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xStack®

Web UI Reference Guide

Product Model: xStack® DES-3528/DES-3552 Series
Layer 2 Managed Stackable Fast Ethernet Switch
Release 2.6

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The ***DES-3528/DES-3552 Series Web UI Reference Guide*** contains information for setup and management of the Switch. This manual is intended for network managers familiar with network management concepts and terminology.

Typographical Conventions

Convention	Description
[ ]	In a command line, square brackets indicate an optional entry. For example: [copy filename] means that optionally you can type copy followed by the name of the file. Do not type the brackets.
Bold font	Indicates a button, a toolbar icon, menu, or menu item. For example: Open the **File** menu and choose **Cancel**. Used for emphasis. May also indicate system messages or prompts appearing on screen. For example: **You have mail**. **Bold** font is also used to represent filenames, program names and commands. For example: **use the copy command**.
`Boldface Typewriter Font`	Indicates commands and responses to prompts that must be typed exactly as printed in the manual.
Initial capital letter	Indicates a window name. Names of keys on the keyboard have initial capitals. For example: Click Enter.
Menu Name > Menu Option	**Menu Name > Menu Option** Indicates the menu structure. **Device > Port > Port Properties** means the Port Properties menu option under the Port menu option that is located under the Device menu.

Notes, Notices and Cautions

A **NOTE** indicates important information that helps make better use of the device.

A **NOTICE** indicates either potential damage to hardware or loss of data and tells how to avoid the problem.

A **CAUTION** indicates a potential for property damage, personal injury, or death.

Chapter 1 Web-based Switch Configuration

Introduction

All software functions of the Switch can be managed, configured and monitored via the embedded web-based (HTML) interface. The Switch can be managed from remote stations anywhere on the network through a standard browser such as Firefox, Safari, or Microsoft Internet Explorer. The browser acts as a universal access tool and can communicate directly with the Switch using the HTTP protocol.

The Web-based management module and the Console program (and Telnet) are different ways to access the same internal switching software and configure it. Thus, all settings encountered in web-based management are the same as those found in the console program.

Login to the Web Manager

To begin managing the Switch, simply run the browser installed on your computer and point it to the IP address you have defined for the device. The URL in the address bar should read something like: http://123.123.123.123, where the numbers 123 represent the IP address of the Switch.

NOTE: The factory default IP address is 10.90.90.90.

This opens the management module's user authentication window, as seen below.

Figure 1-1 Enter Network Password window

Leave both the User Name field and the Password field blank and click **OK**. This will open the Web-based user interface. The Switch management features available in the Web-based manager are explained below.

Web-based User Interface

The user interface provides access to various Switch configuration and management windows, allows you to view performance statistics, and permits you to graphically monitor the system status.

Areas of the User Interface

The figure below shows the user interface. Three distinct areas divide the user interface, as described in the table.

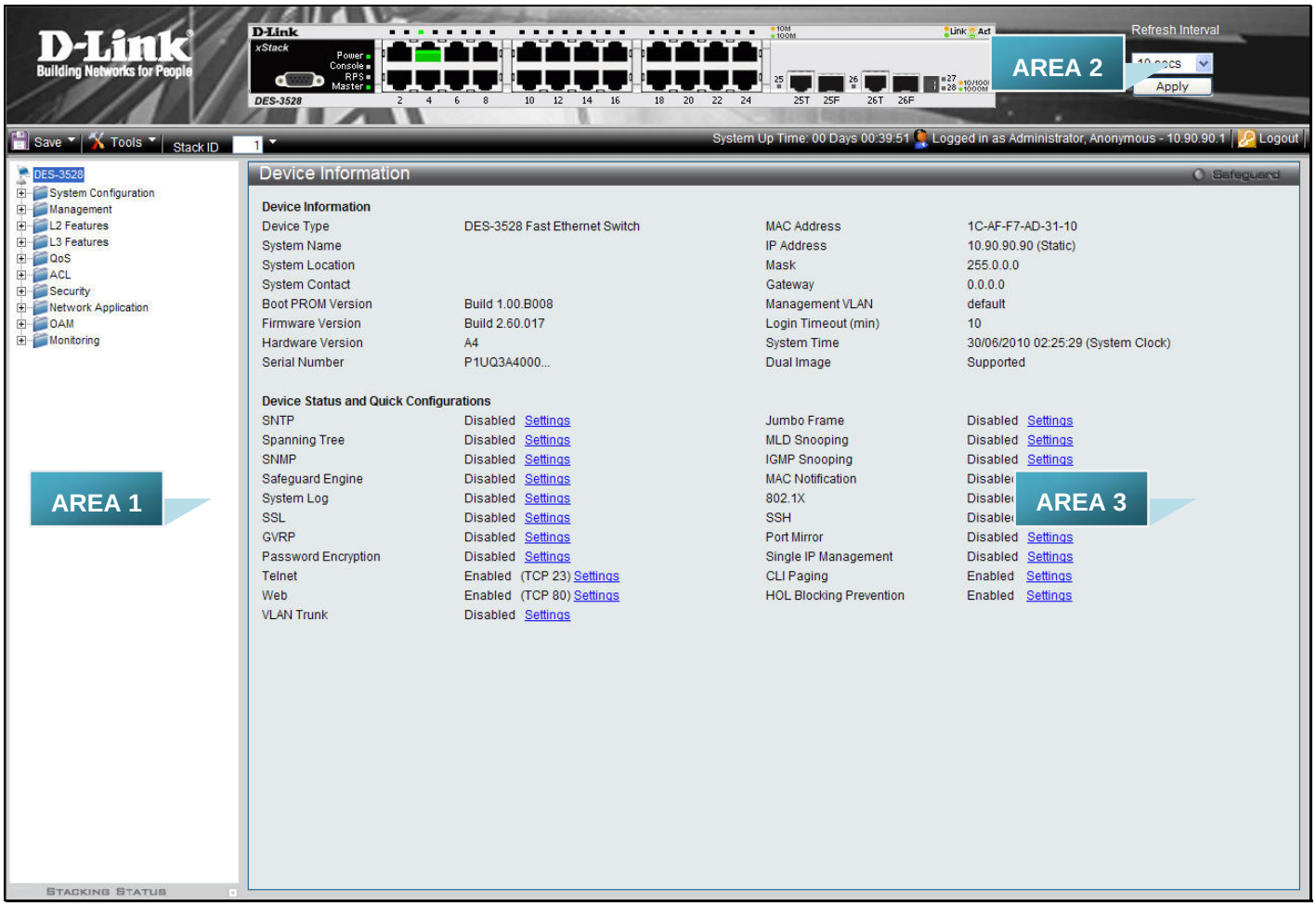


Figure 1-2 Main Web-Manager page

Area Number	Function
Area 1	Select the menu or window to display. Open folders and click the hyperlinked menu buttons and subfolders contained within them to display menus. Click the D-Link logo to go to the D-Link Website.
Area 2	Presents a graphical near real-time image of the front panel of the Switch. This area displays the Switch's ports, console and management port, showing port activity. Some management functions, including save, reboot, download and upload are accessible

	here.
Area 3	Presents switch information based on user selection and the entry of configuration data.

Web Pages

When connecting to the management mode of the Switch with a Web browser, a login screen is displayed. Enter a user name and password to access the Switch's management mode.

Below is a list of the main folders available in the Web interface:

System Configuration - In this section the user will be able to configure features regarding the Switch's configuration.

Management - In this section the user will be able to configure features regarding the Switch's management.

L2 Features - In this section the user will be able to configure features regarding the Layer 2 functionality of the Switch.

L3 Features - In this section the user will be able to configure features regarding the Layer 3 functionality of the Switch.

QoS - In this section the user will be able to configure features regarding the Quality of Service functionality of the Switch.

ACL - In this section the user will be able to configure features regarding the Access Control List functionality of the Switch.

Security - In this section the user will be able to configure features regarding the Switch's security.

Network Application - In this section the user will be able to configure features regarding network applications handled by the Switch.

OAM - In this section the user will be able to configure features regarding the Switch's Object Access Method

Monitoring - In this section the user will be able to monitor the Switch's configuration and statistics.

NOTE: Be sure to configure the user name and password in the User Accounts menu before connecting the Switch to the greater network.

Chapter 2 System Configuration

Device Information
System Information Settings
Dual Configuration Settings
Firmware Information Settings
Port Configuration
PoE
Serial Port Settings
System Log configuration
Time Range Settings
Time Settings
User Accounts Settings
Stacking

Device Information

This window contains the main settings for all the major functions for the Switch. It appears automatically when you log on to the Switch. To return to the Device Information window after viewing other windows, click the **DES-3528/DES-3552 Series** link.

The **Device Information** window shows the Switch's MAC Address (assigned by the factory and unchangeable), the Boot PROM Version, Firmware Version, Hardware Version, and many other important types of information. This is helpful to keep track of PROM and firmware updates and to obtain the Switch's MAC address for entry into another network device's address table, if necessary. In addition, this window displays the status of functions on the Switch to quickly assess their current global status.

Many functions are hyper-linked for easy access to enable quick configuration from this window.

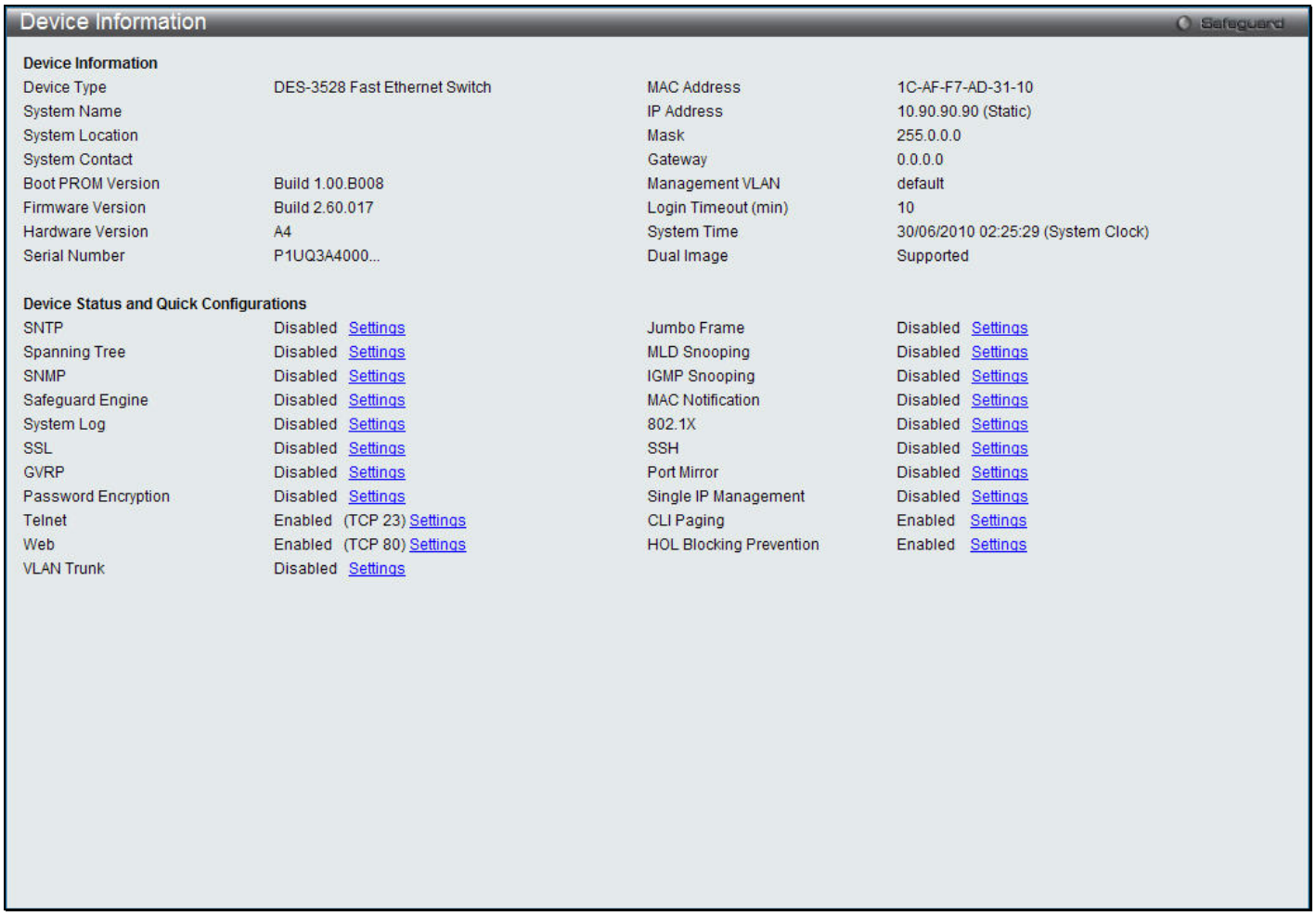


Figure 2-1 Device Information window

Click the Settings link to navigate to the appropriate feature page for configuration.

System Information Settings

The user can enter a System Name, System Location, and System Contact to aid in defining the Switch. This window also displays the MAC Address, Firmware Version and Hardware Version.

To view the following window, click **System Configuration > System Information Settings**, as shown below:

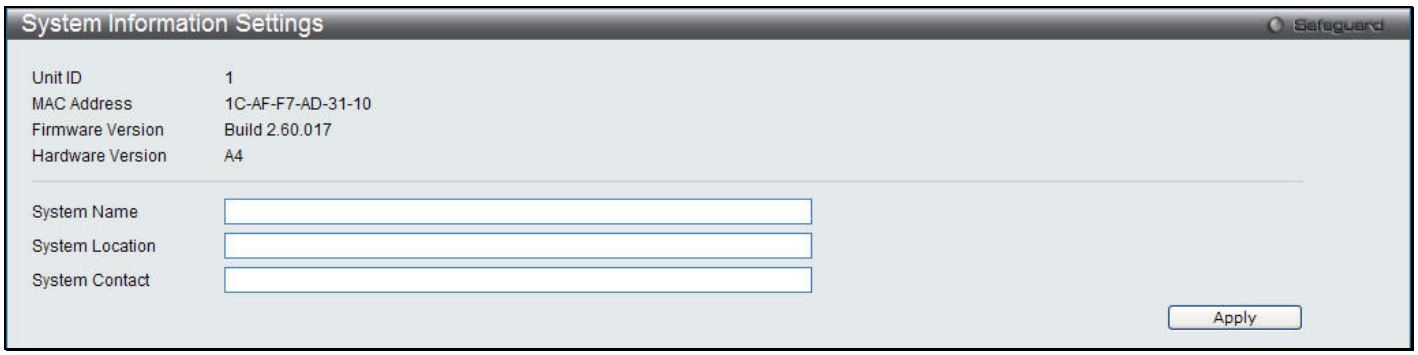


Figure 2-2 System Information Settings window

The fields that can be configured are described below:

Parameter	Description
System Name	Enter a system name for the Switch, if so desired. This name will identify it in the Switch network.
System Location	Enter the location of the Switch, if so desired.
System Contact	Enter a contact name for the Switch, if so desired.

Click the **Apply** button to implement changes made.

Dual Configuration Settings

The following window is used to manage configuration information in the Switch. The DES-3528/DES-3552 Series has the capability to store two firmware images in its memory.

To access this table, click **System Configuration > Dual Configuration Settings**, as shown below:

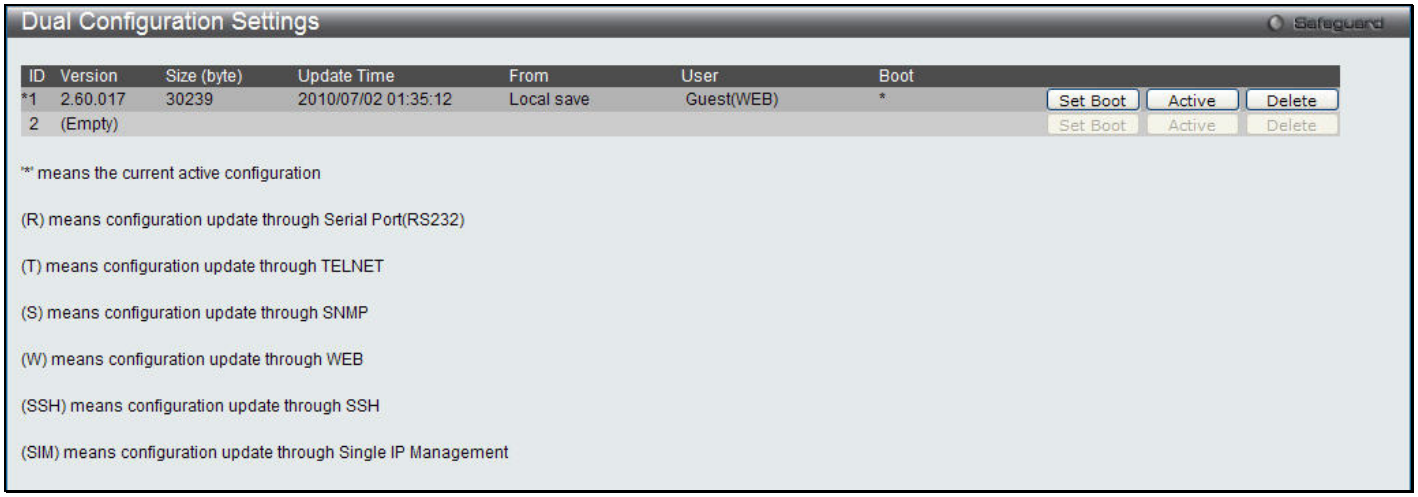


Figure 2 - 1 Dual Configuration Settings

This window holds the following information:

Parameter	Description
ID	State the ID number of the configuration file located in the Switch's memory. The Switch can store two configuration files for use. ID 1 will be the default boot up configuration file for the Switch unless otherwise configured by the user.
Version	Display the firmware version that has been saved or uploaded in the Switch.
Size (Bytes)	Display the size of the configuration file, in bytes.
Update Time	Display the time that the configuration file was updated to the Switch.
From	Display the location from which the configuration file was uploaded.
User	Display the name of the user (device) that updated this configuration file. Unknown users will be displayed as Anonymous.

Click the corresponding **Set Boot** button to use the configuration file as the boot up firmware for the Switch. This will apply upon the next reboot of the Switch.

Click the **Active** button to enable the configuration file settings.

Click the corresponding **Delete** button to remove this configuration file from the Switch's memory.

Firmware Information Settings

The following screen allows the user to view information about current firmware images stored on the Switch.

To access this table, click **System Configuration > Firmware Information Settings**

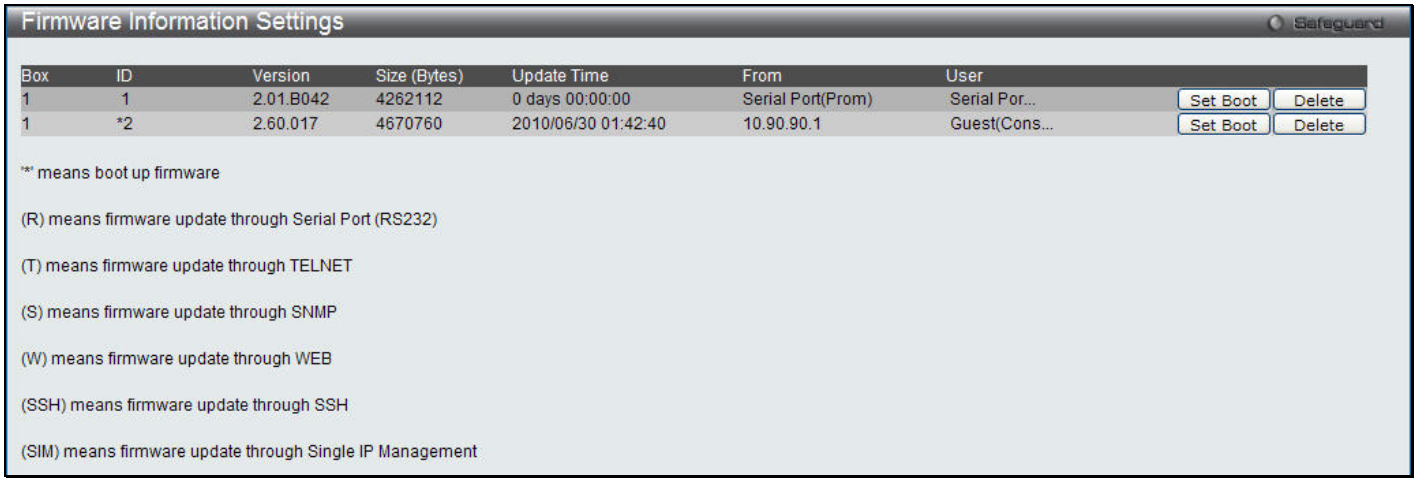


Figure 2 - 2 Firmware Information window

This window holds the following information:

Parameter	Description
ID	States the image ID number of the firmware in the Switch's memory. The Switch can store two firmware images for use. Image ID 1 will be the default boot up firmware for the Switch unless otherwise configured by the user.
Version	States the firmware version.
Size (Bytes)	States the size of the corresponding firmware, in bytes.
Update Time	States the specific time the firmware version was downloaded to the Switch.
From	States the IP address of the origin of the firmware. There are five ways firmware may be downloaded to the Switch. • R – If the IP address has this letter attached, it denotes a firmware upgrade through the serial port RS232. • T - If the IP address has this letter attached to it, it denotes a firmware upgrade through Telnet. • S - If the IP address has this letter attached to it, it denotes a firmware upgrade through the Simple Network Management Protocol (SNMP). • W - If the IP address has this letter attached to it, it denotes a firmware upgrade through the web-based management interface. • SSH – If the IP address has these three letters attached, it denotes a firmware update through SSH. • SIM – If the IP address has these letters attached, it denotes a firmware upgrade through the Single IP Management feature.
User	States the user who downloaded the firmware. This field may read "Anonymous" or "Unknown" for users that are unidentified.

Click the corresponding **Set Boot** button to use this configuration file as the boot up firmware for the Switch. This will apply upon the next reboot of the Switch.

Click the corresponding **Delete** button to remove this configuration file from the Switch's memory.

Port Configuration

Port Settings

This page used to configure the details of the switch ports. To view the following window, click **System Configuration > Port Configuration > Port Settings**, as shown below:

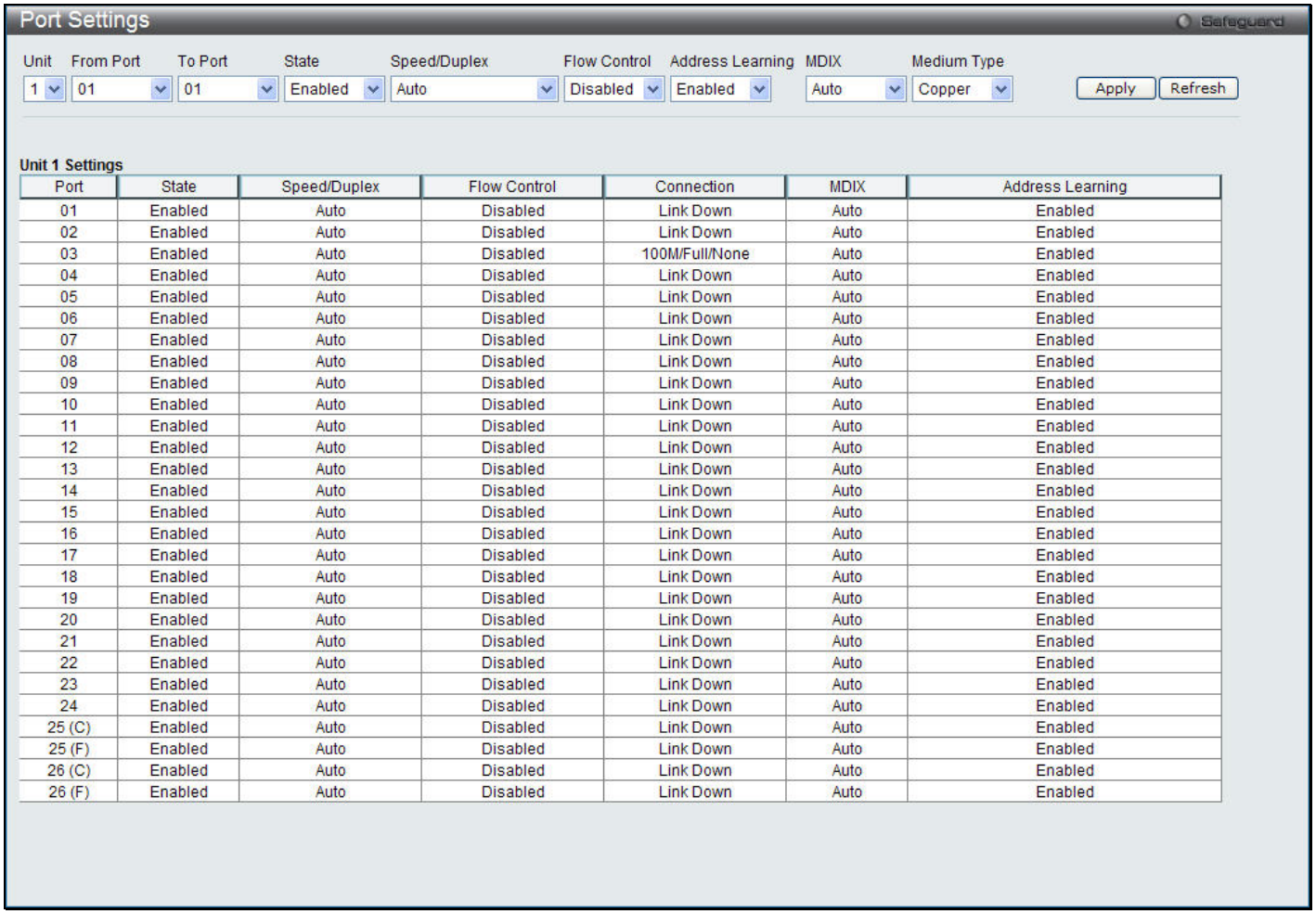


Figure 2-3 Port Settings window

To configure switch ports:

1. Choose the port or sequential range of ports using the From Port and To Port pull-down menus.
2. Use the remaining pull-down menus to configure the parameters described below:

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the appropriate port range used for the configuration here.
State	Toggle the State field to either enable or disable a given port or group of ports.
Speed/Duplex	Toggle the Speed/Duplex field to select the speed and full-duplex/half-duplex state of the

	port. *Auto* denotes auto-negotiation among 10, 100 and 1000 Mbps devices, in full- or half-duplex (except 1000 Mbps which is always full duplex). The *Auto* setting allows the port to automatically determine the fastest settings the device the port is connected to can handle, and then to use those settings. The other options are *10M Half*, *10M Full, 100M Half*, *100M Full*, *1000M Full_Master*, *1000M Full_Slave, and 1000M Full*. There is no automatic adjustment of port settings with any option other than *Auto*. The Switch allows the user to configure three types of gigabit connections; *1000M Full_Master*, *1000M Full_Slave*, and *1000M Full*. Gigabit connections only support full duplex connections and take on certain characteristics that are different from the other choices listed. The *1000M Full_Master* and *1000M Full_Slave* parameters refer to connections running a 1000BASE-T cable for connection between the Switch port and other device capable of a gigabit connection. The master setting (*1000M Full_Master)* will allow the port to advertise capabilities related to duplex, speed and physical layer type. The master setting will also determine the master and slave relationship between the two connected physical layers. This relationship is necessary for establishing the timing control between the two physical layers. The timing control is set on a master physical layer by a local source. The slave setting (*1000M Full_Slave)* uses loop timing, where the timing comes from a data stream received from the master. If one connection is set for *1000M Full_Master*, the other side of the connection must be set for *1000M Full_Slave*. Any other configuration will result in a link down status for both ports.
Flow Control	Displays the flow control scheme used for the various port configurations. Ports configured for full-duplex use 802.3x flow control, half-duplex ports use backpressure flow control, and Auto ports use an automatic selection of the two. The default is *Disabled*.
Address Learning	Enable or disable MAC address learning for the selected ports. When *Enabled*, destination and source MAC addresses are automatically listed in the forwarding table. When address learning is *Disabled*, MAC addresses must be manually entered into the forwarding table. This is sometimes done for reasons of security or efficiency. See the section on Forwarding/Filtering for information on entering MAC addresses into the forwarding table. The default setting is *Enabled*.
MDIX	*Auto* - Select auto for auto sensing of the optimal type of cabling. *Normal* - Select normal for normal cabling. If set to normal state, the port is in MDI mode and can be connected to a PC NIC using a straight-through cable or a port (in MDI mode) on another switch through a cross-over cable. *Cross* - Select cross for cross cabling. If set to cross state, the port is in MDIX mode, and can be connected to a port (in MDI mode) on another switch through a straight cable.
Medium Type	If configuring the Combo ports, this defines the type of transport medium to be used.

Click the **Apply** button to implement changes made.

Click the **Refresh** button to update the display section of this page.

Port Description Settings

The Switch supports a port description feature where the user may name various ports.

To view the following window, click **System Configuration > Port Configuration > Port Description Settings**, as shown below:

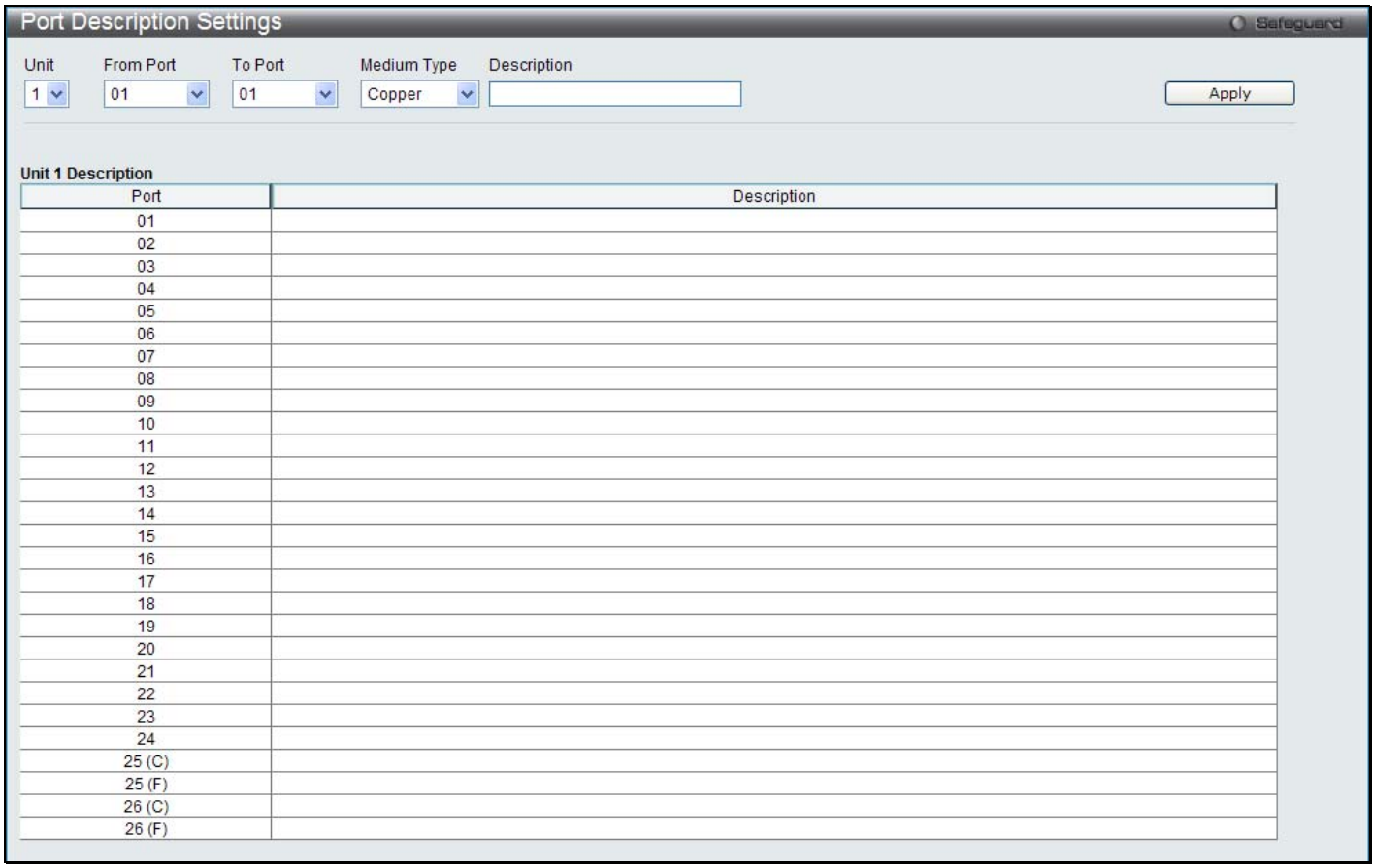


Figure 2-4 Port Description Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the appropriate port range used for the configuration here.
Medium Type	Specify the medium type for the selected ports. If configuring the Combo ports, the Medium Type defines the type of transport medium to be used, whether *Copper* or *Fiber.*
Description	Users may then enter a description for the chosen port(s).

Click the **Apply** button to implement changes made.

Port Error Disabled

The following window displays the information about ports that have been disconnected by the Switch when a packet storm occurs or a loop was detected.

To view the following window, click **System Configuration > Port Configuration > Port Error Disabled**, as shown below:

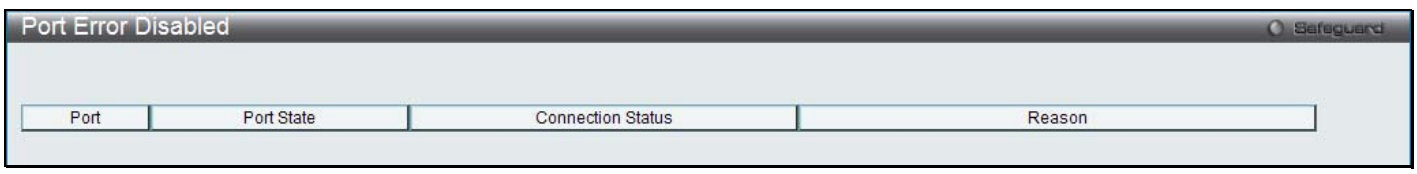


Figure 2-5 Port Error Disabled window

The fields that can be displayed are described below:

Parameter	Description
Port	Display the port that has been error disabled.
Port State	Describe the current running state of the port, whether enabled or disabled.
Connection Status	Display the uplink status of the individual ports, whether enabled or disabled.
Reason	Describe the reason why the port has been error-disabled, such as it has become a shutdown port for storm control.

Jumbo Frame Settings

The Switch supports jumbo frames. Jumbo frames are Ethernet frames with more than 1,518 bytes of payload. The Switch supports jumbo frames with a maximum frame size of up to 9216 bytes.

To view the following window, click **System Configuration > Port Configuration > Jumbo Frame Settings**, as shown below:

Figure 2-6 Jumbo Frame Settings window

The fields that can be configured are described below:

Parameter	Description
Jumbo Frame	Use the radio buttons to enable or disable the Jumbo Frame function on the Switch. The default is Disabled. The maximum frame size is 1536 bytes.

Click the **Apply** button to implement changes made.

PoE

The DES-3528P/DES-3552P Switch supports Power over Ethernet (PoE) as defined by the IEEE 802.3af. Ports 1 to 8 can support PoE up to 30W. (DES-3528P) Ports 1 to 24/(DES-3552P) Ports 1 to 48 can supply about 48 VDC power to Powered Devices (PDs) over Category 5 or Category 3 UTP Ethernet cables. The DES-3528P/DES-3552P follows the standard PSE (Power Sourcing Equipment) pinout *Alternative A*, whereby power is sent out over pins 1, 2, 3 and 6. The DES-3528P/3552P works with all D-Link 802.3af capable devices.

The DES-3528P/DES-3552P includes the following PoE features:

- Auto-discovery recognizes the connection of a PD (Powered Device) and automatically sends power to it.
- The Auto-disable feature occurs under two conditions: firstly, if the total power consumption exceeds the system power limit; and secondly, if the per port power consumption exceeds the per port power limit.
- Active circuit protection automatically disables the port if there is a short. Other ports will remain active.

Based on 802.3af/at PDs receive power according to the following classification:

Class	Maximum power available to PD
0	12.95W
1	3.84W
2	6.49W
3	12.95W
4	29.5W

PSE provides power according to the following classification:

Class	Max power used by PSE
0	15.4W
1	4.0W
2	7.0W
3	15.4W
User define	Maximum 30W, PSE configuration is up to 35W (only for ports 1-8)

To configure the PoE features on the DES-3528P/DES-3552P, click **Configuration > PoE**. The **PoE System Settings** window is used to assign a power limit and power disconnect method for the whole PoE system. To configure the Power Limit for the PoE system, enter a value between 37W and 370W for the DES-3528P/DES-3552P in the Power Limit field. The default setting is 370W. When the total consumed power exceeds the power limit, the PoE controller (located in the PSE) disconnects the power to prevent overloading the power supply.

PoE System Settings

To view the following window, click **System Configuration > PoE > PoE System Settings**, as shown below:

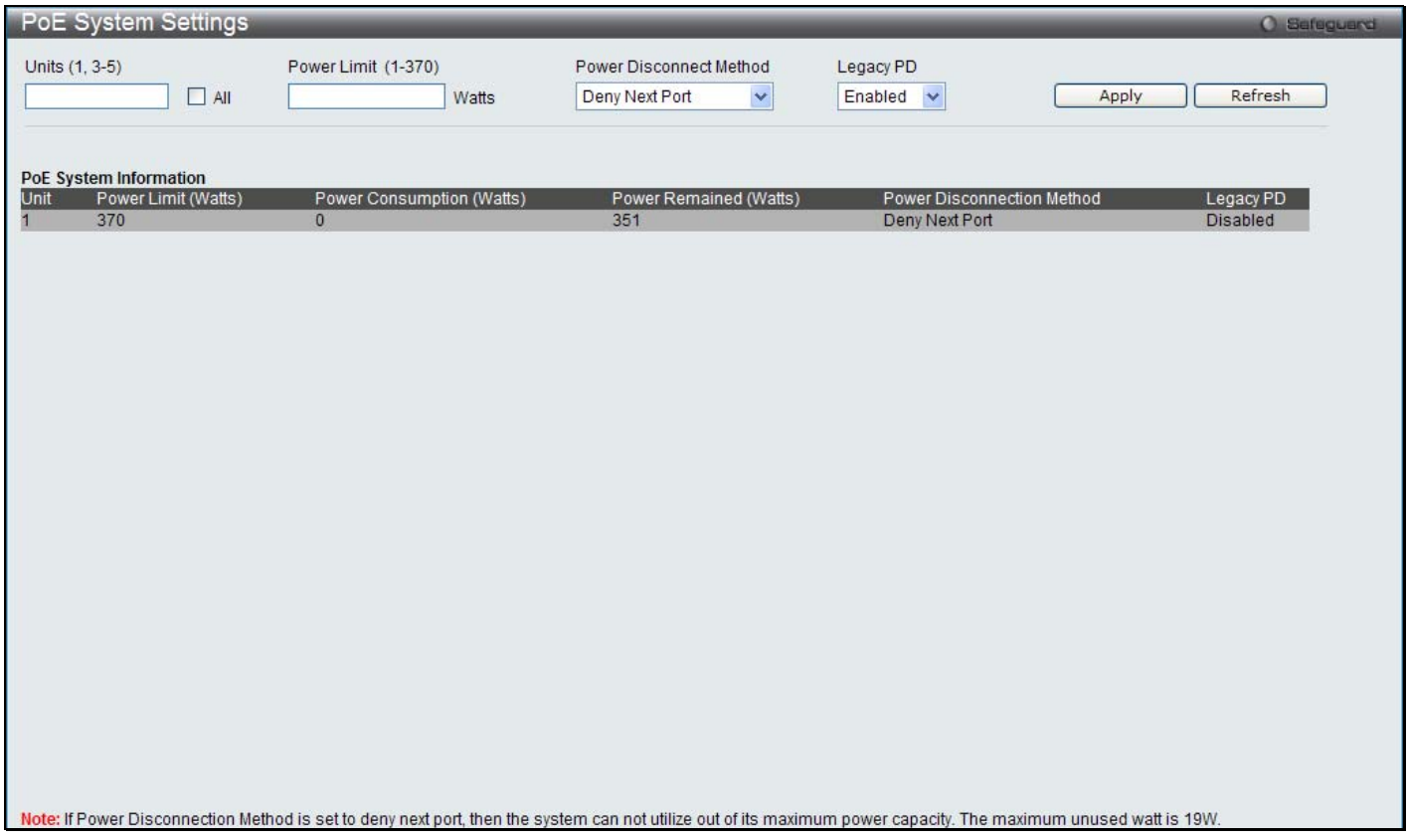


Figure 2-7 PoE System Settings window

The following parameters can be configured:

Parameter	Description
Unit (1, 3-5)	Select the unit to configure. Tick the All check box to select all units.

Power Limit (1-370)	Sets the limit of power to be used from the Switch's power source to PoE ports. The user may configure a Power Limit between 37W and 370W for the DES-3528P/DES-3552P. The default setting is 370W.
Power Disconnect Method	The PoE controller uses either *Deny Next Port* or *Deny Low Priority Port* to offset the power limit being exceeded and keeps the Switch's power at a usable level. Use the drop-down menu to select a Power Disconnect Method. The default Power Disconnect Method is *Deny Next Port*. Both Power Disconnection Methods are described below: *Deny Next Port* - After the power limit has been exceeded, the next port attempting to power up is denied, regardless of its priority. If Power Disconnection Method is set to *Deny Next Port*, the system cannot utilize out of its maximum power capacity. The maximum unused watt is 19W. *Deny Low Priority Port* - After the power limit has been exceeded, the next port attempting to power up causes the port with the lowest priority to shut down so as to allow the high-priority and critical priority ports to power up.
Legacy PD	Use the drop-down menu to enable or disable detecting legacy PDs signal.

Click the **Apply** button to implement changes made.

Click the **Refresh** button to update the display section of this page.

