar** on a port by issuing the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gvrp registration normal <port id>
set gvrp registration forbidden <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set gvrp registration normal fe1
switch_a(config)# set gvrp registration forbidden fe1
switch_a(config)#q
switch_a#
```

IGMP Snooping

The settings in the IGMP Snooping feature of the EtherWAN switch controls how the switch forwards multicast packets.

General Overview

The EX24000 Switch has been outfitted with the IGMP Snooping function in three modes:

- **Disabled:**
    - The switch will forward all multicast packets according to the **Forced Forwarding Port** setting based on the following rule:
        - All multicast packets will be forwarded to only the port specified by either the **PassiveForwardMode** or the **ForcedForwardMode** function.
- **Passive mode:**
    - The switch will forward any multicast packets that have known receivers to the known multicast receiver ports only.
    - The switch will forward any unknown multicast packets (multicast packets without any known receivers) according to the **Forced Forwarding Port** setting based on the following rule:
        - When there is no Querier Port (a port that receives IGMP queries) present all unknown multicast packets will be forwarded to the port specified by either the **PassiveForwardMode** function or the **ForcedForwardMode** function.
        - When there is a Querier port present, the switch will forward all unknown multicast packets to the Querier port. In addition, all unknown multicast packets will be forwarded to the port specified by the **ForcedForwardMode** function as well.
- **Querier mode:**
    - The switch will forward any multicast packets that have known receivers to the known multicast receiver ports only.
    - The switch will forward any unknown multicast packets according to the **Forced Forwarding Port** setting based on the following rule:
        - All unknown multicast packets will be sent to only the port specified by the **ForcedForwardMode** function.

- The switch will also transmit IGMP Queries to the specified VLAN and according to the specified IGMP Query parameters.

Enabling the IGMP Snooping Modes

To navigate to the **IGMP Snooping** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.

To put the IGMP Snooping feature in the correct Mode, follow the steps below:

- Choose the appropriate choice from the dropdown list next to **IGMP mode**
- Click on the **Update Setting** button (See 如下)

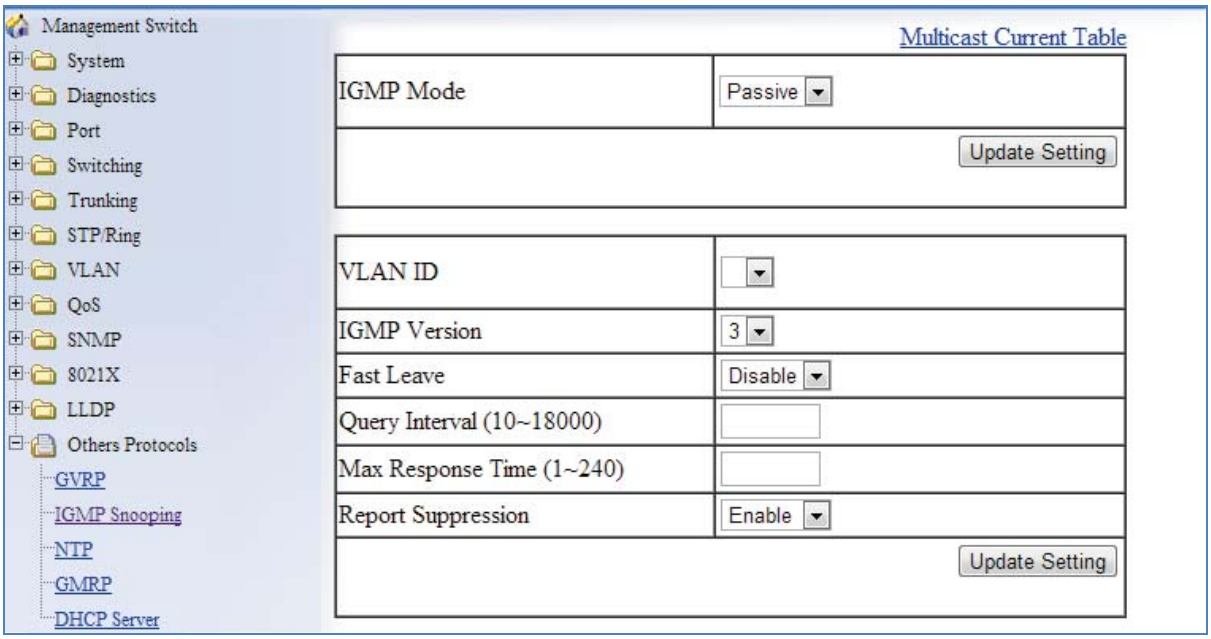


Figure 99: IGMP Mode

Configuring IGMP Snooping General properties

To navigate to the **IGMP Snooping** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.

To configure the general features for IGMP Snooping in either the **Passive** or **Querier** mode, follow the steps below (see Figure 100):

1. From the dropdown list next to **VLAN ID**, choose the VLAN that you want the IGMP Snooping process to run on.
2. From the dropdown list next to **IGMP Version**, choose the correct IGMP version to be run on this VLAN. This setting must match the IGMP version being used by the IGMP querier and the IGMP client on the network.
3. Choosing the appropriate choice (Enable or Disable) from the dropdown list next to **Fast Leave**.
    - If this feature is enabled on the switch, and the switch receives a request to leave a multicast stream on a port, then the switch will drop this multicast stream on that port without checking to see if there are any other multicast clients on that port that might still be interested in receiving this multicast stream. This allows the multicast stream to disappear from a port much faster.
1. Next, click on the **Update Setting** button