PoE Port Settings

To view the following window, click **System Configuration > PoE > PoE Port Settings**, as shown below:

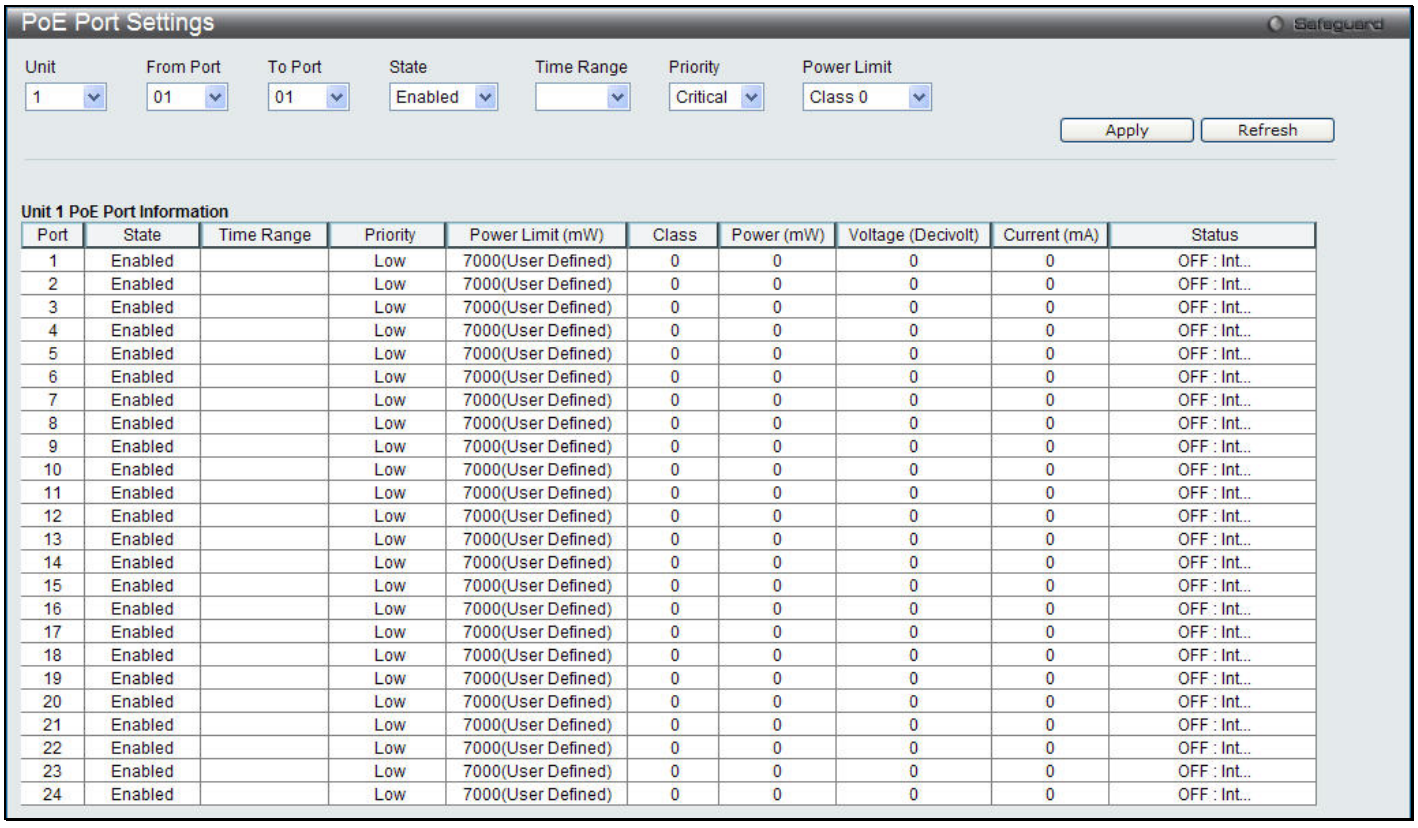


Figure 2-8 PoE Port Settings window

The following parameters can be configured:

Parameter	Description
Unit	Select the unit to configure.

From Port / To Port	Select a range of ports from the pull-down menus to be enabled or disabled for PoE.
State	Use the pull-down menu to enable or disable ports for PoE.
Time Range	Select a range of the time to the port set as PoE. If Time Range is configured, the power can only be supplied during the specified period of time.
Priority	Use the pull-down menu to select the priority of the PoE ports. Port priority determines the priority which the system attempts to supply the power to the ports. There are three levels of priority that can be selected, critical, high, and low. When multiple ports happen to have the same level of priority, the port ID will be used to determine the priority. The lower port ID has higher priority. The setting of priority will affect the order of supplying power. Whether the disconnect method is set to deny low priority port, the priority of each port will be used by the system to manage the supply of power to ports.
Power Limit	This function is used to configure the per-port power limit. If a port exceeds its power limit, it will shut down. Based on 802.3af/802.3at, there are different PD classes and power consumption ranges; Class 0 – 0.44~12.95W Class 1 – 0.44~3.84W Class 2 – 3.84~6.49W Class 3 – 6.49~12.95W Class 4 – 12.95W~29.5W (only ports 1~8) The following is the power limit applied to the port for these five classes. For each class, the power limit is a little more than the power consumption range for that class. This takes into account any power loss on the cable. Thus, the following are the typical values; Class 0 : 15400mW Class 1 : 4000mW Class 2 : 7000mW Class 3 : 15400mW User define: 30000mW (15400~30000 only applies to ports 1 - 8) As well as these four pre-defined settings, users can directly specify any value ranging from 1000mW to 30000mW on DES-3528P/DES-3552P ports 1 to 8 and 1000mW - 15400mW on DES-3528P ports 9 to 24/DES-3552P ports 9 to 48. **NOTE:** DES-3528P/DES-3552P ports 1 to 8 can support PoE up to 30W by configuring the PoE port user define value, also all ports can support 802.3af (1000 - 15400mW).

Click **Apply** to implement changes made. The port status of all PoE configured ports is displayed in the table in the bottom half of the screen shown above.

Click the **Refresh** button to update the display section of this page.

Serial Port Settings

This window allows the user to adjust the Baud Rate and the Auto Logout values.

To view the following window, click **System Configuration > Serial Port Settings**, as shown below:

Figure 2-9 Serial Port Settings window

The fields that can be configured are described below:

Parameter	Description
Baud Rate	Specify the baud rate for the serial port on the Switch. There are four possible baud rates to choose from, *9600*, *19200*, *38400* and *115200*. For a connection to the Switch using the console port, the baud rate must be set to *115200*, which is the default setting.
Auto Logout	Select the logout time used for the console interface. This automatically logs the user out after an idle period of time, as defined. Choose from the following options: *2, 5, 10, 15 minutes* or *Never*. The default setting is *10 minutes*.
Data Bits	Display the data bits used for the serial port connection.
Parity Bits	Display the parity bits used for the serial port connection.
Stop Bits	Display the stop bits used for the serial port connection.

Click the **Apply** button to implement changes made.

System Log configuration

System Log Settings

The Switch allows users to choose a method for which to save the switch log to the flash memory of the Switch.

To view the following window, click **System Configuration > System Log Configuration > System Log Settings**, as shown below:

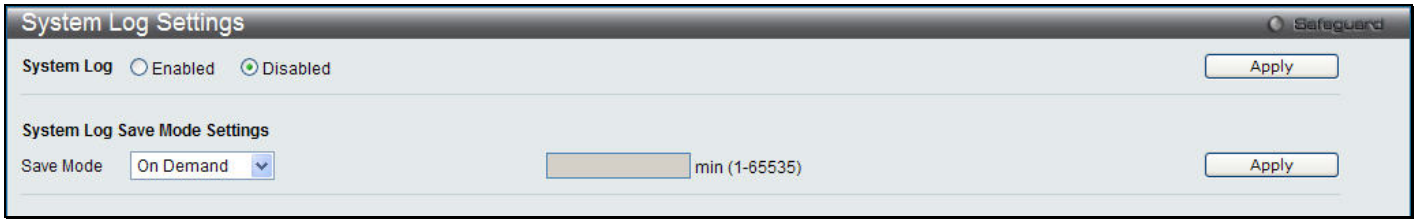


Figure 2-10 System Log Settings window

The fields that can be configured are described below:

Parameter	Description
System Log	Use the radio buttons to enable or disable the system log settings. Click the **Apply** button to accept the changes made.
Save Mode	Use the pull-down menu to choose the method for saving the switch log to the flash memory. The user has three options: *On Demand* – Users who choose this method will only save log files when they manually tell the Switch to do so, either using the Save Log link in the Save folder or clicking the Save Log Now button on this window. *Time Interval* – Users who choose this method can configure a time interval by which the Switch will save the log files, in the box adjacent to this configuration field. The user may set a time between 1 and 65535 minutes. *Log Trigger* – Users who choose this method will have log files saved to the Switch every time a log event occurs on the Switch.

Click the **Apply** button to accept the changes made for each individual section.

System Log Server Settings

The Switch can send System log messages to up to four designated servers using the System Log Server.

To view the following window, click **System Configuration > System Log Configuration > System Log Server Settings**, as shown below:

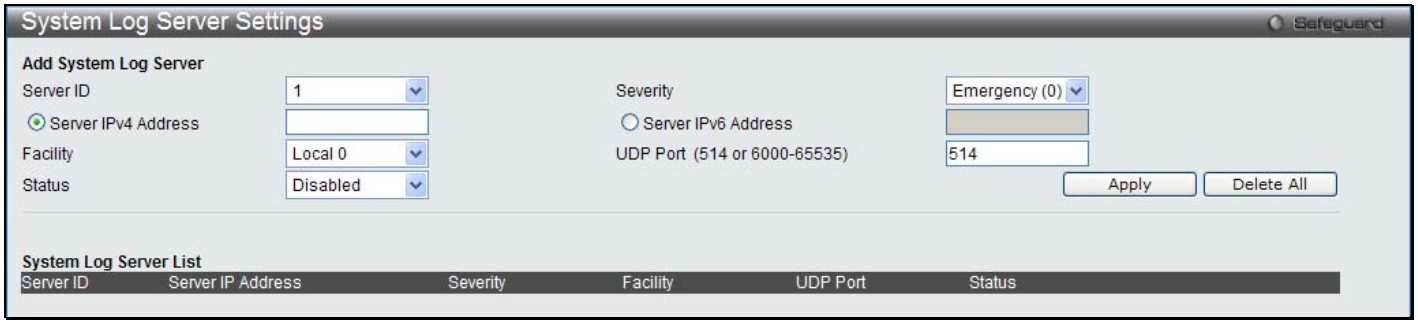


Figure 2-11 System Log Server Settings

The fields that can be configured are described below:

Parameter	Description
Server ID	Syslog server settings index (*1* to *4*).
Severity	Use the drop-down menu to select the higher level of messages that will be sent. All messages which level is higher than selecting level will be sent. The options are *Emergency*, *Alert*, *Critical*, *Error*, *Warning*, *Notice*, *Informational* and *Debug*.
Server IPv4 Address	Click the radio button and enter the IPv4 address of the Syslog server.
Server IPv6 Address	Click the radio button and enter the IPv6 address of the Syslog server.
Facility	Use the drop-down menu to select *Local 0*, *Local 1*, *Local 2*, *Local 3*, *Local 4*, *Local 5*, *Local 6*, or *Local 7*.
UDP Port	Type the UDP port number used for sending Syslog messages. The default is *514*.
Status	Choose *Enabled* or *Disabled* to activate or deactivate.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all servers configured.

System Log

Users can view and delete the local history log as compiled by the Switch's management agent.

To view the following window, click **System Configuration > System Log Configuration > System Log**, as shown below:

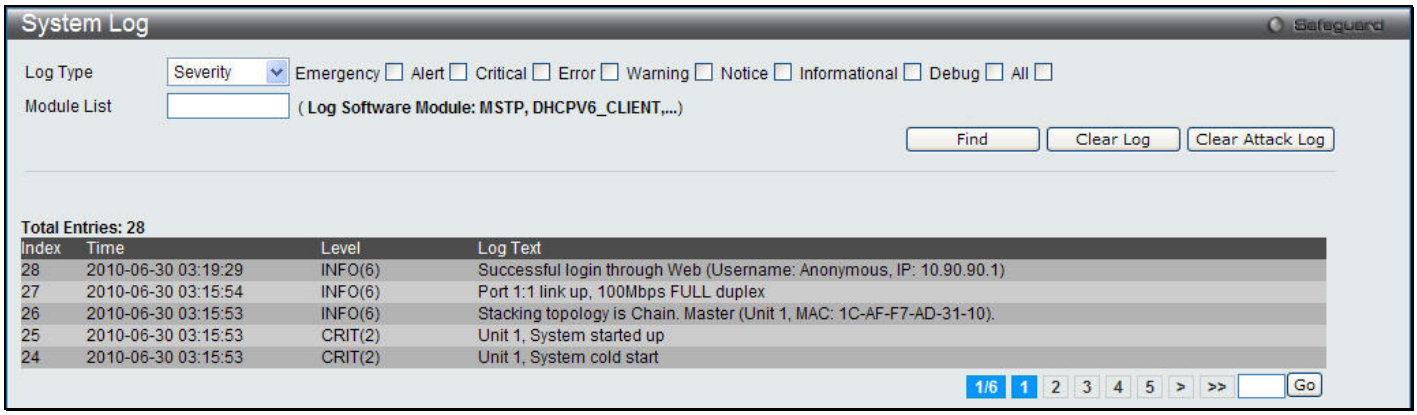


Figure 2-12 System Log window

The Switch can record event information in its own log. Click **Go** to go to the next page of the **System Log** window.

The fields that can be configured or viewed are described below:

Parameter	Description
Log Type	In the drop-down menu the user can select the log type that will be displayed. *Severity* - When selecting *Severity* from the drop-down menu, a secondary tick must be made. Secondary ticks are Emergency, Alert, Critical, Error, Warning, Notice, Informational and Debug. To view all information in the log, simply tick the **All** check box. *Module List* - When selecting *Module List*, the module name must be manually entered like MSTP or ERPS. *Attack Log* - When selecting *Attack Log* all attacks will be listed.
Index	A counter incremented whenever an entry to the Switch's history log is made. The table displays the last entry (highest sequence number) first.
Time	Display the time in days, hours, minutes, and seconds since the Switch was last restarted.
Level	Display the level of the log entry.
Log Text	Display text describing the event that triggered the history log entry.

Click the **Find** button to display the log in the display section according to the selection made.

Click the **Clear Log** button to clear the entries from the log in the display section.

Click the **Clear Attack Log** button to clear the entries from the attack log in the display section.

System Log & Trap Settings

The Switch allows users to configure the system log source IP interface addresses here.

To view the following window, click **System Configuration > System Log Configuration > System Log & Trap Settings**, as shown below:

Figure 2-13 System Log & Trap Settings window (EI Mode Only)

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter the IP interface name used.
IPv4 Address	Enter the IPv4 address used.
IPv6 Address	Enter the IPv6 address used.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all the information entered in the fields.

System Severity Settings

The Switch can be configured to allow alerts be logged or sent as a trap to an SNMP agent or both. The level at which the alert triggers either a log entry or a trap message can be set as well. Use the System Severity Settings window to set the criteria for alerts. The current settings are displayed below the System Severity Table.

To view the following window, click **System Configuration > System Log Configuration > System Severity Settings**, as shown below:

Figure 2-14 System Severity Settings window

The fields that can be configured are described below:

Parameter	Description
System Severity	Choose how the alerts are used from the drop-down menu. Select *Log* to send the alert of the Severity Type configured to the Switch's log for analysis. Choose *Trap* to send it to an SNMP agent for analysis, or select *All* to send the chosen alert type to an SNMP agent and the Switch's log for analysis.
Severity Level	This drop-down menu allows you to select the level of messages that will be sent. The options

	are *Emergency (0), Alert (1), Critical (2), Error (3), Warning (4), Notice (5), Information(6)* and *Debug(7).*

Click the **Apply** button to accept the changes made.

Time Range Settings

Time range is a time period that the respective function will take an effect on, such as ACL. For example, the administrator can configure the time based ACL to allow users to surf the Internet on every Saturday and every Sunday, meanwhile to deny users to surf the Internet on weekdays.

The user may enter up to 64 time range entries on the Switch.

To view the following window, click **System Configuration > Time Range Settings**, as shown below:

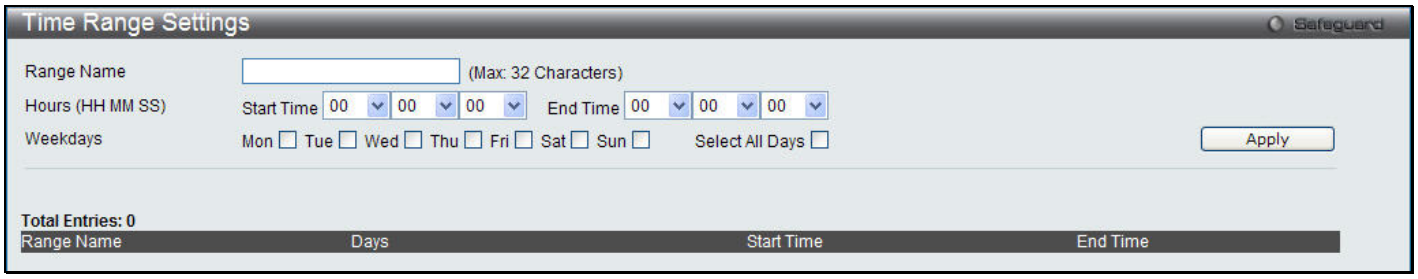


Figure 2-15 Time Range Settings window

The fields that can be configured are described below:

Parameter	Description
Range Name	Enter a name of no more than 32 alphanumeric characters that will be used to identify this time range on the Switch. This range name will be used in the Access Profile table to identify the access profile and associated rule to be enabled during this time range.
Hours	This parameter is used to set the time in the day that this time range is to be enabled using the following parameters: *Start Time* - Use this parameter to identify the starting time of the time range, in hours, minutes and seconds, based on the 24-hour time system. *End Time* - Use this parameter to identify the ending time of the time range, in hours, minutes and seconds, based on the 24-hour time system.
Weekdays	Use the check boxes to select the corresponding days of the week that this time range is to be enabled. Tick the Select All Days check box to configure this time range for every day of the week.

Click the **Apply** button to accept the changes made. Current configured entries will be displayed in the table in the bottom half of the window shown above.

Time Settings

Users can configure the time settings for the Switch.

To view the following window, click **System Configuration > Time Settings**, as shown below:

Figure 2-16 Time Settings window

The fields that can be configured are described below:

Parameter	Description
Date (DD/MM/YYYY)	Enter the current day, month, and year to update the system clock.
Time (HH:MM:SS)	Enter the current time in hours, minutes, and seconds.

Click the **Apply** button to accept the changes made.

User Accounts Settings

The Switch allows the control of user privileges.

To view the following window, click **System Configuration > User Accounts Settings**, as shown below:

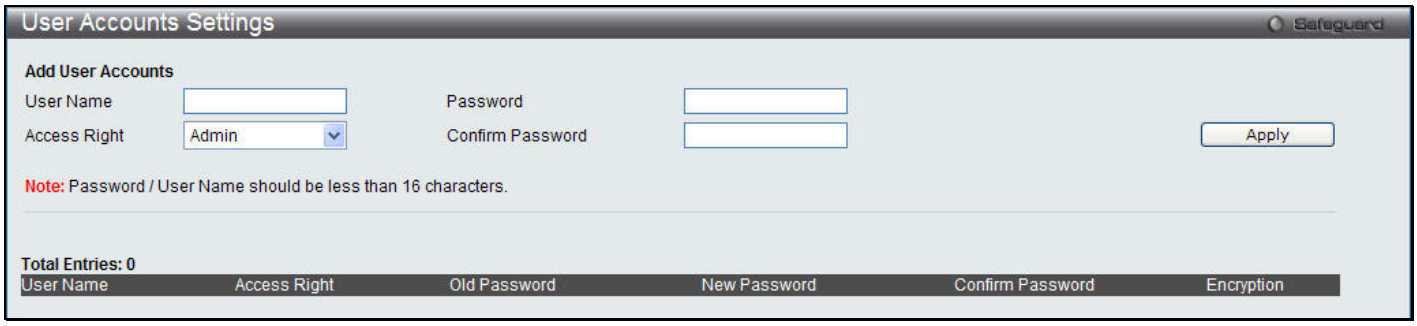


Figure 2-17 User Accounts Settings window

To add a new user, type in a User Name and New Password and retype the same password in the Confirm New Password field. Choose the level of privilege (Admin, Operator, Power_User or User) from the Access Right drop-down menu.

Management	Admin	Operator	Power_User	User
Configuration	Read/Write	Read/Write–partly	Read/Write–partly	No
Network Monitoring	Read/Write	Read/Write	Read-only	Read-only
Community Strings and Trap Stations	Read/Write	Read-only	Read-only	Read-only
Update Firmware and Configuration Files	Read/Write	No	No	No
System Utilities	Read/Write	Read-only	Read-only	Read-only
Factory Reset	Read/Write	No	No	No
User Account Management				
Add/Update/Delete User Accounts	Read/Write	No	No	No
View User Accounts	Read/Write	No	No	No

The fields that can be configured are described below:

Parameter	Description
User Name	Enter a new user name for the Switch.
Password	Enter a new password for the Switch.
Confirm Password	Re-type in a new password for the Switch.
Access Right	Specify the access right for this user.

Click the **Apply** button to accept the changes made.

NOTICE: In case of lost passwords or password corruption, please refer to the appendix chapter entitled, "Password Recovery Procedure," which will guide you through the steps necessary to resolve this issue.

NOTE: The username and password should be less than 16 characters.

Stacking

From firmware release v2.00 of this Switch, the DES-3528/DES-3552 Series now supports switch stacking, where a set of eight switches can be combined to be managed by one IP address through Telnet, the GUI interface (Web), the console port or through SNMP. Each switch of this series has two stacking ports located at the rear of the device, which can be used to connect stacking enabled devices and make them stack together. After adding these stacking ports, the user may connect these ports together using copper cables (also sold separately) in one of two possible topologies.

Duplex Chain – As shown in Figure 2-18, The Duplex Chain topology stacks switches together in a chain-link format. Using this method, data transfer is only possible in one direction and if there is a break in the chain, then data transfer will obviously be affected.

Duplex Ring – As shown in Figure 2-19, the Duplex Ring stacks switches in a ring or circle format where data can be transferred in two directions. This topology is very resilient due to the fact that if there is a break in the ring, data can still be transferred through the stacking cables between switches in the stack.

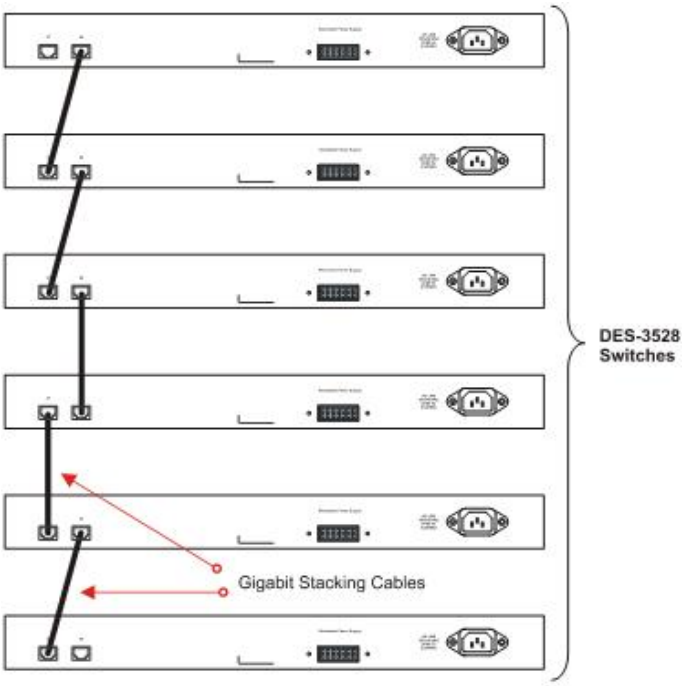


Figure 2-18 Switches stacked in a Duplex Chain

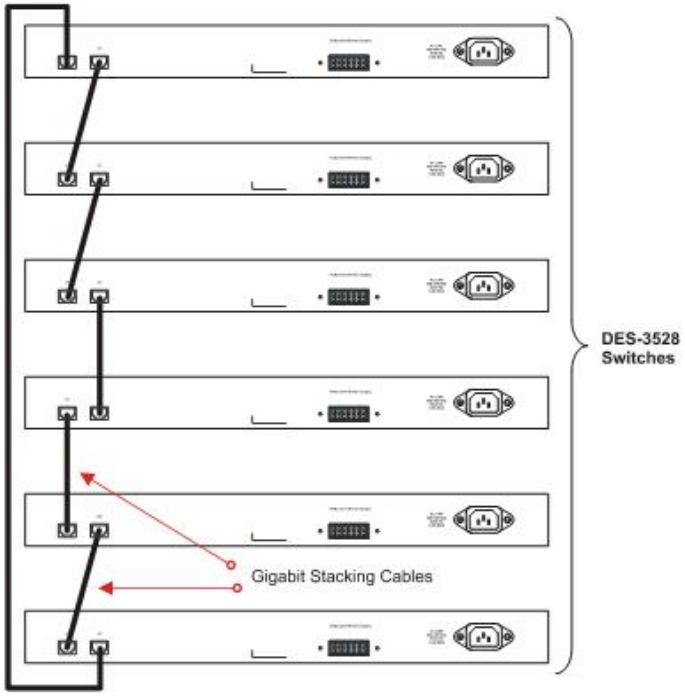


Figure 2-19 Switches stacked in a Duplex Ring

Within each of these topologies, each switch plays a role in the Switch stack. These roles can be set by the user per individual Switch, or if desired, can be automatically determined by the Switch stack. Three possible roles exist when stacking with the DES-3528/DES-3552 Series.

NOTE: Only ports 27 and 28 of the DES-3528/DES-3552 Series, or ports 51 and ports 52 of DES-3552/DES-3552P support stacking. The other ports cannot be used for stacking. For a stacking disabled device, ports 27 and 28 of the DES-3528 Series, or ports 51 and ports 52 of DES-3552/DES-3552P can be used as normal GE ports.

Primary Master – The Primary Master is the leader of the stack. It will maintain normal operations, monitor operations and the running topology of the Stack. This switch will also assign Stack Unit IDs, synchronize configurations and transmit commands to remaining switches in the switch stack. The Primary Master can be manually set by assigning this Switch the highest priority (a lower number denotes a higher priority) before physically assembling the stack, or it can be determined automatically by the stack through an election process which determines the lowest MAC address and then will assign that switch as the Primary Master, if all priorities are the same. The Primary master are physically displayed by the seven segment LED to the far right on the front panel of the switch where this LED will flash between its given Box ID and 'H'.

Backup Master – The Backup Master is the backup to the Primary Master, and will take over the functions of the Primary Master if the Primary Master fails or is removed from the Stack. It also monitors the status of neighboring switches in the stack, will perform commands assigned to it by the Primary Master and will monitor the running status of the Primary Master. The Backup Master can be set by the user by assigning this Switch the second highest priority before physically assembling the stack, or it can be determined automatically by the stack through an election process which determines the second lowest MAC address and then will assign that switch as the Backup Master, if all priorities are the same.

Slave – Slave switches constitute the rest of the switch stack and although not Primary or Backup Masters, they can be placed into these roles when these other two roles fail or are removed from the stack. Slave switches perform operations requested by the master, monitor the status of neighbor switches in the stack and the stack topology and adhere to the Backup Master's commands once it becomes a Primary Master. Slave switches will do a self-check to determine if it is to become the Backup Master if the Backup Master is promoted to the Primary Master, or if the Backup Master fails or is removed from the switch stack. If both Primary and Backup masters fail, or are removed from the Switch stack, it will determine if it is to become the Primary Master. These roles will be determined, first by priority and if the priority is the same, the lowest MAC address.

Once switches have been assembled in the topology desired by the user and powered on, the stack will undergo three processes until it reaches a functioning state.

Initialization State – This is the first state of the stack, where the runtime codes are set and initialized and the system conducts a peripheral diagnosis to determine each individual switch is functioning properly.

Master Election State – Once the codes are loaded and initialized, the stack will undergo the Master Election State where it will discover the type of topology used, elect a Primary Master and then a Backup Master.

Synchronization State – Once the Primary Master and the Backup Master have been established, the Primary Master will assign Stacking Unit IDs to switches in the stack, synchronize configurations for all switches and then transmit commands to the rest of the switches based on the users configurations of the Primary Master.

Once these steps have been completed, the switch stack will enter a normal operating mode.

Stack Switch Swapping

The stacking feature of the Switch supports “hot swapping” of switches in and out of the running stack. Users may remove or add switches to the stack without powering down or largely affecting the transfer of data between switches in the stack, with a few minor provisions.

When switches are “hot inserted” into the running stack, the new switch may take on the Primary Master, Backup Master or Slave role, depending on configurations set on the newly added switch, such as configured priority or MAC address. Yet, if adding two stacks together that have both previously undergone the election process, and therefore both have a Primary Master and a Backup master, a new Primary Master will be elected from one of the already existing Primary Masters, based on priority or MAC address. This Primary Master will take over all of the Primary Master’s roles for all new switches that were hot inserted. This process is done using discovery packets that circulate through the switch stack every 1.5 seconds until the discovery process has been completed.

The “hot remove” action means removing a device from the stack while the stack is still running. The hot removal is detected by the stack when it fails to receive heartbeat packets during its specified interval from a device, or when one of the stacking ports links is down. Once the device has been removed, the remaining switches will update their stacking topology database to reflect the change. Any one of the three roles, Primary Master, Backup Master or Slave, may be removed from the stack, yet different processes occur for each specific device removal.

If a Slave device has been removed, the Primary Master will inform other switches of the hot remove of this device through the use of unit leave messages. Switches in the stack will clear the configurations of the unit removed, and dynamically learned databases, such as ARP, will be cleared as well.

If the Backup Master has been hot removed, a new Backup Master will be chosen through the election process previously described. Switches in the stack will clear the configurations of the unit removed, and dynamically learned databases, such as ARP, will be cleared as well. Then the Backup Master will begin backing up the Primary Master when the database synchronization has been completed by the stack.

If the Primary Master is removed, the Backup Master will assume the Primary Master’s role and a new Backup Master will be chosen using the election process. Switches in the stack will clear the configurations of the unit removed, and dynamically learned databases, such as ARP, will be cleared as well. The new Primary Master will inherit the MAC and IP address of the previous Primary Master to avoid conflict within the stack and the network itself.

If both the Primary Master and the Backup Master are removed, the election process is immediately processed and a new Primary Master and Backup Master is determined. Switches in the stack will clear the configurations of the units removed, and dynamically learned databases, such as ARP, will be cleared as well. Static switch configurations still remain in the database of the remaining switches in the stack and those functions will not be affected.

NOTE: If there is a Box ID conflict when the stack is in the discovery phase, the device will enter a special standalone topology mode. Users can only get device information, configure Box IDs, save and reboot. All stacking ports will be disabled and an error message will be produced on the local console port of each device in the stack. Users must reconfigure Box IDs and reboot the stack.

Stacking Device Table

This window is used to display the current devices in the Switch Stack.

To view this window, click **System Configuration > Stacking > Stacking Device Table**, as shown below:

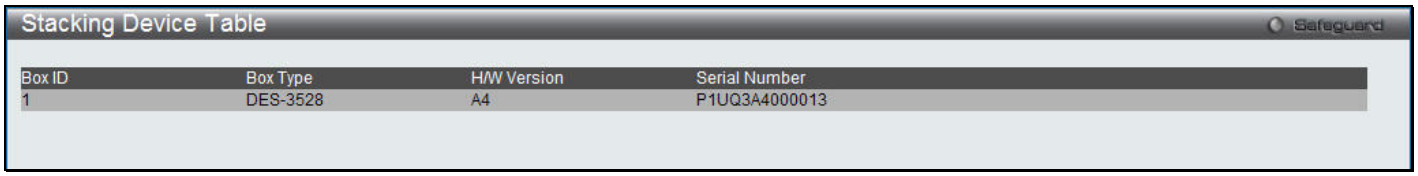


Figure 2-20 Stacking Device Table window

Stacking Mode Settings

To begin the stacking process, users must first enable this device for stacking by using the Stacking Mode Settings window.

To view this window, click **System Configuration > Stacking > Stacking Mode Settings**, as shown below:

Figure 2-21 Stacking Mode Settings window

The fields that can be configured or viewed are described below:

Parameter	Description
Stacking Mode	Click the radio buttons to enable or disable the stacking function.
Force Master Role	Use the radio buttons to enable or disable the function. It is used to ensure the master role is unchanged when adding a new device to the current stacking topology. If the Enabled radio button is selected, the master's priority will become zero after the stacking has stabilized.
Current Box ID	The Box ID of the Switch in the stack to be configured.
New Box ID	The new box ID of the selected switch in the stack that was selected in the Current Box ID field. The user may choose any number between 1 and 8 to identify the Switch in the switch stack. *Auto* will automatically assign a box number to the Switch in the switch stack.
Priority (1-63)	Displays the priority ID of the Switch. The lower the number, the higher the priority. The box (switch) with the lowest priority number in the stack is the Primary Master switch. The Primary Master switch will be used to configure applications of the switch stack.

Click the **Apply** button to accept the changes made.

Chapter 3 Management

ARP
Gratuitous ARP
IPv6 Neighbor Settings
IP Interface
Management Settings
Session Table
Single IP Management
SNMP Settings
Telnet Settings
Web Settings

ARP

Static ARP Settings

The Address Resolution Protocol is a TCP/IP protocol that converts IP addresses into physical addresses. This table allows network managers to view, define, modify, and delete ARP information for specific devices. Static entries can be defined in the ARP table. When static entries are defined, a permanent entry is entered and is used to translate IP addresses to MAC addresses.

To view the following window, click **Management > ARP > Static ARP Settings**, as shown below:

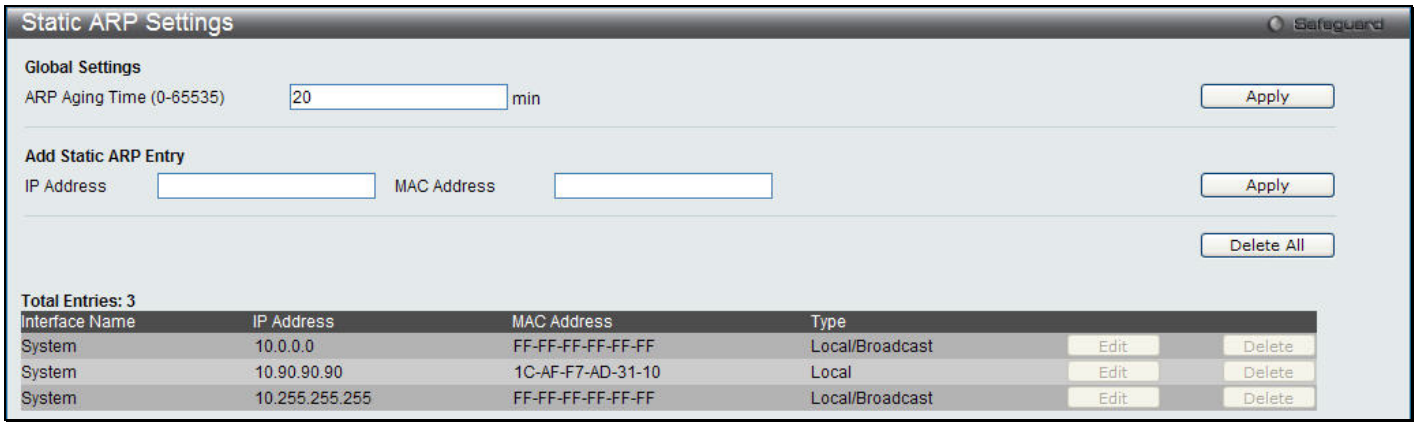


Figure 3-1 Static ARP Settings window

The fields that can be configured are described below:

Parameter	Description
ARP Aging Time (0-65535)	The ARP entry age-out time, in minutes. The default is *20* minutes.
IP Address	The IP address of the ARP entry.
MAC Address	The MAC address of the ARP entry.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Proxy ARP Settings

The Proxy ARP (Address Resolution Protocol) feature of the Switch will allow the Switch to reply to ARP requests destined for another device by faking its identity (IP and MAC Address) as the original ARP responder. Therefore, the Switch can then route packets to the intended destination without configuring static routing or a default gateway.

The host, usually a layer 3 switch, will respond to packets destined for another device. For example, if hosts A and B are on different physical networks, B will not receive ARP broadcast requests from A and therefore cannot respond. Yet, if the physical network of A is connected by a router or layer 3 switch to B, the router or Layer 3 switch will see the ARP request from A.

This local proxy ARP function allows the Switch to respond to the proxy ARP, if the source IP and destination IP are in the same interface.

To view the following window, click **Management > ARP > Proxy ARP Settings**, as shown below:

Figure 3-2 Proxy ARP Settings window

Click the **Edit** button to re-configure the specific entry and select the proxy ARP state of the IP interface. By default, both the **Proxy ARP State** and **Local Proxy ARP State** are disabled.

ARP Table

Users can display current ARP entries on the Switch.

To view the following window, click **Management > ARP > ARP Table**, as shown below:

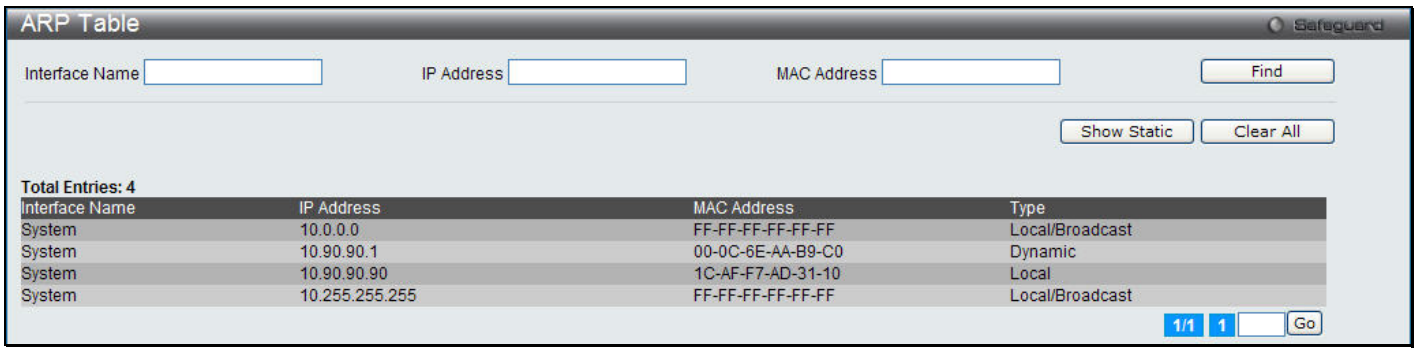


Figure 3-3 ARP Table window

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter or view the Interface name used.
IP Address	Enter or view the IP Address used.
MAC Address	Enter or view the MAC Address used.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Show Static** button to display only the static entries in the display table.

Click the **Clear All** button to remove all the entries listed in the table.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

Gratuitous ARP

Gratuitous ARP Global Settings

An ARP announcement (also known as Gratuitous ARP) is a packet (usually an ARP Request) containing a valid SHA and SPA for the host which sent it, with TPA equal to SPA. Such a request is not intended to solicit a reply, but merely updates the ARP caches of other hosts which receive the packet.

This is commonly done by many operating systems on startup, and helps to resolve problems which would otherwise occur if, for example, a network card had recently been changed (changing the IP address to MAC address mapping) and other hosts still had the old mapping in their ARP cache.

The user can enable or disable the gratuitous ARP global settings here. To view the following window, click **Management > Gratuitous ARP > Gratuitous ARP Global Settings**, as shown below:

Figure 3-4 Gratuitous ARP Global Settings Window

The fields that can be configured are described below:

Parameter	Description
Send On IP Interface Status Up	The command is used to enable/disable sending of gratuitous ARP request packet while the IPIF interface become up. This is used to automatically announce the interface's IP address to other nodes. By default, the state is disabled, and only one gratuitous ARP packet will be broadcast.
Send On Duplicate IP Detected	The command is used to enable/disable the sending of gratuitous ARP request packet while a duplicate IP is detected. By default, the state is disabled. For this command, the duplicate IP detected means that the system received an ARP request packet that is sent by an IP address that match the system's own IP address. In this case, the system knows that somebody out there uses an IP address that is conflict with the system. In order to reclaim the correct host of this IP address, the system can send out the gratuitous ARP request packets for this duplicate IP address.
Gratuitous ARP Learning	Normally, the system will only learn the ARP reply packet or a normal ARP request packet that asks for the MAC address that corresponds to the system's IP address. The command is used to enable/disable learning of ARP entry in ARP cache based on the received gratuitous ARP packet. The gratuitous ARP packet is sent by a source IP address that is identical to the IP that the packet is queries for. By default, the state is Disabled status.

Click the **Apply** button to accept the changes made.

NOTE: With the gratuitous ARP learning, the system will not learn new entry but only do the update on the ARP table based on the received gratuitous ARP packet.

Gratuitous ARP Settings

The user can configure the IP interface's gratuitous ARP parameter.

To view the following window, click **Management > Gratuitous ARP > Gratuitous ARP Settings**, as shown below:

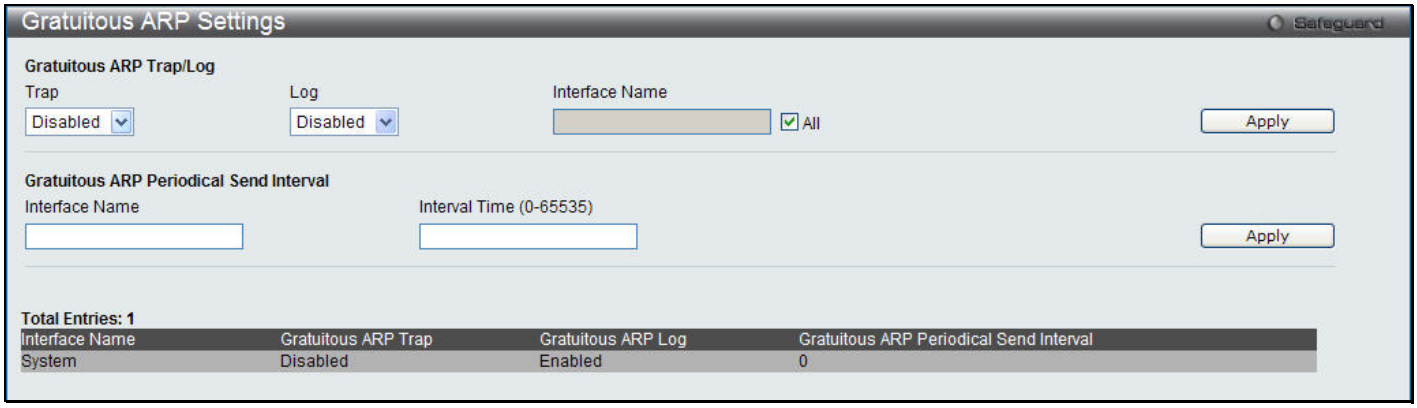


Figure 3-5 Gratuitous ARP Settings window

The fields that can be configured are described below:

Parameter	Description
Trap	Use the drop-down menu to enable or disable the trap option. By default the trap is *Disabled*.
Log	Use the drop-down menu to enable or disable the logging option. By default the event log is *Enabled*.
Interface Name	Enter the interface name of the Layer 3 interface. Select All to enable or disable gratuitous ARP trap or log on all interfaces.
Interval Time	Enter the periodically send gratuitous ARP interval time in seconds. 0 means that gratuitous ARP request will not be sent periodically. By default the interval time is *0*.

Click the **Apply** button to accept the changes made for each individual section.

IPv6 Neighbor Settings

The user can configure the Switch's IPv6 neighbor settings. The Switch's current IPv6 neighbor settings will be displayed in the table at the bottom of this window.

To view the following window, click **Management > IPv6 Neighbor Settings**, as shown below:

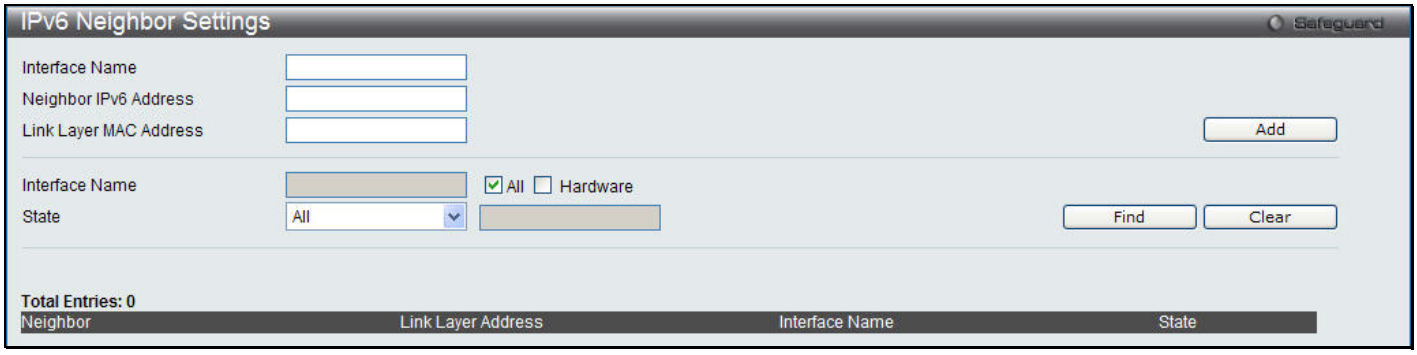


Figure 3-6 IPv6 Neighbor Settings window

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter the interface name of the IPv6 neighbor.
Neighbor IPv6 Address	Enter the neighbor IPv6 address.
Link Layer MAC Address	Enter the link layer MAC address.
Interface Name	Enter the interface name of the IPv6 neighbor. To search for all the current interfaces on the Switch, go to the second Interface Name field in the middle part of the window, tick the All check box. Tick the Hardware option to display all the neighbor cache entries which were written into the hardware table.
State	Use the drop-down menu to select *All*, *Address*, *Static*, or *Dynamic*. When the user selects address from the drop-down menu, the user will be able to enter an IP address in the space provided next to the state option.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear** button to clear all the information entered in the fields.

IP Interface

System IP Address Settings

The IP address may initially be set using the console interface prior to connecting to it through the Ethernet. The Web manager will display the Switch's current IP settings.

NOTE: The Switch's factory default IP address is 10.90.90.90 with a subnet mask of 255.0.0.0 and a default gateway of 0.0.0.0.

To view the following window, click **Management > IP Interface > System IP Address Settings**, as shown below:

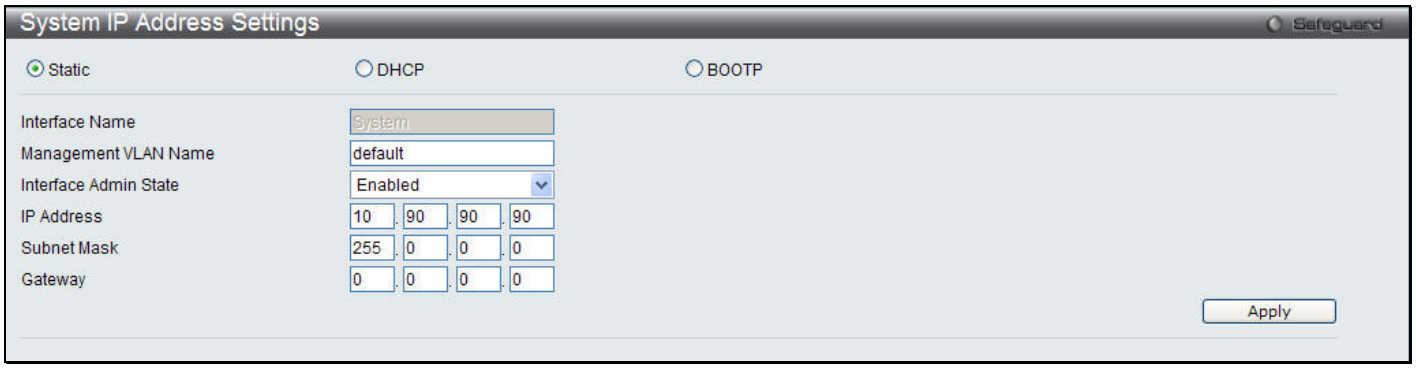


Figure 3-7 System IP Address Settings window

The fields that can be configured are described below:

Parameter	Description
Static	Allow to assign the entry of an IP address, subnet mask, and a default gateway for the Switch manually.
DHCP	The Switch will send out a DHCP broadcast request when it is powered up. The DHCP

	protocol allows IP addresses, network masks, and default gateways to be assigned by a DHCP server. If this option is set, the Switch will first look for a DHCP server to provide it with this information before using the default or previously entered settings.
BOOTP	The Switch will send out a BOOTP broadcast request when it is powered up. The BOOTP protocol allows IP addresses, network masks, and default gateways to be assigned by a central BOOTP server. If this option is set, the Switch will first look for a BOOTP server to provide it with this information before using the default or previously entered settings.
Interface Name	Display the System interface name.
Management VLAN Name	This allows the entry of a VLAN name from which a management station will be allowed to manage the Switch using TCP/IP (in-band via Web manager or Telnet). Management stations that are on VLANs other than the one entered here will not be able to manage the Switch in-band unless their IP addresses are entered in the Trusted Host Settings window (**Security > Trusted Host Settings**). If VLANs have not yet been configured for the Switch, the default VLAN contains all of the Switch's ports. There are no entries in the Trusted Host table, by default, so any management station that can connect to the Switch can access the Switch until a management VLAN is specified or Management Station IP addresses are assigned.
Interface Admin State	Use the drop-down menu to enable or disable the configuration on this interface.
IP Address	This field allows the entry of an IPv4 address to be assigned to this IP interface. These fields should be of the form xxx.xxx.xxx.xxx, where each xxx is a number (represented in decimal form) between *0* and *255*. This address should be a unique address on the network assigned for use by the network administrator.
Subnet Mask	A Bitmask that determines the extent of the subnet that the Switch is on. Should be of the form xxx.xxx.xxx.xxx, where each xxx is a number (represented in decimal) between *0* and *255*. The value should be 255.0.0.0 for a Class A network, 255.255.0.0 for a Class B network, and 255.255.255.0 for a Class C network, but custom subnet masks are allowed.
Gateway	IP address that determines where packets with a destination address outside the current subnet should be sent. This is usually the address of a router or a host acting as an IP gateway. If your network is not part of an intranet, or you do not want the Switch to be accessible outside your local network, you can leave this field unchanged.

Click the **Apply** button to accept the changes made.

Interface Settings

Users can display the Switch's current IP interface settings.

To view the following window, click **Management > IP Interface > Interface Settings**, as shown below:

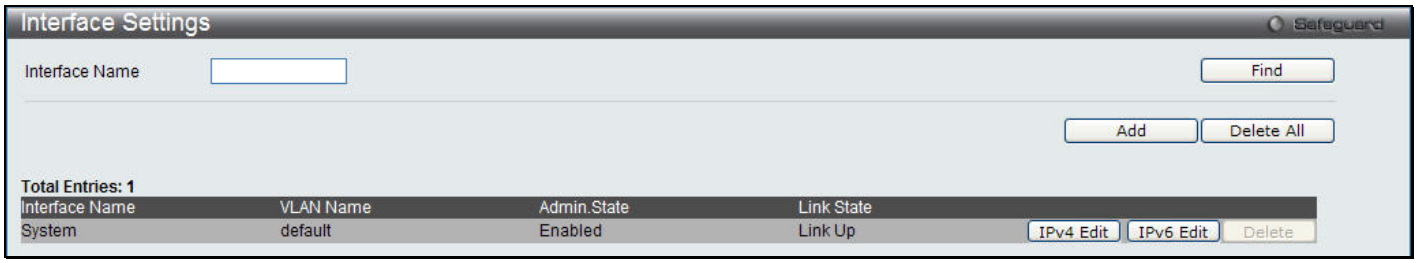


Figure 3-8 Interface Settings window

The fields that can be configured are described below:

Parameter	Description

Interface Name	Enter the name of the IP interface to search for.

Click the **Find** button to locate a specific entry based on the information entered.
Click the **Add** button to add a new entry based on the information entered.
Click the **Delete All** button to remove all the entries listed.
Click the **IPv4 Edit** button to edit the IPv4 settings for the specific entry.
Click the **IPv6 Edit** button to edit the IPv6 settings for the specific entry.
Click the **Delete** button to remove the specific entry.

NOTE: To create IPv6 interfaces, the user has to create an IPv4 interface then edit it to IPv6.

Click the **Add** button to see the following window.

Figure 3-9 IPv4 Interface Settings – Add window

The fields that can be configured are described below:

Parameter	Description
IP Interface Name	Enter the name of the IP interface being created.
IPv4 Address	Enter the IPv4 address used.
Subnet Mask	Enter the IPv4 subnet mask used.
VLAN Name	Enter the VLAN Name used.
Interface Admin State	Use the drop-down menu to enable or disable the Interface Admin State.

Click the **Apply** button to accept the changes made.
Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **IPv4 Edit** button to see the following window.

Figure 3-10 IPv4 Interface Settings – IPv4 Edit window

The fields that can be configured are described below:

Parameter	Description
Get IP From	Use the drop-down menu to specify the method that this Interface uses to acquire an IP address.
Interface Name	Enter the name of the IP interface being configured.
IPv4 Address	Enter the IPv4 address used.
Subnet Mask	Enter the IPv4 subnet mask used.
VLAN Name	Enter the VLAN Name used.
IPv4 State	Use the drop-down menu to enable or disable IPv4 State.
Interface Admin State	Use the drop-down menu to enable or disable the Interface Admin State.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **IPv6 Edit** button to see the following window.

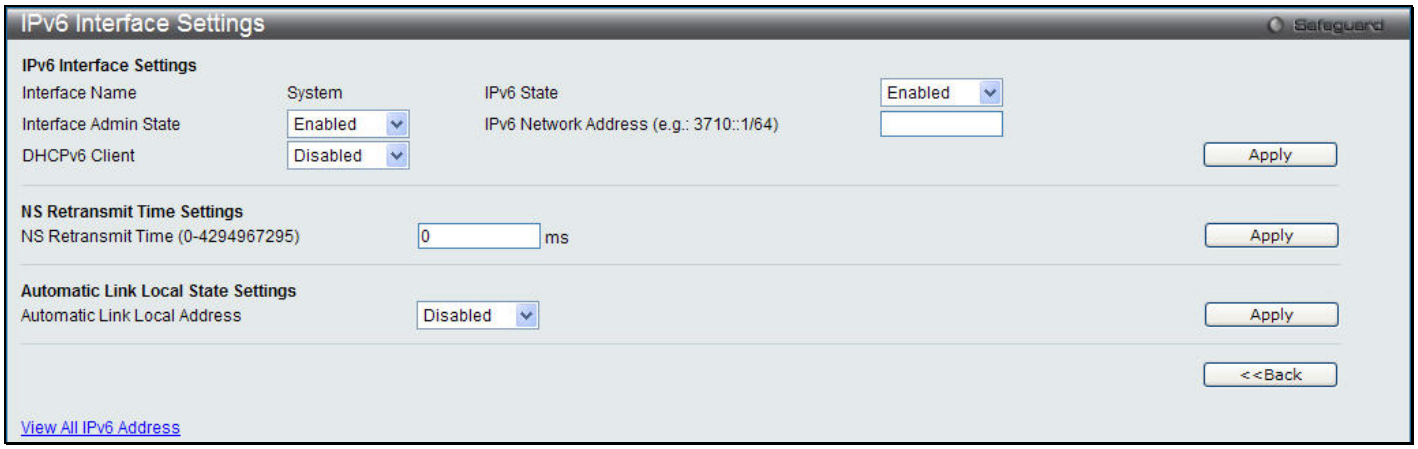


Figure 3-11 IPv6 Interface Settings – IPv6 Edit window

The fields that can be configured are described below:

Parameter	Description
Interface Name	Display the IPv6 interface name.
IPv6 State	Use the drop-down menu to enable or disable IPv6 State.
Interface Admin State	Use the drop-down menu to enable or disable the Interface Admin State.
IPv6 Network Address (e.g.: 3710::1/64)	Enter the neighbor's global or local link address.
DHCPv6 Client	Use the drop-down menu to enable or disable the DHCPv6 client.
NS Retransmit Time (0-4394967295)	Enter the Neighbor solicitation's retransmit timer in millisecond here. It has the same value as the RA retransmit time in the configuration of the IPv6 ND RA command. If this field is configure, it will duplicate the enter into the RA field.
Automatic Link Local Address	Use the drop-down menu to enable or disable the Automatic Link Local Address.

Click the **Apply** button to accept the changes made for each individual section.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the View All IPv6 Address link to view all the current IPv6 address.

Click the View All IPv6 Address link to see the following window.

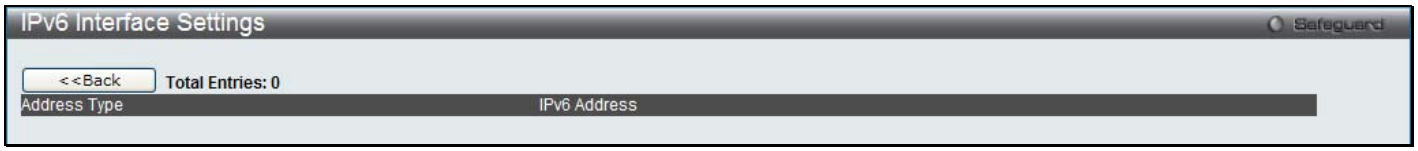


Figure 3-12 IPv6 Interface Settings – View All IPv6 Address window

Click the **<<Back** button to return to the previous page.

Management Settings

Users can stop the scrolling of multiple pages beyond the limits of the console when using the Command Line Interface.

This window is also used to enable the DHCP auto configuration feature on the Switch. When enabled, the Switch is instructed to receive a configuration file from a TFTP server, which will set the Switch to become a DHCP client automatically on boot-up. To employ this method, the DHCP server must be set up to deliver the TFTP server IP address and configuration file name information in the DHCP reply packet. The TFTP server must be up and running and hold the necessary configuration file stored in its base directory when the request is received from the Switch. For more information about loading a configuration file for use by a client, see the DHCP server and/or TFTP server software instructions. The user may also consult the **Upload Log File** window description located in the **Tools** section of this manual.

If the Switch is unable to complete the DHCP auto configuration, the previously saved configuration file present in the Switch's memory will be used.

This window also allows the user to implement the Switch's built-in power saving feature. When power saving is Enabled, a port which has a link down status will be turned off to save power to the Switch. This will not affect the port's capabilities when the port status is link up.

Users can also configure Password Encryption on the Switch.

To view the following window, click **Management > Management Settings**, as shown below:

Figure 3-13 Management Settings window

The fields that can be configured are described below:

Parameter	Description
CLI Paging State	Command Line Interface paging stops each page at the end of the console. This allows you to stop the scrolling of multiple pages of text beyond the limits of the console. CLI Paging is Enabled by default. To disable it, click the Disabled radio button.

DHCP Auto Configuration State	Enable or disable the Switch's DHCP auto configuration feature. When enabled, the Switch is instructed to receive a configuration file from a TFTP server, which will set the Switch to become a DHCP client automatically on boot-up. To employ this method, the DHCP server must be set up to deliver the TFTP server IP address and configuration file name information in the DHCP reply packet. The TFTP server must be up and running and hold the necessary configuration file stored in its base directory when the request is received from the Switch. The default is *Disabled*.
Password Encryption State	Password encryption will encrypt the password configuration in configuration files. Password encryption is Disabled by default. To enable password encryption, click the Enabled radio button.

Click the **Apply** button to accept the changes made.

Session Table

Users can display the management sessions since the Switch was last rebooted.

To view the following window, click **Management > Session Table**, as shown below:

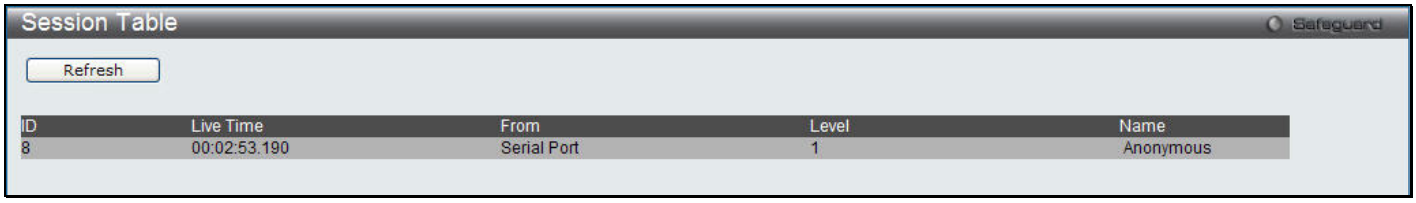


Figure 3-14 Session Table window

Click the **Refresh** button to refresh the display table so that new entries will appear.

Single IP Management

Simply put, D-Link Single IP Management is a concept that will stack switches together over Ethernet instead of using stacking ports or modules. There are some advantages in implementing the "Single IP Management" feature:

1. SIM can simplify management of small workgroups or wiring closets while scaling the network to handle increased bandwidth demand.
2. SIM can reduce the number of IP address needed in your network.
3. SIM can eliminate any specialized cables for stacking connectivity and remove the distance barriers that typically limit your topology options when using other stacking technology.

Switches using D-Link Single IP Management (labeled here as SIM) must conform to the following rules:

- SIM is an optional feature on the Switch and can easily be enabled or disabled through the Command Line Interface or Web Interface. SIM grouping has no effect on the normal operation of the Switch in the user's network.
- There are three classifications for switches using SIM. The **Commander Switch (CS)**, which is the master switch of the group, **Member Switch (MS)**, which is a switch that is recognized by the CS a member of a SIM group, and a **Candidate Switch (CaS)**, which is a Switch that has a physical link to the SIM group but has not been recognized by the CS as a member of the SIM group.
- A SIM group can only have one Commander Switch (CS).
- All switches in a particular SIM group must be in the same IP subnet (broadcast domain). Members of a SIM group cannot cross a router.
- A SIM group accepts up to 32 switches (numbered 1-32), not including the Commander Switch (numbered 0).

- There is no limit to the number of SIM groups in the same IP subnet (broadcast domain); however a single switch can only belong to one group.
- If multiple VLANs are configured, the SIM group will only utilize the default VLAN on any switch.
- SIM allows intermediate devices that do not support SIM. This enables the user to manage switches that are more than one hop away from the CS.

The SIM group is a group of switches that are managed as a single entity. The Switch may take on three different roles:

1. **Commander Switch (CS)** – This is a switch that has been manually configured as the controlling device for a group, and takes on the following characteristics:
   a. It has an IP Address.
   b. It is not a command switch or member switch of another Single IP group.
   c. It is connected to the member switches through its management VLAN.
2. **Member Switch (MS)** – This is a switch that has joined a single IP group and is accessible from the CS, and it takes on the following characteristics:
   a. It is not a CS or MS of another IP group.
   b. It is connected to the CS through the CS management VLAN.
3. **Candidate Switch (CaS)** – This is a switch that is ready to join a SIM group but is not yet a member of the SIM group. The Candidate Switch may join the SIM group of the Switch by manually configuring it to be a MS of a SIM group. A switch configured as a CaS is not a member of a SIM group and will take on the following characteristics:
   a. It is not a CS or MS of another Single IP group.
   b. It is connected to the CS through the CS management VLAN

The following rules also apply to the above roles:

- Each device begins in a Candidate state.
- CSs must change their role to CaS and then to MS, to become a MS of a SIM group. Thus, the CS cannot directly be converted to a MS.
- The user can manually configure a CS to become a CaS.
- A MS can become a CaS by:
- Being configured as a CaS through the CS.
- If report packets from the CS to the MS time out.
- The user can manually configure a CaS to become a CS
- The CaS can be configured through the CS to become a MS.

After configuring one switch to operate as the CS of a SIM group, additionalDES-3528/DES-3552 Series switches may join the group by manually configuring the Switch to be a MS. The CS will then serve as the in band entry point for access to the MS. The CS's IP address will become the path to all MS's of the group and the CS's Administrator's password, and/or authentication will control access to all MS's of the SIM group.

With SIM enabled, the applications in the CS will redirect the packet instead of executing the packets. The applications will decode the packet from the administrator, modify some data, and then send it to the MS. After execution, the CS may receive a response packet from the MS, which it will encode and send it back to the administrator.

When a CaS becomes a MS, it automatically becomes a member of the first SNMP community (includes read/write and read only) to which the CS belongs. However, if a MS has its own IP address, it can belong to SNMP communities to which other switches in the group, including the CS, do not belong.

Upgrade to v1.61

To better improve SIM management, the DES-3528/DES-3552 Series switches have been upgraded to version 1.61 in this release. Many improvements have been made, including:

1. The Commander Switch (CS) now has the capability to automatically rediscover member switches that have left the SIM group, either through a reboot or web malfunction. This feature is accomplished through the use of Discover packets and Maintenance packets that previously set SIM members will emit after a reboot. Once a MS has had its MAC address and password saved to the CS's database, if a reboot occurs in the MS, the CS will keep this MS information in its database and when a MS has been rediscovered, it will add the MS back into the SIM tree automatically. No configuration will be necessary to rediscover these switches.

There are some instances where pre-saved MS switches cannot be rediscovered. For example, if the Switch is still powered down, if it has become the member of another group, or if it has been configured to be a Commander Switch, the rediscovery process cannot occur.

2. The topology map now includes new features for connections that are a member of a port trunking group. It will display the speed and number of Ethernet connections creating this port trunk group, as shown in the adjacent picture.
3. This version will support switch upload and downloads for firmware, configuration files and log files, as follows:
   a. **Firmware** – The Switch now supports MS firmware downloads from a TFTP server.
   b. **Configuration Files** – This switch now supports downloading and uploading of configuration files both to (for configuration restoration) and from (for configuration backup) MS's, using a TFTP server.
   c. **Log** – The Switch now supports uploading MS log files to a TFTP server.
4. The user may zoom in and zoom out when utilizing the topology window to get a better, more defined view of the configurations.

Single IP Settings

The Switch is set as a Candidate (CaS) as the factory default configuration and Single IP Management is disabled.

To view the following window, click **Management > Single IP Management > Single IP Settings**, as shown below:

Figure 3-15 Single IP Settings window

The fields that can be configured are described below:

Parameter	Description
SIM State	Use the pull-down menu to either enable or disable the SIM state on the Switch. *Disabled* will render all SIM functions on the Switch inoperable.
Role State	Use the pull-down menu to change the SIM role of the Switch. The two choices are: *Candidate* – A Candidate Switch (CaS) is not the member of a SIM group but is connected to a Commander Switch. This is the default setting for the SIM role of the Switch. *Commander* – Choosing this parameter will make the Switch a Commander Switch (CS). The user may join other switches to this Switch, over Ethernet, to be part of its SIM group. Choosing this option will also enable the Switch to be configured for SIM.

Group Name	Enter a group name in this textbox. This is optional. This name is used to segment switches into different SIM groups.
Discovery Interval (30-90)	The user may set the discovery protocol interval, in seconds that the Switch will send out discovery packets. Returning information to a Commander Switch will include information about other switches connected to it. (Ex. MS, CaS). The user may set the Discovery Interval from *30* to *90* seconds. The default value is *30* seconds.
Hold Time Count (100-255)	This parameter may be set for the time, in seconds; the Switch will hold information sent to it from other switches, utilizing the Discovery Interval. The user may set the hold time from *100* to *255* seconds. The default value is *100* seconds.

Click the **Apply** button to accept the changes made.

After enabling the Switch to be a Commander Switch (CS), the **Single IP Management** folder will then contain four added links to aid the user in configuring SIM through the web, including **Topology**, **Firmware Upgrade**, **Configuration Backup/Restore** and **Upload Log File**.

Topology

This window will be used to configure and manage the Switch within the SIM group and requires Java script to function properly on your computer.

The Java Runtime Environment on your server should initiate and lead you to the Topology window, as seen below.

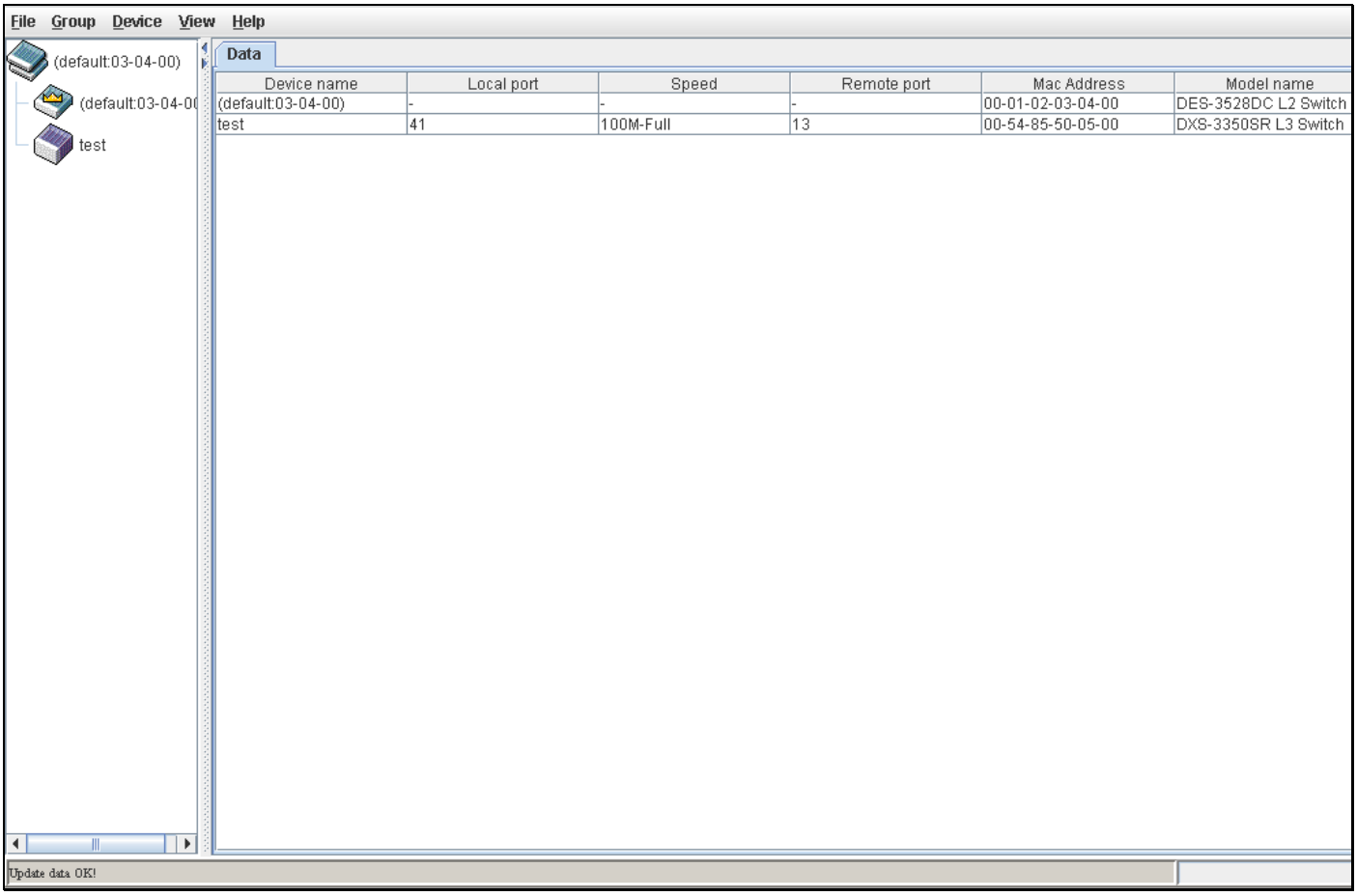


Figure 3-16 Single IP Management window - Tree View

The Topology window holds the following information on the **Data** tab:

Parameter	Description
Device Name	This field will display the Device Name of the switches in the SIM group configured by the user. If no device is configured by the name, it will be given the name default and tagged with the last six digits of the MAC Address to identify it.
Local Port	Displays the number of the physical port on the CS that the MS or CaS is connected to. The CS will have no entry in this field.
Speed	Displays the connection speed between the CS and the MS or CaS.
Remote Port	Displays the number of the physical port on the MS or CaS to which the CS is connected. The CS will have no entry in this field.
MAC Address	Displays the MAC Address of the corresponding Switch.
Model Name	Displays the full Model Name of the corresponding Switch.

To view the Topology View window, open the **View** drop-down menu in the toolbar and then click **Topology**, which will open the following Topology Map. This window will refresh itself periodically (20 seconds by default).

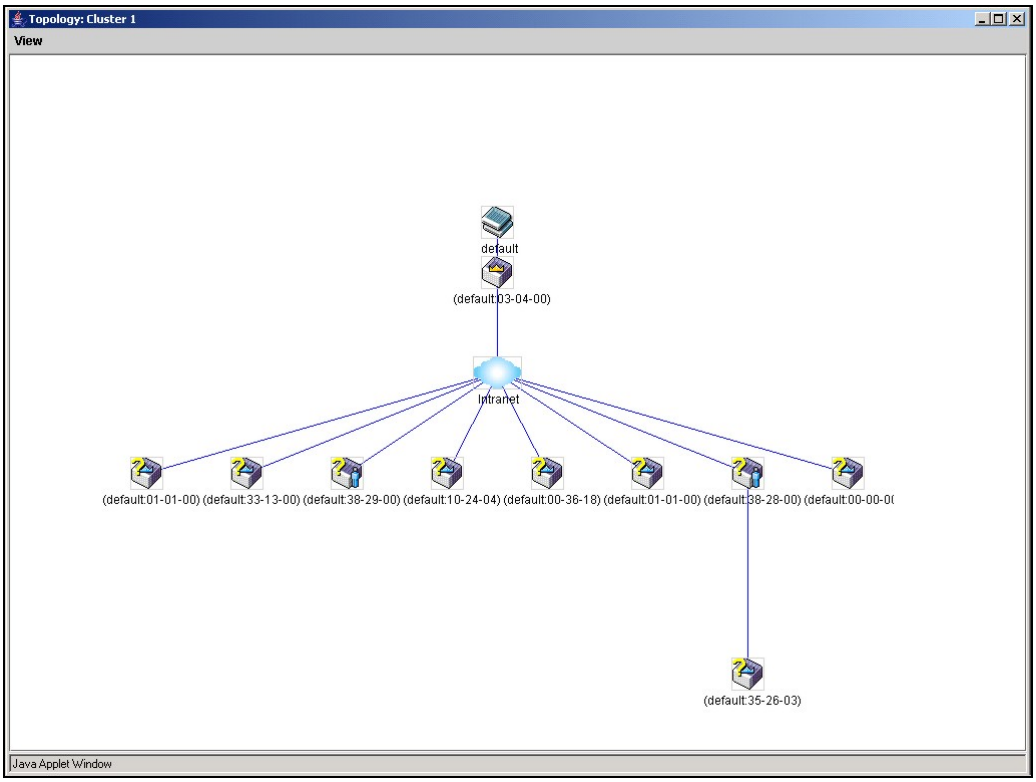


Figure 3-17 Topology view

This window will display how the devices within the Single IP Management Group connect to other groups and devices. Possible icons on this window are as follows:

Icon	Description	Icon	Description
	Group		Layer 3 member switch
	Layer 2 commander switch		Member switch of other group

	Layer 3 commander switch		Layer 2 candidate switch
	Commander switch of other group		Layer 3 candidate switch
	Layer 2 member switch.		Unknown device
	Non-SIM devices		

Tool Tips

In the Topology view window, the mouse plays an important role in configuration and in viewing device information. Setting the mouse cursor over a specific device in the topology window (tool tip) will display the same information about a specific device as the Tree view does. See the window below for an example.

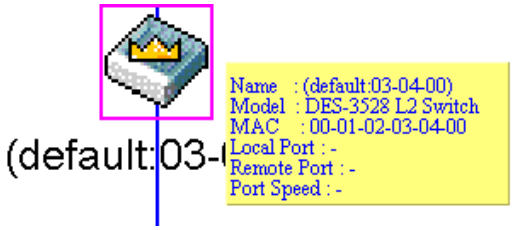


Figure 3-18 Device Information Utilizing the Tool Tip

Setting the mouse cursor over a line between two devices will display the connection speed between the two devices, as shown below.

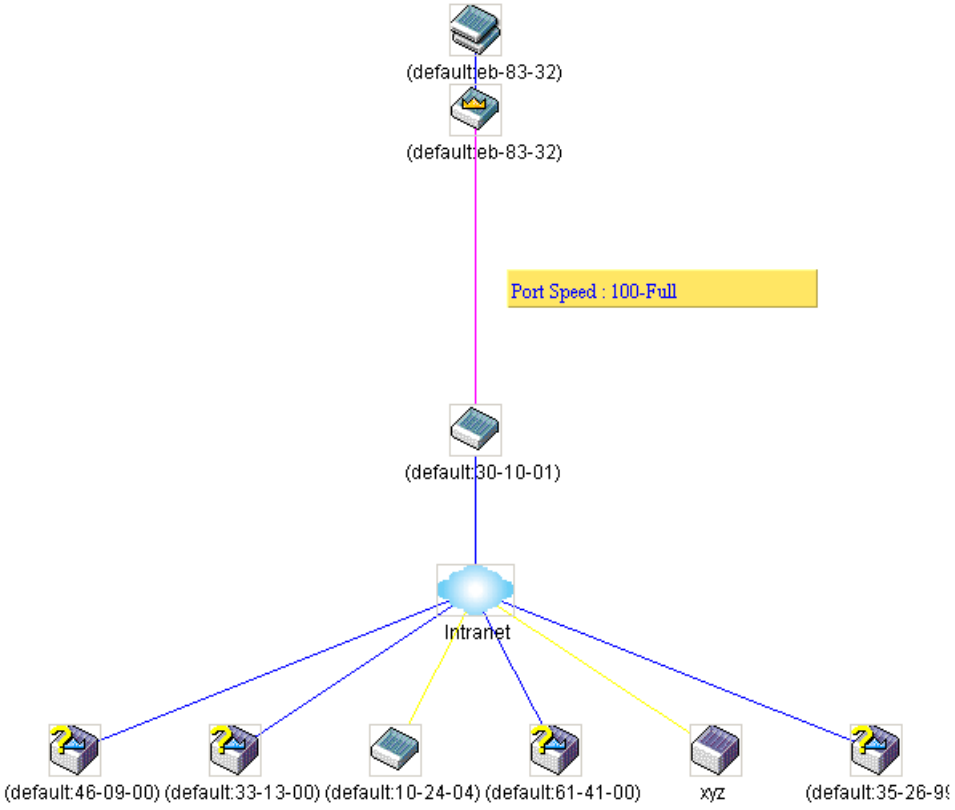


Figure 3-19 Port Speed Utilizing the Tool Tip

Right-click

Right-clicking on a device will allow the user to perform various functions, depending on the role of the Switch in the SIM group and the icon associated with it.

Group Icon

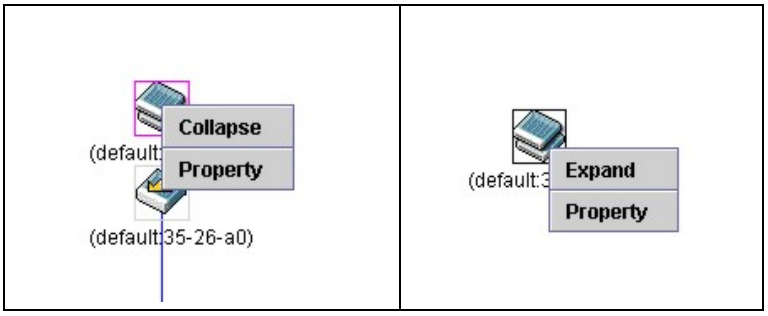


Figure 3-20 Right-clicking a Group Icon

The following options may appear for the user to configure:

- **Collapse** – To collapse the group that will be represented by a single icon.
- **Expand** – To expand the SIM group, in detail.
- **Property** – To pop up a window to display the group information.

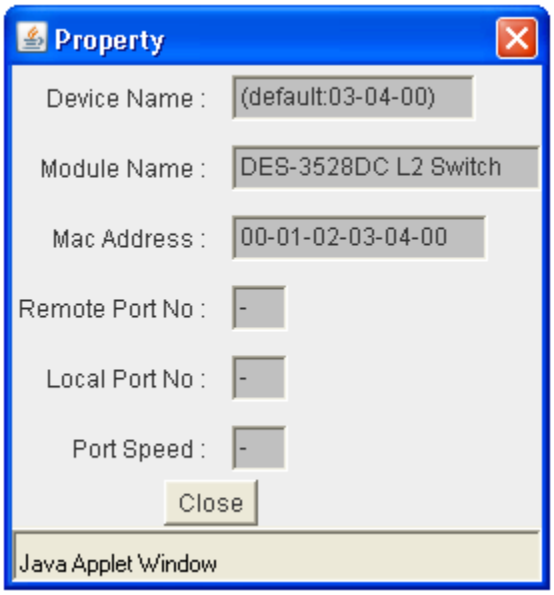


Figure 3-21 Property window

Parameter	Description
Device Name	This field will display the Device Name of the switches in the SIM group configured by the user. If no Device Name is configured by the name, it will be given the name default and tagged with the last six digits of the MAC Address to identify it.
Module Name	Displays the full module name of the switch that was right-clicked.
MAC Address	Displays the MAC Address of the corresponding Switch.
Remote Port No	Displays the number of the physical port on the MS or CaS that the CS is connected to. The CS will have no entry in this field.
Local Port No	Displays the number of the physical port on the CS that the MS or CaS is connected to. The

	CS will have no entry in this field.
Port Speed	Displays the connection speed between the CS and the MS or CaS

Click the **Close** button to close the property window.

Commander Switch Icon

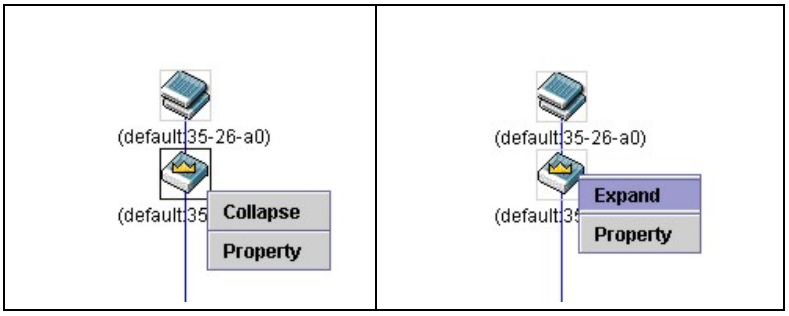


Figure 3-22 Right-clicking a Commander Icon

The following options may appear for the user to configure:

- **Collapse** – To collapse the group that will be represented by a single icon.
- **Expand** – To expand the SIM group, in detail.
- **Property** – To pop up a window to display the group information.

Member Switch Icon

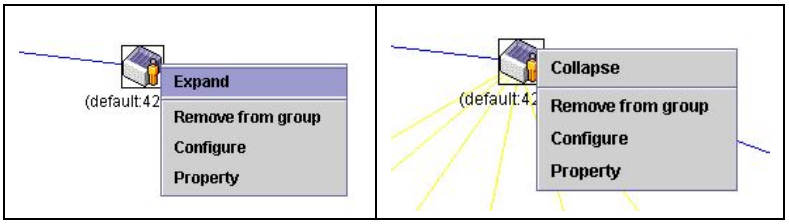


Figure 3-23 Right-clicking a Member icon

The following options may appear for the user to configure:

- **Collapse** – To collapse the group that will be represented by a single icon.
- **Expand** – To expand the SIM group, in detail.
- **Remove from group** – Remove a member from a group.
- **Configure** – Launch the web management to configure the switch.
- **Property** – To pop up a window to display the device information.

Candidate Switch Icon

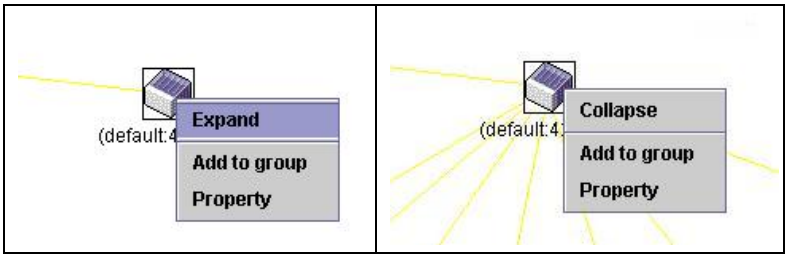


Figure 3-24 Right-clicking a Candidate icon

The following options may appear for the user to configure:

- **Collapse** – To collapse the group that will be represented by a single icon.
- **Expand** – To expand the SIM group, in detail.
- **Add to group** – Add a candidate to a group. Clicking this option will reveal the following dialog box for the user to enter a password for authentication from the Candidate Switch before being added to the SIM group. Click **OK** to enter the password or **Cancel** to exit the dialog box.

Figure 3-25 Input password window

- **Property** – To pop up a window to display the device information.

Menu Bar

The **Single IP Management** window contains a menu bar for device configurations, as seen below.

Figure 3-26 Menu Bar of the Topology View

File

- **Print Setup** – Will view the image to be printed.
- **Print Topology** – Will print the topology map.
- **Preference** – Will set display properties, such as polling interval, and the views to open at SIM startup.

Figure 3-27 Preference window

Group

- **Add to group** – Add a candidate to a group. Clicking this option will reveal the following dialog box for the user to enter a password for authentication from the Candidate Switch before being added to the SIM group. Click **OK** to enter the password or **Cancel** to exit the dialog box.

Figure 3-28 Input password window

- **Remove from Group** – Remove an MS from the group.

Device

- **Configure** – Will open the Web manager for the specific device.

View

- **Refresh** – Update the views with the latest status.
- **Topology** – Display the Topology view.

Help

- **About** – Will display the SIM information, including the current SIM version.

Figure 3-29 About window

Firmware Upgrade

This screen is used to upgrade firmware from the Commander Switch to the Member Switch. Member Switches will be listed in the table and will be specified by ID, Port (port on the CS where the MS resides), MAC Address, Model Name and Firmware Version. To specify a certain Switch for firmware download, click its corresponding check box under the Port heading. To update the firmware, enter the Server IP Address where the firmware resides and enter the Path/Filename of the firmware. Click **Download** to initiate the file transfer.