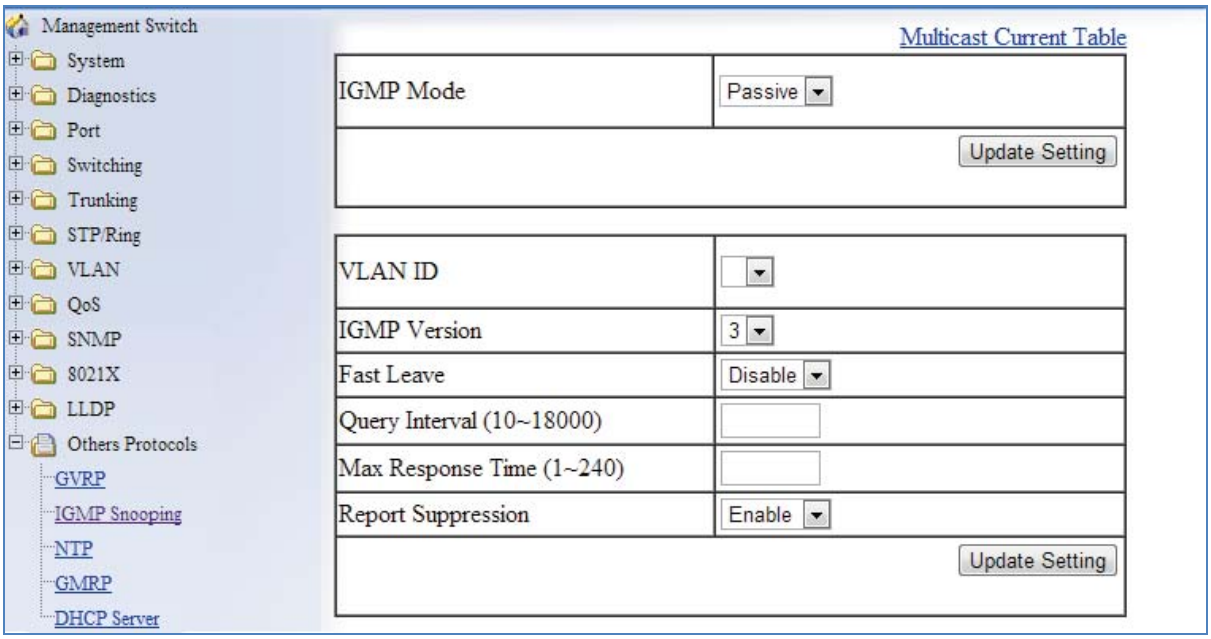


Figure 100: IGMP General Properties

Configuring IGMP Passive Mode Specific properties

To navigate to the **IGMP Snooping** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.

To configure specific properties for IGMP Passive Mode, please follow the steps below.

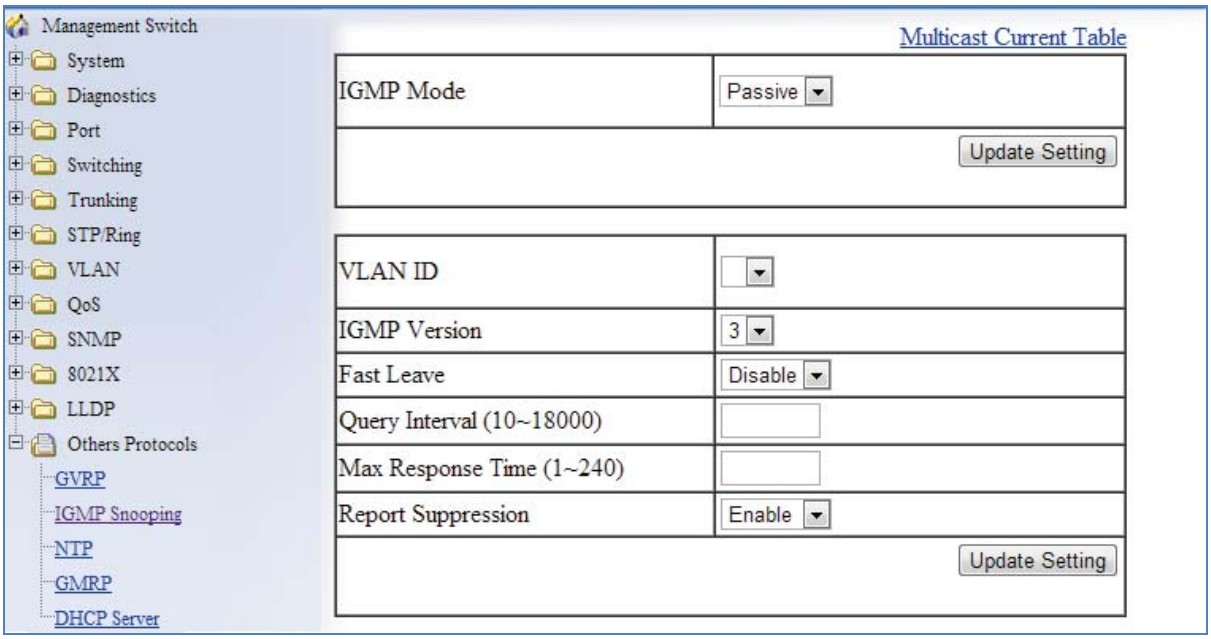


Figure 101: IGMP Passive Mode

1. From the dropdown list next to **VLAN ID**, choose the VLAN for which you wish to configure the Report Suppression feature.
2. Choose **Enable** or **Disable** in the dropdown list next to **Report Suppression**. (Note: if the switch is not in **Passive** mode, then this feature will have no effect.)

Note: If you are using IGMP version 1 or 2, the **Query Interval**, and the **Max Response Time** setting must be configured even if you are not configuring IGMP Querier mode. For IGMP version 1 and 2, the membership registration timer (used to time out the membership status on each port) is based on these two parameters on the local switch. These two parameters should configure to match that of the current active IGMP Querier. The formula for the membership registration timer is: 2 X query-interval + max-response-time = Timeout period.

Configuring IGMP Querier Mode Specific properties

To navigate to the **IGMP Snooping** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.

To configure specific properties for IGMP Querier Mode, follow the steps below (see Figure 102):

1. In the text box next to **Query Interval,** enter a value between 10 and 18000
    - This value will represent the time interval, in seconds, between any two queries that the switch scents on to the network. It is recommended that you use the default setting of 125 seconds that are according to the IGMP standard.
2. In the text box next to **Max Response Time**, enter a value between 1 and 240.
    - This value represents the maximum time in seconds that a multicast client will have to respond to an IGMP query. Any response received after this time will not be accepted by the Querier. It is recommended that you use the default setting of 10 seconds according to the IGMP standard.

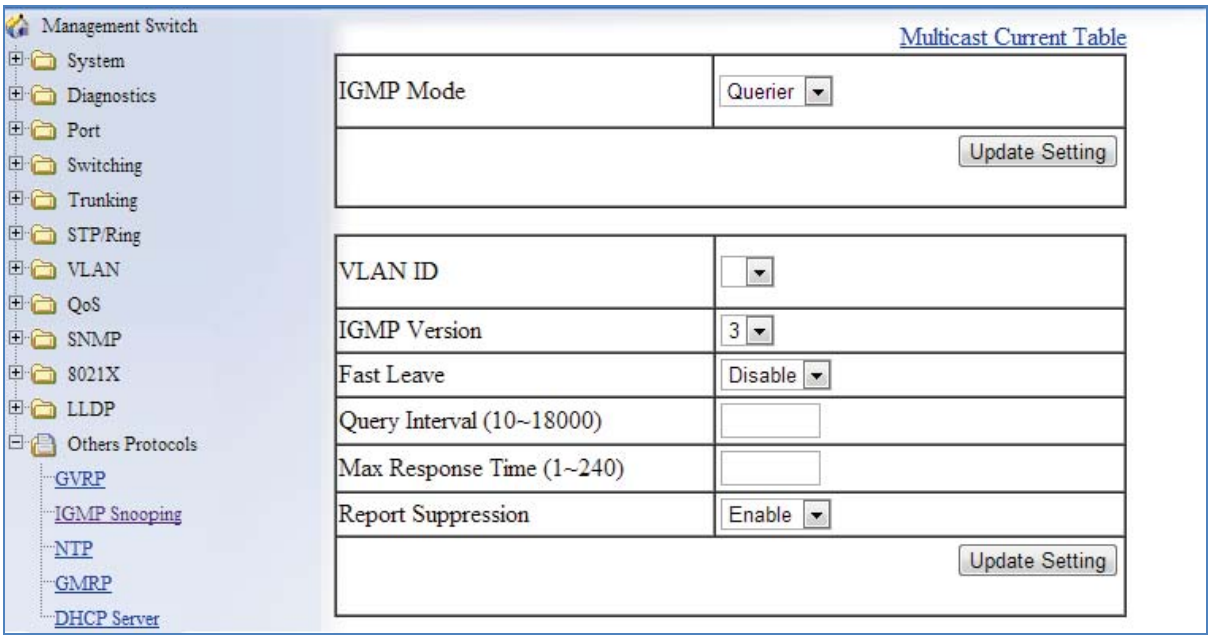


Figure 102: Querier Mode Properties

Configuring IGMP Unknown Multicast Forwarding

To navigate to the **IGMP Snooping** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.

With IGMP enabled, the EtherWAN switch will transmit all multicast packets to their only multicast receiver ports. However, some multicast packets will not have any known multicast receiver ports either due to IGMP Snooping being disabled on the switch, or because no multicast receiver has sent IGMP requests for these multicast packets. The multicast packets in these scenarios are referred to as **unknown multicast packets**. You can use the **Passive Mode Forwarding Port** section of the IGMP Snooping configuration page to control how the switch will forward these unknown multicast packets under different IGMP Snooping modes of the switch (see Figure 103).

Disabled Mode Forwarding Port Configuration

When IGMP is in Disabled Mode, all multicast packets are unknown multicast packets, and by default all unknown multicast packets are forwarded to all the ports of the switch. To modify the default behavior and to control how the switch will forward unknown multicast packets when the switch is in **IGMP Snooping Disabled mode**:

1. Select either the **PassiveForwardMode** or the **ForceForwardMode** radio button.
2. Make sure that only the ports that you would like to have the **unknown multicast packets** to be forwarded to, have a check mark next to it.
3. Then click on the **Update Setting** button.

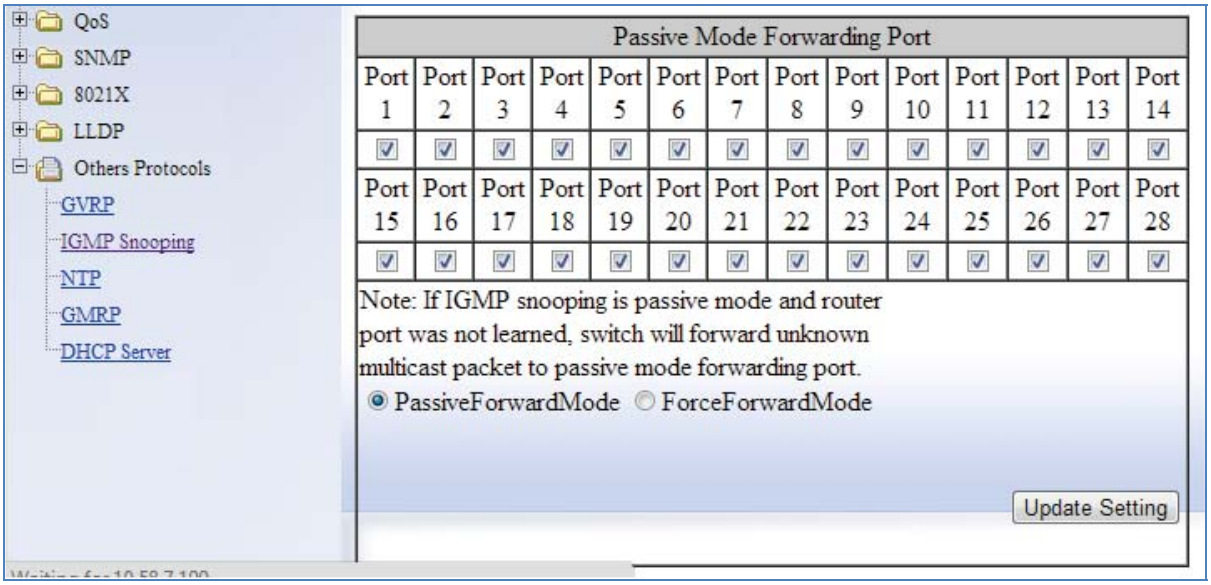


Figure 103: Disabled Mode Forwarding Port

Passive Mode Forwarding Port Configuration

You can control how the switch forwards unknown multicast packets under **IGMP Passive mode** in two different conditions:

- When there is no IGMP Querier port (a port that receives IGMP queries) present.
- When an IGMP Querier port is present **or** when no IGMP Querier port is present.

To configure how the switch forwards unknown multicast packets when the switch is in IGMP Passive mode, follow the steps below:

No IGMP Querier port present

1. Under the **Passive Mode Forwarding Port** section, select the **PassiveForwardMode** radio button.
2. Select the checkbox under the ports that you would like to have the **unknown multicast packets** forwarded to.
3. Click on the “Update Setting” button.

   Note: The presence of an IGMP Querier port will make the settings provided by the **PassiveForwardMode** to have no effect, and all unknown multicast packets will be forwarded to the IGMP Querier port only.

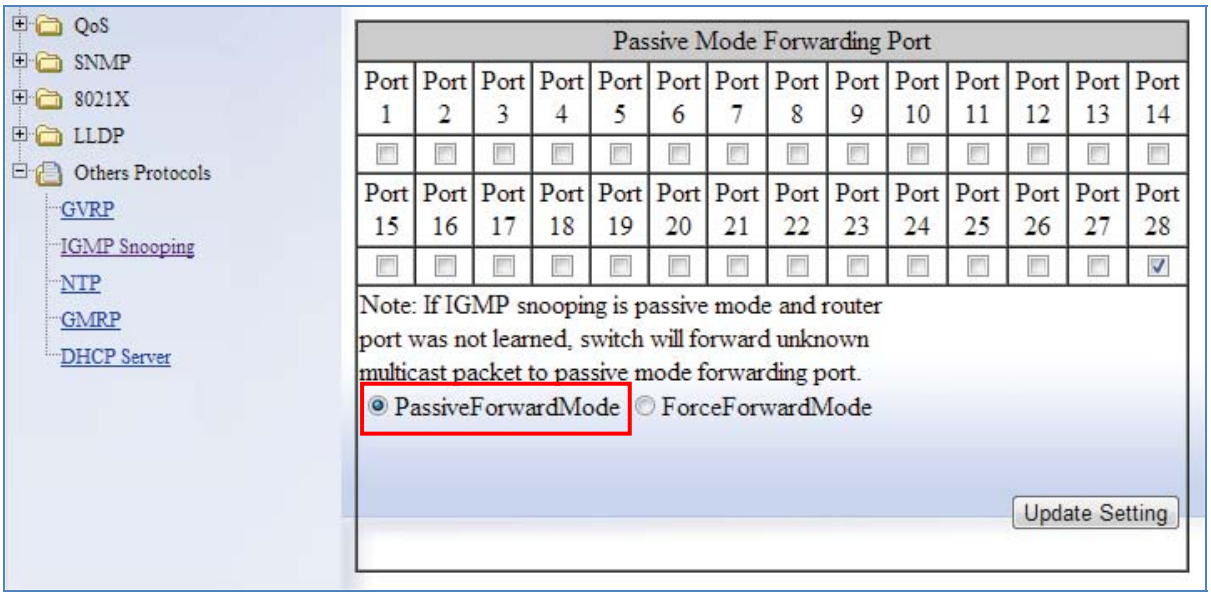


Figure 104: PassiveForwardMode

IGMP Querier port present or no IGMP Querier port present

1. Under the **Passive Mode Forwarding Port** section, select the **ForceForwardMode** radio button
2. Select the checkbox under the ports that you would like to have the **unknown multicast packets** forwarded to.
3. Click on the **Update Setting** button.

Note: The settings according to the **ForceForwardMode** will always be in effect both with and without the presence of an IGMP Querier port. In addition, when an IGMP Querier port is present, all unknown multicast packets will also be forwarded to the IGMP Querier port as well, in addition to the settings in the **ForceForwardMode** function.

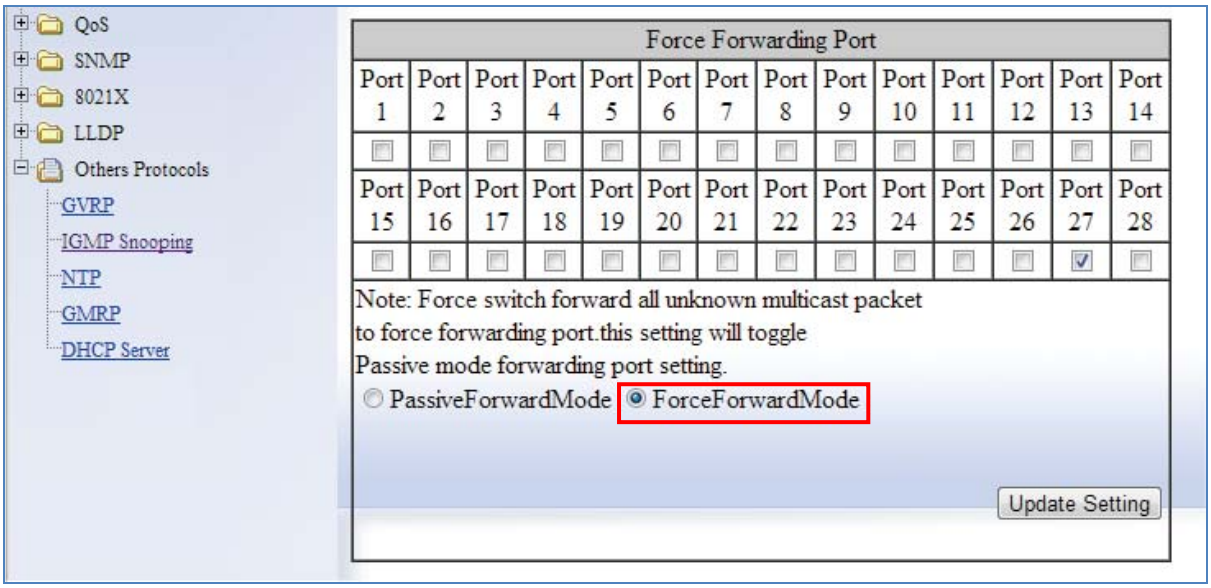


Figure 105: ForceForwardMode

IGMP Querier Mode Forwarding Port Configuration

To configure how the switch forwards unknown multicast packets when the switch is in IGMP Querier mode, follow the below instructions:

1. Under the **Passive Mode Forwarding Port** section, select the **ForceForwardMode** radio button
2. Select the checkbox under the ports that you would like to have the **unknown multicast packets** forwarded to.
3. Click on the **Update Setting** button.

   Note: When the switch is in **IGMP Snooping Querier mode**, there will not be an IGMP Querier port present, and the settings according to the **ForceForwardMode** will always be in effect.

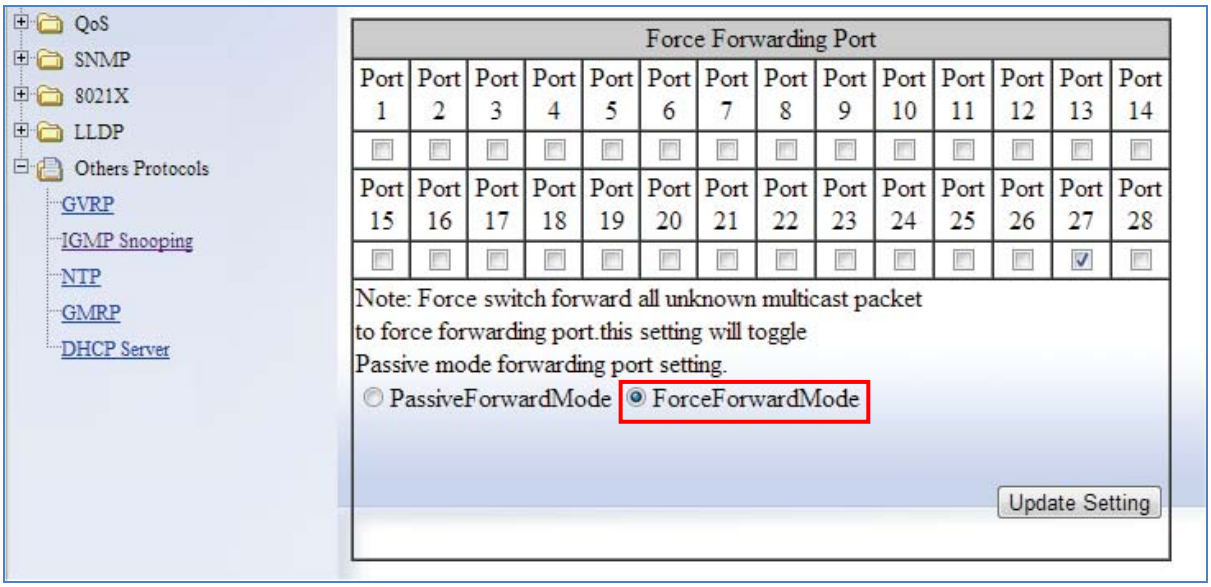


Figure 106: IGMP Querier Mode Forwarding

Monitoring Registered Multicast Groups

To navigate to the **Multicast Current Table** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **IGMP Snooping**.
3. Click on the **Multicast Current Table** link at the top of the page.

When the switch is in IGMP Passive **or** IGMP Querier mode, registered Multicast Groups can be monitored on each port, as well as the location of the IGMP Querier port (see Figure 107).

- All the registered multicast Groups will be listed in the **Group Address** column.
- The port where each registered Group ID was received can be found in the **Membership** column in each registered Groups corresponding row.

Note: when an IGMP Querier port is present, all registered multicast group IDs will show up in the **Membership** column as a checked box for the IGMP Querier port, even if an **IGMP Join** was never received for that Group ID on the Querier port.

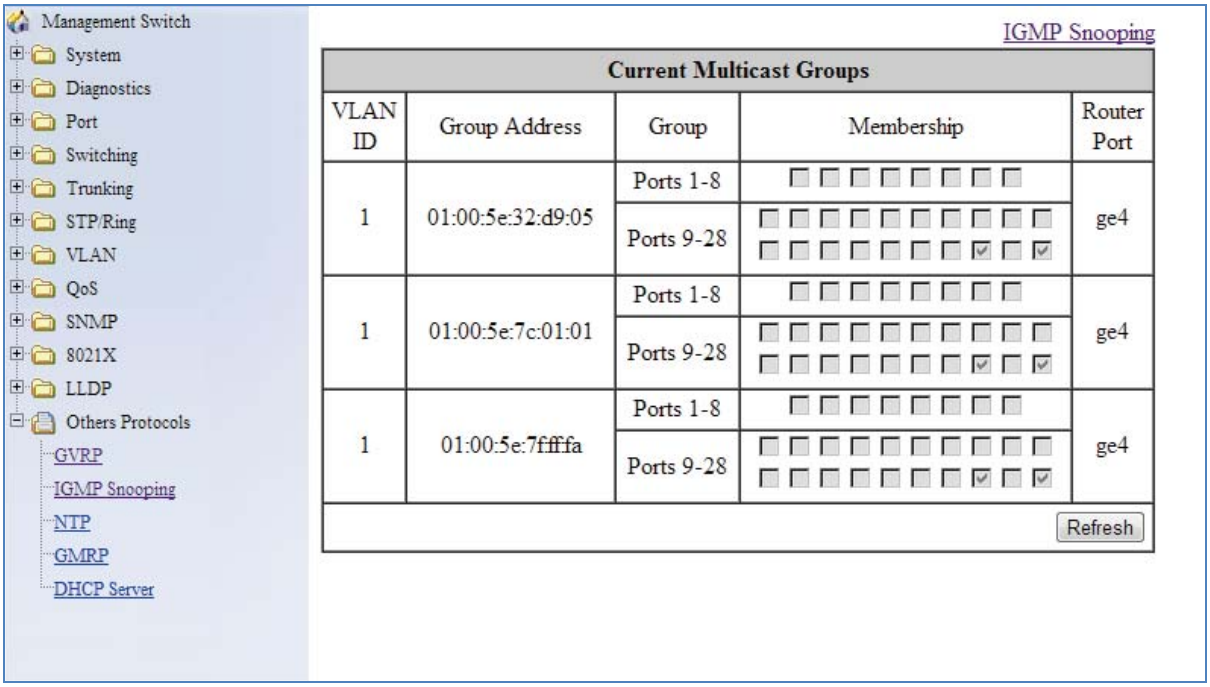


Figure 107: Current Multicast Groups

IGMP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

To put the IGMP Snooping feature in **Disabled Mode** use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **no ip igmp snooping**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#no ip igmp snooping
switch_a(config)#q
switch_a#
```