To view the following window, click **Management > Single IP Management > Firmware Upgrade**, as shown below:

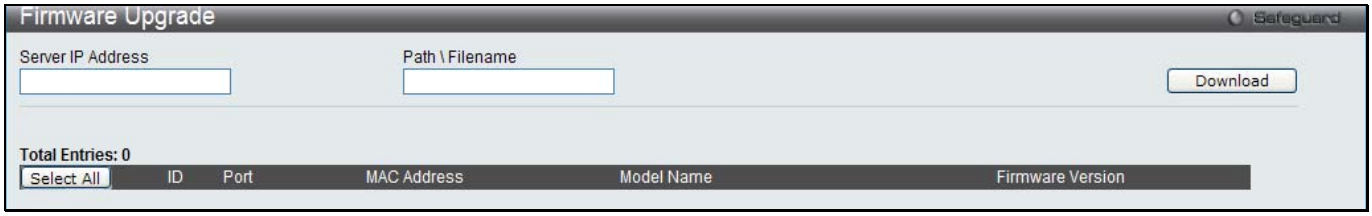


Figure 3-30 Firmware Upgrade window

Configuration File Backup/Restore

This screen is used to upgrade configuration files from the Commander Switch to the Member Switch using a TFTP server. Member Switches will be listed in the table and will be specified by ID, Port (port on the CS where the MS resides), MAC Address, Model Name and Firmware Version. To update the configuration file, enter the Server IP Address where the file resides and enter the Path/Filename of the configuration file. Click **Restore** to initiate the file transfer from a TFTP server to the Switch. Click **Backup** to backup the configuration file to a TFTP server.

To view the following window, click **Management > Single IP Management > Configuration File Backup/Restore**, as shown below:

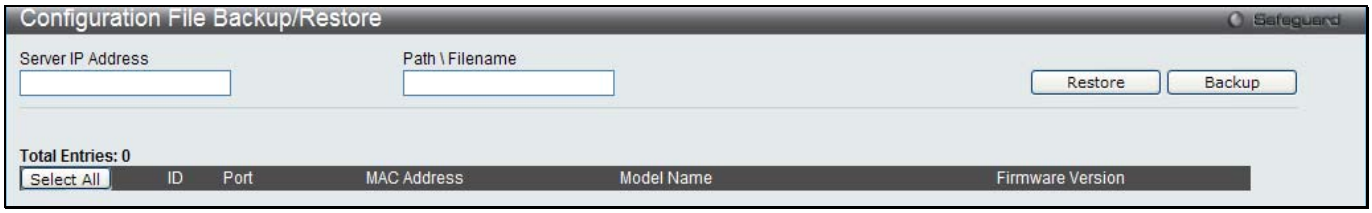


Figure 3-31 Configuration File Backup/Restore window

Upload Log File

The following window is used to upload log files from SIM member switches to a specified PC. To upload a log file, enter the Server IP address of the SIM member switch and then enter a Path\Filename on your PC where you wish to save this file. Click **Upload** to initiate the file transfer.

To view the following window, click **Management > Single IP Management > Upload Log File**, as shown below:

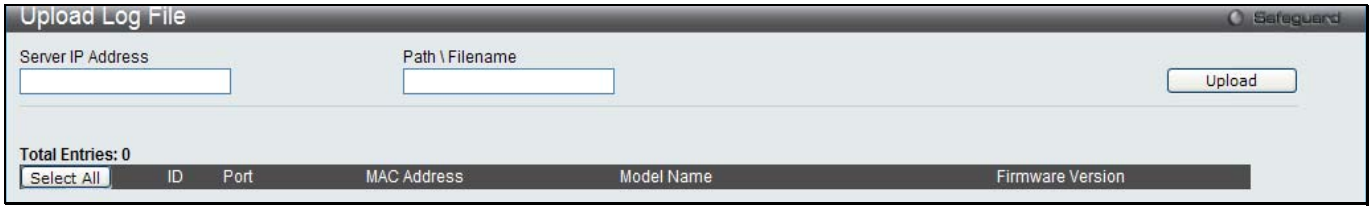


Figure 3-32 Upload Log File window

SNMP Settings

Simple Network Management Protocol (SNMP) is an OSI Layer 7 (Application Layer) designed specifically for managing and monitoring network devices. SNMP enables network management stations to read and modify the settings of gateways, routers, switches, and other network devices. Use SNMP to configure system features for proper operation, monitor performance and detect potential problems in the Switch, switch group or network.

Managed devices that support SNMP include software (referred to as an agent), which runs locally on the device. A defined set of variables (managed objects) is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB), which provides a standard presentation of the information controlled by the on-board SNMP agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

The Switch supports the SNMP versions 1, 2c, and 3. The three versions of SNMP vary in the level of security provided between the management station and the network device.

In SNMP v.1 and v.2, user authentication is accomplished using 'community strings', which function like passwords. The remote user SNMP application and the Switch SNMP must use the same community string. SNMP packets from any station that has not been authenticated are ignored (dropped).

The default community strings for the Switch used for SNMP v.1 and v.2 management access are:

- **public** – Allows authorized management stations to retrieve MIB objects.
- **private** – Allows authorized management stations to retrieve and modify MIB objects.

SNMPv3 uses a more sophisticated authentication process that is separated into two parts. The first part is to maintain a list of users and their attributes that are allowed to act as SNMP managers. The second part describes what each user on that list can do as an SNMP manager.

The Switch allows groups of users to be listed and configured with a shared set of privileges. The SNMP version may also be set for a listed group of SNMP managers. Thus, you may create a group of SNMP managers that are allowed to view read-only information or receive traps using SNMPv1 while assigning a higher level of security to another group, granting read/write privileges using SNMPv3.

Using SNMPv3 individual users or groups of SNMP managers can be allowed to perform or be restricted from performing specific SNMP management functions. The functions allowed or restricted are defined using the Object Identifier (OID) associated with a specific MIB. An additional layer of security is available for SNMPv3 in that SNMP messages may be encrypted. To read more about how to configure SNMPv3 settings for the Switch read the next section.

Traps

Traps are messages that alert network personnel of events that occur on the Switch. The events can be as serious as a reboot (someone accidentally turned OFF the Switch), or less serious like a port status change. The Switch generates traps and sends them to the trap recipient (or network manager). Typical traps include trap messages for Authentication Failure, Topology Change and Broadcast\Multicast Storm.

MIBs

The Switch in the Management Information Base (MIB) stores management and counter information. The Switch uses the standard MIB-II Management Information Base module. Consequently, values for MIB objects can be retrieved from any SNMP-based network management software. In addition to the standard MIB-II, the Switch also supports its own proprietary enterprise MIB as an extended Management Information Base. Specifying the MIB Object Identifier may also retrieve the proprietary MIB. MIB values can be either read-only or read-write.

The Switch incorporates a flexible SNMP management for the switching environment. SNMP management can be customized to suit the needs of the networks and the preferences of the network administrator. Use the SNMP V3 menus to select the SNMP version used for specific tasks.

The Switch supports the Simple Network Management Protocol (SNMP) versions 1, 2c, and 3. The administrator can specify the SNMP version used to monitor and control the Switch. The three versions of SNMP vary in the level of security provided between the management station and the network device.

SNMP settings are configured using the menus located on the SNMP V3 folder of the Web manager. Workstations on the network that are allowed SNMP privileged access to the Switch can be restricted with the Management Station IP Address menu.

SNMP Global Settings

SNMP global state settings can be enabled or disabled.

To view the following window, click **Management > SNMP Settings > SNMP Global Settings**, as shown below:

Figure 3-33 SNMP Global Settings window

The fields that can be configured are described below:

Parameter	Description
SNMP State	Enable this option to use the SNMP feature.

Click the **Apply** button to accept the changes made.

SNMP Traps Settings

Users can enable and disable the SNMP trap support function of the Switch and SNMP authentication failure trap support, respectively.

To view the following window, click **Management > SNMP Settings > SNMP Traps Settings**, as shown below:

Figure 3-34 SNMP Traps Settings window

The fields that can be configured are described below:

Parameter	Description
SNMP Traps	Enable this option to use the SNMP Traps feature.
SNMP Authentication Trap	Enable this option to use the SNMP Authentication Traps feature.
Linkchange Traps	Enable this option to use the SNMP Link Change Traps feature.
Coldstart Traps	Enable this option to use the SNMP Cold Start Traps feature.
Warmstart Traps	Enable this option to use the SNMP Warm Start Traps feature.

Click the **Apply** button to accept the changes made.

SNMP Linkchange Traps Settings

On this page the user can configure the SNMP link change trap settings.

To view the following window, click **Management > SNMP Settings > SNMP Linkchange Traps Settings**, as shown below:

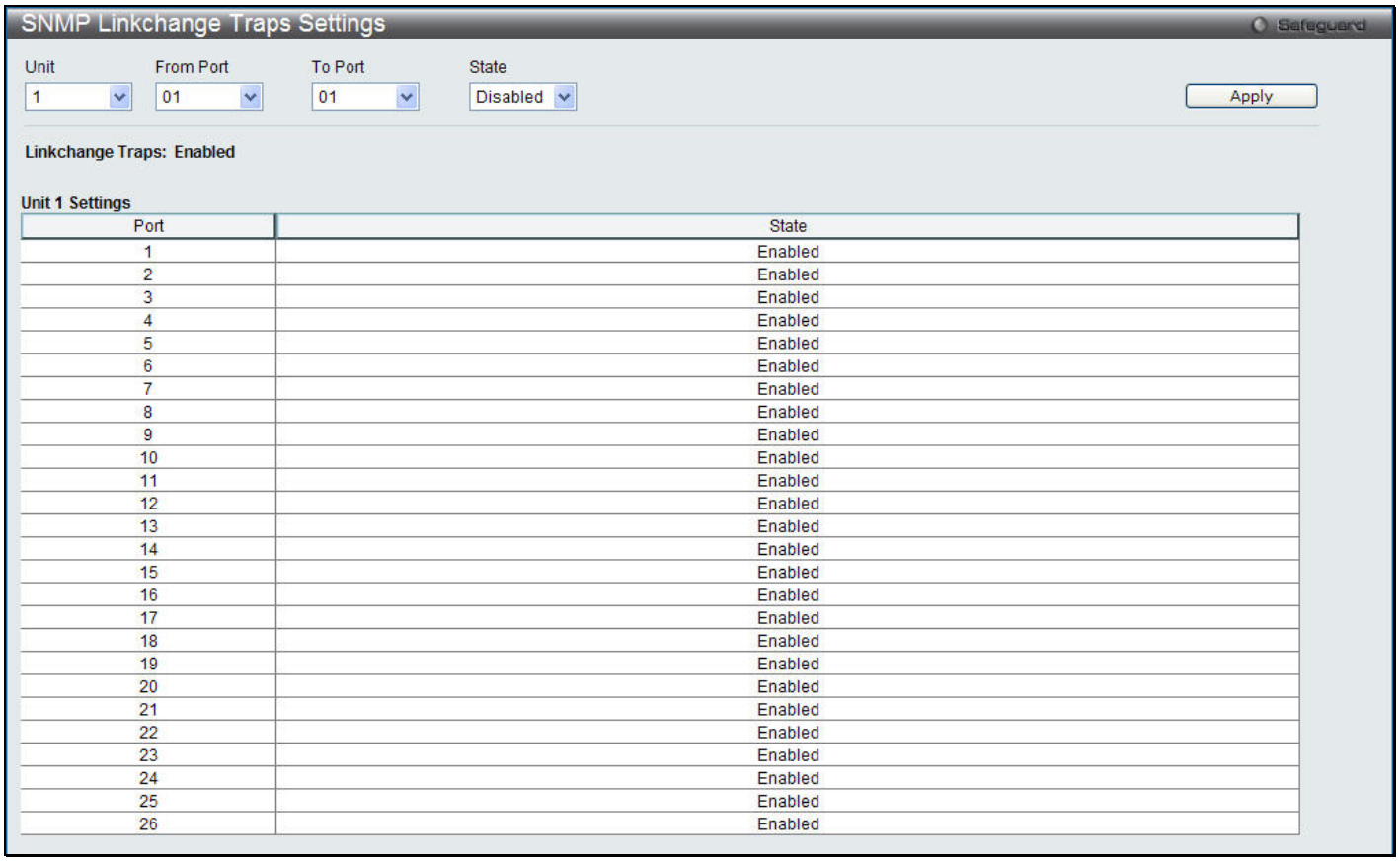


Figure 3-35 SNMP Linkchange Traps Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports to use.
State	Use the drop-down menu to enable or disable the SNMP link change Trap.

Click the **Apply** button to accept the changes made.

SNMP View Table Settings

Users can assign views to community strings that define which MIB objects can be accessed by a remote SNMP manager. The SNMP Group created with this table maps SNMP users (identified in the SNMP User Table) to the views created in the previous window.

To view the following window, click **Management > SNMP Settings > SNMP View Table Settings**, as shown below:

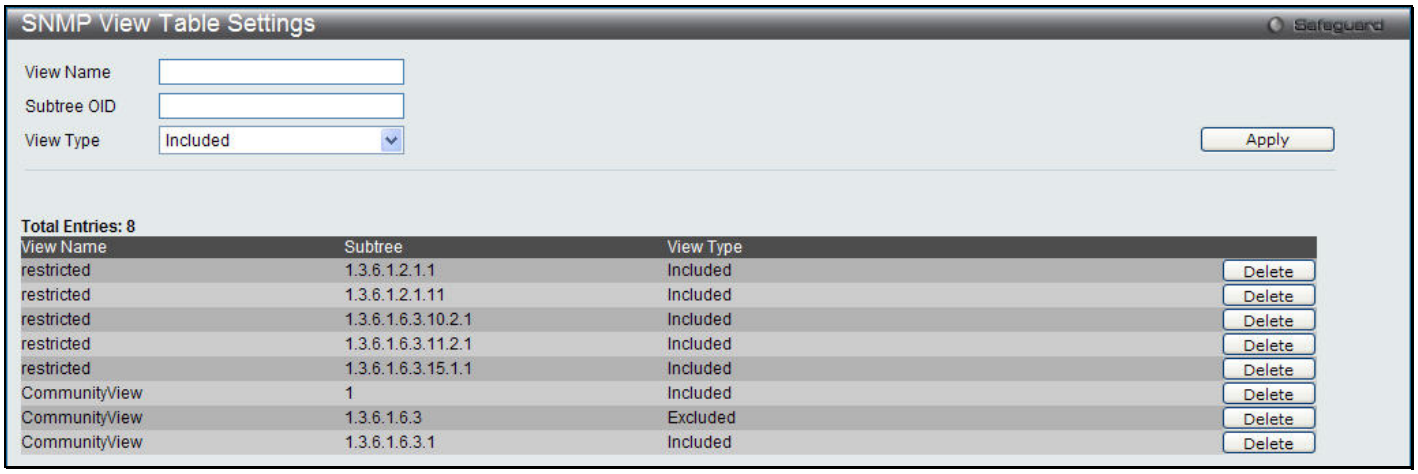


Figure 3-36 SNMP View Table Settings window

The fields that can be configured are described below:

Parameter	Description
View Name	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP view being created.
Subtree OID	Type the Object Identifier (OID) Subtree for the view. The OID identifies an object tree (MIB tree) that will be included or excluded from access by an SNMP manager.
View Type	Select Included to include this object in the list of objects that an SNMP manager can access. Select Excluded to exclude this object from the list of objects that an SNMP manager can access.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

SNMP Community Table Settings

Users can create an SNMP community string to define the relationship between the SNMP manager and an agent. The community string acts like a password to permit access to the agent on the Switch. One or more of the following characteristics can be associated with the community string:

- An Access List of IP addresses of SNMP managers that are permitted to use the community string to gain access to the Switch's SNMP agent.
- Any MIB view that defines the subset of all MIB objects will be accessible to the SNMP community.
- Read/write or read-only level permission for the MIB objects accessible to the SNMP community.

To view the following window, click **Management > SNMP Settings > SNMP Community Table Settings**, as shown below:

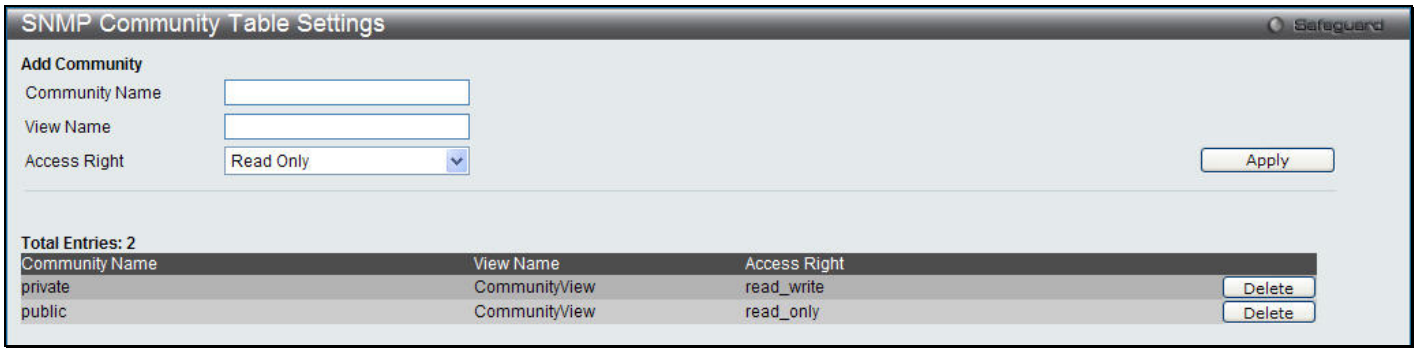


Figure 3-37 SNMP community Table Settings window

The fields that can be configured are described below:

Parameter	Description
Community Name	Type an alphanumeric string of up to 32 characters that is used to identify members of an SNMP community. This string is used like a password to give remote SNMP managers access to MIB objects in the Switch's SNMP agent.
View Name	Type an alphanumeric string of up to 32 characters that is used to identify the group of MIB objects that a remote SNMP manager is allowed to access on the Switch. The view name must exist in the SNMP View Table.
Access Right	*Read Only* – Specify that SNMP community members using the community string created can only read the contents of the MIBs on the Switch. *Read Write* – Specify that SNMP community members using the community string created can read from, and write to the contents of the MIBs on the Switch.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

SNMP Group Table Settings

An SNMP Group created with this table maps SNMP users (identified in the SNMP User Table) to the views created in the previous window.

To view the following window, click **Management > SNMP Settings > SNMP Group Table Settings**, as shown below:

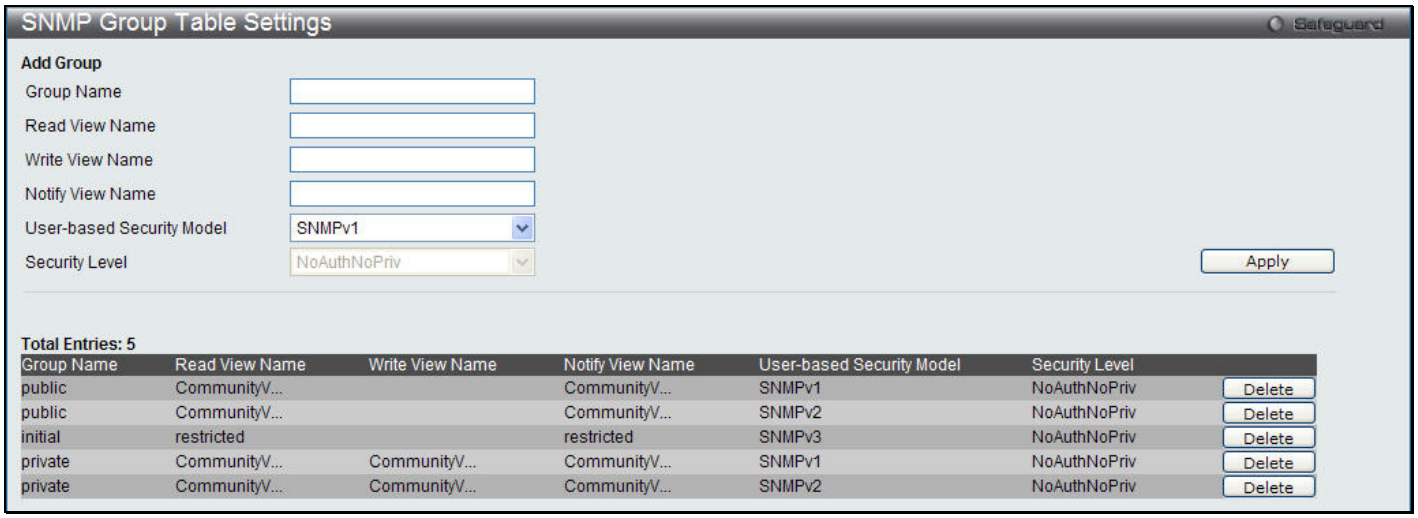


Figure 3-38 SNMP Group Table Settings window

The fields that can be configured are described below:

Parameter	Description
Group Name	Type an alphanumeric string of up to 32 characters. This is used to identify the new SNMP group of SNMP users.
Read View Name	This name is used to specify the SNMP group created can request SNMP messages.
Write View Name	Specify a SNMP group name for users that are allowed SNMP write privileges to the Switch's SNMP agent.
Notify View Name	Specify a SNMP group name for users that can receive SNMP trap messages generated by the Switch's SNMP agent.
User-based Security Model	*SNMPv1* – Specify that SNMP version 1 will be used. *SNMPv2* – Specify that SNMP version 2c will be used. The SNMPv2 supports both centralized and distributed network management strategies. It includes improvements in the Structure of Management Information (SMI) and adds some security features. *SNMPv3* – Specify that the SNMP version 3 will be used. SNMPv3 provides secure access to devices through a combination of authentication and encrypting packets over the network.
Security Level	The Security Level settings only apply to SNMPv3. *NoAuthNoPriv* – Specify that there will be no authorization and no encryption of packets sent between the Switch and a remote SNMP manager. *AuthNoPriv* – Specify that authorization will be required, but there will be no encryption of packets sent between the Switch and a remote SNMP manager. *AuthPriv* – Specify that authorization will be required, and that packets sent between the Switch and a remote SNMP manger will be encrypted.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

SNMP Engine ID Settings

The Engine ID is a unique identifier used for SNMP V3 implementations on the Switch.

To view the following window, click **Management > SNMP Settings > SNMP Engine ID Settings**, as shown below:

Figure 3-39 SNMP Engine ID Settings window

To change the Engine ID, type the new Engine ID value in the space provided.

The fields that can be configured are described below:

Parameter	Description
Engine ID	The SNMP engine ID displays the identification of the SNMP engine on the Switch. The default value is suggested in RFC2271. The very first bit is 1, and the first four octets are set to the binary equivalent of the agent's SNMP management private enterprise number as assigned by IANA (D-Link is 171). The fifth octet is 03 to indicate the rest is the MAC address of this device. The sixth to eleventh octets is the MAC address.

Click the **Apply** button to accept the changes made.

NOTE: The Engine ID length is 10-64 and accepted characters can range from 0 to F.

SNMP User Table Settings

This window displays all of the SNMP User's currently configured on the Switch.

To view the following window, click **Management > SNMP Settings > SNMP User Table Settings**, as shown below:

Figure 3-40 SNMP User Table Settings window

The fields that can be configured are described below:

Parameter	Description
User Name	An alphanumeric string of up to 32 characters. This is used to identify the SNMP users.
Group Name	This name is used to specify the SNMP group created can request SNMP messages.
SNMP Version	*V3* – Indicates that SNMP version 3 is in use.
SNMP V3 Encryption	Use the drop-down menu to enable encryption for SNMP V3. This is only operable in SNMP V3 mode. The choices are *None*, *Password*, or *Key*.
Auth-Protocol	*MD5* – Specify that the HMAC-MD5-96 authentication level will be used. This field is only operable when *V3* is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password. *SHA* – Specify that the HMAC-SHA authentication protocol will be used. This field is only operable when *V3* is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password.
Priv-Protocol	*None* – Specify that no authorization protocol is in use. *DES* – Specify that DES 56-bit encryption is in use, based on the CBC-DES (DES-56) standard. This field is only operable when *V3* is selected in the SNMP Version field and the Encryption field has been checked. This field will require the user to enter a password.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

SNMP Host Table Settings

Users can set up SNMP trap recipients for IPv4.

To view the following window, click **Management > SNMP Settings > SNMP Host Table Settings**, as shown below:

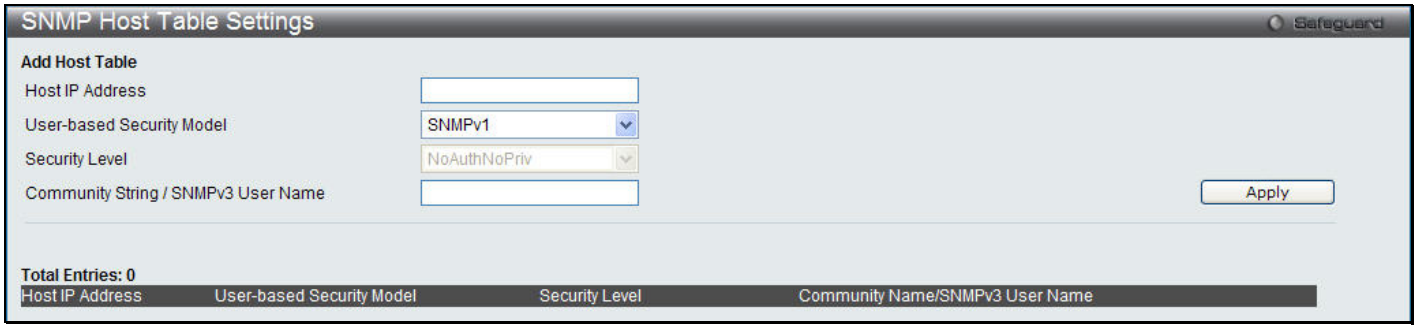


Figure 3-41 SNMP Host Table Settings window

The fields that can be configured are described below:

Parameter	Description
Host IP Address	Enter the IP address of the remote management station that will serve as the SNMP host for the Switch.
User-based Security Model	*SNMPv1* – Specify that SNMP version 1 will be used. *SNMPv2* – Specify that SNMP version 2 will be used. *SNMPv3* – Specify that SNMP version 3 will be used.
Security Level	*NoAuthNoPriv* – To specify that the SNMP version 3 will be used, with a NoAuth-NoPriv security level. *AuthNoPriv* – To specify that the SNMP version 3 will be used, with an Auth-NoPriv security level. *AuthPriv* – To specify that the SNMP version 3 will be used, with an Auth-Priv security level.
Community String / SNMPv3 User Name	Enter the community string or SNMP V3 user name as appropriate.

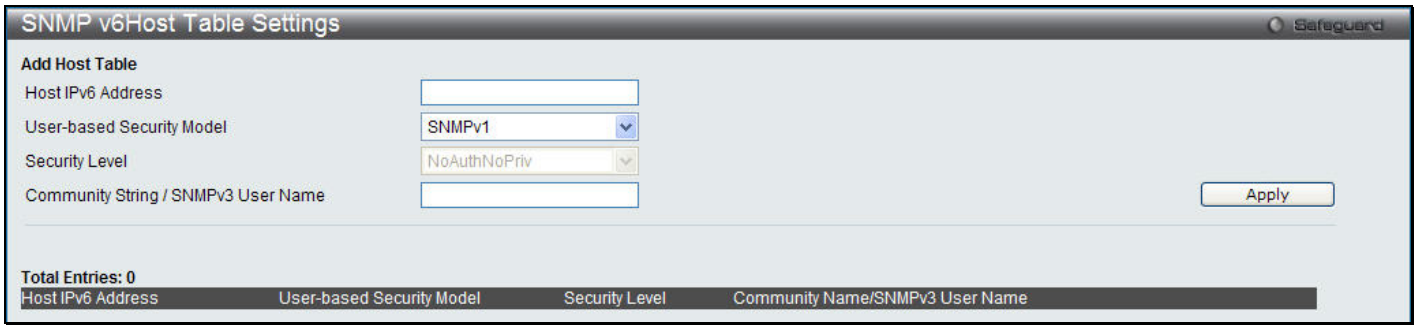
Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

SNMPv6 Host Table Settings

Users can set up SNMP trap recipients for IPv6.

To view the following window, click **Management > SNMP Settings > SNMPv6 Host Table Settings**, as shown below:



3-42 SNMPv6 Host Table Settings

The fields that can be configured are described below:

Parameter	Description
Host IPv6 Address	Type the IPv6 address of the remote management station that will serve as the SNMP host for the Switch.
User-based Security Model	*SNMPv1* – Specifies that SNMP version 1 will be used. *SNMPv2* – Specifies that SNMP version 2 will be used. *SNMPv3* – Specifies that SNMP version 3 will be used.
Security Level	*NoAuthNoPriv* – To specify that the SNMP version 3 will be used, with a NoAuth-NoPriv security level. *AuthNoPriv* – To specify that the SNMP version 3 will be used, with an Auth-NoPriv security level. *AuthPriv* – To specify that the SNMP version 3 will be used, with an Auth-Priv security level.
Community String / SNMPv3 User Name	Type in the community string or SNMP V3 user name as appropriate.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

RMON Settings

On this page the user can enable or disable remote monitoring (RMON) for the rising and falling alarm trap feature for the SNMP function on the Switch.

To view the following window, click **Management > SNMP Settings > RMON Settings**, as shown below:

Figure 3-43 RMON Settings window

The fields that can be configured are described below:

Parameter	Description
RMON Rising Alarm Trap	Enable this option to use the RMON Rising Alarm Trap Feature.

RMON Falling Alarm Trap	Enable this option to use the RMON Falling Alarm Trap Feature.

Click the **Apply** button to accept the changes made.

Telnet Settings

Users can configure Telnet Settings on the Switch.

To view the following window, click **Management > Telnet Settings**, as shown below:

Figure 3-44 Telnet Settings window

The fields that can be configured are described below:

Parameter	Description
Telnet State	Telnet configuration is Enabled by default. If you do not want to allow configuration of the system through Telnet choose Disabled.
Port (1-65535)	The TCP port number used for Telnet management of the Switch. The “well-known” TCP port for the Telnet protocol is *23*.

Click the **Apply** button to accept the changes made.

Web Settings

Users can configure the Web settings on the Switch.

To view the following window, click **Management > Web Settings**, as shown below:

Figure 3-45 Web Settings window

The fields that can be configured are described below:

Parameter	Description
Web Status	Web-based management is Enabled by default. If you choose to disable this by clicking Disabled, you will lose the ability to configure the system through the Web interface as soon as these settings are applied.
Port (1-65535)	The TCP port number used for Web-based management of the Switch. The “well-known” TCP port for the Web protocol is *80*.

Click the **Apply** button to accept the changes made.

Chapter 4 L2 Features

VLAN
Q-in-Q
Layer 2 Protocol Tunneling Settings
Spanning Tree
Link Aggregation
FDB
L2 Multicast Control
Multicast Filtering
ERPS Settings
LLDP

VLAN

Understanding IEEE 802.1p Priority

Priority tagging is a function defined by the IEEE 802.1p standard designed to provide a means of managing traffic on a network where many different types of data may be transmitted simultaneously. It is intended to alleviate problems associated with the delivery of time critical data over congested networks. The quality of applications that are dependent on such time critical data, such as video conferencing, can be severely and adversely affected by even very small delays in transmission.

Network devices that are in compliance with the IEEE 802.1p standard have the ability to recognize the priority level of data packets. These devices can also assign a priority label or tag to packets. Compliant devices can also strip priority tags from packets. This priority tag determines the packet's degree of expeditiousness and determines the queue to which it will be assigned.

Priority tags are given values from 0 to 7 with 0 being assigned to the lowest priority data and 7 assigned to the highest. The highest priority tag 7 is generally only used for data associated with video or audio applications, which are sensitive to even slight delays, or for data from specified end users whose data transmissions warrant special consideration.

The Switch allows you to further tailor how priority tagged data packets are handled on your network. Using queues to manage priority tagged data allows you to specify its relative priority to suit the needs of your network. There may be circumstances where it would be advantageous to group two or more differently tagged packets into the same queue. Generally, however, it is recommended that the highest priority queue, Queue 7, be reserved for data packets with a priority value of 7. Packets that have not been given any priority value are placed in Queue 0 and thus given the lowest priority for delivery.

Strict mode and weighted round robin system are employed on the Switch to determine the rate at which the queues are emptied of packets. The ratio used for clearing the queues is 4:1. This means that the highest priority queue, Queue 7, will clear 4 packets for every 1 packet cleared from Queue 0.

Remember, the priority queue settings on the Switch are for all ports, and all devices connected to the Switch will be affected. This priority queuing system will be especially beneficial if your network employs switches with the capability of assigning priority tags.

VLAN Description

A Virtual Local Area Network (VLAN) is a network topology configured according to a logical scheme rather than the physical layout. VLANs can be used to combine any collection of LAN segments into an autonomous user group that appears as a single LAN. VLANs also logically segment the network into different broadcast domains so that packets are forwarded only between ports within the VLAN. Typically, a VLAN corresponds to a particular subnet, although not necessarily.

VLANs can enhance performance by conserving bandwidth, and improve security by limiting traffic to specific domains.

A VLAN is a collection of end nodes grouped by logic instead of physical location. End nodes that frequently communicate with each other are assigned to the same VLAN, regardless of where they are physically on the network. Logically, a VLAN can be equated to a broadcast domain, because broadcast packets are forwarded to only members of the VLAN on which the broadcast was initiated.

Notes about VLANs on the Switch

- No matter what basis is used to uniquely identify end nodes and assign these nodes VLAN membership, packets cannot cross VLANs without a network device performing a routing function between the VLANs.
- The Switch supports IEEE 802.1Q VLANs. The port untagging function can be used to remove the 802.1Q tag from packet headers to maintain compatibility with devices that are tag-unaware.
- The Switch's default is to assign all ports to a single 802.1Q VLAN named "default."
- The "default" VLAN has a VID = 1.
- The member ports of Port-based VLANs may overlap, if desired.

IEEE 802.1Q VLANs

Some relevant terms:

- **Tagging** – The act of putting 802.1Q VLAN information into the header of a packet.
- **Untagging** – The act of stripping 802.1Q VLAN information out of the packet header.
- **Ingress port** – A port on a switch where packets are flowing into the Switch and VLAN decisions must be made.
- **Egress port** – A port on a switch where packets are flowing out of the Switch, either to another switch or to an end station, and tagging decisions must be made.

IEEE 802.1Q (tagged) VLANs are implemented on the Switch. 802.1Q VLANs require tagging, which enables them to span the entire network (assuming all switches on the network are IEEE 802.1Q-compliant).

VLANs allow a network to be segmented in order to reduce the size of broadcast domains. All packets entering a VLAN will only be forwarded to the stations (over IEEE 802.1Q enabled switches) that are members of that VLAN, and this includes broadcast, multicast and unicast packets from unknown sources.

VLANs can also provide a level of security to your network. IEEE 802.1Q VLANs will only deliver packets between stations that are members of the VLAN.

Any port can be configured as either tagging or untagging. The untagging feature of IEEE 802.1Q VLANs allows VLANs to work with legacy switches that don't recognize VLAN tags in packet headers. The tagging feature allows VLANs to span multiple 802.1Q-compliant switches through a single physical connection and allows Spanning Tree to be enabled on all ports and work normally.

The IEEE 802.1Q standard restricts the forwarding of untagged packets to the VLAN the receiving port is a member of.

The main characteristics of IEEE 802.1Q are as follows:

- Assigns packets to VLANs by filtering.
- Assumes the presence of a single global spanning tree.
- Uses an explicit tagging scheme with one-level tagging.
- 802.1Q VLAN Packet Forwarding
- Packet forwarding decisions are made based upon the following three types of rules:
- Ingress rules – rules relevant to the classification of received frames belonging to a VLAN.
- Forwarding rules between ports – decides whether to filter or forward the packet.
- Egress rules – determines if the packet must be sent tagged or untagged.

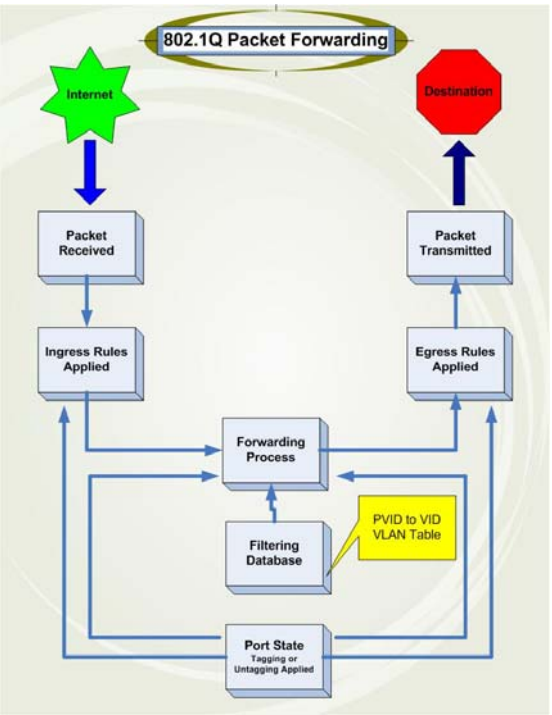


Figure 4-1 IEEE 802.1Q Packet Forwarding

802.1Q VLAN Tags

The figure below shows the 802.1Q VLAN tag. There are four additional octets inserted after the source MAC address. Their presence is indicated by a value of 0x8100 in the EtherType field. When a packet's EtherType field is equal to 0x8100, the packet carries the IEEE 802.1Q/802.1p tag. The tag is contained in the following two octets and consists of 3 bits of user priority, 1 bit of Canonical Format Identifier (CFI – used for encapsulating Token Ring packets so they can be carried across Ethernet backbones), and 12 bits of VLAN ID (VID). The 3 bits of user priority are used by 802.1p. The VID is the VLAN identifier and is used by the 802.1Q standard. Because the VID is 12 bits long, 4094 unique VLANs can be identified.

The tag is inserted into the packet header making the entire packet longer by 4 octets. All of the information originally contained in the packet is retained.

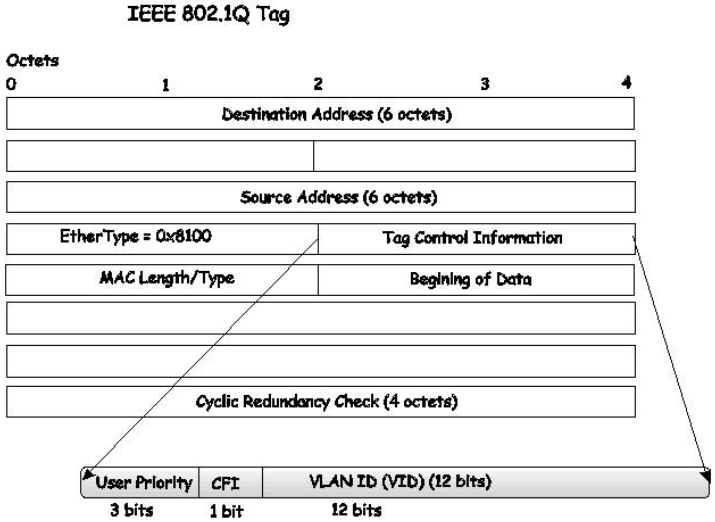


Figure 4-2 IEEE 802.1Q Tag

The EtherType and VLAN ID are inserted after the MAC source address, but before the original EtherType/Length or Logical Link Control. Because the packet is now a bit longer than it was originally, the Cyclic Redundancy Check (CRC) must be recalculated.

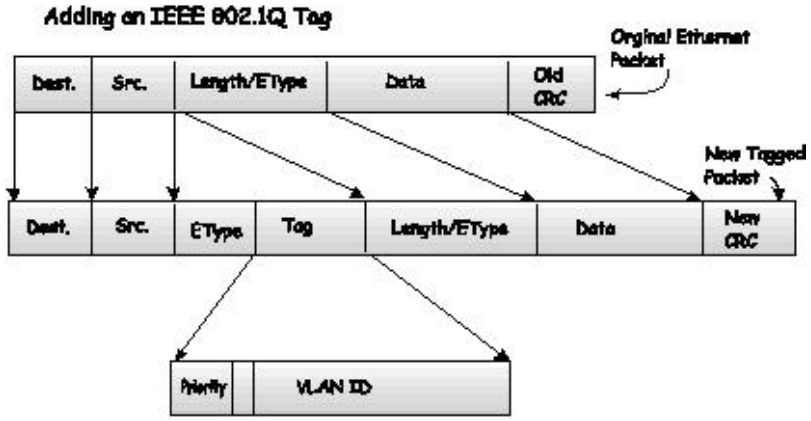


Figure 4-3 Adding an IEEE 802.1Q Tag

Port VLAN ID

Packets that are tagged (are carrying the 802.1Q VID information) can be transmitted from one 802.1Q compliant network device to another with the VLAN information intact. This allows 802.1Q VLANs to span network devices (and indeed, the entire network, if all network devices are 802.1Q compliant).

Unfortunately, not all network devices are 802.1Q compliant. These devices are referred to as tag-unaware. 802.1Q devices are referred to as tag-aware.

Prior to the adoption of 802.1Q VLANs, port-based and MAC-based VLANs were in common use. These VLANs relied upon a Port VLAN ID (PVID) to forward packets. A packet received on a given port would be assigned that port's PVID and then be forwarded to the port that corresponded to the packet's destination address (found in the Switch's forwarding table). If the PVID of the port that received the packet is different from the PVID of the port that is to transmit the packet, the Switch will drop the packet.

Within the Switch, different PVIDs mean different VLANs (remember that two VLANs cannot communicate without an external router). So, VLAN identification based upon the PVIDs cannot create VLANs that extend outside a given switch (or switch stack).

Every physical port on a switch has a PVID. 802.1Q ports are also assigned a PVID, for use within the Switch. If no VLANs are defined on the Switch, all ports are then assigned to a default VLAN with a PVID equal to 1. Untagged packets are assigned the PVID of the port on which they were received. Forwarding decisions are based upon this PVID, in so far as VLANs are concerned. Tagged packets are forwarded according to the VID contained within the tag. Tagged packets are also assigned a PVID, but the PVID is not used to make packet-forwarding decisions, the VID is.

Tag-aware switches must keep a table to relate PVIDs within the Switch to VIDs on the network. The Switch will compare the VID of a packet to be transmitted to the VID of the port that is to transmit the packet. If the two VIDs are different, the Switch will drop the packet. Because of the existence of the PVID for untagged packets and the VID for tagged packets, tag-aware and tag-unaware network devices can coexist on the same network.

A switch port can have only one PVID, but can have as many VIDs as the Switch has memory in its VLAN table to store them.

Because some devices on a network may be tag-unaware, a decision must be made at each port on a tag-aware device before packets are transmitted – should the packet to be transmitted have a tag or not? If the transmitting port is

connected to a tag-unaware device, the packet should be untagged. If the transmitting port is connected to a tag-aware device, the packet should be tagged.

Tagging and Untagging

Every port on an 802.1Q compliant switch can be configured as tagging or untagging.

Ports with tagging enabled will put the VID number, priority and other VLAN information into the header of all packets that flow into and out of it.

If a packet has previously been tagged, the port will not alter the packet, thus keeping the VLAN information intact. Other 802.1Q compliant devices on the network to make packet-forwarding decisions can then use the VLAN information in the tag.

Ports with untagging enabled will strip the 802.1Q tag from all packets that flow into and out of those ports. If the packet doesn't have an 802.1Q VLAN tag, the port will not alter the packet. Thus, all packets received by and forwarded by an untagging port will have no 802.1Q VLAN information. (Remember that the PVID is only used internally within the Switch). Untagging is used to send packets from an 802.1Q-compliant network device to a non-compliant network device.