To put the IGMP Snooping feature in **Passive Mode** use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
ip igmp snooping enable
no ip igmp snooping querier

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ip igmp snooping enable
switch_a(config)#no ip igmp snooping querier
switch_a(config)#q
switch_a#
```

To put the IGMP Snooping feature in **Querier Mode** use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
ip igmp snooping enable
ip igmp snooping querier

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ip igmp snooping enable
switch_a(config)#ip igmp snooping querier
switch_a(config)#q
switch_a#
```

To set the IGMP version per VLAN, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **ip igmp version <1-3>**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)#ip igmp version 2
switch_a(config)#q
switch_a#
```

To enable or disable the IGMP **fast-leave** feature on a VLAN, use the CLI commands below:

CLI Command Mode: **VLAN Interface Configuration Mode**

CLI Command Syntax:
ip igmp snooping fast-leave
no ip igmp snooping fast-leave

Usage Example - **Enabling** the IGMP **fast-leave** feature:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)#ip igmp snooping fast-leave
switch_a(config)#q
switch_a#
```

Usage Example - **Disabling** the IGMP **fast-leave** feature:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)#no ip igmp snooping fast-leave
switch_a(config)#q
switch_a#
```

To enable or disable the IGMP **Report Suppression** feature on a VLAN, use the CLI commands below:

CLI Command Mode: **VLAN Interface Configuration Mode**

CLI Command Syntax:
ip igmp snooping report-suppression
no ip igmp snooping report-suppression

Usage Example - **Enabling** the IGMP **Report Suppression** feature:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)# ip igmp snooping report-suppression
switch_a(config)#q
switch_a#
```

Usage Example - **Disabling** the IGMP **Report Suppression** feature:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)#no ip igmp snooping report-suppression
switch_a(config)#q
switch_a#
```

To configure the IGMP **query-interval**, and the **max-response-time** settings per VLAN, use the CLI commands below:

CLI Command Mode: **VLAN Interface Configuration Mode**

CLI Command Syntax:
ip igmp query-interval <10-18000>
ip igmp query-max-response-time <1-240>

Usage Example - Configuring the IGMP **query-interval** parameter:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)# ip igmp query-interval 125
switch_a(config)#q
switch_a#
```

Usage Example - Configuring the IGMP **max-response-time** parameter:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#interface vlan1.1
switch_a(config-if)# ip igmp query-max-response-time 10
switch_a(config)#q
switch_a#
```

To control how the switch forwards unknown multicast packets when the switch is in IGMP Disabled mode, follow the instructions below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
ip igmp snooping passive-forward all
ip igmp snooping passive-forward none
ip igmp snooping passive-forward *<ifname>,<ifname>,<ifname>*

Usage Example - Flood all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward all
switch_a(config)#q
switch_a#
```

Usage Example - Drop all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward none
switch_a(config)#q
switch_a#
```

Usage Example - Forward unknown multicast packets to the specified ports only:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward fe1,fe2,fe3
switch_a(config)#q
switch_a#
```

To only control how the switch will forward unknown multicast packets when the switch is in IGMP Passive mode and also without a Querier Port present, follow the below instructions:

CLI Command Mode: General Configuration Mode

CLI Command Syntax:
ip igmp snooping passive-forward all
ip igmp snooping passive-forward none
ip igmp snooping passive-forward *<ifname>,<ifname>,<ifname>*

Usage Example - Flood all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward all
switch_a(config)#q
switch_a#
```

Usage Example - Drop all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward none
switch_a(config)#q
switch_a#
```

Usage Example - Forward unknown multicast packets to the specified ports only:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping passive-forward fe1,fe2,fe3
switch_a(config)#q
switch_a#
```

To control how the switch will forward unknown multicast packets when the switch is in IGMP Passive mode, both with or without a Querier Port present, follow the instructions below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
ip igmp snooping force-forward all
ip igmp snooping force-forward none
ip igmp snooping force-forward *<ifname>,<ifname>,<ifname>*

Usage Example - Flood all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward all
switch_a(config)#q
switch_a#
```

Usage Example - Drop all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward none
switch_a(config)#q
switch_a#
```

Usage Example - Forward unknown multicast packets to the specified ports only:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward fe1,fe2,fe3
switch_a(config)#q
switch_a#
```

To control how the switch will forward unknown multicast packets when the switch is in IGMP Querier mode, follow the below instructions:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
ip igmp snooping force-forward all
ip igmp snooping force-forward none
ip igmp snooping force-forward *<ifname>,<ifname>,<ifname>*

Usage Example - Flood all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward all
switch_a(config)#q
switch_a#
```

Usage Example - Drop all unknown multicast packets:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward none
switch_a(config)#q
switch_a#
```