Ingress Filtering

A port on a switch where packets are flowing into the Switch and VLAN decisions must be made is referred to as an ingress port. If ingress filtering is enabled for a port, the Switch will examine the VLAN information in the packet header (if present) and decide whether or not to forward the packet.

If the packet is tagged with VLAN information, the ingress port will first determine if the ingress port itself is a member of the tagged VLAN. If it is not, the packet will be dropped. If the ingress port is a member of the 802.1Q VLAN, the Switch then determines if the destination port is a member of the 802.1Q VLAN. If it is not, the packet is dropped. If the destination port is a member of the 802.1Q VLAN, the packet is forwarded and the destination port transmits it to its attached network segment.

If the packet is not tagged with VLAN information, the ingress port will tag the packet with its own PVID as a VID. The Switch then determines if the destination port is a member of the same VLAN (has the same VID) as the ingress port. If it does not, the packet is dropped. If it has the same VID, the packet is forwarded and the destination port transmits it on its attached network segment.

This process is referred to as ingress filtering and is used to conserve bandwidth within the Switch by dropping packets that are not on the same VLAN as the ingress port at the point of reception. This eliminates the subsequent processing of packets that will just be dropped by the destination port.

Default VLANs

The Switch initially configures one VLAN, VID = 1, called "default." The factory default setting assigns all ports on the Switch to the "default." As new VLANs are configured in Port-based mode, their respective member ports are not removed from the "default."

Packets cannot cross VLANs. If a member of one VLAN wants to connect to another VLAN, the link must be through an external router.

NOTE: If no VLANs are configured on the Switch, then all packets will be forwarded to any destination port. Packets with unknown source addresses will be flooded to all ports. Broadcast and multicast packets will also be flooded to all ports.

An example is presented below:

VLAN Name	VID	Switch Ports
System (default)	1	5, 6, 7
Engineering	2	9, 10
Sales	5	1, 2, 3, 4

Port-based VLANs

Port-based VLANs limit traffic that flows into and out of switch ports. Thus, all devices connected to a port are members of the VLAN(s) the port belongs to, whether there is a single computer directly connected to a switch, or an entire department.

On port-based VLANs, NICs do not need to be able to identify 802.1Q tags in packet headers. NICs send and receive normal Ethernet packets. If the packet's destination lies on the same segment, communications take place using normal Ethernet protocols. Even though this is always the case, when the destination for a packet lies on another switch port, VLAN considerations come into play to decide if the packet gets dropped by the Switch or delivered.

VLAN Segmentation

Take for example a packet that is transmitted by a machine on Port 1 that is a member of VLAN 2. If the destination lies on another port (found through a normal forwarding table lookup), the Switch then looks to see if the other port (Port 10) is a member of VLAN 2 (and can therefore receive VLAN 2 packets). If Port 10 is not a member of VLAN 2, then the packet will be dropped by the Switch and will not reach its destination. If Port 10 is a member of VLAN 2, the packet will go through. This selective forwarding feature based on VLAN criteria is how VLANs segment networks. The key point being that Port 1 will only transmit on VLAN 2.

802.1Q VLAN Settings

The **VLAN List** tab lists all previously configured VLANs by VLAN ID and VLAN Name.

To view the following window, click **L2 Features > VLAN > 802.1Q VLAN Settings**, as shown below:

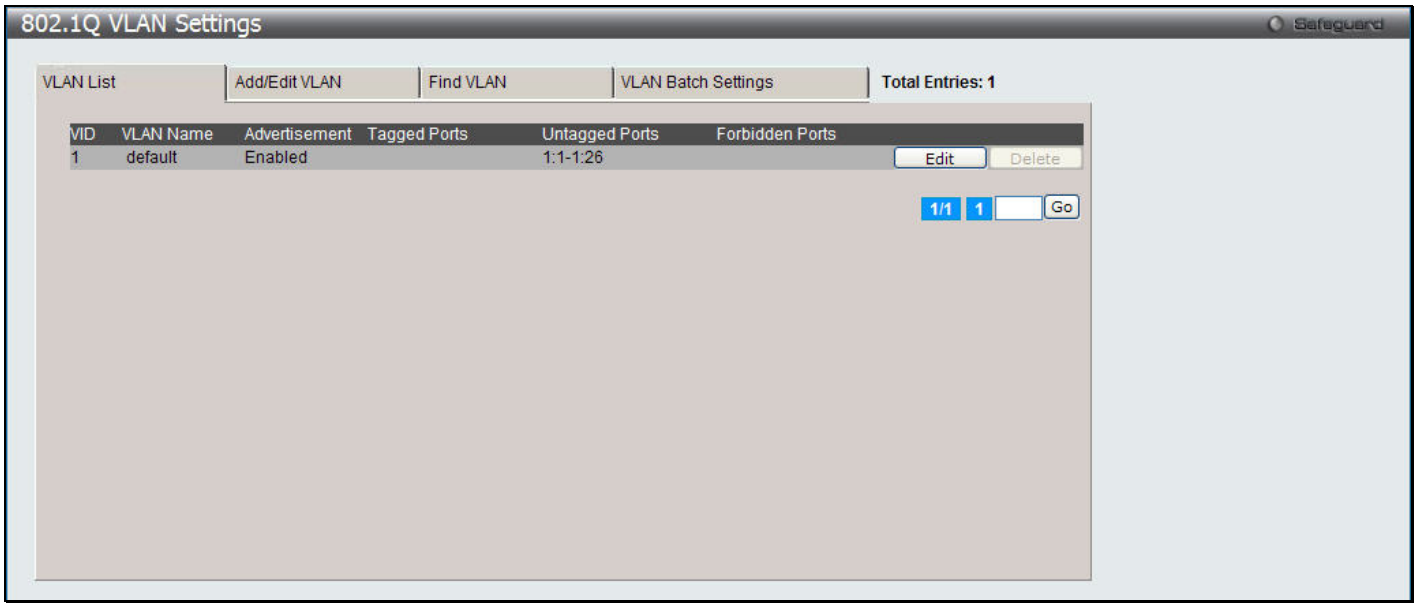


Figure 4-4 802.1Q VLAN Settings –VLAN List Tab window

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

To create a new 802.1Q VLAN or modify an existing 802.1Q VLAN, click the **Add/Edit VLAN** tab.

A new tab will appear, as shown below, to configure the port settings and to assign a unique name and number to the new VLAN.

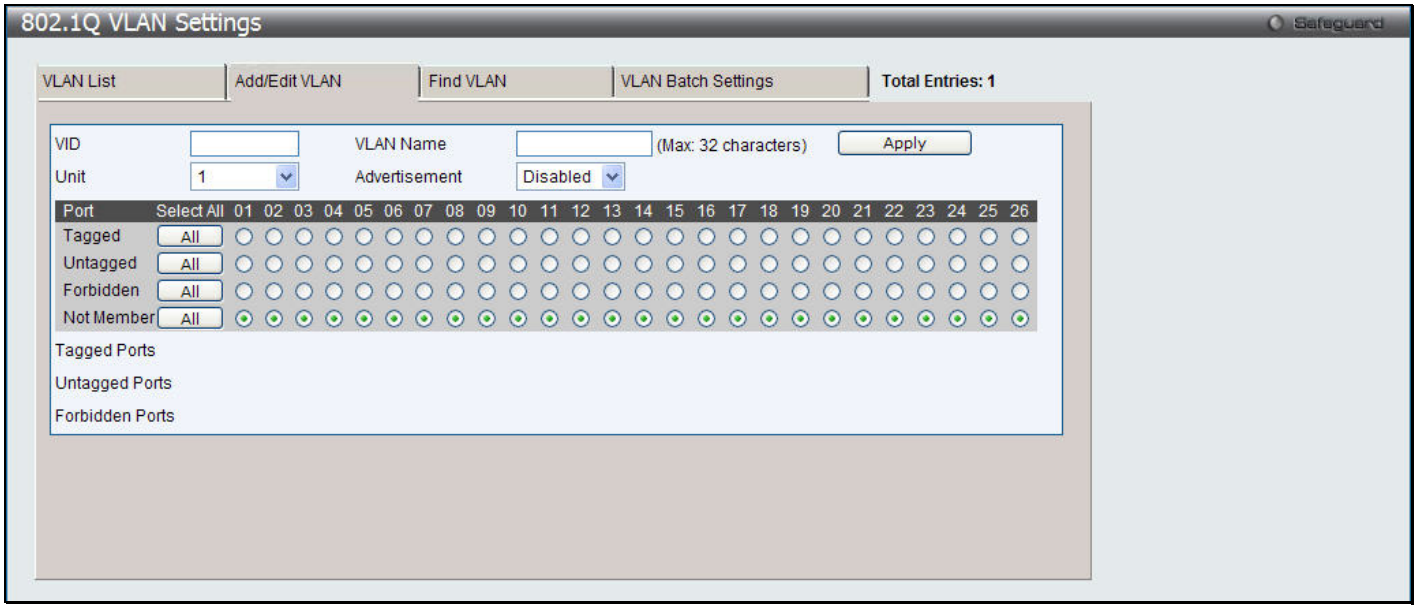


Figure 4-5 802.1Q VLAN Settings – Add/Edit VLAN Tab window

The fields that can be configured are described below:

Parameter	Description
VID	Allow the entry of a VLAN ID or displays the VLAN ID of an existing VLAN in the **Add/Edit VLAN** tab. VLANs can be identified by either the VID or the VLAN name.
VLAN Name	Allow the entry of a name for the new VLAN or for editing the VLAN name in the **Add/Edit VLAN** tab.
Advertisement	Enable this function to allow the Switch sending out GVRP packets to outside sources, notifying that they may join the existing VLAN.
Unit	Select the unit to configure.
Port	Display all ports of the Switch for the configuration option.
Tagged	Specify the port as 802.1Q tagging. Clicking the radio button will designate the port as tagged. Click the **All** button to select all ports.
Untagged	Specify the port as 802.1Q untagged. Clicking the radio button will designate the port as untagged. Click the **All** button to select all ports.
Forbidden	Click the radio button to specify the port as not being a member of the VLAN and that the port is forbidden from becoming a member of the VLAN dynamically. Click the **All** button to select all ports.
Not Member	Click the radio button to allow an individual port to be specified as a non-VLAN member. Click the **All** button to select all ports.

Click the **Apply** button to accept the changes made.

To search for a VLAN, click the **Find VLAN** tab. A new tab will appear, as shown below.

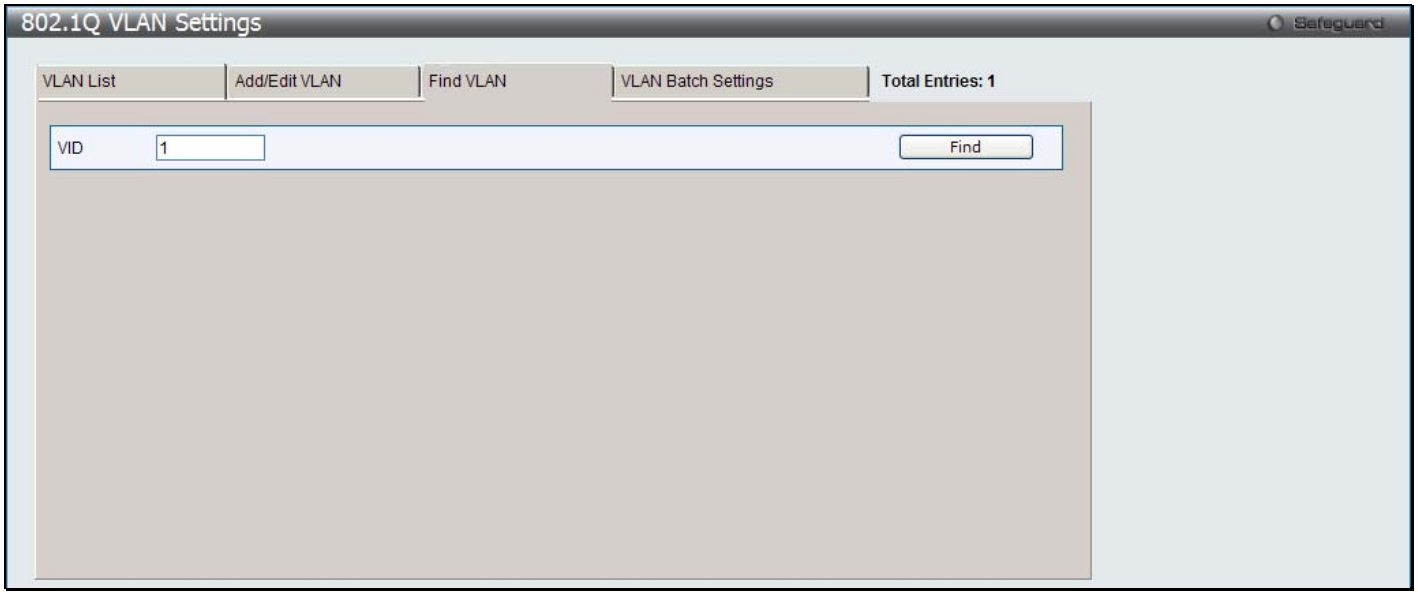


Figure 4-6 802.1Q VLAN Settings – Find VLAN Tab window

Enter the VLAN ID number in the field offered and then click the **Find** button. You will be redirected to the **VLAN List** tab.

To create, delete and configure a VLAN Batch entry click the **VLAN Batch Settings** tab, as shown below.

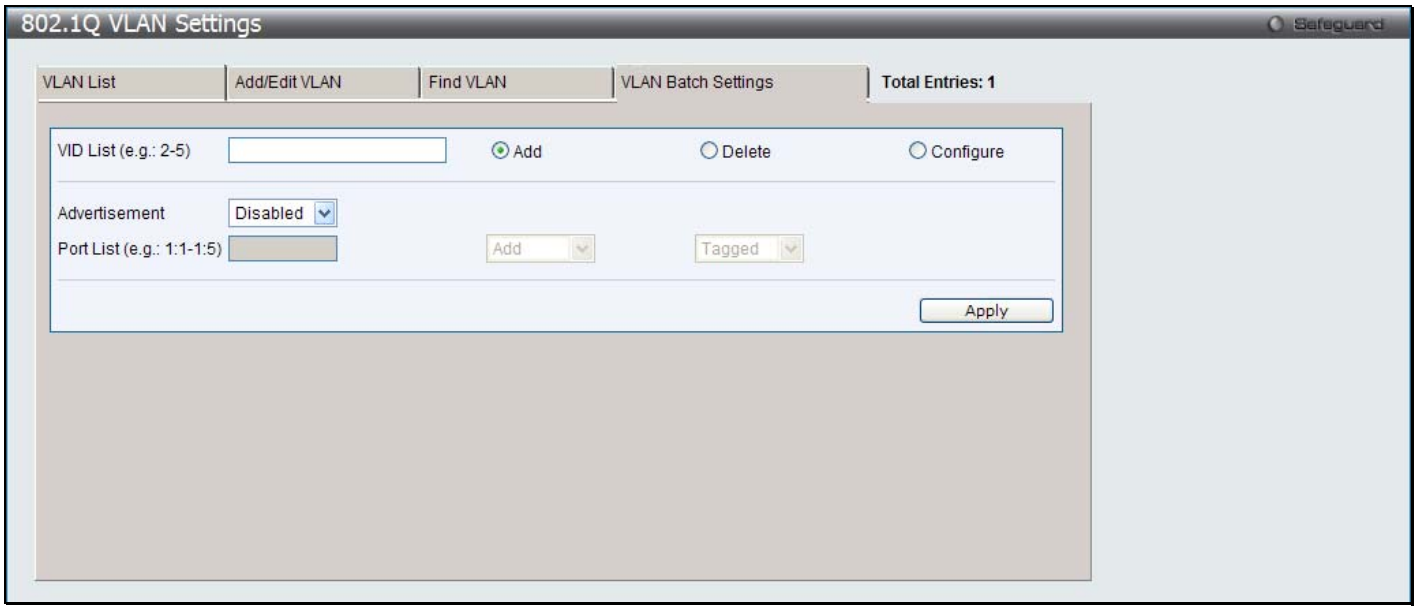


Figure 4-7 802.1Q VLAN Settings – VLAN Batch Settings Tab window

The fields that can be configured are described below:

Parameter	Description
VID List	Enter a VLAN ID List that can be added, deleted or configured.
Advertisement	Enabling this function will allow the Switch to send out GVRP packets to outside sources, notifying that they may join the existing VLAN.
Port List	Allows an individual port list to be added or deleted as a member of the VLAN.
Tagged	Specify the port as 802.1Q tagged. Use the drop-down menu to designate the port as

	tagged.
Untagged	Specify the port as 802.1Q untagged. Use the drop-down menu to designate the port as untagged.
Forbidden	Specify the port as not being a member of the VLAN and that the port is forbidden from becoming a member of the VLAN dynamically. Use the drop-down menu to designate the port as forbidden.

Click the **Apply** button to accept the changes made.

NOTE: The Switch supports up to 4k static VLAN entries.

802.1v Protocol VLAN

802.1v Protocol Group Settings

The user can create Protocol VLAN groups and add protocols to these groups. The 802.1v Protocol VLAN Group Settings support multiple VLANs for each protocol and allows the user to configure the untagged ports of different protocols on the same physical port. For example, it allows the user to configure an 802.1Q and 802.1v untagged port on the same physical port. The lower half of the table displays any previously created groups.

To view the following window, click **L2 Features > VLAN > 802.1v protocol VLAN > 802.1v Protocol Group Settings**, as shown below:

Figure 4-8 802.1v Protocol Group Settings window

The fields that can be configured are described below:

Parameter	Description
Group ID (1-16)	Select an ID number for the group, between *1* and *16.*
Group Name	This is used to identify the new Protocol VLAN group. Type an alphanumeric string of up to 32 characters.
Protocol	This function maps packets to protocol-defined VLANs by examining the type octet within the packet header to discover the type of protocol associated with it. Use the drop-down menu to toggle between *Ethernet II*, *IEEE802.3 SNAP*, and *IEEE802.3 LLC*.
Protocol Value (0-FFFF)	Enter a value for the Group. The protocol value is used to identify a protocol of the frame type specified. The form of the input is 0x0 to 0xffff. Depending on the frame type, the octet string will have one of the following values: For Ethernet II, this is a 16-bit (2-octet) hex value. For example, IPv4 is 0800, IPv6 is 86dd, ARP is 0806, etc. For IEEE802.3 SNAP, this is a 16-bit

	(2-octet) hex value. For IEEE802.3 LLC, this is a 2-octet IEEE 802.2 Link Service Access Point (LSAP) pair. The first octet is for Destination Service Access Point (DSAP) and the second octet is for Source.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete All** button to remove all the entries based on the information entered.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete Settings** button to remove the Protocol for the Protocol VLAN Group information for the specific entry.

Click the **Delete Group** button to remove the entry completely.

NOTE: The Group name value should be less than 33 characters.

802.1v Protocol VLAN Settings

The user can configure Protocol VLAN settings. The lower half of the table displays any previously created settings.

To view the following window, click **L2 Features > VLAN > 802.1v protocol VLAN > 802.1v Protocol VLAN Settings**, as shown below:

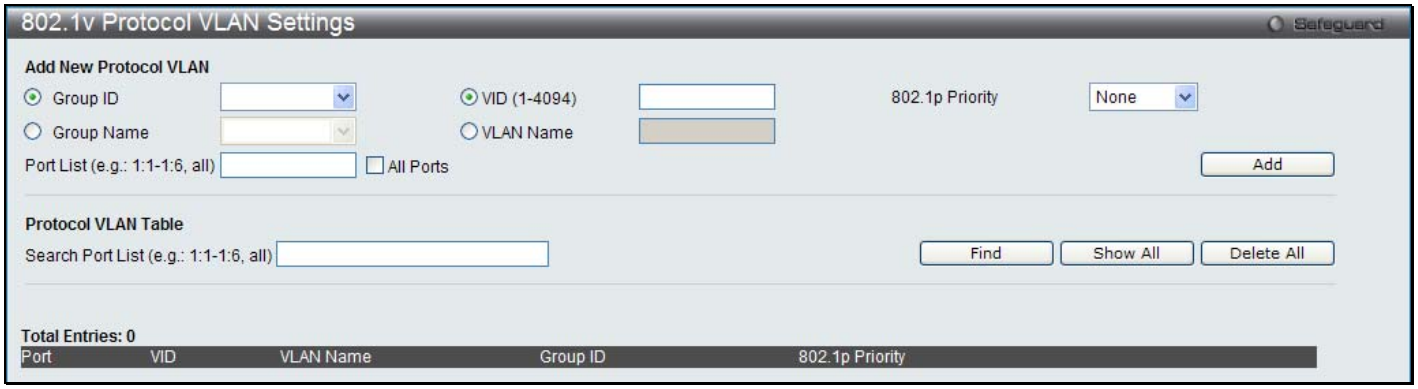


Figure 4-9 802.1v Protocol VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
Group ID	Select a previously configured Group ID from the drop-down menu.
Group Name	Select a previously configured Group Name from the drop-down menu.
VID (1-4094)	This is the VLAN ID that, along with the VLAN Name, identifies the VLAN the user wishes to create.
VLAN Name	This is the VLAN Name that, along with the VLAN ID, identifies the VLAN the user wishes to create.
802.1p Priority	This parameter is specified if you want to re-write the 802.1p default priority previously set in the Switch, which is used to determine the CoS queue to which packets are forwarded to. Once this field is specified, packets accepted by the Switch that match this priority are forwarded to the CoS queue specified previously by the user. Click the corresponding box if you want to set the 802.1p default priority of a packet to the value entered in the Priority (0-7) field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch.

	For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
Port List (e.g.: 1:1-1:6, all)	Select the specified ports you wish to configure by entering the port number in this field, or tick the All Ports check box.
Search Port List (e.g.: 1:1-1:6, all)	This function allows the user to search all previously configured port list settings and display them on the lower half of the table. To search for a port list enter the port number you wish to view and click **Find**. To display all previously configured port lists on the bottom half of the screen click the **Show All** button, to clear all previously configured lists click the **Delete All** button.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Show All** button to display all the Protocol VLANs configured.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Asymmetric VLAN Settings

Shared VLAN Learning is a primary example of the requirement for Asymmetric VLANs. Under normal circumstances, a pair of devices communicating in a VLAN environment will both send and receive using the same VLAN; however, there are some circumstances in which it is convenient to make use of two distinct VLANs, one used for A to transmit to B and the other used for B to transmit to A in these cases Asymmetric VLANs are needed. An example of when this type of configuration might be required would be if the client was on a distinct IP subnet, or if there was some confidentiality-related need to segregate traffic between the clients.

To view this window click **L2 Features > VLAN > Asymmetric VLAN Settings**

Figure 4-10 Asymmetric VLAN Settings window

Click **Apply** to implement changes.

GVRP

GVRP Global Settings

Users can determine whether the Switch will share its VLAN configuration information with other GARP VLAN Registration Protocol (GVRP) enabled switches. In addition, Ingress Checking can be used to limit traffic by filtering incoming packets whose PVID does not match the PVID of the port. Results can be seen in the table under the configuration settings.

To view the following window, click **L2 Features > VLAN > GVRP > GVRP Global Settings**, as shown below:

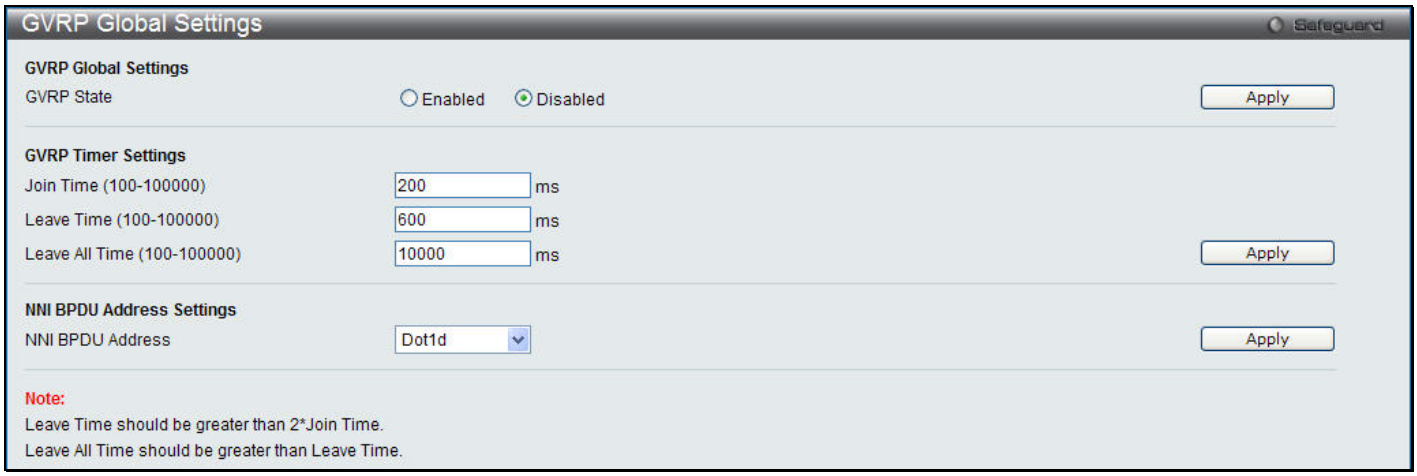


Figure 4-11 GVRP Global Settings window

The fields that can be configured are described below:

Parameter	Description
GVRP State	Click the radio buttons to enable or disable the GVRP State.
Join Time	Enter the Join Time value in milliseconds.
Leave Time	Enter the Leave Time value in milliseconds.
Leave All Time	Enter the Leave All Time value in milliseconds.
NNI BPDU Address	Use the drop-down menu to determine the BPDU protocol address for GVRP in service provide site. It can use an 802.1d GVRP address, 802.1ad service provider GVRP address.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: The **Leave Time** value should be greater than twice the **Join Time** value. The **Leave All Time** value should be greater than the **Leave Time** value.

GVRP Port Settings

On this page the user can configure the GVRP port parameters.

To view the following window, click **L2 Features > VLAN > GVRP > GVRP Port Settings**, as shown below:

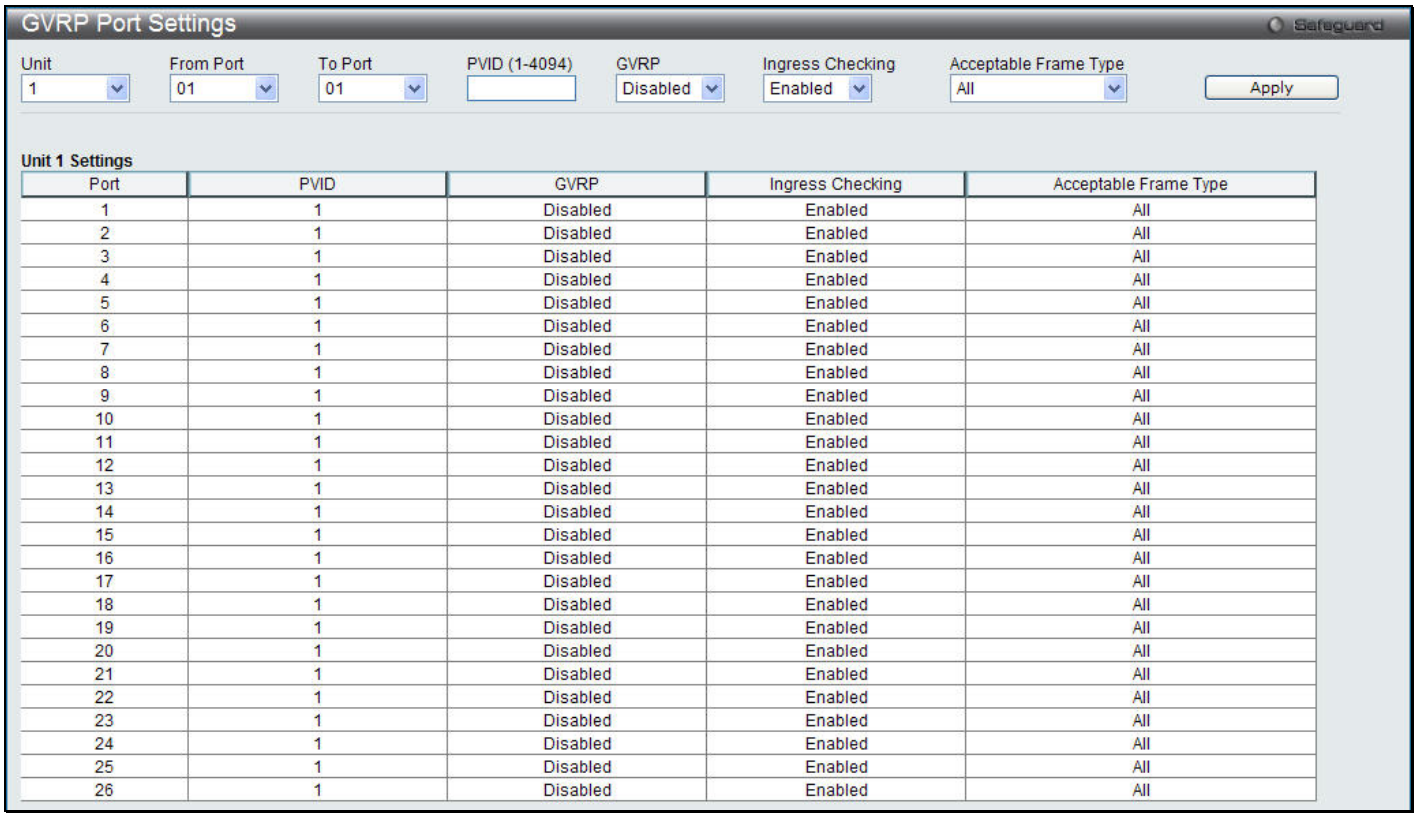


Figure 4-12 GVRP Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports to use.
PVID	This field is used to manually assign a PVID to a VLAN. The Switch's default is to assign all ports to the default VLAN with a VID of 1.The PVID is used by the port to tag outgoing, untagged packets, and to make filtering decisions about incoming packets. If the port is specified to accept only tagged frames - as tagging, and an untagged packet is forwarded to the port for transmission, the port will add an 802.1Q tag using the PVID to write the VID in the tag. When the packet arrives at its destination, the receiving device will use the PVID to make VLAN forwarding decisions. If the port receives a packet, and Ingress filtering is *Enabled*, the port will compare the VID of the incoming packet to its PVID. If the two are unequal, the port will drop the packet. If the two are equal, the port will receive the packet.
GVRP	The GARP VLAN Registration Protocol (GVRP) enables the port to dynamically become a member of a VLAN. GVRP is *Disabled* by default.
Ingress Checking	This drop-down menu allows the user to check whether the VID tag of an incoming packet and the port is the member of this VLAN. If the two are different, the port filters (drops) the packet. *Disabled* disables ingress filtering. Ingress checking is *Enabled* by default.
Acceptable Frame Type	This field denotes the type of frame that will be accepted by the port. The user may choose between *Tagged Only*, which means only VLAN tagged frames will be accepted, and *All*, which mean both tagged and untagged frames will be accepted. *All* is enabled by default.

Click the **Apply** button to accept the changes made.

MAC-based VLAN Settings

Users can create new MAC-based VLAN entries, search and delete existing entries. When a static MAC-based VLAN entry is created for a user, the traffic from this user will be able to be serviced under the specified VLAN.

To view the following window, click **L2 Features > VLAN > MAC-based VLAN Settings**, as shown below:

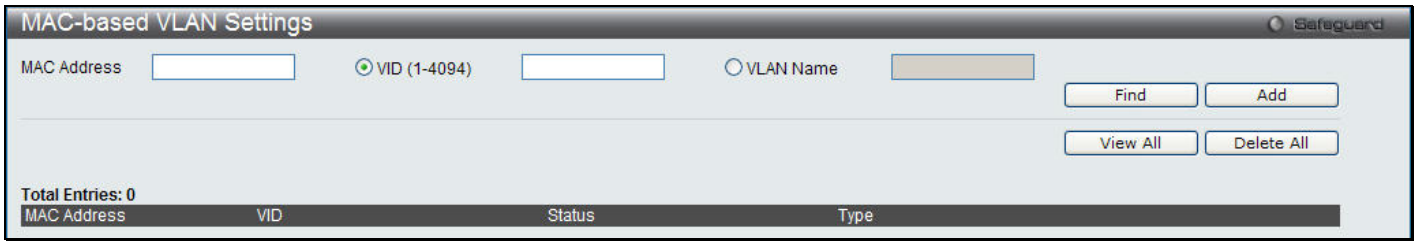


Figure 4-13 MAC-based VLAN Settings

The fields that can be configured are described below:

Parameter	Description
MAC Address	Specify the MAC address to be used to create a MAC-based VLAN entry.
VID (1-4094)	Select this option and enter the VLAN ID.
VLAN Name	Select this option and enter the VLAN name of a previously configured VLAN.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Add** button to add a new entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the **Delete All** button to remove all the entries listed.

Click the **Delete** button to remove the specific entry.

PVID Auto Assign Settings

Users can enable or disable PVID Auto Assign Status. The default setting is enabled.

To view the following window, click **L2 Features > VLAN > PVID Auto Assign Settings**, as shown below:

Figure 4-14 PVID Auto Assign Settings window

Click the **Apply** button to accept the changes made.

Subnet VLAN

The Switch uses IP subnet-based VLAN classification to group devices.

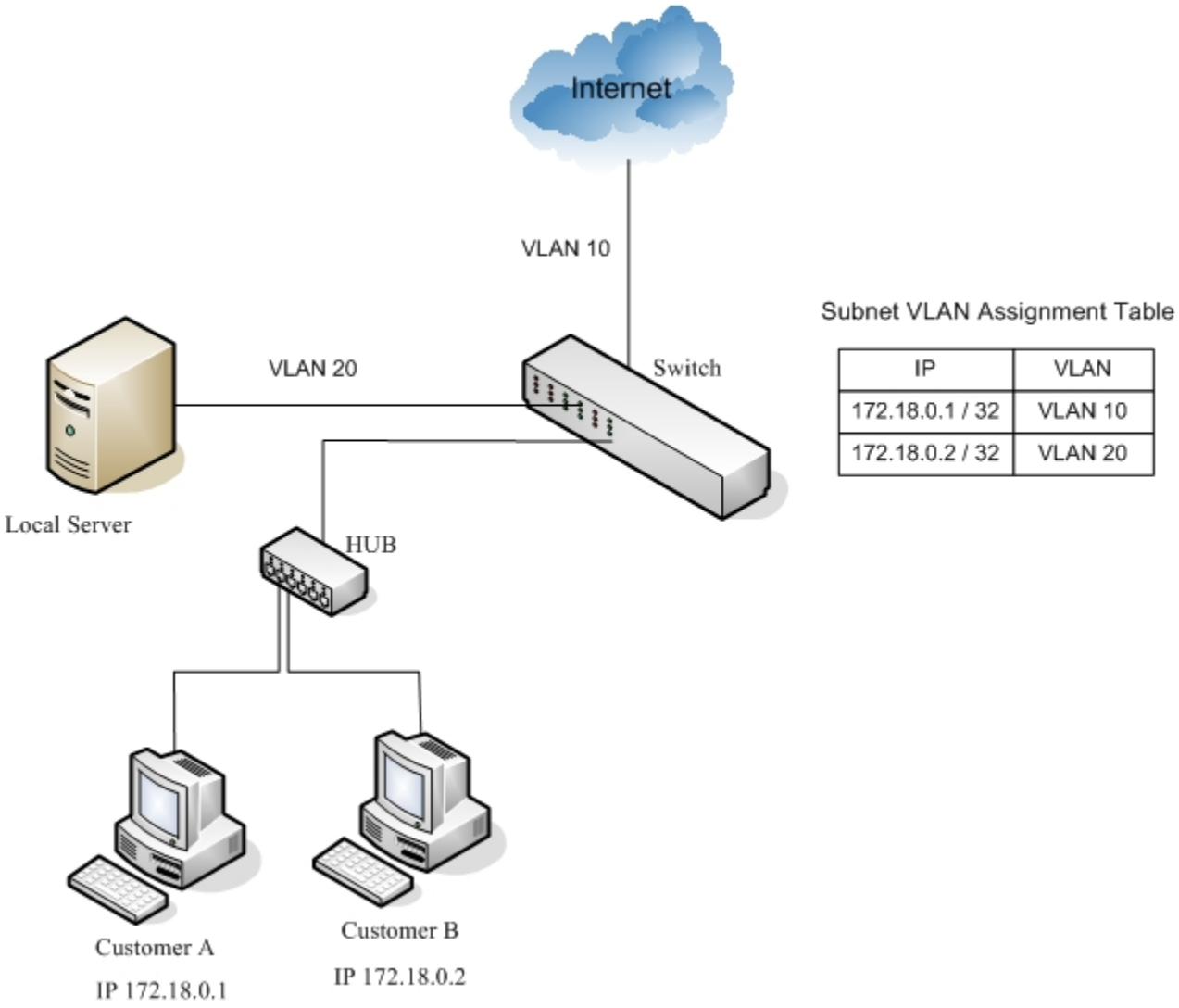


Figure 3 - 1 Application of Subnet VLAN

The above figure is an example of subnet-based VLAN. The IP address of customer A is 172.18.0.1 and IP address of customer B is 172.18.0.2. Both of them connect to the same port of the Switch through a HUB. Customers can access Internet through VLAN 10 and the local server through VLAN 20. However, with the subnet VLAN configuration in the example, IP 172.18.0.1 is assigned to VLAN 10 and 172.18.0.2 is assigned to VLAN 20. Customer A can only access Internet, and customer B can only access the local server.

Subnet VLAN Settings

The subnet-based VLAN settings are used to create, find or delete a subnet-based VLAN entry. A subnet-based VLAN entry is an IP subnet-based VLAN classification rule. If an untagged or priority-tagged IP packet is received on a port, its source IP address will be used to match the subnet-based VLAN entries. If the source IP is in the subnet of an entry, the packet will be classified to the VLAN defined for this subnet.

To view this window, click **L2 Features > Subnet VLAN > Subnet VLAN Settings**, as shown below:

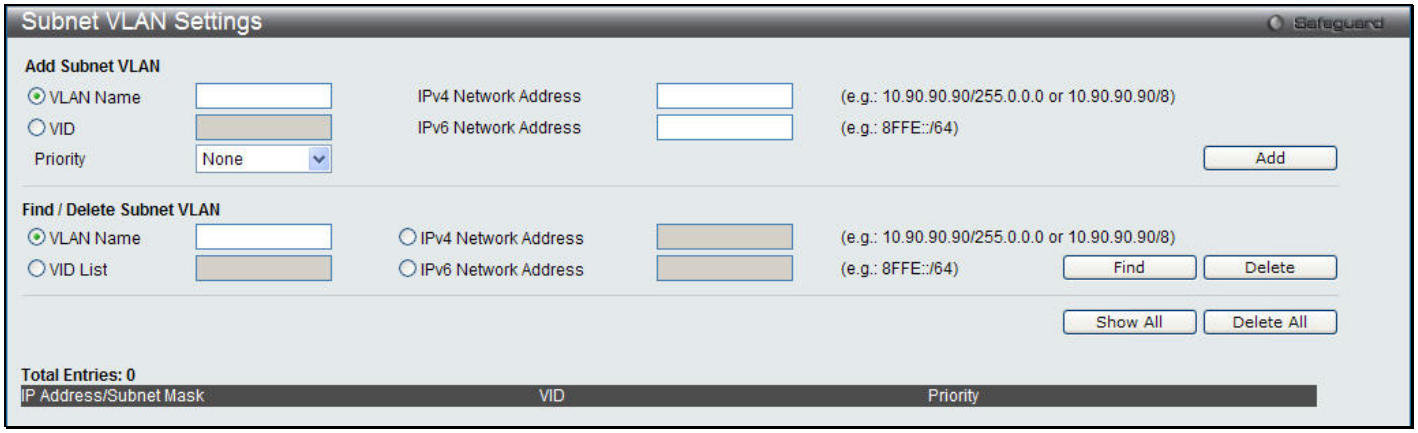


Figure 4-15 Subnet VLAN Settings window

The following parameters can be configured:

Parameter	Description
VLAN Name	The VLAN Name to be associated with the subnet.
VID / VID List	The VLAN ID to be associated with the subnet.
Priority	The priority to be associated with the subnet. Its range is *0* to *7*.
IPv4 Network Address	Enter an IPv4 network address. The format is IP address/prefix length.
IPv6 Network Address	Enter an IPv6 network address. The format is IP address/prefix length. The prefix length of the IPv6 network address cannot be greater than 64 bites.

Enter the appropriate information and click **Add** to create a new entry.

To search for a particular entry enter the appropriate information and click **Find**.

To remove an entry click **Delete**.

To view all entries on the Switch click **Show All**.

To remove all entries click **Delete All**.

VLAN Precedence Settings

The VLAN precedence settings are used to configure VLAN classification precedence on each port. You can specify the order of MAC-based VLAN classifications and subnet-based VLAN classifications. If a port's VLAN classification is a MAC-based precedence, MAC-based VLAN classification will be processed first. If MAC-based VLAN classification fails, the subnet-based VLAN classification will be executed. If a port's VLAN classification is subnet-based VLAN precedence, the subnet-based VLAN classification will be processed first. If subnet-based VLAN classification fails, the MAC-based VLAN classification will be executed.