Usage Example - Forward unknown multicast packets to the specified ports only:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# ip igmp snooping force-forward fe1,fe2,fe3
switch_a(config)#q
switch_a#
```

Network Time Protocol

NTP or Network Time Protocol is a useful tool designed to update your switch with the most accurate time available from a user specified time source. This is useful for the end user in that the switch logging is noted with the actual time rather than the default switch time (begins on Jan 1st, 2010) as it can aid debugging switching related problems by showing an accurate time an event occurred.

To navigate to the **NTP** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **NTP**

Enabling NTP

To enable the NTP client, follow the steps below (see Figure 108):

1. Choose Enable from the dropdown list next to **NTP Status**
2. Click on the **Update Setting** button

Setting the NTP Server IP Address

To provide a time source for the NTP client, follow the steps below:

1. Enter an IP address or host name in the **NTP Server** text box.
2. Click on the **Update Setting** button

Setting the Timezone

To change the timezone of the switch, follow the steps below:

1. Select the proper timezone from the dropdown list next to **Time Zone.**
2. Click on the **Update Setting** button

Setting the Polling Period

To alter the polling period (how often the NTP client checks the server for the correct time), follow the steps below:

1. Enter the new polling period in the Polling Interval textbox**.**

2. Click on the **Update Setting** button

Manually Syncing Time

To set the time immediately using an NTP server, follow the steps below:

1. Enter the new polling period in the Polling Interval textbox**.**
2. Click on the **Sync Time** button in the **NTP Server** field

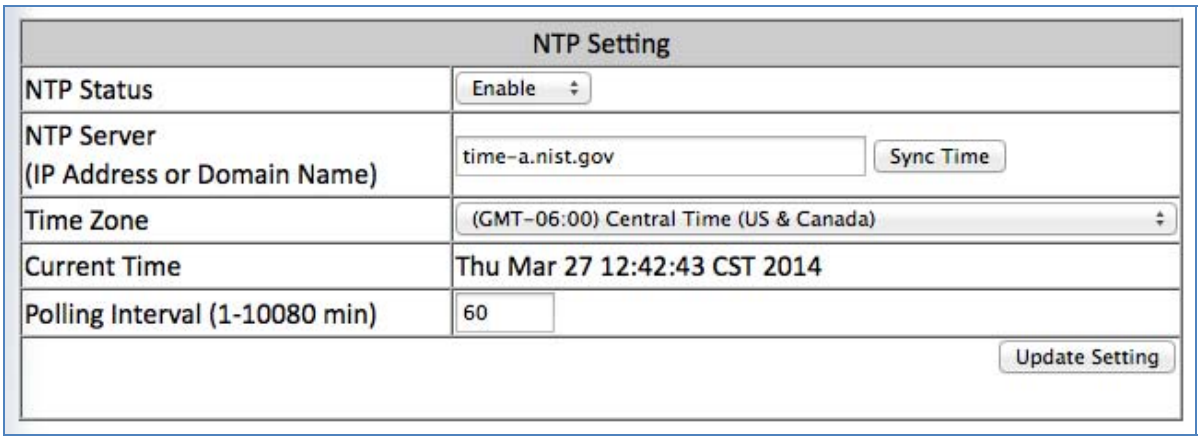


Figure 108: NTP Settings

Daylight Savings Time - Weekday Mode

To adjust the switch's clock for Daylight Savings Time using the weekday mode, follow the steps below:

1. Select the option **Weekday** from the **Daylight Saving Mode** dropdown box.
2. Enter the value for the time offset in the **Time Set Offset** textbox.
3. Enter the name of the **Daylight Saving Timezone**.
4. In the **Weekday Box**, select the month, week, day, hour, and minute for both the from and to fields. For example, if Daylight Saving Time begins on the second Sunday in March at 2:00AM and ends on the first Sunday in November at 2:00AM, then select the values as shown in Figure 109.
5. Click on the **Update Setting** button

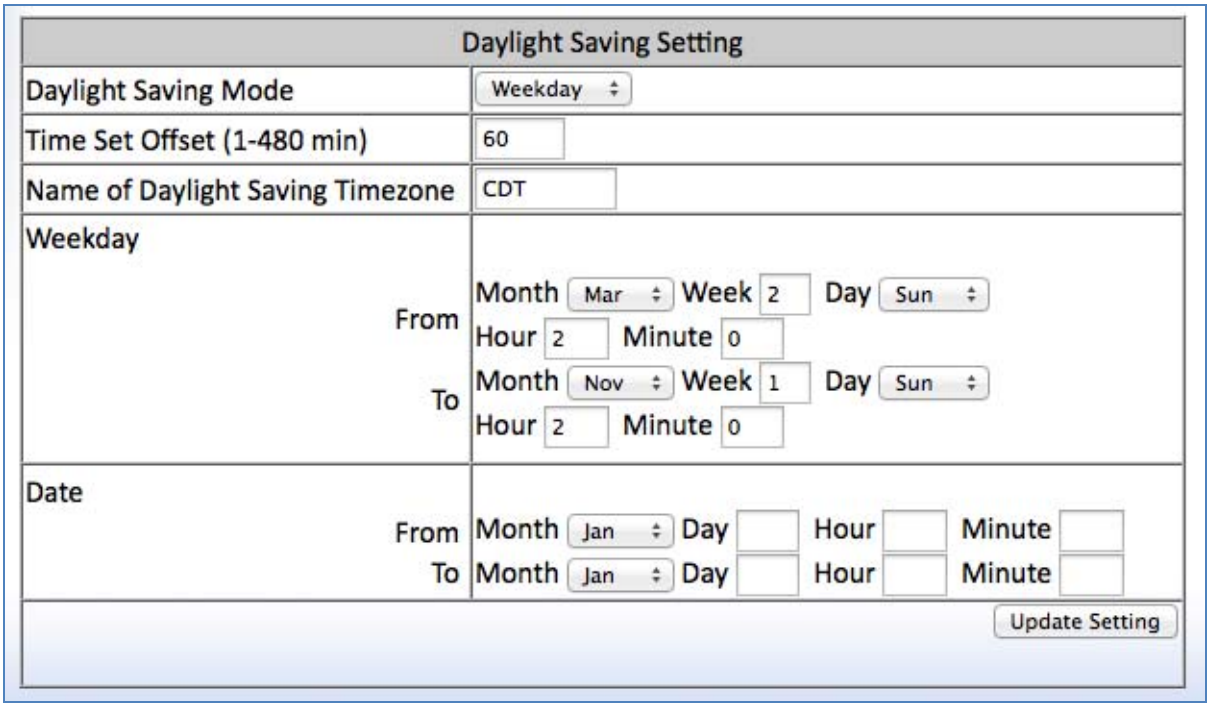


Figure 109: Daylight Savings – Weekday Mode

Daylight Savings Time – Date Mode

To adjust the switch's clock for Daylight Savings Time using the date mode, follow the steps below:

1. Select the option **Date** from the **Daylight Saving Mode** dropdown box.
2. Enter the value for the time offset in the **Time Set Offset** textbox.
3. Enter the name of the **Daylight Saving Timezone**.
4. In the **Date section**, select the month and enter the date, hour, and minute for both the from and to fields. For example, if Daylight Saving Time begins on March 9th at 2:00AM and ends on November 2nd at 2:00AM, then select the values as shown in Figure 110.
5. Click on the **Update Setting** button

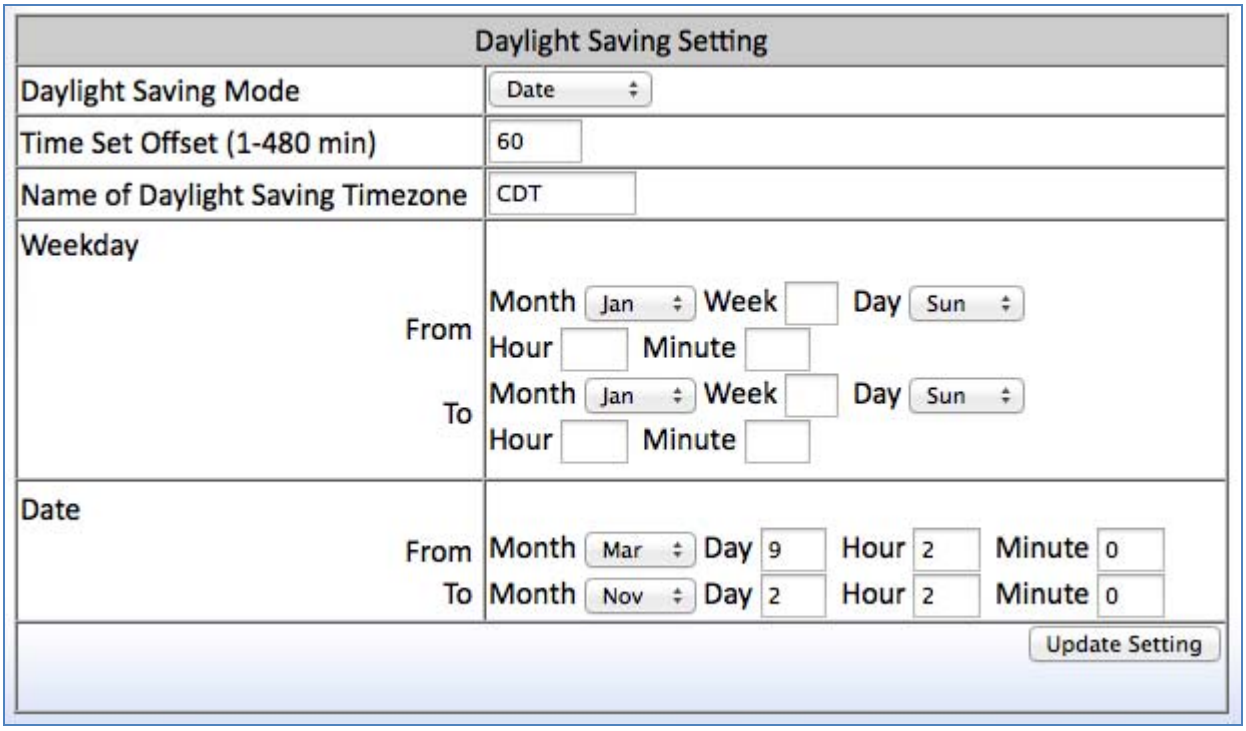


Figure 110: Daylight Savings – Date Mode

Network Time Protocol Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

To enable NTP on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **ntp enable**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ntp enable
switch_a(config)#q
switch_a#
```

To set the NTP server on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **ntp server *<IP Address or Host Name of NTP Server>***

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ntp server 192.168.1.126
switch_a(config)#q
switch_a#
```

To set the NTP polling interval on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **ntp polling-interval *<time in minutes, 1-10080>***

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ntp polling-interval 180
```

```
switch_a(config)#q
switch_a#
```

To have the NTP client sync the clock immediately on the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax: **ntp sync-time**

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#ntp sync-time
switch_a(config)#q
switch_a#
```

To set the current time zone for the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
clock timezone *<Name of Time Zone> <UTC Offset in hh:mm format>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#clock timezone CDT -6:00
switch_a(config)#q
switch_a#
```

To set the Daylight Savings Time settings using weekday mode for the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
clock summer-time *<Name of Time Zone>* weekday *<start week number>* *<start day>* *<start month>* *<start hour>* *<start minute>* *<end week number>* *<end day>* *<end hour>* *<end minute>* *<time offset in minutes>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# clock summer-time CDT weekday 2 Sun March 2
0 1 Sun November 2 0 60
switch_a(config)#q
switch_a#
```

To set the Daylight Savings Time settings using date mode for the EX24000 Switch, use the CLI commands below:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
clock summer-time *<Name of Time Zone>* date *<start date>* *<start month>* *<start hour>* *<start minute>* *<end date>* *<end month>* *<end hour>* *<end minute>* *<time offset in minutes>*

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# clock summer-time CDT date 9 March 2 0 2 November 2
0 60
switch_a(config)#q
switch_a#
```

GMRP

The settings in the GMRP feature controls how the switch automates the process of multicast packet forwarding, both within a single switch as wells as between switches in a bridged network. With the GMRP feature enabled, when the switch receives any GMRP multicast group registration requests from either a multicast client or a neighbor switch, the switch will register these multicast groups on these ports and will only transmit the multicast packets that belong to these groups to these ports. The switch will also automatically propagate these multicast group registrations onto the neighbor switches to allow the neighbor switches to forward the multicast packets that belong to these groups to the local switch.

To navigate to the **Other Protocols / GMRP** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **GMRP**.

General Overview

The ports on the EtherWAN switch can be configured with the GMRP feature in five modes:

- Disabled
- Normal
- Fixed
- Forbidden
- Forward All.

GMRP Normal mode

When a port is put in GMRP **Normal** mode, that port can accept both multicast group registration and multicast group deregistration from the multicast client or the neighbor switch that is residing on that port. Also, the switch will propagate all the registered multicast groups on the switch to the neighbor switch residing on that port.

GMRP Fixed mode

When a port is put in GMRP **Fixed** mode, that port can accept group registration but will not accept any group deregistration from multicast clients or neighbor switches that reside on that port. Also, the switch will be propagating all the registered multicast groups on the switch to the neighbor switch residing on that port.

GMRP Forbidden mode

When a port is put in GMRP **Forbidden** mode, all multicast groups will be deregistered on that port and that port will not be accepting any further multicast group registrations. However, the switch will still be propagating all the registered multicast groups on the switch to the neighbor switch residing on that port.

GMRP Forward All mode

When a port is put in GMRP **Forward All** mode, all the registered multicast groups on the switch will automatically be registered to this port, so the switch will be forwarding all the multicast packets that belong to these groups to this port and this port will also be propagating all the registered multicast groups on the switch to the neighbor switch residing on that port.

GMRP Disabled mode

When a port is put in GMRP **disabled** mode that port will not participate in any GMRP activities.

Enabling the GMRP Feature Globally on the Switch

To navigate to the **Other Protocols / GMRP** page:

1. Click on the **+** next to **Other Protocols**.
2. Click on **GMRP**.

To enable the GMRP function in the switch, follow the procedure below:

1. Choose the **Enable** option from the dropdown list next to **GMRP**
2. Click on the **Update Setting** button. (See Figure 111)

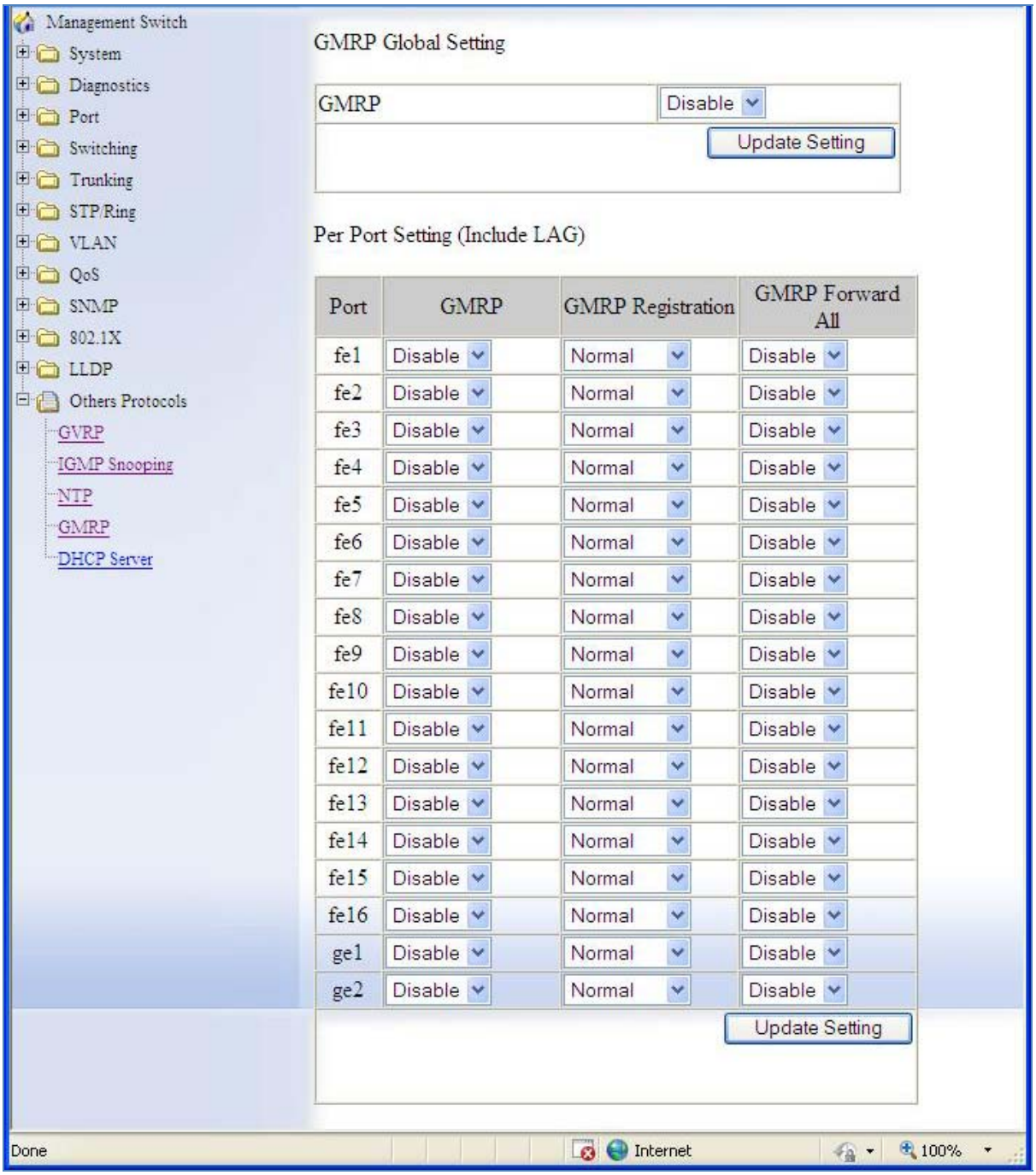


Figure 111: GMRP Global Setting

Configuring the GMRP Feature Per Port

To navigate to the **Other Protocols / GMRP** page:

1. Click on the **+** next to **Other Protocols**.

2. Click on **GMRP**.

GMRP should be enabled on all the ports that could be a potential source of multicast traffic, and on the ports that are connected to multicast clients. You can also further configure each GMRP enabled port with the particular application modes described in the below configuration.