To view this window, click **L2 Features > Subnet VLAN > VLAN Precedence Settings**, as shown below:

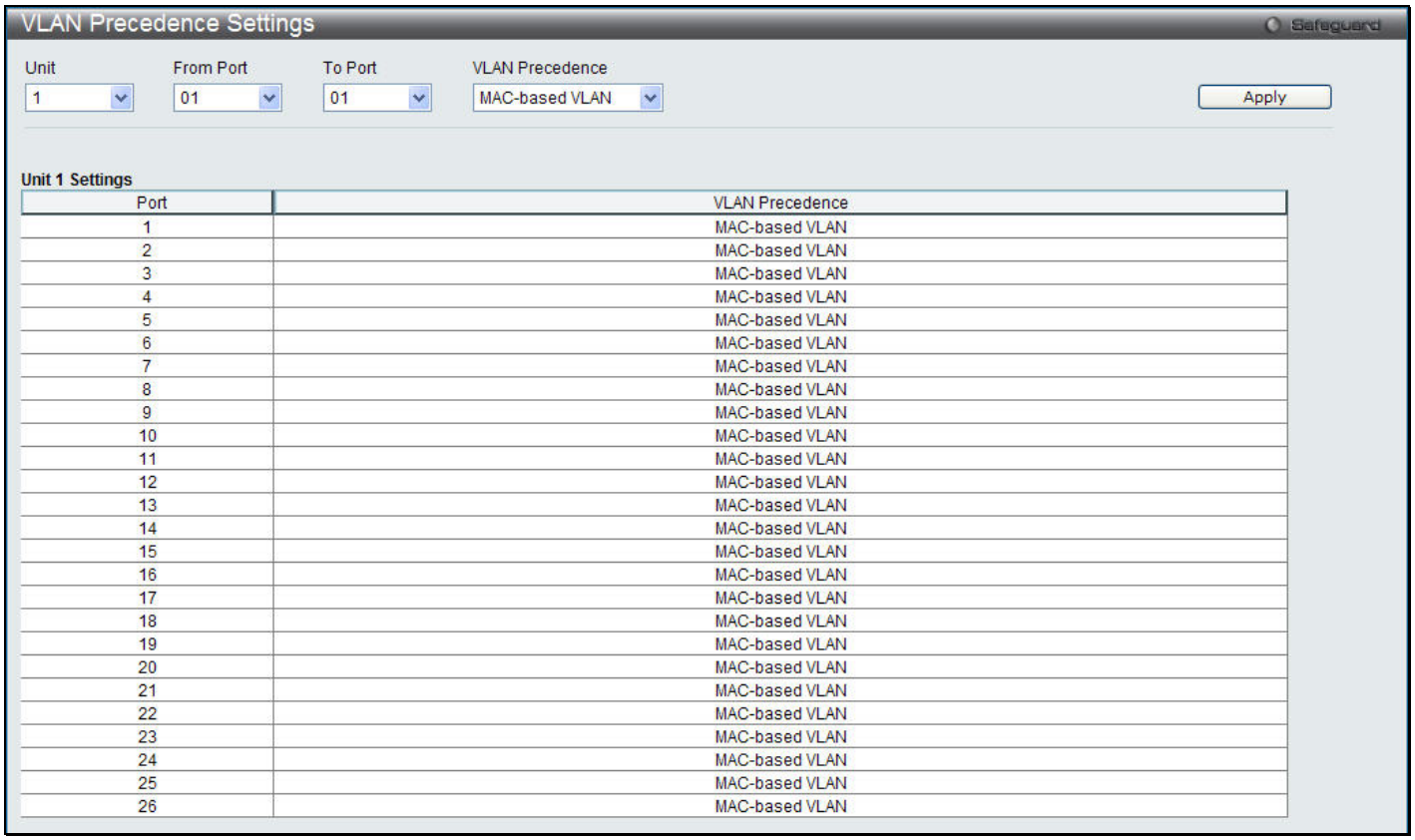


Figure 4-16 VLAN Precedence Settings window

The following parameters can be configured:

Parameter	Description
Unit	Select a unit to be configured.
From Port / To Port	Specify the port or range of ports to configure.
VLAN Precedence	Use the drop down menu to select the VLAN precedence, choose either *MAC-based VLAN* or *Subnet VLAN*. *MAC-based VLAN* – Specifies that the MAC-based VLAN classification is given precedence over the subnet-based VLAN classification. *Subnet VLAN* – Specifies that the subnet-based VLAN classification is given precedence over the MAC-based VLAN classification.

Click **Apply** to implement changes made.

VLAN Counter Settings

To view the following window, click **L2 Features > VLAN > VLAN Counter Settings**, as shown below:

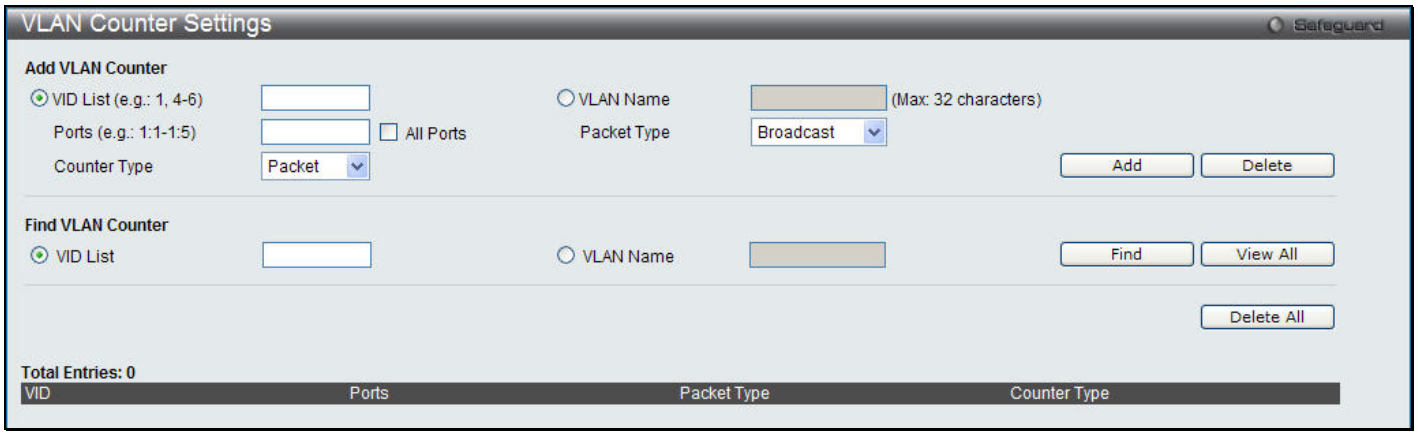


Figure 4-17 VLAN Counter Settings window

The following parameters can be configured:

Parameter	Description
VID List (e.g.: 1, 4-6)	Click the radio button and enter a list of VLAN ID.
VLAN Name	Click the radio button and enter a VLAN name.
Ports (e.g.: 1:1-1:5)	Enter a port or range of ports to configure. Tick the All Ports check box to select all ports on the Switch.
Packet Type	Use the drop-down menu to select the packet type. *Broadcast* – Specify to count broadcast packets. *Multicast* – Specify to count multicast packets. *Unicast* - Specify to count unicast packets. *All* – The statistics is counted for all packets.
Counter Type	Use the drop-down menu to select the counter type. *Packet* – Specify to count at the packet level. *Byte* - Specify to count at the byte level.

Enter the appropriate information and click **Add** to create a new entry.

To search for a particular entry, enter the appropriate information and click **Find**.

To remove an entry click **Delete**.

To view all entries on the Switch, click **View All**.

To remove all entries click **Delete All**.

Voice VLAN

Voice VLAN Global Settings

Voice VLAN is a VLAN used to carry voice traffic from IP phone. Because the sound quality of an IP phone call will be deteriorated if the data is unevenly sent, the quality of service (QoS) for voice traffic shall be configured to ensure the transmission priority of voice packet is higher than normal traffic.

The switches determine whether a received packet is a voice packet by checking its source MAC address. If the source MAC addresses of packets comply with the organizationally unique identifier (OUI) addresses configured by the system, the packets are determined as voice packets and transmitted in voice VLAN.

To view the following window, click **L2 Features > VLAN > Voice VLAN > Voice VLAN Global Settings**, as shown below:

Figure 4-18 Voice VLAN Global Settings window

The fields that can be configured are described below:

Parameter	Description
Voice VLAN State	The state of the voice VLAN.
Voice VLAN Name	The name of the voice VLAN.
Voice VID (1-4094)	The VLAN ID of the voice VLAN.
Priority	The priority of the voice VLAN, the range is *0* to *7*. The default priority is *5*.
Aging Time (1-65535)	Set the aging time from *1* to *65535* minutes. The default value is *720* minutes. The aging time is used to remove a port from voice VLAN if the port is an automatic VLAN member. When the last voice device stops sending traffic and the MAC address of this voice device is aged out, the voice VLAN aging timer will be started. The port will be removed from the voice VLAN after expiration of voice VLAN aging timer. If the voice traffic resumes during the aging time, the aging timer will be reset and stop.
Log State	Used to enable or disable the sending of voice VLAN logs.

Click the **Apply** button to accept the changes made for each individual section.

Voice VLAN Port Settings

This page is used to show the ports voice VLAN information.

To view the following window, click **L2 Features > VLAN > Voice VLAN > Voice VLAN Port Settings**, as shown below:

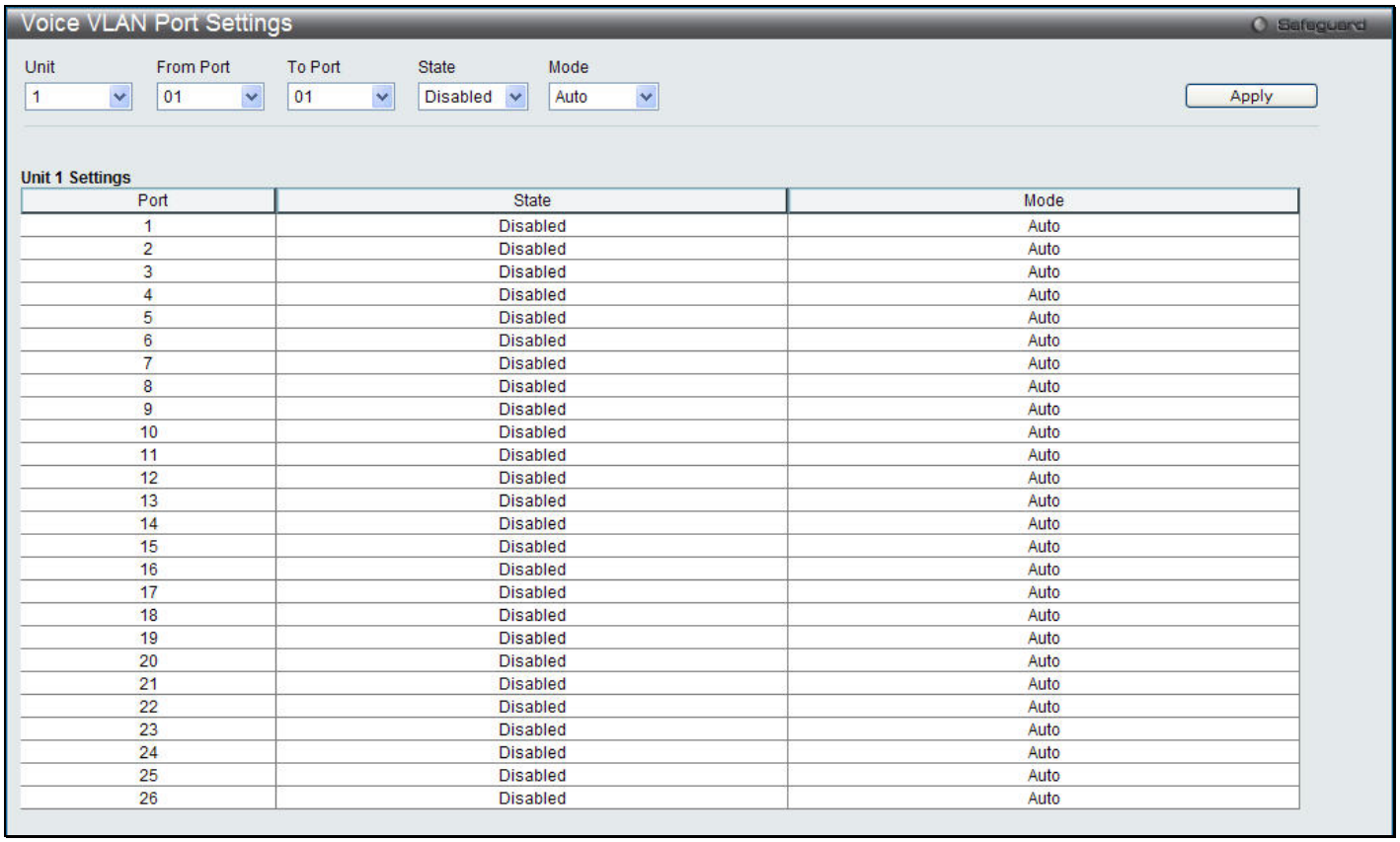


Figure 4-19 Voice VLAN Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select a range of ports to be displayed.
State	Select the state of the port.
Mode	Select the mode of the port.

Click the **Apply** button to accept the changes made.

Voice VLAN OUI Settings

This page is used to configure the user-defined voice traffic's OUI. The OUI is used to identify the voice traffic. There are a number of pre-defined OUIs. The user can further define the user-defined OUIs if needed. The user-defined OUI cannot be the same as the pre-defined OUI.

To view the following window, click **L2 Features > VLAN > Voice VLAN > Voice VLAN OUI Settings**, as shown below:

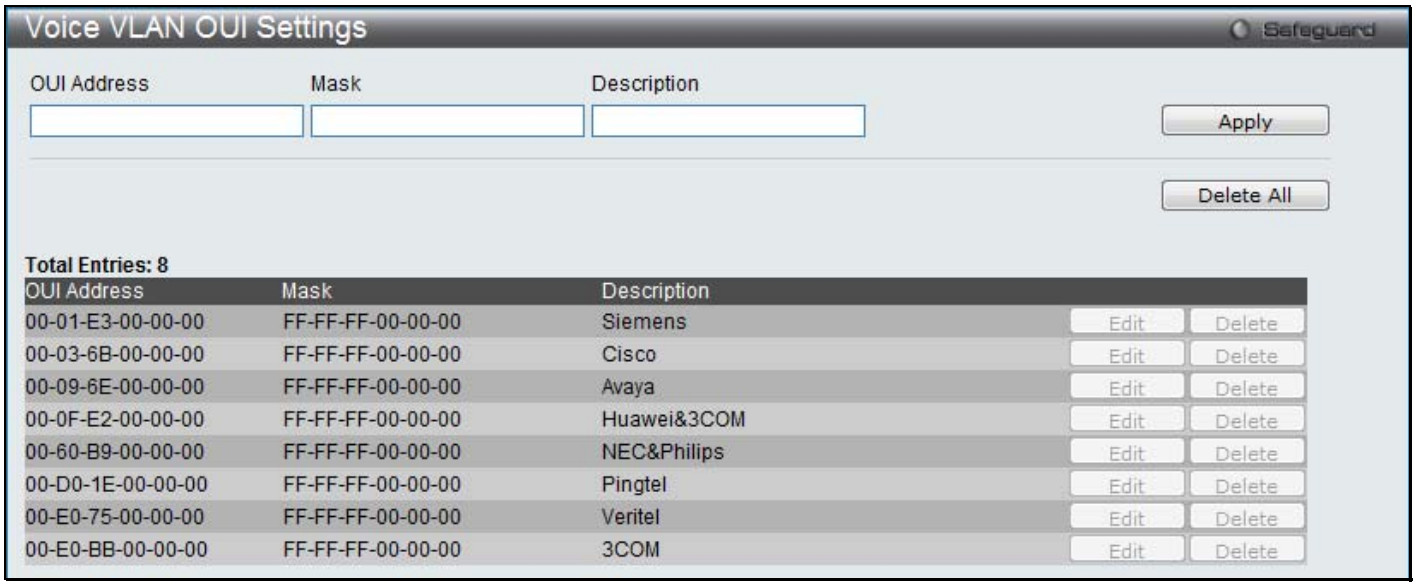


Figure 4-20 Voice VLAN OUI Settings window

The fields that can be configured are described below:

Parameter	Description
OUI Address	User-defined OUI MAC address.
Mask	User-defined OUI MAC address mask.
Description	The description for the user-defined OUI.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Voice VLAN Device

This page is used to show voice devices that are connected to the ports. The start time is the time when the device is detected on this port, the activate time is the latest time saw the device sending the traffic.

To view the following window, click **L2 Features > VLAN > Voice VLAN > Voice VLAN Device**, as shown below:

Figure 4-21 Voice VLAN Device window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.

VLAN Trunk Settings

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

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

Refer to the following figure for an illustrated example.

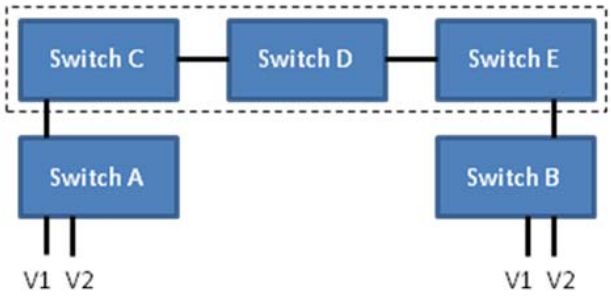


Figure 4-22 Example of VLAN Trunk

Users can combine a number of VLAN ports together to create VLAN trunks.

To view the following window, click **L2 Features > VLAN > VLAN Trunk Settings**, as shown below:

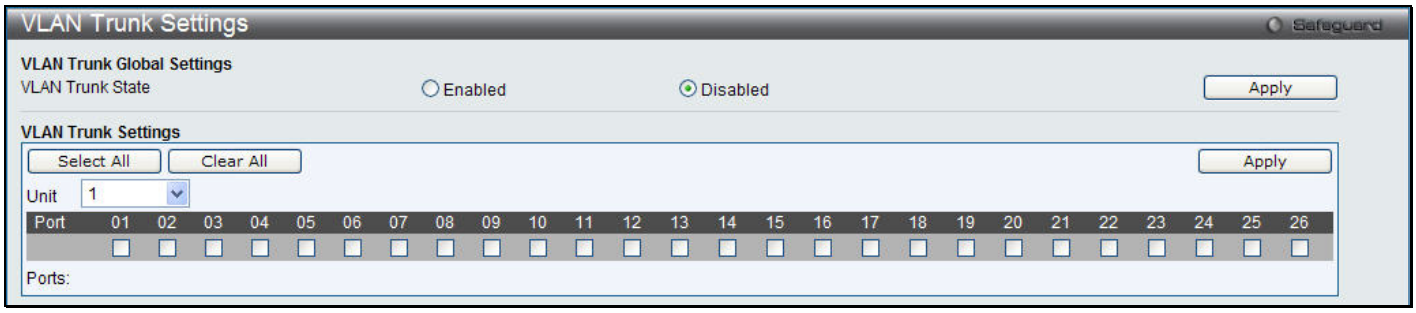


Figure 4-23 VLAN Trunk Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Trunk State	Enable or disable the VLAN trunking global state.
Unit	Select the unit to configure.
Ports	The ports to be configured. By clicking the **Select All** button, all the ports will be included. By clicking the **Clear All** button, all the ports will not be included.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Select All** button to tick all ports.

Click the **Clear All** button to deselect all ports.

Browse VLAN

Users can display the VLAN status for each of the Switch's ports viewed by VLAN. Enter a VID (VLAN ID) in the field at the top of the window and click the **Find** button.

To view the following window, click **L2 Features > VLAN > Browse VLAN**, as shown below:

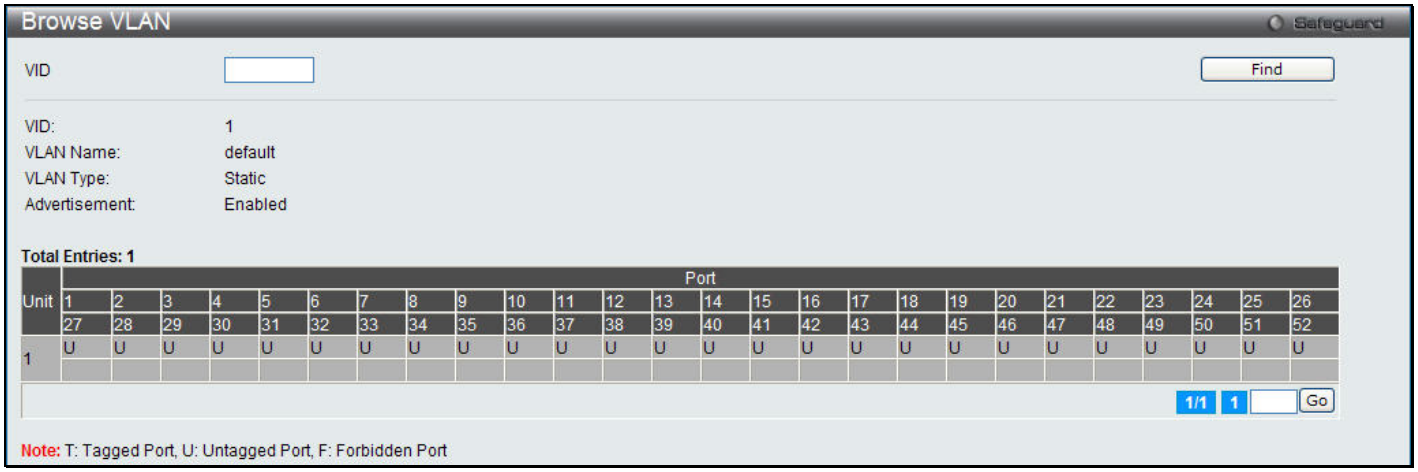


Figure 4-24 Browse VLAN window

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

NOTE: The abbreviations used on this page are **Tagged Port (T)**, **Untagged Port (U)** and **Forbidden Port (F)**.

Show VLAN Ports

Users can display the VLAN ports of the Switch's viewed by VID. Enter a Port or a **Port List** in the field at the top of the window and click the **Find** button.

To view the following window, click **L2 Features > VLAN > Show VLAN Ports**, as shown below:

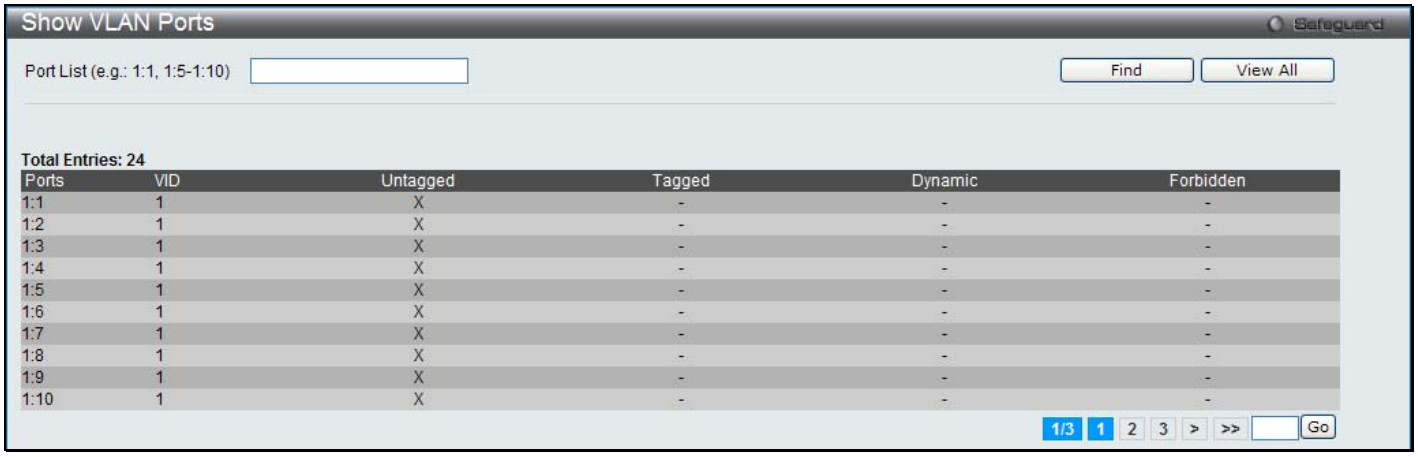


Figure 4-25 Show VLAN Ports window

Click the **View All** button to display all the existing entries.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

Q-in-Q

Q-in-Q Settings

This function allows the user to enable or disable the Q-in-Q function. Q-in-Q is designed for service providers to carry traffic from multiple users across a network.
Q-in-Q is used to maintain customer specific VLAN and Layer 2 protocol configurations even when the same VLAN ID is being used by different customers. This is achieved by inserting SPVLAN tags into the customer's frames when they enter the service provider's network, and then removing the tags when the frames leave the network.

Customers of a service provider may have different or specific requirements regarding their internal VLAN IDs and the number of VLANs that can be supported. Therefore customers in the same service provider network may have VLAN ranges that overlap, which might cause traffic to become mixed up. So assigning a unique range of VLAN IDs to each customer might cause restrictions on some of their configurations requiring intense processing of VLAN mapping tables which may exceed the VLAN mapping limit. Q-in-Q uses a single service provider VLAN (SPVLAN) for customers who have multiple VLANs. Customer's VLAN IDs are segregated within the service provider's network even when they use the same customer specific VLAN ID. Q-in-Q expands the VLAN space available while preserving the customer's original tagged packets and adding SPVLAN tags to each new frame.

To view the following window, click **L2 Features > QinQ > QinQ Settings**, as shown below:

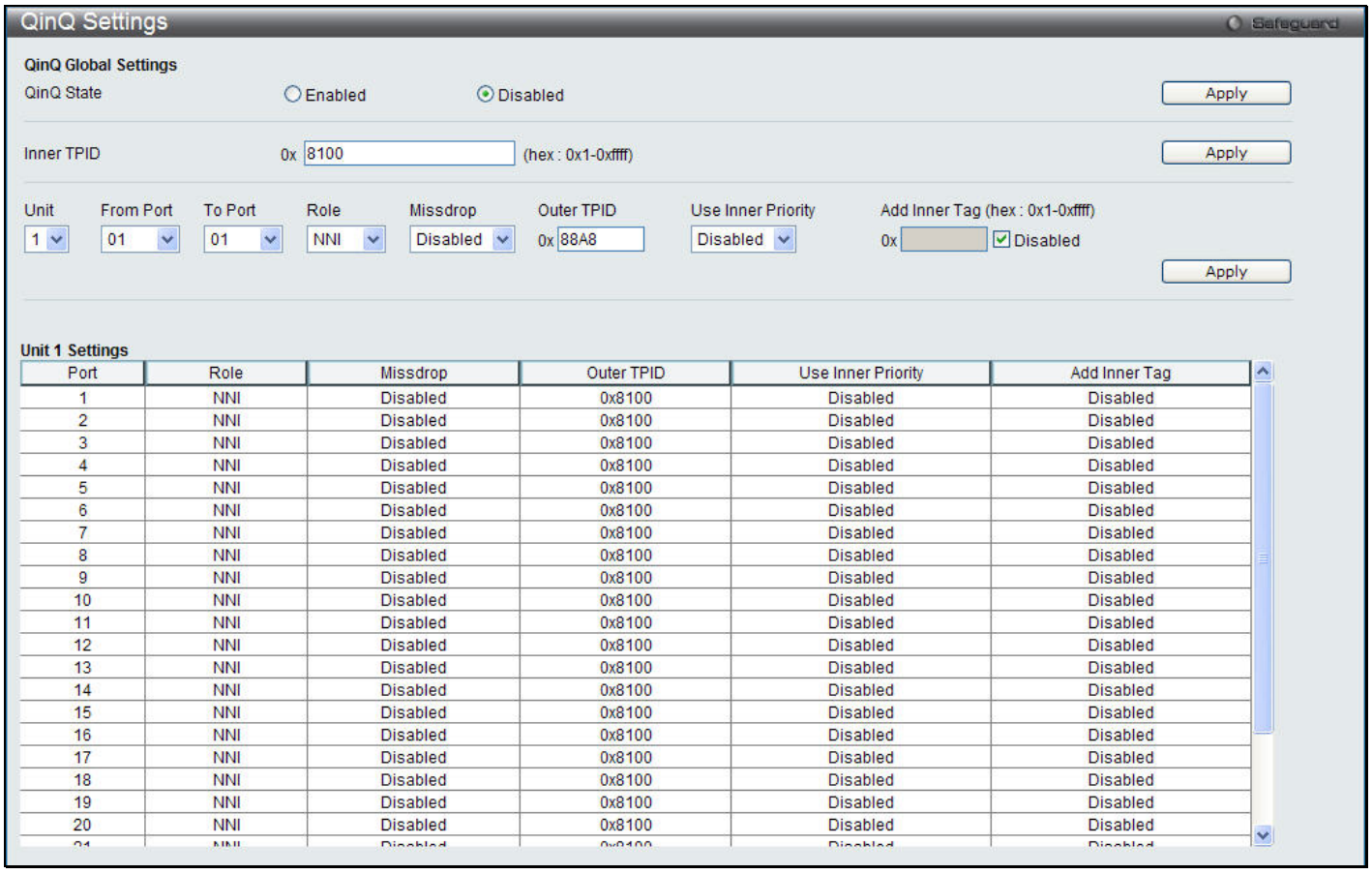


Figure 4-26 Q-in-Q Settings window

The fields that can be configured are described below:

Parameter	Description
QinQ State	Click the radio button to enable or disable the Q-in-Q Global Settings.

Inner TPID	This is used to decide if the ingress packet is c-tagged. Inner tag TPID is per system configurable.
Unit	Select a unit to be configured.
From Port / To Port	A consecutive group of ports that are part of the VLAN configuration starting with the selected port.
Role	The user can choose between UNI or NNI role. *UNI* – To select a user-network interface which specifies that communication between the specified user and a specified network will occur. *NNI* – To select a network-to-network interface specifies that communication between two specified networks will occur.
Missdrop	Use the drop-down menu to enable or disable missdrop. If missdrop is enabled, the packet that does not match any VLAN translation rule on the UNI port will be dropped. If disabled, then the packet will be assigned the S-VLAN tag based on the VLAN classification rule of the received port.
Outer TPID	The Outer TPID is used for learning and switching packets. The Outer TPID constructs and inserts the outer tag into the packet based on the VLAN ID and Inner Priority.
Use Inner Priority	This is the priority given to the inner tag that is copied to the outer tag if this setting is enabled.
Add Inner Tag (hex: 0x1-0xffff)	Deselect the Disabled check box and enter an inner tag for the packet to use.

Click the **Apply** button to accept the changes made for each individual section.

VLAN Translation Settings

VLAN translation translates the VLAN ID carried in the data packets it receives from private networks into those used in the Service Providers network.

To view this window, click **L2 Features > QinQ > VLAN Translation Settings**, as shown below:

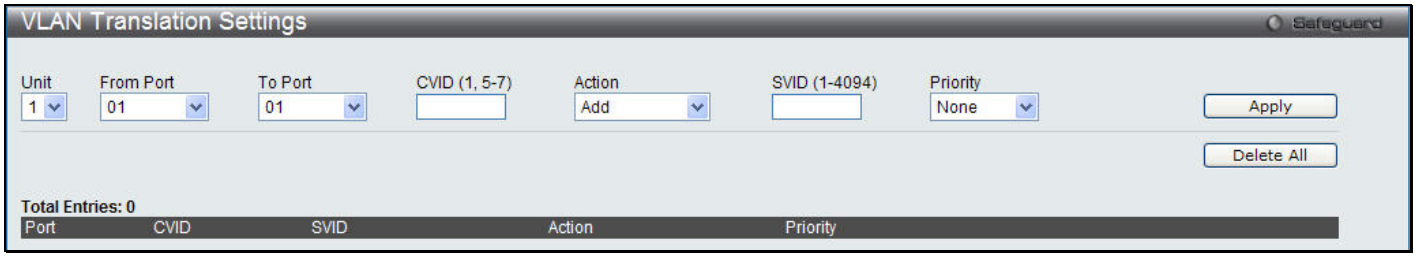


Figure 4-27 VLAN Translation Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to be configured.
From Port / To Port	A consecutive group of ports that are part of the VLAN configuration starting with the selected port.
CVID (1, 5-7)	The customer VLAN ID List to which the tagged packets will be added.
Action	Specify for SPVID packets to be added or replaced.
SVID (1-4094)	This configures the VLAN to join the Service Providers VLAN as a tagged member.
Priority	Select a priority for the VLAN ranging from *0* to *7*. With 7 having the highest priority.

Click **Apply** to make a new entry.

Click **Delete All** to remove all entries.

Q-in-Q and VLAN Translation Rules

For ingress untagged packets at UNI ports:

1. The Switch does not reference the VLAN translation table.
2. Check the Switch VLAN tables. The sequence is MAC-based VLAN -> subnet-based VLAN -> protocol-based VLAN -> port-based VLAN. If matched, the matched VLAN will become this packet's 'SPVLAN'.

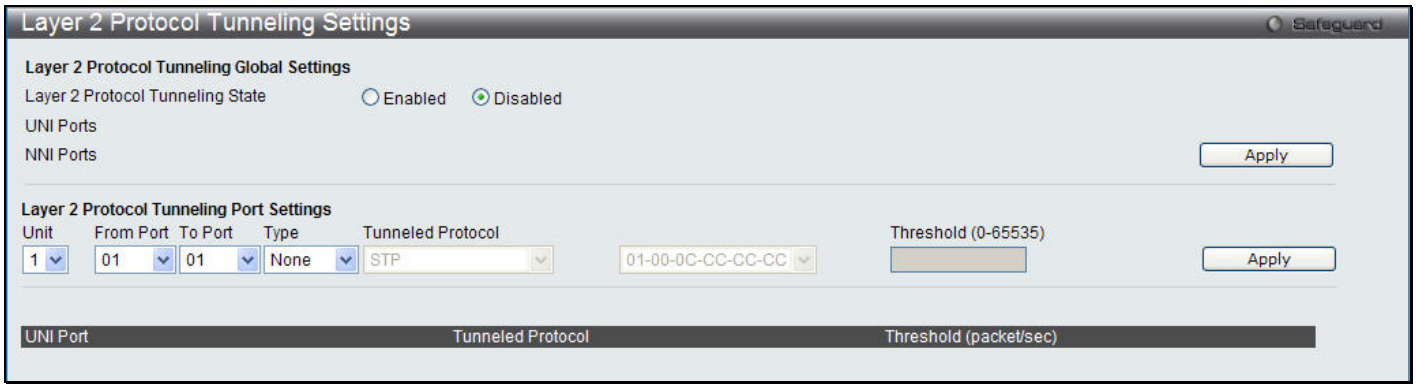
For ingress tagged packets at UNI ports:

1. The Switch looks up the VLAN translation table. If matched, the VLAN tag will be translated (replace CEVLAN with SPVLAN, or add SPVLAN).
2. Or, check the Switch VLAN tables. The sequence is the same as above. The matched VLAN becomes this packet's 'SPVLAN'.

Layer 2 Protocol Tunneling Settings

The layer 2 protocol tunneling is used to tunnel the layer 2 protocol packets. When the device is operating with the Q-in-Q enabled, DA will be replaced by the tunnel multicast address, and the BPDU will be tagged with the tunnel VLAN based on the QinQ VLAN configuration and the tunnel/uplink setting. When the device is operating with the Q-in-Q disabled, the BPDU will have its DA replaced by the tunnel multicast address and is transmitted out based on the VLAN configuration and the tunnel/uplink setting.

To view this window, click **L2 Features > Layer 2 Protocol Tunneling Settings**, as shown below:



The fields that can be configured are described below:

Parameter	Description
Layer 2 Protocol Tunneling State	Toggle the State field to either enable or disable Layer 2 Protocol Tunneling of ports.
Unit	Select a unit in the stack to be configured.
From Port / To Port	Specify the ports on which the L2PT to be configured.
Type	Specify the layer 2 protocol tunnel type which will apply on the specified ports. *UNI* - Specify the port is UNI port. *NNI* - Specify the port is NNI port. *None* –Disable the tunneling function.
Tunneled Protocol	Specify tunneled protocols on this UNI port.

	STP - Specify the BPDU received on these UNI will be tunneled. *GVRP* - Specify the GVRP PDU received on these UNI will be tunneled. *Protocol MAC* - Specify the destination MAC address of the L2 protocol packets that will tunneled on these UNI ports. The MAC address can be 01-00-0C-CC-CC-CC or 01-00-0C-CC-CC-CD. *All* - Specify all supported.
Threshold	Specify the drop threshold for packets-per-second accepted on this UNI port. The port drops the PDU if the protocol's threshold is exceeded. The range of the threshold value is *0* to *65535* (packet/second). The value 0 means unlimited. By default, the value is *0*.

Click the **Apply** button to accept the changes made for each individual section.

Spanning Tree

This Switch supports three versions of the Spanning Tree Protocol: 802.1D-1998 STP, 802.1D-2004 Rapid STP, and 802.1Q-2005 MSTP. 802.1D-1998 STP will be familiar to most networking professionals. However, since 802.1D-2004 RSTP and 802.1Q-2005 MSTP have been recently introduced to D-Link managed Ethernet switches, a brief introduction to the technology is provided below followed by a description of how to set up 802.1D-1998 STP, 802.1D-2004 RSTP, and 802.1Q-2005 MSTP.

802.1Q-2005 MSTP

Multiple Spanning Tree Protocol, or MSTP, is a standard defined by the IEEE community that allows multiple VLANs to be mapped to a single spanning tree instance, which will provide multiple pathways across the network. Therefore, these MSTP configurations will balance the traffic load, preventing wide scale disruptions when a single spanning tree instance fails. This will allow for faster convergences of new topologies for the failed instance. Frames designated for these VLANs will be processed quickly and completely throughout interconnected bridges utilizing any of the three spanning tree protocols (STP, RSTP or MSTP).

This protocol will also tag BDPU packets so receiving devices can distinguish spanning tree instances, spanning tree regions and the VLANs associated with them. An MSTI ID will classify these instances. MSTP will connect multiple spanning trees with a Common and Internal Spanning Tree (CIST). The CIST will automatically determine each MSTP region, its maximum possible extent and will appear as one virtual bridge that runs a single spanning tree. Consequentially, frames assigned to different VLANs will follow different data routes within administratively established regions on the network, continuing to allow simple and full processing of frames, regardless of administrative errors in defining VLANs and their respective spanning trees.

Each switch utilizing the MSTP on a network will have a single MSTP configuration that will have the following three attributes:

1. A configuration name defined by an alphanumeric string of up to 32 characters (defined in the **MST Configuration Identification** window in the Configuration Name field).
2. A configuration revision number (named here as a Revision Level and found in the **MST Configuration Identification** window) and;
3. A 4094-element table (defined here as a VID List in the **MST Configuration Identification** window), which will associate each of the possible 4094 VLANs supported by the Switch for a given instance.

To utilize the MSTP function on the Switch, three steps need to be taken:

1. The Switch must be set to the MSTP setting (found in the **STP Bridge Global Settings** window in the STP Version field)
2. The correct spanning tree priority for the MSTP instance must be entered (defined here as a Priority in the **MSTI Config Information** window when configuring MSTI ID settings).
3. VLANs that will be shared must be added to the MSTP Instance ID (defined here as a VID List in the **MST Configuration Identification** window when configuring an MSTI ID settings).

802.1D-2004 Rapid Spanning Tree

The Switch implements three versions of the Spanning Tree Protocol, the Multiple Spanning Tree Protocol (MSTP) as defined by the IEEE 802.1Q-2005, the Rapid Spanning Tree Protocol (RSTP) as defined by the IEEE 802.1D-2004 specification and a version compatible with the IEEE 802.1D-1998 STP. RSTP can operate with legacy equipment implementing IEEE 802.1D-1998; however the advantages of using RSTP will be lost.

The IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP) evolved from the 802.1D-1998 STP standard. RSTP was developed in order to overcome some limitations of STP that impede the function of some recent switching innovations, in particular, certain Layer 3 functions that are increasingly handled by Ethernet switches. The basic function and much of the terminology is the same as STP. Most of the settings configured for STP are also used for RSTP. This section introduces some new Spanning Tree concepts and illustrates the main differences between the two protocols.

Port Transition States

An essential difference between the three protocols is in the way ports transition to a forwarding state and in the way this transition relates to the role of the port (forwarding or not forwarding) in the topology. MSTP and RSTP combine the transition states disabled, blocking and listening used in 802.1D-1998 and creates a single state Discarding. In either case, ports do not forward packets. In the STP port transition states disabled, blocking or listening or in the RSTP/MSTP port state discarding, there is no functional difference, the port is not active in the network topology. Table 7-3 below compares how the three protocols differ regarding the port state transition.

All three protocols calculate a stable topology in the same way. Every segment will have a single path to the root bridge. All bridges listen for BPDU packets. However, BPDU packets are sent more frequently - with every Hello packet. BPDU packets are sent even if a BPDU packet was not received. Therefore, each link between bridges is sensitive to the status of the link. Ultimately this difference results in faster detection of failed links, and thus faster topology adjustment. A drawback of 802.1D-1998 is this absence of immediate feedback from adjacent bridges.

802.1Q-2005 MSTP	802.1D-2004 RSTP	802.1D-1998 STP	Forwarding	Learning
Disabled	Disabled	Disabled	No	No
Discarding	*Discarding*	*Blocking*	No	No
Discarding	*Discarding*	*Listening*	No	No
Learning	*Learning*	*Listening*	No	**Yes**
Forwarding	**Forwarding**	**Forwarding**	**Yes**	**Yes**

RSTP is capable of a more rapid transition to a forwarding state - it no longer relies on timer configurations - RSTP compliant bridges are sensitive to feedback from other RSTP compliant bridge links. Ports do not need to wait for the topology to stabilize before transitioning to a forwarding state. In order to allow this rapid transition, the protocol introduces two new variables: the edge port and the point-to-point (P2P) port.

Edge Port

The edge port is a configurable designation used for a port that is directly connected to a segment where a loop cannot be created. An example would be a port connected directly to a single workstation. Ports that are designated as edge ports transition to a forwarding state immediately without going through the listening and learning states. An edge port loses its status if it receives a BPDU packet, immediately becoming a normal spanning tree port.

P2P Port

A P2P port is also capable of rapid transition. P2P ports may be used to connect to other bridges. Under RSTP/MSTP, all ports operating in full-duplex mode are considered to be P2P ports, unless manually overridden through configuration.

802.1D-1998/802.1D-2004/802.1Q-2005 Compatibility

MSTP or RSTP can interoperate with legacy equipment and is capable of automatically adjusting BPDU packets to 802.1D-1998 format when necessary. However, any segment using 802.1D-1998 STP will not benefit from the rapid transition and rapid topology change detection of MSTP or RSTP. The protocol also provides for a variable used for migration in the event that legacy equipment on a segment is updated to use RSTP or MSTP.

The Spanning Tree Protocol (STP) operates on two levels:

1. On the switch level, the settings are globally implemented.
2. On the port level, the settings are implemented on a per-user-defined group of ports basis.

BPDU Loop-back Prevention

When connected to other switches, STP is an important configuration in consistency for delivering packets to ports and can greatly improve the throughput of your switch. Yet, even this function can malfunction with the emergence of STP BPDU packets that occasionally loopback to the Switch, such as BPDU packets looped back from an unmanaged switch connected to the Switch. To maintain the consistency of the throughput, the Switch now implements the BPDU Loop-back prevention function.

When the BPDU Loop-back Detection function is enabled, the Switch will be protected against a loop occurring between switches. Once a BPDU packet returns to the Switch, this function will detect that there is an anomaly occurring and will place the receiving port in an error-disabled state. Consequentially, a message will be placed in the Switch's Syslog and will be defined there as "BPDU Loop Back on Port #".

Setting the Loop-back Timer

The Loop-back timer plays a key role in the next step for the Switch to take to resolve this problem. Choosing a non-zero value on the timer will enable the Auto-Recovery Mechanism. When the timer expires, the Switch will again look for its returning BPDU packet on the same port. If no returning packet is received, the Switch will recover the port as a Designated Port in the Discarding State. If another returning BPDU packet is received, the port will remain in a blocked state, the timer will reset to the specified value, restart, and the process will begin again.

For those who choose not to employ this function, the Loop-back Recovery time must be set to zero. In this case, when a BPDU packet is returned to the Switch, the port will be placed in a blocking state and a message will be sent to the Syslog of the Switch. To recover the port, the administrator must disable the state of the problematic port and enable it again. This is the only method available to recover the port when the Loop-back Recover Time is set to 0.