To allow a port to dynamically receive GMRP multicast group registrations and dynamically transmit the multicast packets that belong to these multicast groups on this port configure the items listed below:

- For each port that you wish to apply this application, select the **Enable** option from the drop-down list under the GMRP column.
- For each port that you wish to apply this application, select the **Normal** option from the drop-down list under the GMRP Registration column.
- For each port that you wish to apply this application, select the **Disable** option from the drop-down list under the GMRP Forward All column.
- Click on the **Update Setting** button.

To allow a port to dynamically receive GMRP multicast group registrations and then make the multicast packets that belong to these multicast groups constantly available on this port, configure the items listed below:

- For each port that you wish to apply this application, select the **Enable** option from the drop-down list under the GMRP column.
- For each port that you wish to apply this application, select the **Fixed** option from the drop-down list under the GMRP Registration column.
- For each port that you wish to apply this application, select the **Disable** option from the drop-down list under the GMRP Forward All column.
- Click on the **Update Setting** button.

If you do not wish to transmit any multicast packets on a port based on the received GMRP multicast group registrations on that port, but would like to receive multicast packets that belong to the currently registered multicast groups on the switch on that port, configure the items listed below:

- For each port that you wish to apply this application, select the **Enable** option from the drop-down list under the GMRP column.
- For each port that you wish to apply this application, select the **Forbidden** option from the drop-down list under the GMRP Registration column.

- For each port that you wish to apply this application, select the **Disable** option from the drop-down list under the GMRP Forward All column.
- Click on the **Update Setting** button.

If you wish to transmit all the multicast packets that belong to all the currently registered multicast groups on the switch on a port, configure the items listed below:

- For each port that you wish to apply this application, select the "**Enable**" option from the drop-down list under the GMRP column.
- For each port that you wish to apply this application, select the appropriate option from the drop-down list under the GMRP Registration column, according to the previous instructions.
- For each port that you wish to apply this application, select the **Enable** option from the drop-down list under the GMRP Forward All column.
- Click on the **Update Setting** button.

If you do not want a port to participate in the GMRP protocol, configure the items listed below:

- For each port that you wish to apply this application, select the **Disable** option from the drop-down list under the GMRP column.
- Click on the **Update Setting** button.

GMRP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

To enable or disable GMRP globally on the EtherWAN switch, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gmrp enable bridge 1
set gmrp disable bridge 1

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set gmrp enable bridge 1
switch_a(config)# set gmrp disable bridge 1
switch_a(config)#q
switch_a#
```

To enable GMRP locally on a port on the EtherWAN switch, you must use the below CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set port gmrp enable <port id>
set port gmrp enable <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)# set port gmrp enable fe1
switch_a(config)# set port gmrp disable fe1
switch_a(config)#q
switch_a#
```

When you enable GMRP on a port, the **Registrar** is in **Normal** mode by default.
The GMRP **Registrar** on a port can be configured in 3 different modes by issuing the following CLI commands

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gmrp registration normal <port id>
set gmrp registration fixed fe1 <port id>
set gmrp registration forbidden <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#set gmrp registration normal fe1
switch_a(config)#set gmrp registration fixed fe1
switch_a(config)#set gmrp registration forbidden fe1
switch_a(config)#q
switch_a#
```

By default when you enable GVRP on a port this feature is disabled
To enable or disable the **Forward All** feature on a port, use the following CLI commands:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
set gmrp fwdall enable <port id>
set gmrp fwdall disable <port id>

Usage Example:

```
switch_a>enable
switch_a#configure terminal
switch_a(config)#set gmrp fwdall enable fe1
switch_a(config)#set gmrp fwdall disable fe1
switch_a(config)#q
switch_a#
```

DHCP Server

DHCP is a TCP/IP application protocol that allows any TCP/IP device to dynamically obtain its initial TCP/IP configurations through the TCP/IP protocol itself (in this case, through the UDP protocol). It is based on the client-server paradigm. The EtherWAN switch can be setup as a DHCP server to allow any DHCP client to dynamically obtain its IP address, default router, and DNS servers.

General Overview

The EtherWAN switch can function as a DHCP server for a single VLAN (it can be any VLAN) on the switch. When functioning as a DHCP server, the EtherWAN switch can be configured with a range of IP addresses, default gateway and DNS servers, which will allow the switch to use the dynamic configuration function of the DHCP protocol to provide any TCP/IP device that is a DHCP client, to dynamically obtain an IP address, default router, and DNS servers. The EtherWAN DHCP server can also be configured with a lease period that the DHCP clients are allowed the use of their assigned IP address. In this simple implementation, both the DHCP Client and the DHCP Server must be on the same network (same VLAN).

Configuring the DHCP Server

To navigate to the **DHCP Server** page:

1. Click on the **+** next to **Other Protocols**
2. Click on **DHCP Server** (see Figure 112)

You can use the GUI to set the following DHCP server parameters:

- DHCP Server Enable
- DHCP VLAN.
- DHCP Client Parameters
    - IP Address range
    - Subnet Mask
    - Default gateway
    - Primary and Secondary DNS.
- DHCP Client lease time

To set the DHCP server parameters:

1. From the drop-down list next to **DHCP Server Status,** select the VLAN that will get the DHCP provided TCP/IP Parameters.
2. Enter the starting and ending IP addresses for the DHCP Client IP address range, in the text boxes next to **Start IP** and **End IP**.
3. Enter the Subnet Mask in the text box next to **Subnet Mask.**
4. Enter the IP address for the DHCP Client default router in the text entry box next to **Gateway**.
5. Enter the IP addresses for the DHCP Client primary and secondary DNS servers, in the text entry box next to **Primary DNS** and **Secondary DNS**.
6. Enter the lease period in seconds, which the DHCP clients are allowed the use of their leased IP addresses, in the text entry box next to **Lease Time**.
7. Click on the **Update Setting** button.

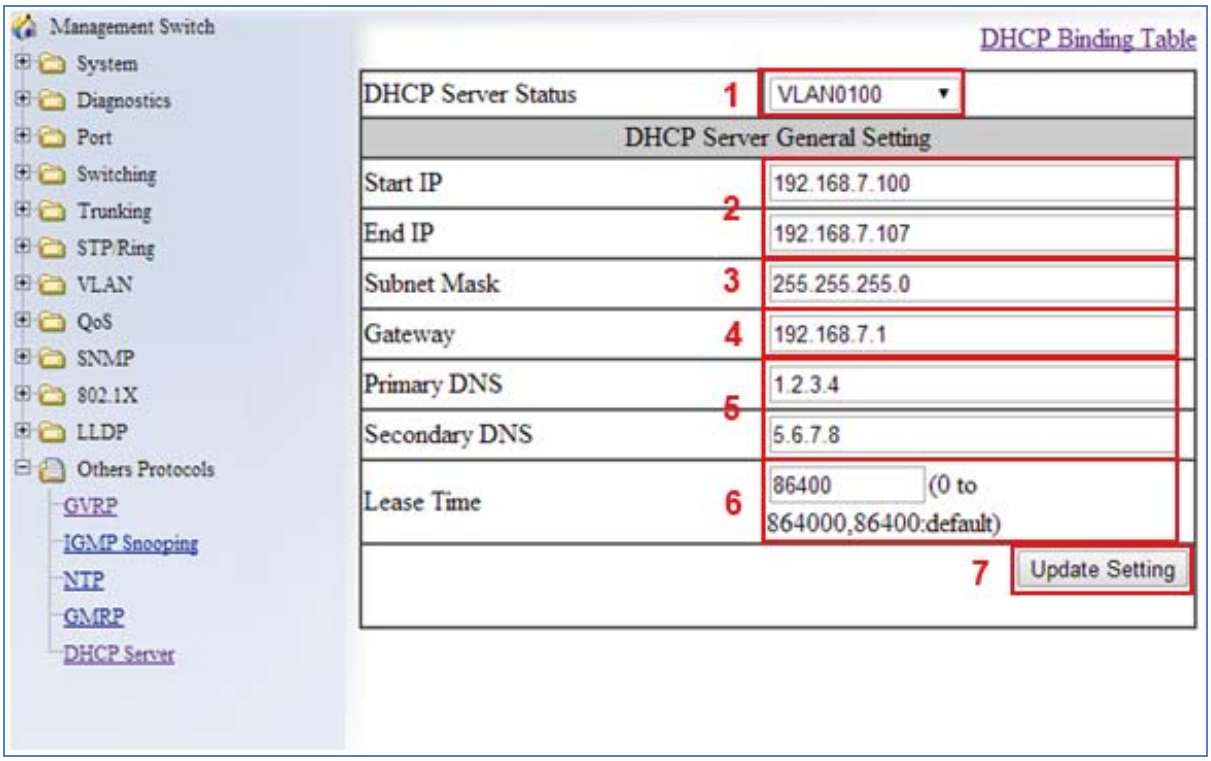


Figure 112: DHCP Server

To check what IP addresses has been allocated to which DHCP clients:

1. Click on the **DHCP Binding Table** link (see Figure 113)
2. Click on the DHCP General Setting link to get back to the previous DHCP configuration Web GUI page (see Figure 114).

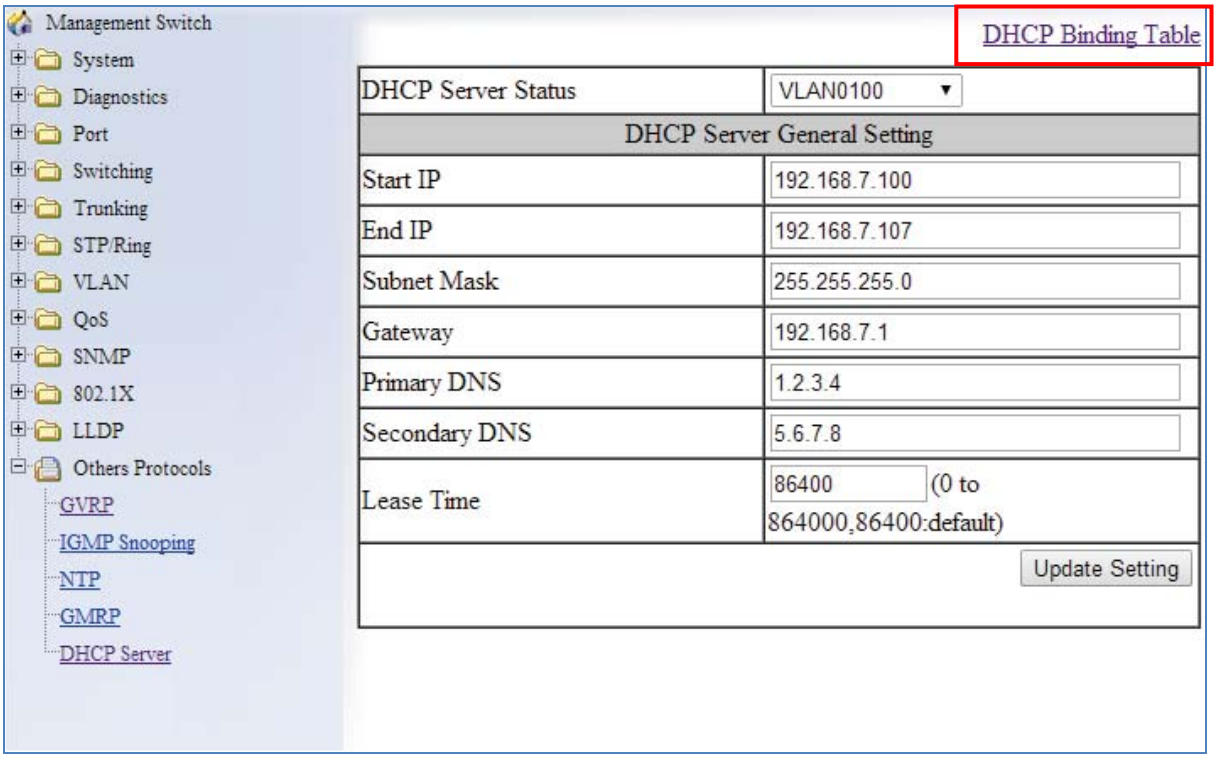


Figure 113: DHCP Bindings

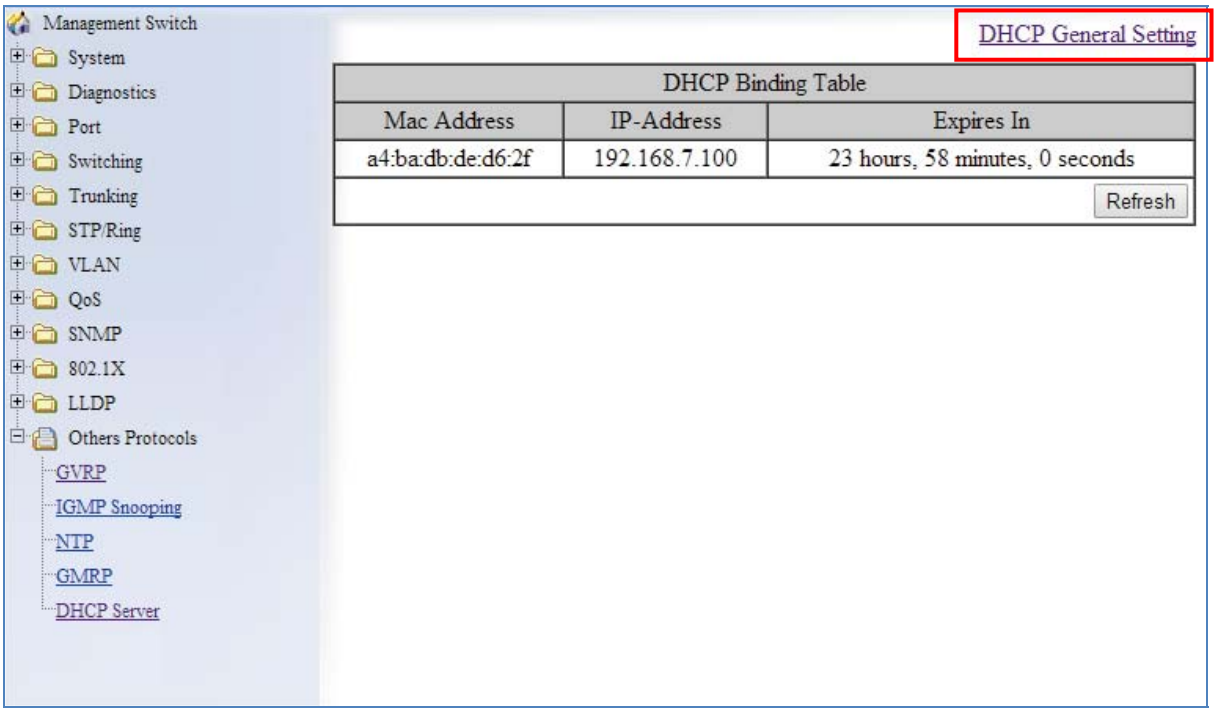


Figure 114: DHCP Binding Table

DHCP Configuration Examples Using CLI Commands

For more information on CLI command usage see CLI Command Usage.

To set the DHCP server parameters:

CLI Command Mode: **General Configuration Mode**

CLI Command Syntax:
dhcp-server range *<start IP> <end IP>*
dhcp-server subnet-mask *<subnet mask in doted decimal notation>*
dhcp-server gateway *<IP address>*
dhcp-server dns 1 *<IP address>*
dhcp-server dns 2 *<IP address>*
dhcp-server lease-time *<0-864000>*

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)#dhcp-server range 192.168.7.100 192.168.7.107
switch_a(config)#dhcp-server subnet-mask 255.255.255.0
switch_a(config)#dhcp-server gateway 192.168.7.1
switch_a(config)#dhcp-server dns 1 1.2.3.4
```

```
switch_a(config)#dhcp-server dns 2 5.6.7.8
switch_a(config)#dhcp-server lease-time 86400
switch_a(config)#q
switch_a#
```

To enable the DHCP server and set the DHCP VLAN:

CLI Command Mode: **Interface Configuration Mode**

CLI Command Syntax: **dhcp-server enable; no dhcp-server enable**

Usage Example:

```
switch_a> enable
switch_a#configure terminal
switch_a(config)#interface vlan1.100
switch_a(config-if)#dhcp-server enable
switch_a(config-if)#no dhcp-server enable
switch_a(config-if)#q
switch_a(config)#q
switch_a#
```

To check what IP addresses has been allocated:

CLI Command Mode: **enable**

CLI Command Syntax: **show dhcp-server binding**

Usage Example:

```
switch_a> enable
switch_a#show dhcp-server binding
Mac Address       IP-Address      Expires in
a4:ba:db:de:d6:2f 192.168.7.100   23 hours, 57 minutes, 15
seconds
switch_a#
```

EtherWAN Corporation
17595 Mount Hermann Street
Fountain Valley, CA. 92708
Phone: 714.885.6000
www.EtherWAN.com

EtherWAN User Guide

December 16, 2014

Document version: Version 1