Regulations and Restrictions for the Loop-back Detection Function

- All versions of STP (STP and RSTP) can enable this feature.
- May be configured globally (STP Global Bridge Settings).
- Neighbor switches of the Switch must have the capability to forward BPDU packets. Switches the fail to meet this requirement will disable this function for the port in question on the Switch.
- The default setting for this function is disabled.
- The default setting for the Loop-back timer is 60 seconds.
- This setting will only be operational if the interface is STP-enabled.

The Loop-back Detection feature can only prevent BPDU loops on designated ports. It can detect a loop condition occurring on the user's side connected to the edge port, but it cannot detect the Loop-back condition on the elected root port of STP on another switch

STP Bridge Global Settings

On this page the user can configure the STP bridge global parameters.

To view the following window, click **L2 Features > Spanning Tree > STP Bridge Global Settings**, as shown below:

Figure 4-28 STP Bridge Global Settings window

The fields that can be configured are described below:

Parameter	Description
STP State	Use the radio button to globally enable or disable STP.
STP Version	Use the pull-down menu to choose the desired version of STP: *STP* - Select this parameter to set the Spanning Tree Protocol (STP) globally on the Switch. *RSTP* - Select this parameter to set the Rapid Spanning Tree Protocol (RSTP) globally on the Switch. *MSTP* - Select this parameter to set the Multiple Spanning Tree Protocol (MSTP) globally on the Switch.
Forwarding BPDU	This field can be *Enabled* or *Disabled.* When *Enabled,* it allows the forwarding of STP BPDU packets from other network devices. The default is *Disabled*.
Bridge Max Age (6 – 40)	The Max Age may be set to ensure that old information does not endlessly circulate through redundant paths in the network, preventing the effective propagation of the new information. Set by the Root Bridge, this value will aid in determining that the Switch has spanning tree configuration values consistent with other devices on the bridged LAN. The user may choose a time between *6* and *40* seconds. The default value is *20* seconds.
Bridge Hello Time (1 – 2)	The Hello Time can be set from *1* to *2* seconds. This is the interval between two transmissions of BPDU packets sent by the Root Bridge to tell all other switches that it is indeed the Root Bridge. This field will only appear here when STP or RSTP is selected for the STP Version. For MSTP, the Hello Time must be set on a port per port basis. The default is *2* seconds.
Bridge Forward Delay (4 – 30)	The Forward Delay can be from *4* to *30* seconds. Any port on the Switch spends this time in the listening state while moving from the blocking state to the forwarding state. The default is *15* seconds
TX Hold Count (1-10)	Used to set the maximum number of Hello packets transmitted per interval. The count can be specified from *1* to *10*. The default is *6*.

Max Hops (6-40)	Used to set the number of hops between devices in a spanning tree region before the BPDU (bridge protocol data unit) packet sent by the Switch will be discarded. Each switch on the hop count will reduce the hop count by one until the value reaches zero. The Switch will then discard the BDPU packet and the information held for the port will age out. The user may set a hop count from *6* to *40*. The default is *20*.
NNI BPDU Address	Configure NNI port address. *dot1d* – Specifies GVRP's BPDU MAC address of NNI port using the definition of 802.1d. *dot1ad* – Specifies GVRP's BPDU MAC address of NNI port using the definition of 802.1ad.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: The Bridge Hello Time cannot be longer than the Bridge Max Age. Otherwise, a configuration error will occur. Observe the following formulas when setting the above parameters:

Bridge Max Age <= 2 x (Bridge Forward Delay - 1 second)

Bridge Max Age > 2 x (Bridge Hello Time + 1 second)

STP Port Settings

STP can be set up on a port per port basis.

To view the following window, click **L2 Features > Spanning Tree > STP Port Settings**, as shown below:

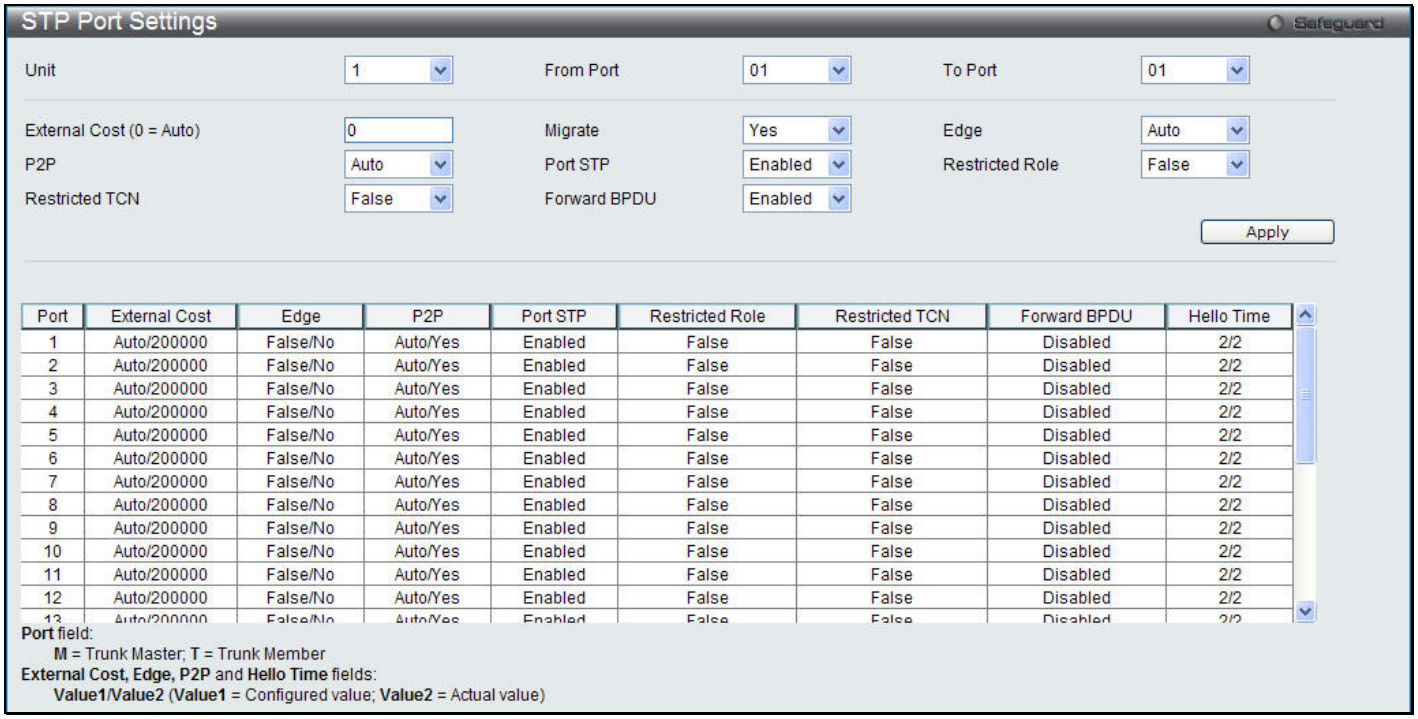


Figure 4-29 STP Port Settings window

It is advisable to define an STP Group to correspond to a VLAN group of ports.

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports to be configured.
External Cost (0=Auto)	This defines a metric that indicates the relative cost of forwarding packets to the specified port list. Port cost can be set automatically or as a metric value. The default value is *0* (auto). Setting *0* for the external cost will automatically set the speed for forwarding packets to the specified port(s) in the list for optimal efficiency. The default port cost for a 100Mbps port is *200000* and the default port cost for a Gigabit port is *20000*. Enter a value between *1* and *200000000* to determine the External Cost. The lower the number, the greater the probability the port will be chosen to forward packets.
P2P	Choosing the *True* parameter indicates a point-to-point (P2P) shared link. P2P ports are similar to edge ports; however they are restricted in that a P2P port must operate in full duplex. Like edge ports, P2P ports transition to a forwarding state rapidly thus benefiting from RSTP. A P2P value of *False* indicates that the port cannot have P2P status. *Auto* allows the port to have P2P status whenever possible and operate as if the P2P status were *True*. If the port cannot maintain this status, (for example if the port is forced to half-duplex operation) the P2P status changes to operate as if the P2P value were *False*. The default setting for this parameter is *Auto*.
Restricted TCN	Topology Change Notification is a simple BPDU that a bridge sends out to its root port to signal a topology change. Restricted TCN can be toggled between *True* and *False*. If set to *True*, this stops the port from propagating received topology change notifications and topology changes to other ports. The default is *False*.
Migrate	When operating in RSTP mode, selecting *Yes* forces the port that has been selected to transmit RSTP BPDUs.
Port STP	This drop-down menu allows you to enable or disable STP for the selected group of ports. The default is *Enabled*.
Forward BPDU	Use the pull-down menu to enable or disable the flooding of BPDU packets when STP is disabled.
Edge	Choosing the *True* parameter designates the port as an edge port. Edge ports cannot create loops, however an edge port can lose edge port status if a topology change creates a potential for a loop. An edge port normally should not receive BPDU packets. If a BPDU packet is received, it automatically loses edge port status. Choosing the *False* parameter indicates that the port does not have edge port status. Alternatively, the *Auto* option is available.
Restricted Role	Use the drop-down menu to toggle Restricted Role between *True* and *False*. If set to *True*, the port will never be selected to be the Root port. The default is *False*.

Click the **Apply** button to accept the changes made.

MST Configuration Identification

This window allows the user to configure a MSTI instance on the Switch. These settings will uniquely identify a multiple spanning tree instance set on the Switch. The Switch initially possesses one CIST, or Common Internal Spanning Tree, of which the user may modify the parameters for but cannot change the MSTI ID for, and cannot be deleted.

To view the following window, click **L2 Features > Spanning Tree > MST Configuration Identification**, as shown below:

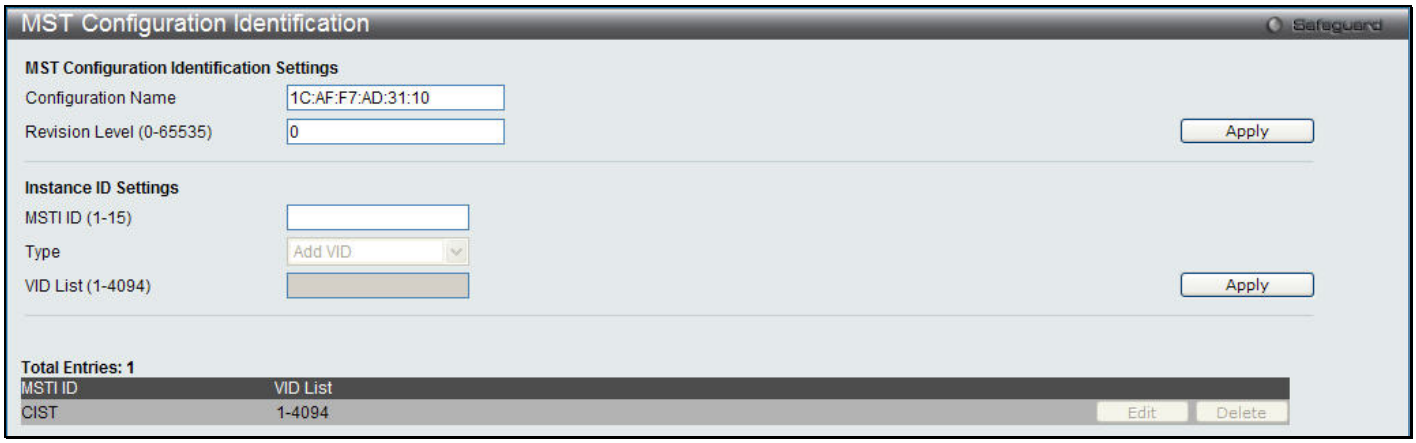


Figure 4-30 MST Configuration Identification window

The fields that can be configured are described below:

Parameter	Description
Configuration Name	This name uniquely identifies the MSTI (Multiple Spanning Tree Instance). If a Configuration Name is not set, this field will show the MAC address to the device running MSTP.
Revision Level (0-65535)	This value, along with the Configuration Name, identifies the MSTP region configured on the Switch.
MSTI ID	Enter a number between *1* and *15* to set a new MSTI on the Switch.
Type	This field allows the user to choose a desired method for altering the MSTI settings. The user has two choices: *Add VID* - Select this parameter to add VIDs to the MSTI ID, in conjunction with the VID List parameter. *Remove VID* - Select this parameter to remove VIDs from the MSTI ID, in conjunction with the VID List parameter.
VID List (1-4094)	This field is used to specify the VID range from configured VLANs set on the Switch. Supported VIDs on the Switch range from ID number *1* to *4094*.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

STP Instance Settings

This window displays MSTIs currently set on the Switch and allows users to change the Priority of the MSTIs.

To view the following window, click **L2 Features > Spanning Tree > STP Instance Settings**, as shown below:

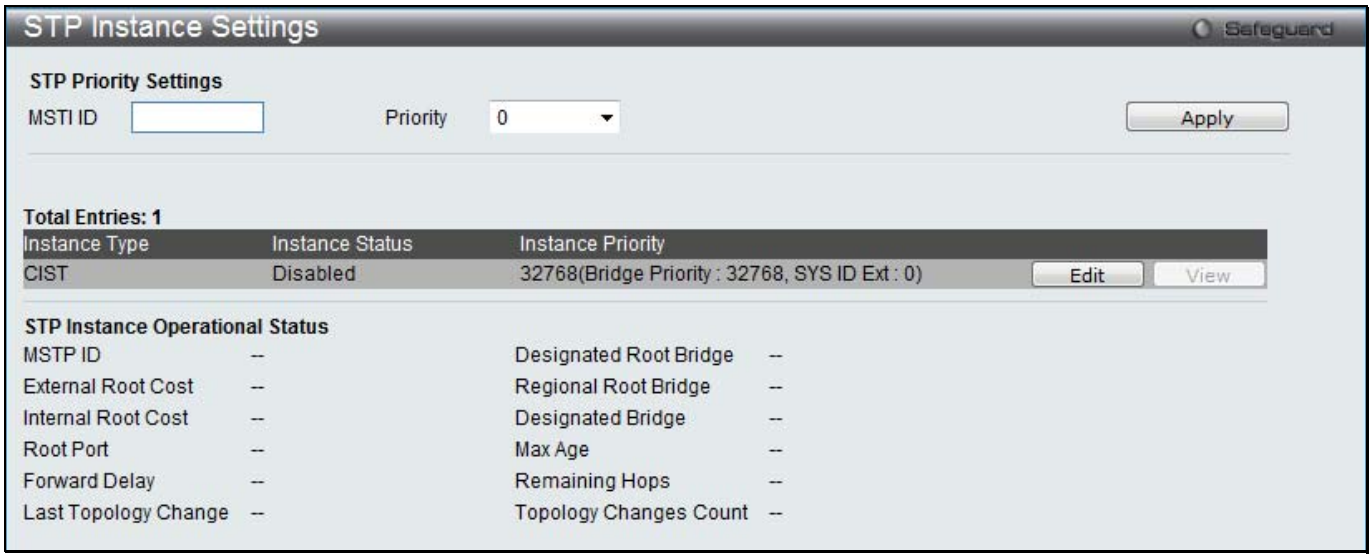


Figure 4-31STP Instance Settings window

The fields that can be configured are described below:

Parameter	Description
MSTI ID	Enter the MSTI ID in this field. An entry of *0* denotes the CIST (default MSTI).
Priority	Enter the priority in this field. The available range of values is from *0* to *61440*.

Click the **Apply** button to accept the changes made.

Click the **Edit** button to re-configure the specific entry.

Click the **View** button to display the information of the specific entry.

MSTP Port Information

This window displays the current MSTI configuration information and can be used to update the port configuration for an MSTI ID. If a loop occurs, the MSTP function will use the port priority to select an interface to put into the forwarding state. Set a higher priority value for interfaces to be selected for forwarding first. In instances where the priority value is identical, the MSTP function will implement the lowest MAC address into the forwarding state and other interfaces will be blocked. Remember that lower priority values mean higher priorities for forwarding packets.

To view the following window, click **L2 Features > Spanning Tree > MSTP Port Information**, as shown below:

Figure 4-32 MSTP Port Information window

To view the MSTI settings for a particular port, use the drop-down menu to select the Port number. To modify the settings for a particular MSTI instance, enter a value in the Instance ID field, an Internal Path Cost, and use the drop-down menu to select a Priority.

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Select the port to configure.
Instance ID	The MSTI ID of the instance to be configured. Enter a value between *0* and *15*. An entry of *0* in this field denotes the CIST (default MSTI).
Internal Path Cost	This parameter is set to represent the relative cost of forwarding packets to specified ports when an interface is selected within an STP instance. Selecting this parameter with a value in the range of *1* to *200000000* will set the quickest route when a loop occurs. A lower Internal cost represents a quicker transmission. Selecting *0* (zero) for this parameter will set the quickest route automatically and optimally for an interface.
Priority	Enter a value between *0* and *240* to set the priority for the port interface. A higher priority will designate the interface to forward packets first. A lower number denotes a higher priority.

Click the **Find** button to locate a specific entry based on the information entered.

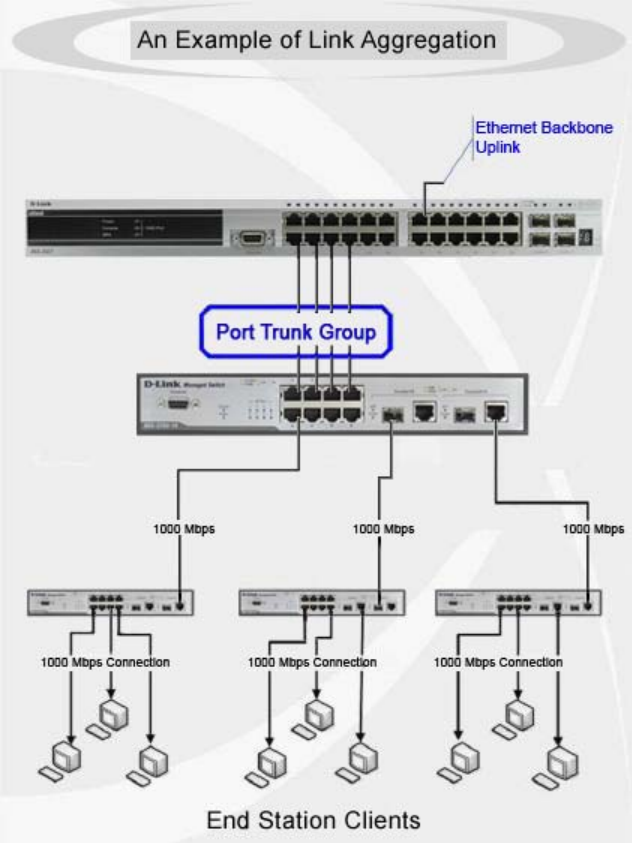
Click the **Apply** button to accept the changes made.

Click the **Edit** button to re-configure the specific entry.

Link Aggregation

Understanding Port Trunk Groups

Port trunk groups are used to combine a number of ports together to make a single high-bandwidth data pipeline. The Switch supports up to eight port trunk groups with two to eight ports in each group. A potential bit rate of 8000 Mbps can be achieved.



4-33 Example of Port Trunk Group

The Switch treats all ports in a trunk group as a single port. Data transmitted to a specific host (destination address) will always be transmitted over the same port in a trunk group. This allows packets in a data stream to arrive in the same order they were sent.

Link aggregation allows several ports to be grouped together and to act as a single link. This gives a bandwidth that is a multiple of a single link's bandwidth.

Link aggregation is most commonly used to link a bandwidth intensive network device or devices, such as a server, to the backbone of a network.

The Switch allows the creation of up to eight link aggregation groups, each group consisting of 2 to 8 links (ports). The (optional) Gigabit ports can only belong to a single link aggregation group.

All of the ports in the group must be members of the same VLAN, and their STP status, static multicast, traffic control; traffic segmentation and 802.1p default priority configurations must be identical. Port locking and 802.1X must not be enabled on the trunk group. Further, the LACP aggregated links should be configured as full duplex.

The Master Port of the group is to be configured by the user, and all configuration options, including the VLAN configuration that can be applied to the Master Port, are applied to the entire link aggregation group.

Load balancing is automatically applied to the ports in the aggregated group, and a link failure within the group causes the network traffic to be directed to the remaining links in the group.

The Spanning Tree Protocol will treat a link aggregation group as a single link, on the switch level. On the port level, the STP will use the port parameters of the Master Port in the calculation of port cost and in determining the state of the link aggregation group. If two redundant link aggregation groups are configured on the Switch, STP will block one entire group; in the same way STP will block a single port that has a redundant link.

NOTE: If any ports within the trunk group become disconnected, packets intended for the disconnected port will be load shared among the other linked ports of the link aggregation group.

Port Trunking Settings

On this page the user can configure the port trunk settings for the Switch.

To view the following window, click **L2 Features > Link Aggregation > Port Trunking Settings**, as shown below:

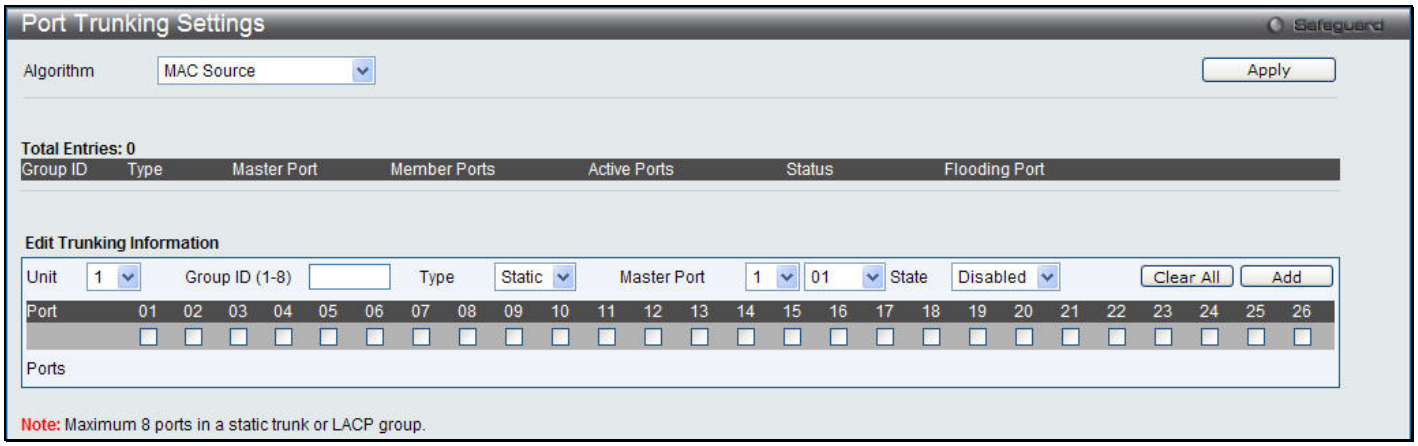


Figure 4-34 Port Trunking Settings window

The fields that can be configured are described below:

Parameter	Description
Algorithm	This is the traffic hash algorithm among the ports of the link aggregation group. Options to choose from are *MAC Source*, *MAC Destination*, *MAC Source Destination*, *IP Source*, *IP Destination* and *IP Source Destination*.
Unit	Select the unit to configure.
Group ID (1-8)	Select an ID number for the group, between *1* and *8*.
Type	This pull-down menu allows users to select between *Static* and *LACP* (Link Aggregation Control Protocol). *LACP* allows for the automatic detection of links in a Port Trunking Group.
Master Port	Choose the Master Port for the trunk group using the drop-down menu.
State	Use the drop-down menu to toggle between *Enabled* and *Disabled*. This is used to turn a port trunking group on or off. This is useful for diagnostics, to quickly isolate a bandwidth intensive network device or to have an absolute backup aggregation group that is not under automatic control.

Click the **Apply** button to accept the changes made.

Click the **Clear All** button to clear out all the information entered.

Click the **Add** button to add a new entry based on the information entered.

NOTE: The maximum number of ports that can be configured in one Static Trunk or LACP Group are 8 ports.

LACP Port Settings

In conjunction with the Trunking window, users can create port trunking groups on the Switch. Using the following window, the user may set which ports will be active and passive in processing and sending LACP control frames.

To view the following window, click **L2 Features > Link Aggregation > LACP Port Settings**, as shown below:

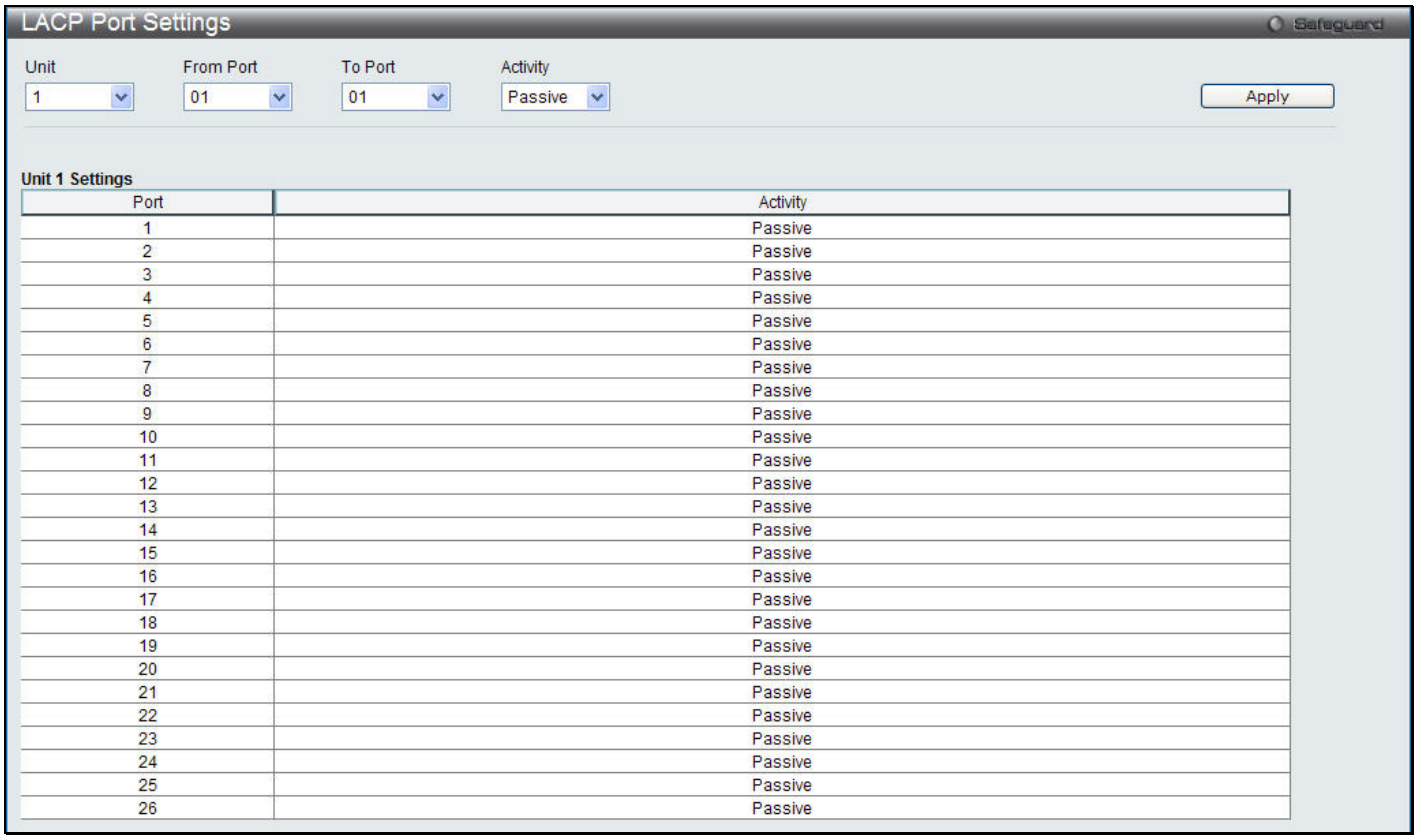


Figure 4-35 LACP Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	A consecutive group of ports may be configured starting with the selected port.
Activity	*Active* - Active LACP ports are capable of processing and sending LACP control frames. This allows LACP compliant devices to negotiate the aggregated link so the group may be changed dynamically as needs require. In order to utilize the ability to change an aggregated port group, that is, to add or subtract ports from the group, at least one of the participating devices must designate LACP ports as active. Both devices must support LACP.

	Passive - LACP ports that are designated as passive cannot initially send LACP control frames. In order to allow the linked port group to negotiate adjustments and make changes dynamically, one end of the connection must have "active" LACP ports (see above).

Click the **Apply** button to accept the changes made.

FDB

Static FDB Settings

Unicast Static FDB Settings

Users can set up static unicast forwarding on the Switch.

To view the following window, click **L2 Features > FDB > Static FDB Settings > Unicast Static FDB Settings**, as shown below:

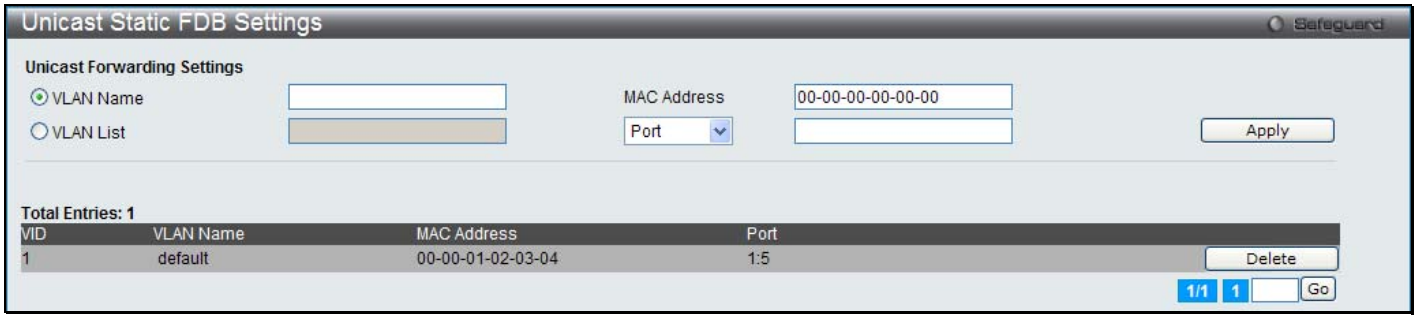


Figure 4-36 Unicast Static FDB Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the radio button and enter the VLAN name of the VLAN on which the associated unicast MAC address resides.
VLAN List	Click the radio button and enter a list of VLAN on which the associated unicast MAC address resides.
MAC Address	The MAC address to which packets will be statically forwarded or dropped. This must be a unicast MAC address.
Port/Drop	Allows the selection of the port number on which the MAC address entered above resides This option could also drop the MAC address from the unicast static FDB.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

Multicast Static FDB Settings

Users can set up static multicast forwarding on the Switch.

To view the following window, click **L2 Features > FDB > Static FDB Settings > Multicast Static FDB Settings**, as shown below:

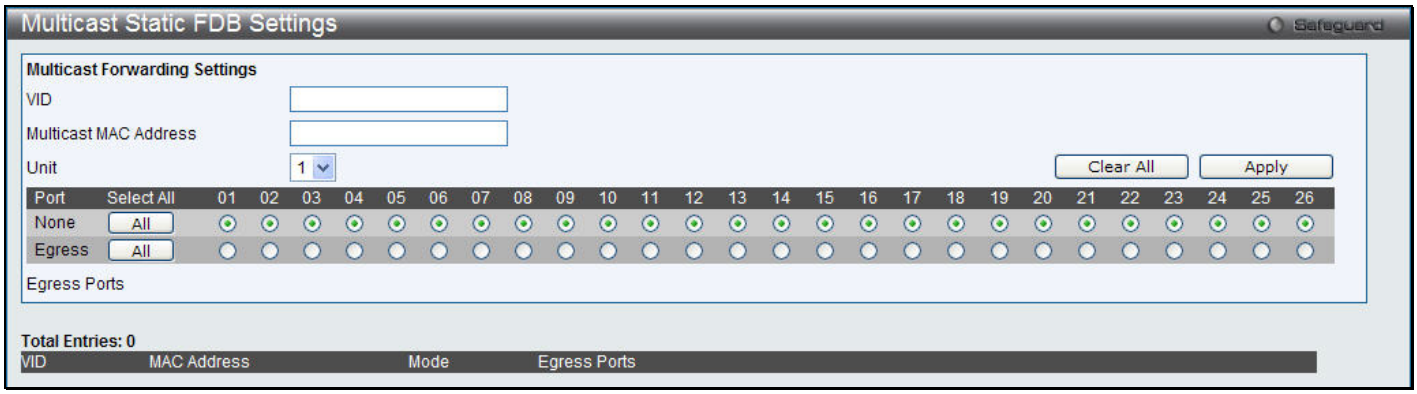


Figure 4-37 Multicast Static FDB Settings window

The fields that can be configured are described below:

Parameter	Description
VID	The VLAN ID of the VLAN the corresponding MAC address belongs to.
Multicast MAC Address	The static destination MAC address of the multicast packets. This must be a multicast MAC address.
Unit	Select the unit to configure.
Port	Allows the selection of ports that will be members of the static multicast group and ports that are either forbidden from joining dynamically, or that can join the multicast group dynamically, using GMRP. The options are: *None* - No restrictions on the port dynamically joining the multicast group. When *None* is chosen, the port will not be a member of the Static Multicast Group. Click the **All** button to select all the ports. *Egress* - The port is a static member of the multicast group. Click the **All** button to select all the ports.

Click the **Clear All** button to clear out all the information entered.

Click the **Apply** button to accept the changes made.

MAC Notification Settings

MAC notification is used to monitor MAC addresses learned and entered into the forwarding database. This window allows you to globally set MAC notification on the Switch. Users can set MAC notification for individual ports on the Switch.

To view the following window, click **L2 Features > FDB > MAC Notification Settings**, as shown below:

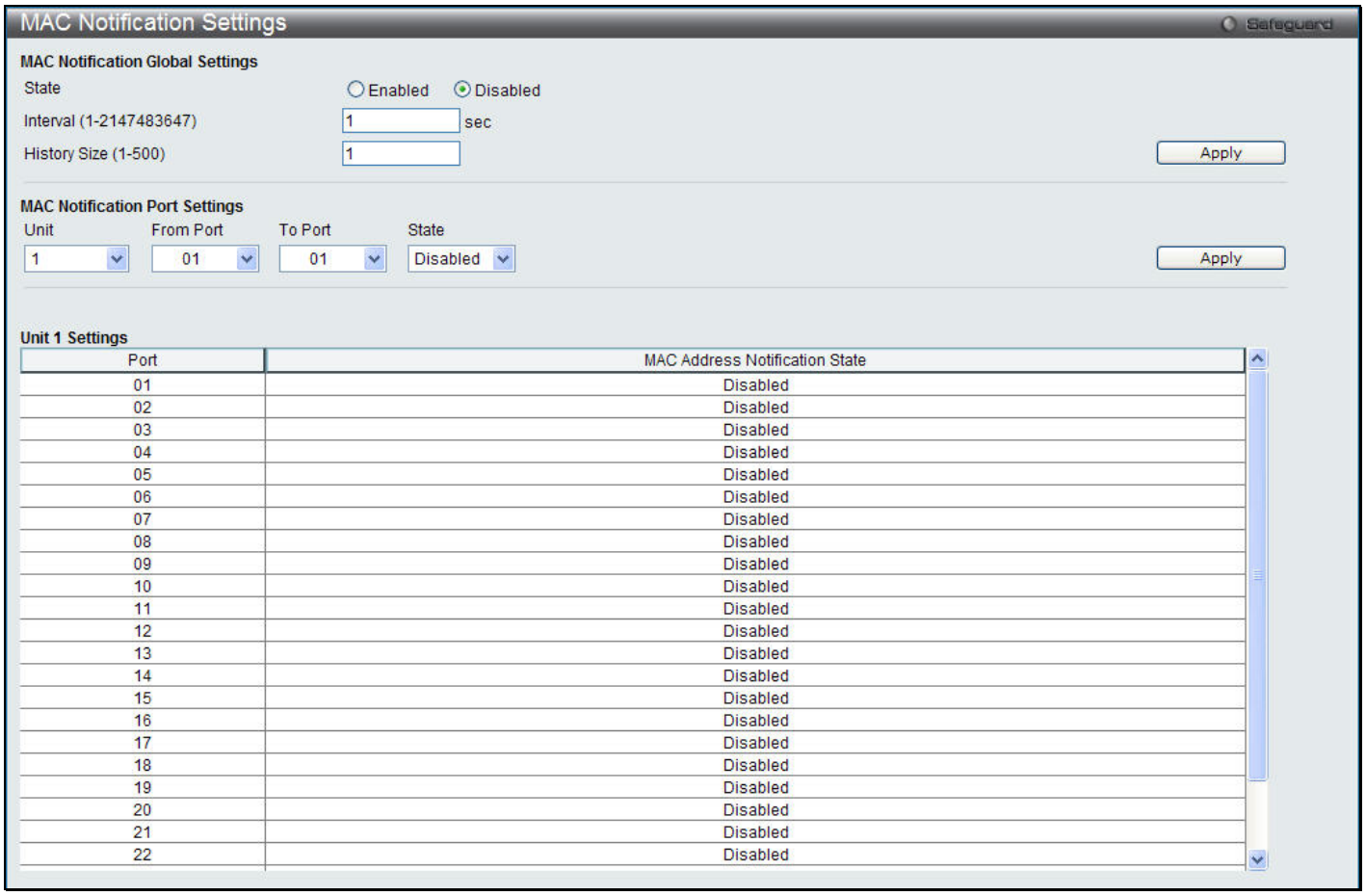


Figure 4-38 MAC Notification Settings window

The fields that can be configured are described below:

Parameter	Description
State	Enable or disable MAC notification globally on the Switch
Interval	The time in seconds between notifications. Value range to use is *1* to *2147483647*.
History Size	The maximum number of entries listed in the history log used for notification. Up to 500 entries can be specified.
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports for MAC notification.
State	Enable MAC Notification for the ports selected using the pull-down menu.

Click the **Apply** button to accept the changes made for each individual section.

MAC Address Aging Time Settings

Users can configure the MAC Address aging time on the Switch.

To view the following window, click **L2 Features > FDB > MAC Address Aging Time Settings**, as shown below:

Figure 4-39 MAC Address Aging Time Settings window

The fields that can be configured are described below:

Parameter	Description
MAC Address Aging Time (10-1000000)	This field specifies the length of time a learned MAC Address will remain in the forwarding table without being accessed (that is, how long a learned MAC Address is allowed to remain idle). To change this option, type in a different value representing the MAC address' age-out time in seconds. The MAC Address Aging Time can be set to any value between *10* and *1000000* seconds. The default setting is *300* seconds.

Click the **Apply** button to accept the changes made.

MAC Address Table

This allows the Switch's MAC address forwarding table to be viewed. When the Switch learns an association between a MAC address, VLAN and a port number, it makes an entry into its forwarding table. These entries are then used to forward packets through the Switch.

To view the following window, click **L2 Features > FDB > MAC Address Table**, as shown below:

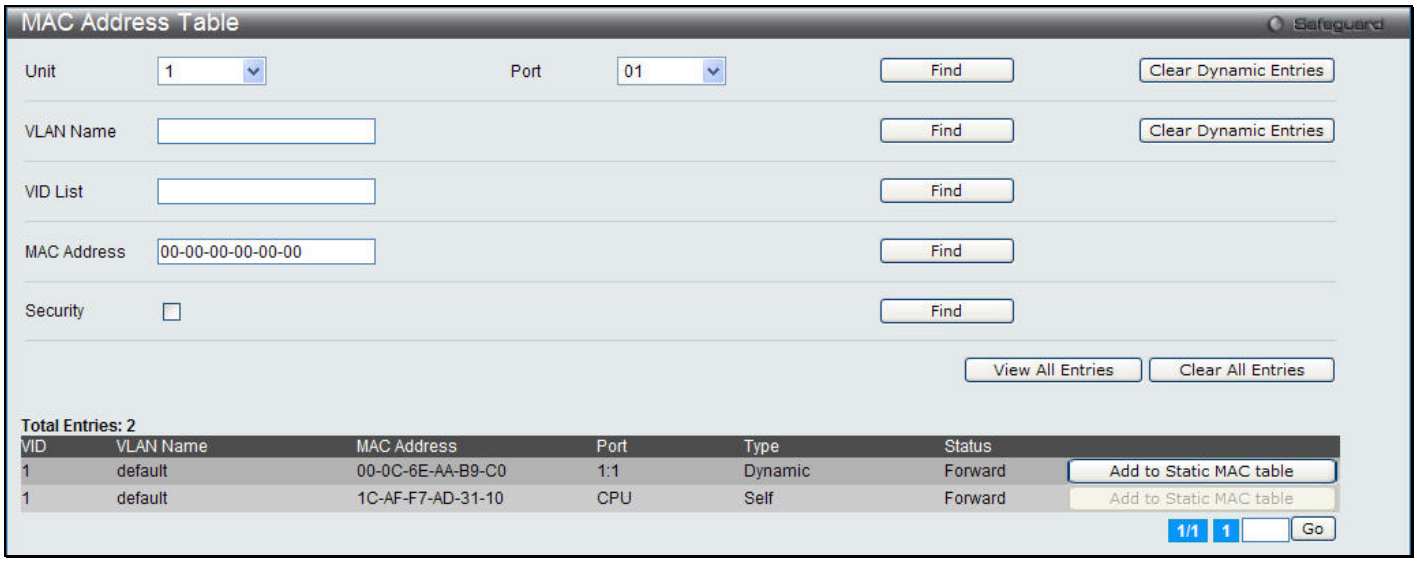


Figure 4-40 MAC Address Table window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	The port to which the MAC address below corresponds.
VLAN Name	Enter a VLAN Name for the forwarding table to be browsed by.
MAC Address	Enter a MAC address for the forwarding table to be browsed by.
Security	Tick the check box to display the FDB entries that are created by the security module.

Click the **Find** button to locate a specific entry based on the information entered.
Click the **Clear Dynamic Entries** button to delete all dynamic entries of the address table.
Click the **View All Entries** button to display all the existing entries.
Click the **Clear All Entries** button to remove all the entries listed in the table.
Click the **Add to Static MAC table** button to add the specific entry to the Static MAC table.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

ARP & FDB Table

On this page the user can find the ARP and FDB table parameters.
To view the following window, click **L2 Features > FDB > ARP & FDB Table**, as shown below:

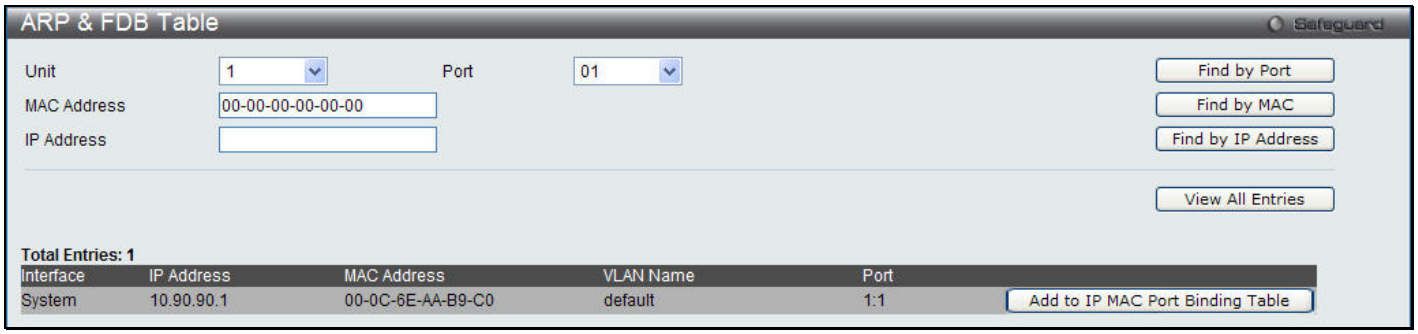


Figure 4-41 ARP & FDB Table window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Select the port number to use for this configuration.
MAC Address	Enter the MAC address to use for this configuration.
IP Address	Enter the IP address the use for this configuration.

Click the **Find by Port** button to locate a specific entry based on the port number selected.
Click the **Find by MAC** button to locate a specific entry based on the MAC address entered.
Click the **Find by IP Address** button to locate a specific entry based on the IP address entered.
Click the **View All Entries** button to display all the existing entries.
Click the **Add to IP MAC Port Binding Table** to add a specific entry to the table in **IMPB Entry Settings** window.

L2 Multicast Control

IGMP Snooping

Internet Group Management Protocol (IGMP) snooping allows the Switch to recognize IGMP queries and reports sent between network stations or devices and an IGMP host. When enabled for IGMP snooping, the Switch can open or close a port to a specific device based on IGMP messages passing through the Switch.

IGMP Snooping Settings

In order to use IGMP Snooping it must first be enabled for the entire Switch under IGMP Global Settings at the top of the window. You may then fine-tune the settings for each VLAN by clicking the corresponding **Edit** button. When enabled for IGMP snooping, the Switch can open or close a port to a specific multicast group member based on IGMP messages sent from the device to the IGMP host or vice versa. The Switch monitors IGMP messages and discontinues forwarding multicast packets when there are no longer hosts requesting that they continue.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Settings**, as shown below:

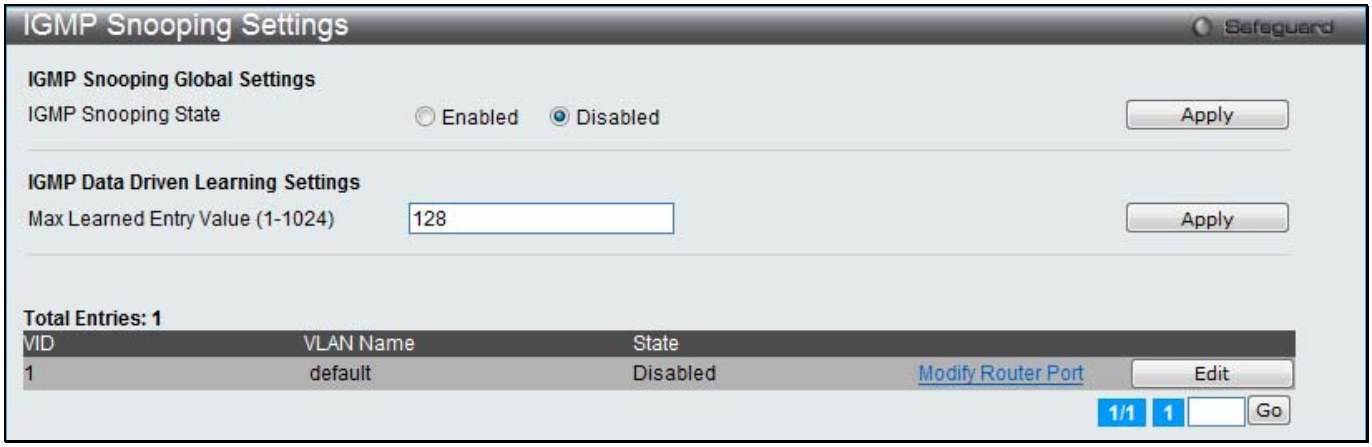


Figure 4-42 IGMP Snooping Settings window

The fields that can be configured are described below:

Parameter	Description
IGMP Snooping State	Click the radio buttons to enable or disable the IGMP Snooping state.
Max Learning Entry Value (1-1024)	Enter the maximum learning entry value.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Edit** button to configure the IGMP Snooping Parameters Settings.

Click the Modify Router Port link to configure the IGMP Snooping Router Port Settings.

After clicking the **Edit** button, the following page will appear:

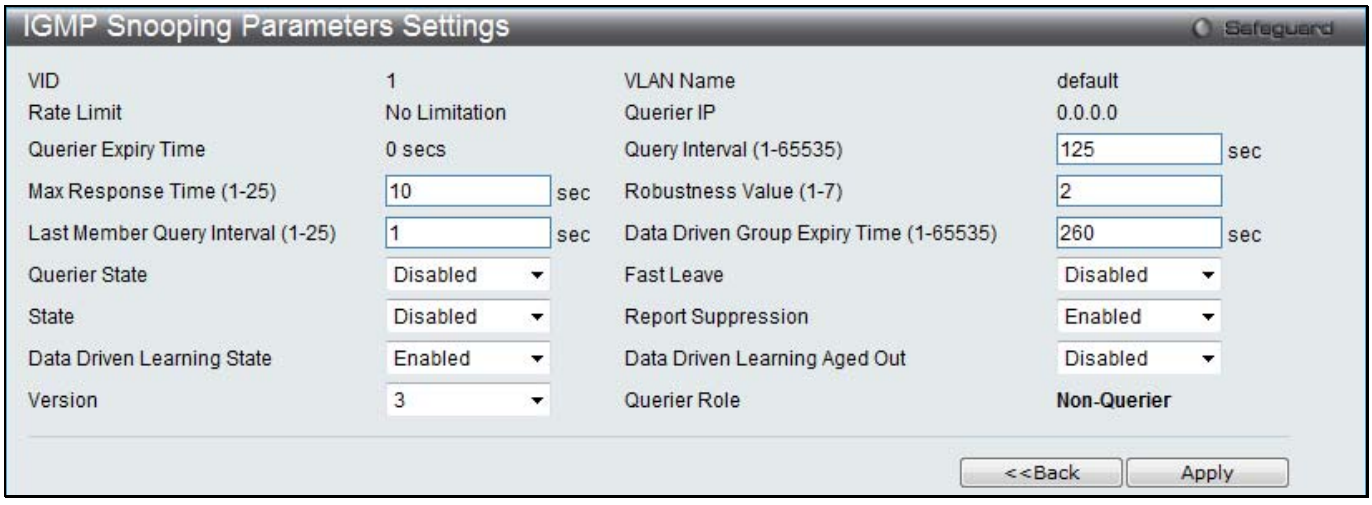


Figure 4-43 IGMP Snooping Parameters Settings window

The fields that can be configured or viewed are described below:

Parameter	Description
VID	Specify the name of the VLAN ID.
VLAN Name	Specify the name of the VLAN for which IGMP snooping querier is to be configured.
Rate Limit	Here is displayed the rate of IGMP control packets that the Switch can process on a specific VLAN. The rate is specified in packet per second. The packets that exceed the limited rate will be dropped.
Querier IP	Displays the querier IP address
Querier Expiry Time	Displays the querier expiry time.
Query Interval (1-65535)	Specify the amount of time in seconds between general query transmissions. The default setting is 125 seconds..
Max Response Time (1-25)	Specify the maximum time in seconds to wait for reports from members. The default setting is 10 seconds.
Robustness Value (1-7)	Provides fine-tuning to allow for expected packet loss on a subnet. The value of the robustness value is used in calculating the following IGMP message intervals: By default, the robustness variable is set to 2.
Last Member Query Interval (1-25)	Specify the maximum amount of time between group-specific query messages, including those sent in response to leave-group messages. You might lower this interval to reduce the amount of time it takes a router to detect the loss of the last member of a group.
Data Drive Group Expiry Time (1-65535)	Specify the data driven group lifetime in seconds.
Querier State	Specify to enable or disable the querier state.
Fast Leave	Enable or disable the IGMP snooping fast leave function. If enabled, the membership is immediately removed when the system receive the IGMP leave message.
State	If the state is enabled, it allows the Switch to be selected as a IGMP Querier (sends IGMP query packets). If the state is disabled, the Switch cannot play the role as a querier. **NOTE:** If the Layer 3 router connected to the Switch provides only the IGMP proxy function but does not provide the multicast routing function, then this state must be configured as *Disabled*. Otherwise, if the Layer 3 router is not selected as the querier, it will not send the IGMP query packet. Since it will not also send the multicast-routing protocol packet, the port will be timed out as a router port.
Report Suppression	When enabled, multiple IGMP reports or leave for a specific (S, G) will be integrated into one report only before sending to the router port.
Data Driven Learning State	Specify to enable or disable the data driven learning state.
Data Drive Learning Aged Out	Specify to enable or disable the data drive learning aged out option.
Version	Specify the version of IGMP packet that will be sent by this VLAN.
Querier Role	Displays the querier role.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the Modify Router Port link, the following page will appear:

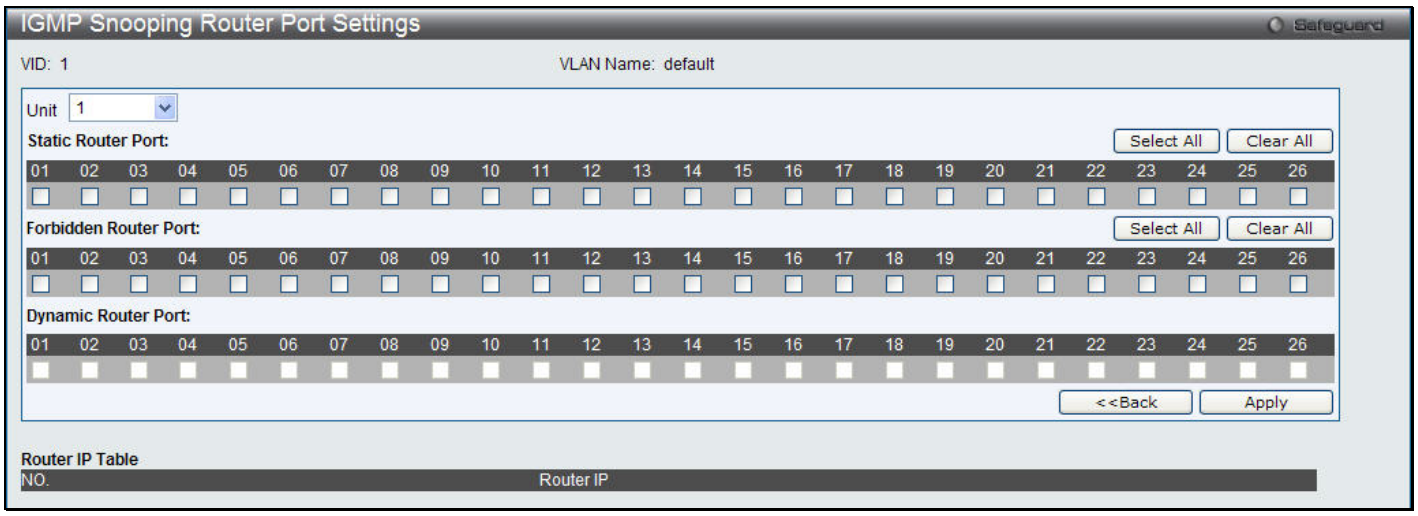


Figure 4-44 IGMP Snooping Router Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Static Router Port	This section is used to designate a range of ports as being connected to multicast-enabled routers. This will ensure that all packets with such a router as its destination will reach the multicast-enabled router regardless of the protocol.
Forbidden Router Port	This section is used to designate a range of ports as being not connected to multicast-enabled routers. This ensures that the forbidden router port will not become a router port to forward the packet to the destined router.
Dynamic Router Port	Displays router ports that have been dynamically configured.
Ports	Select the appropriate ports individually to include them in the Router Port configuration.

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

IGMP Snooping Rate Limit Settings

On this page the user can configure the IGMP snooping rate limit parameters.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Rate Limit Settings**, as shown below:

Figure 4-45 IGMP Snooping Rate Limit Settings window

The fields that can be configured are described below:

Parameter	Description
Port List	Enter the port list used for this configuration.
VID List	Enter the VID list used for this configuration.
Rate Limit	Enter the IGMP snooping rate limit used. Tick the No Limit check box to ignore the rate limit for the entered port(s).

Click the **Apply** button to accept the changes made.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Edit** button to re-configure the specific entry.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

IGMP Snooping Static Group Settings

Users can view the Switch's IGMP Snooping Group Table. IGMP Snooping allows the Switch to read the Multicast Group IP address and the corresponding MAC address from IGMP packets that pass through the Switch.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Static Group Settings**, as shown below:

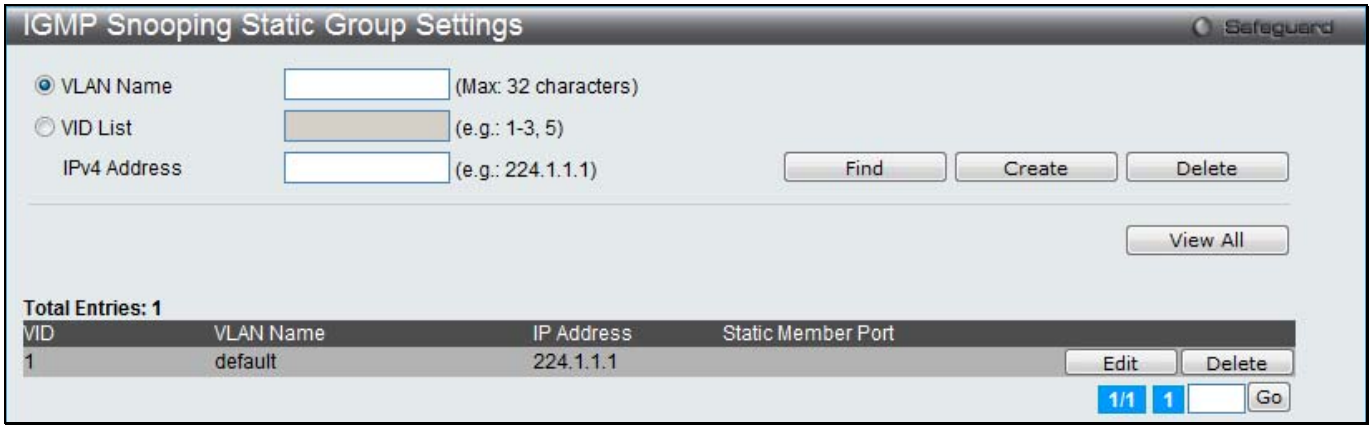


Figure 4-46 IGMP Snooping Static Group Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The VLAN name of the multicast group.
VID List	The VID list of the multicast group.

IPv4 Address	Enter the IPv4 address.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Create** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the **Edit** button to re-configure the specific entry.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Edit** button, the following page will appear:

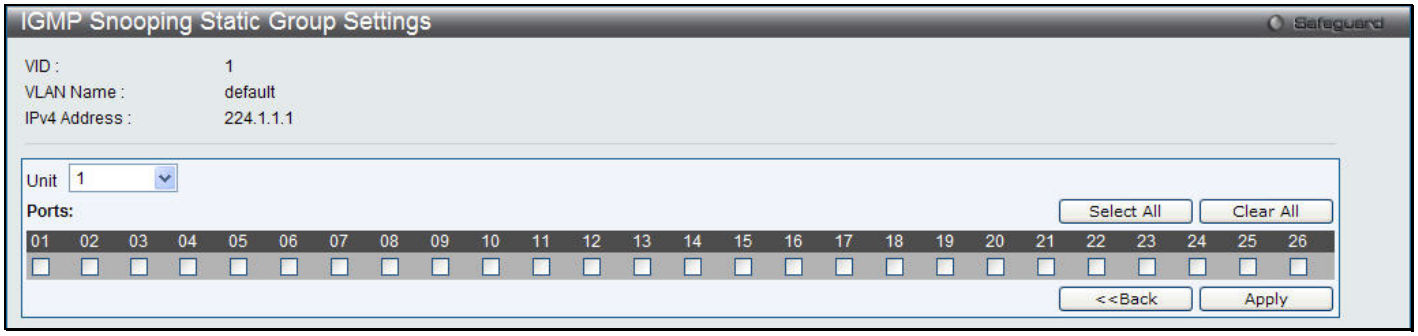


Figure 4-47 IGMP Snooping Static Group Settings window

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

IGMP Router Port

Users can display which of the Switch's ports are currently configured as router ports. A router port configured by a user (using the console or Web-based management interfaces) is displayed as a static router port, designated by S. A router port that is dynamically configured by the Switch is designated by D, while a Forbidden port is designated by F.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Router Port**, as shown below:

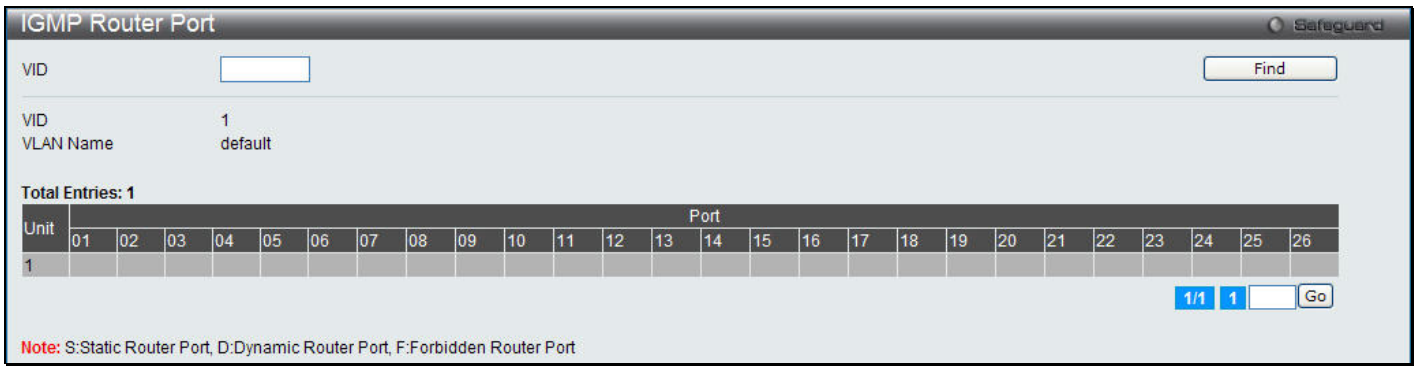


Figure 4-48 IGMP Router Port window

Enter a VID (VLAN ID) in the field at the top of the window.

Click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

NOTE: The abbreviations used on this page are Static Router Port (S), Dynamic Router Port (D) and Forbidden Router Port (F).

IGMP Snooping Group

Users can view the Switch's IGMP Snooping Group Table. IGMP Snooping allows the Switch to read the Multicast Group IP address and the corresponding MAC address from IGMP packets that pass through the Switch.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Group**, as shown below:

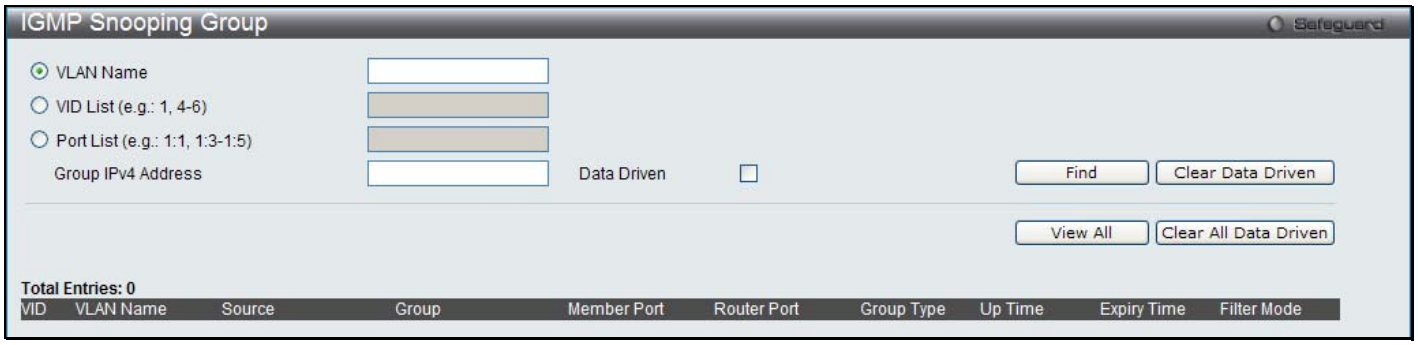


Figure 4-49 IGMP Snooping Group window

The user may search the IGMP Snooping Group Table by either *VLAN Name* or *VID List* by entering it in the top left hand corner and clicking **Find**.

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The VLAN Name of the multicast group.
VID List	The VLAN ID list of the multicast group.
Port List	Specify the port number(s) used to find a multicast group.
Group IPv4 Address	Enter the IPv4 address.
Data Driven	If Data Drive is selected, only data driven groups will be displayed.

Click the **Clear Data Driven** button to delete the specific IGMP snooping group which is learned by the Data Driven feature of the specified VLAN.

Click the **View All** button to display all the existing entries.

Click the **Clear All Data Driven** button to delete all IGMP snooping groups which is learned by the Data Driven feature of specified VLANs.

IGMP Snooping Forwarding Table

This page displays the Switch's current IGMP snooping forwarding table. It provides an easy way for user to check the list of ports that the multicast group comes from and specific sources that it will be forwarded to. The packet comes from the source VLAN. They will be forwarded to the forwarding VLAN. The IGMP snooping further restricts the forwarding ports.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Forwarding Table**, as shown below:

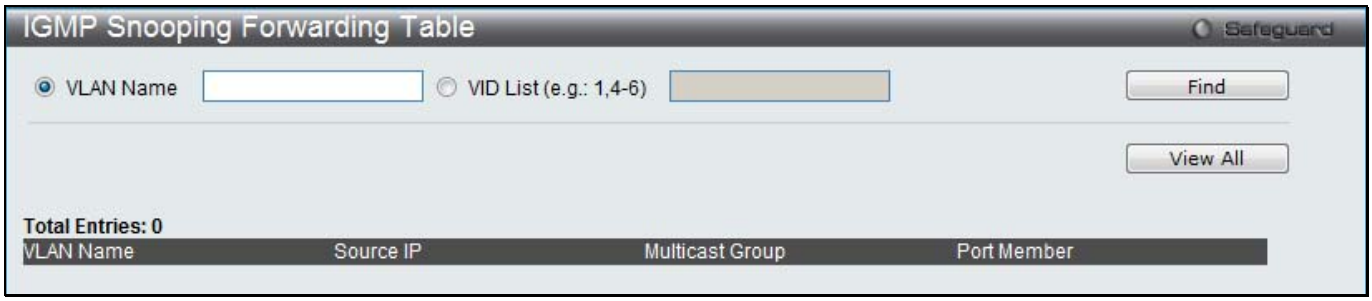


Figure 4-50 IGMP Snooping Forwarding Table window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The VLAN Name of the multicast group.
VID List	The VLAN ID list of the multicast group.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

IGMP Snooping Counter

Users can view the Switch's IGMP Snooping counter table.

To view the following window, click **L2 Features > L2 Multicast Control > IGMP Snooping > IGMP Snooping Counter**, as shown below:

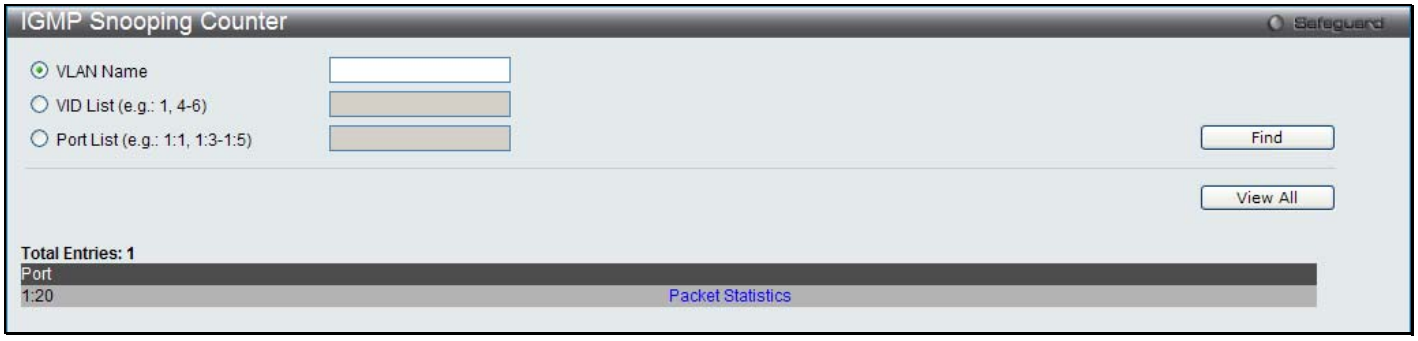


Figure 4-51 IGMP Snooping Counter window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The VLAN Name of the multicast group.
VID List	The VLAN ID list of the multicast group.
Port List	The Port List of the multicast group.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the Packet Statistics link to view the IGMP Snooping Counter Table.

After clicking the Packet Statistics link, the following page will appear:

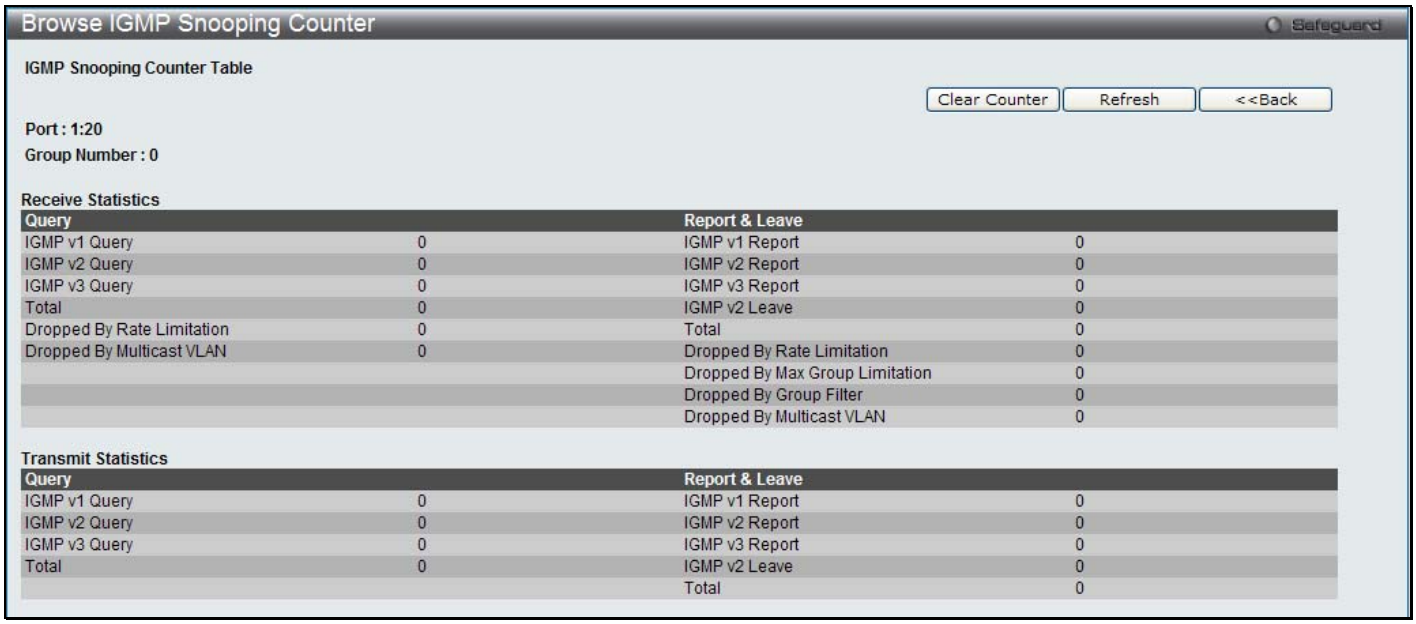


Figure 4-52 Browse IGMP Snooping Counter window

Click the **Clear Counter** button to clear all the information displayed in the fields.

Click the **Refresh** button to refresh the display table so that new information will appear.

Click the **<<Back** button to return to the previous page.

CPU Filter L3 Control Packet Settings

The CPU Filter L3 Control Packet Settings is used to discard the Layer 3 control packets sent to CPU from specific ports.

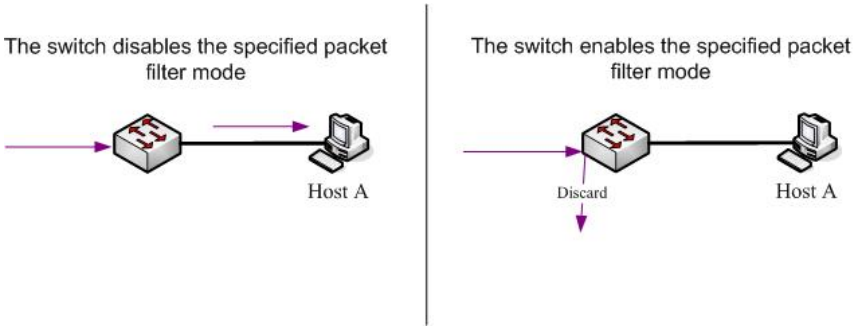


Figure 4-53 Method of dealing with the specified packet

The above figure displays how the Switch handles the specified packets when enabling the function.

To configure these settings, click **L2 Features > IGMP Snooping > CPU Filter L3 Control Packet Settings**

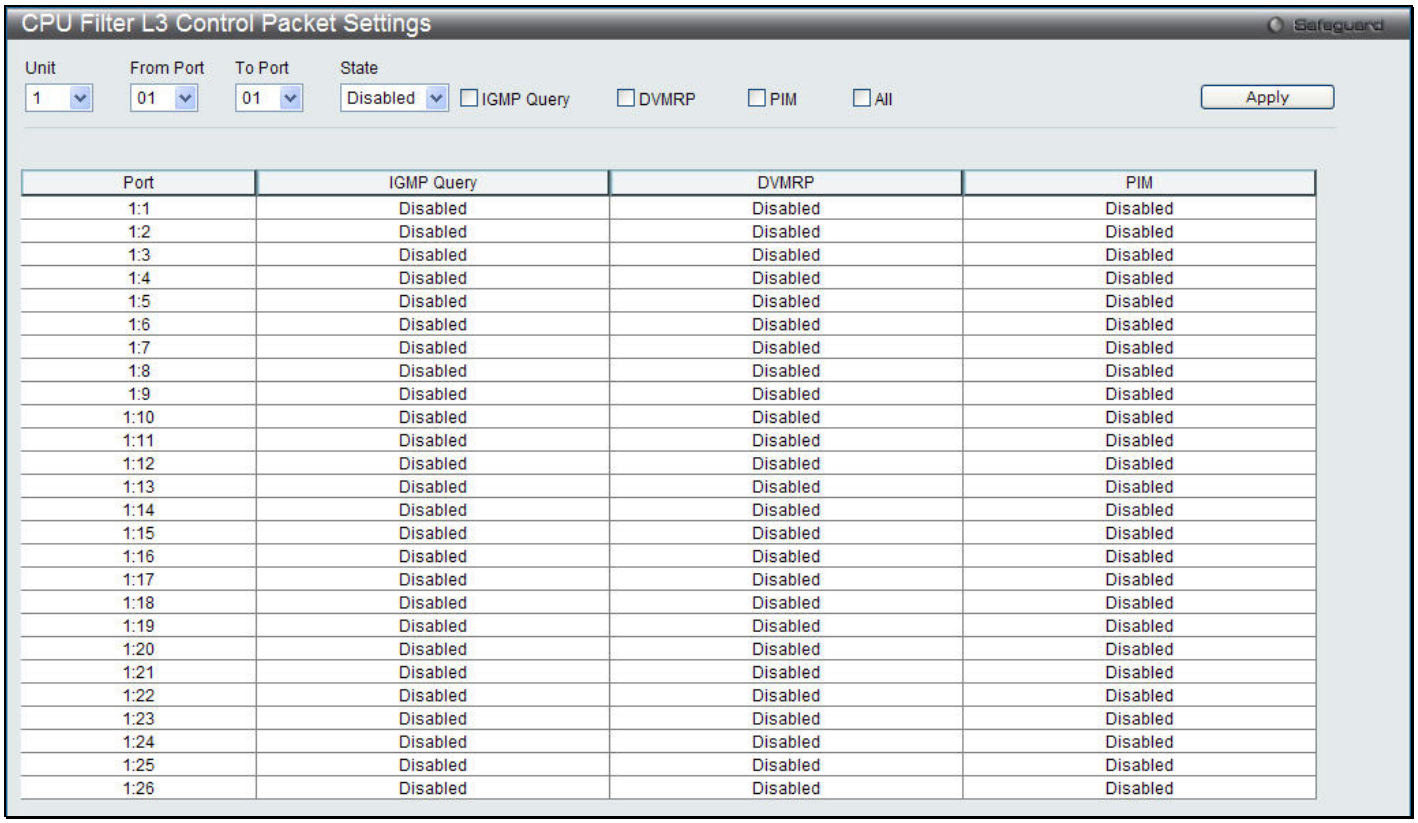


Figure 3 - 2 CPU Filter L3 Control Packet Settings window

The following fields can be set:

Parameter	Description
Unit	Select a unit to be configured.
From Port / To Port	Check the corresponding boxes for the port(s) to filter control packets.
State	Use the drop-down menu to enable or disable the filtering function.
IGMP Query	Tick the check box to set IGMP query packets as the control packets.
DVMRP	Tick the check box to set DVMRP query packets as the control packets.
PIM	Tick the check box to set PIM query packets as the control packets.
All	Tick the check box to set all above query packets as the control packets.

To enable the function, enter the information and click **Apply**.

MLD Snooping

Multicast Listener Discovery (MLD) Snooping is an IPv6 function used similarly to IGMP snooping in IPv4. It is used to discover ports on a VLAN that are requesting multicast data. Instead of flooding all ports on a selected VLAN with multicast traffic, MLD snooping will only forward multicast data to ports that wish to receive this data through the use of queries and reports produced by the requesting ports and the source of the multicast traffic.

MLD snooping is accomplished through the examination of the layer 3 part of an MLD control packet transferred between end nodes and a MLD router. When the Switch discovers that this route is requesting multicast traffic, it adds the port directly attached to it into the correct IPv6 multicast table, and begins the process of forwarding multicast traffic to that port. This entry in the multicast routing table records the port, the VLAN ID, and the associated multicast IPv6

multicast group address, and then considers this port to be an active listening port. The active listening ports are the only ones to receive multicast group data.

MLD Control Messages

Three types of messages are transferred between devices using MLD snooping. These three messages are all defined by four ICMPv6 packet headers, labeled 130, 131, 132, and 143.

1. **Multicast Listener Query** – Similar to the IGMPv2 Host Membership Query for IPv4, and labeled as 130 in the ICMPv6 packet header, this message is sent by the router to ask if any link is requesting multicast data. There are two types of MLD query messages emitted by the router. The General Query is used to advertise all multicast addresses that are ready to send multicast data to all listening ports, and the Multicast Specific query, which advertises a specific multicast address that is also ready. These two types of messages are distinguished by a multicast destination address located in the IPv6 header and a multicast address in the Multicast Listener Query Message.
2. **Multicast Listener Report, Version 1** – Comparable to the Host Membership Report in IGMPv2, and labeled as 131 in the ICMP packet header, this message is sent by the listening port to the Switch stating that it is interested in receiving multicast data from a multicast address in response to the Multicast Listener Query message.
3. **Multicast Listener Done** – Akin to the Leave Group Message in IGMPv2, and labeled as 132 in the ICMPv6 packet header, this message is sent by the multicast listening port stating that it is no longer interested in receiving multicast data from a specific multicast group address, therefore stating that it is “done” with the multicast data from this address. Once this message is received by the Switch, it will no longer forward multicast traffic from a specific multicast group address to this listening port.
4. **Multicast Listener Report, Version 2** - Comparable to the Host Membership Report in IGMPv3, and labeled as 143 in the ICMP packet header, this message is sent by the listening port to the Switch stating that it is interested in receiving multicast data from a multicast address in response to the Multicast Listener Query message.

Data Driven Learning

The Switch allows you to implement data driven learning for MLD snooping groups. If data-driven learning, also known as dynamic IP multicast learning, is enabled for a VLAN, when the Switch receives IP multicast traffic on the VLAN, an MLD snooping group is created. Learning of an entry is not activated by MLD membership registration, but activated by the traffic. For an ordinary MLD snooping entry, the MLD protocol will take care of the aging out of the entry. For a data-driven entry, the entry can be specified not to age out or to age out by a timer.

When the data driven learning State is enabled, the multicast filtering mode for all ports is ignored. This means multicast packets will be forwarded to router ports.

NOTE: If a data-driven group is created and MLD member ports are learned later, the entry will become an ordinary MLD snooping entry. In other words, the aging out mechanism will follow the conditions of an ordinary MLD snooping entry.

Data driven learning is useful on a network which has video cameras connected to a Layer 2 switch that is recording and sending IP multicast data. The Switch needs to forward IP data to a data centre without dropping or flooding any packets. Since video cameras do not have the capability to run MLD protocols, the IP multicast data will be dropped with the original MLD snooping function.

MLD Snooping Settings

Users can configure the settings for MLD snooping.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Settings**, as shown below:

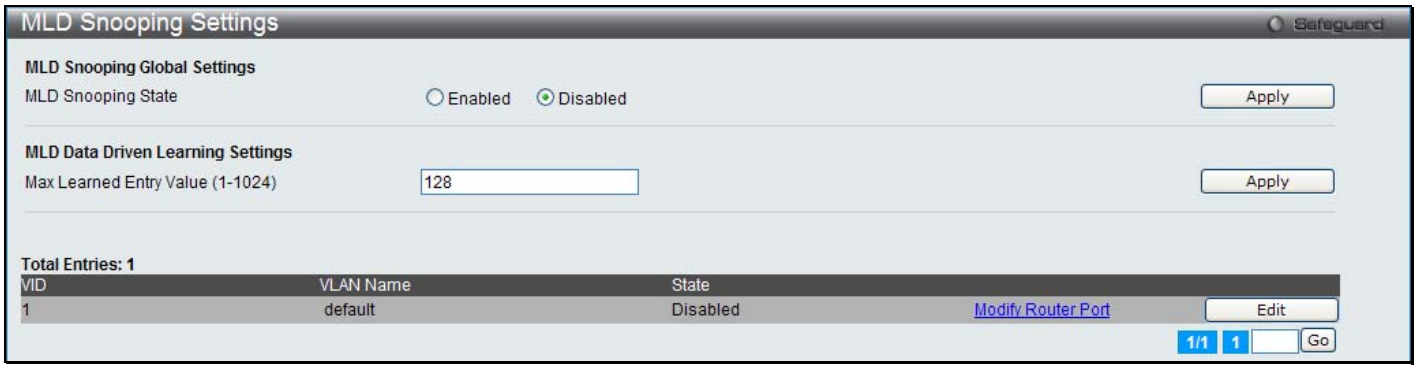


Figure 4-54 MLD Snooping Settings window

The fields that can be configured are described below:

Parameter	Description
MLD Snooping State	Click the radio buttons to enable or disable the MLD snooping state.
Max Learning Entry Value (1-1024)	Enter the maximum learning entry value.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Edit** button to configure the MLD Snooping Parameters Settings for a specific entry.

Click the Modify Router Port link to configure the MLD Snooping Router Port Settings for a specific entry.

After clicking the **Edit** button, the following page will appear:

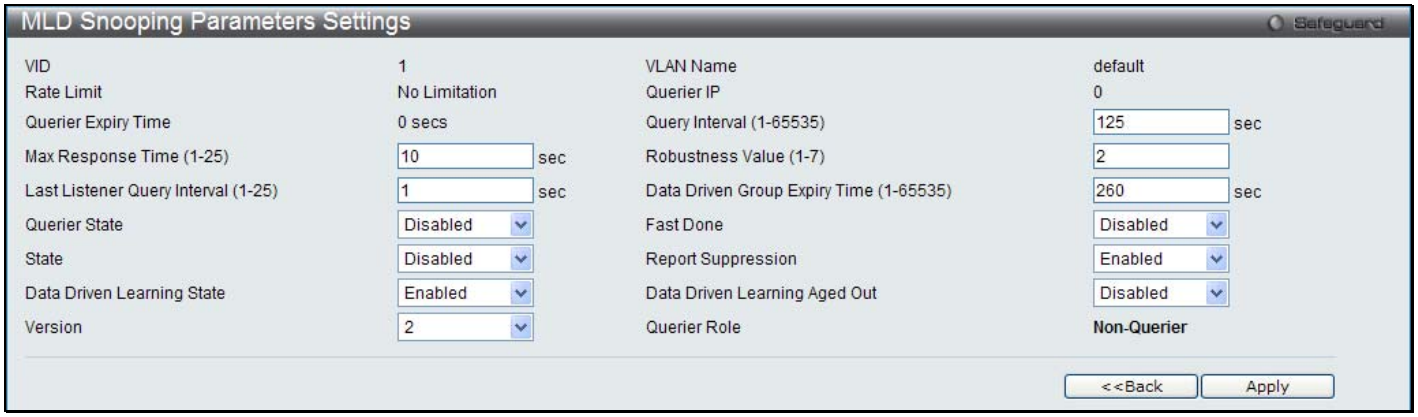


Figure 4-55 MLD Snooping Parameters Settings window

The fields that can be configured or viewed are described below:

Parameter	Description
VID	Specify the name of the VLAN ID.
VLAN Name	Specify the name of the VLAN for which IGMP snooping querier is to be configured.
Rate Limit	This displays the rate of IGMP control packets that the Switch can process on a specific VLAN. The rate is specified in packet per second. The packets that exceed the limited rate will be dropped.
Querier IP	Displays the querier IP address
Querier Expiry Time	Displays the querier expiry time.
Query Interval (1-65535)	Specify the amount of time in seconds between general query transmissions. The default setting is *125* seconds.

Max Response Time (1-25)	The maximum time in seconds to wait for reports from listeners. The default setting is *10* seconds.
Robustness Value (1-7)	Provides fine-tuning to allow for expected packet loss on a subnet. The value of the robustness variable is used in calculating the following MLD message intervals: *Group listener interval* - Amount of time that must pass before a multicast router decides there are no more listeners of a group on a network. *Other Querier present interval* - Amount of time that must pass before a multicast router decides that there is no longer another multicast router that is the Querier. *Last listener query count* - Number of group-specific queries sent before the router assumes there are no local listeners of a group. The default number is the value of the robustness variable. By default, the robustness variable is set to 2. You might want to increase this value if you expect a subnet to be loosely.
Last Listener Query Interval (1-25)	The maximum amount of time between group-specific query messages, including those sent in response to done-group messages. You might lower this interval to reduce the amount of time it takes a router to detect the loss of the last listener of a group.
Data Driven Group Expiry Time (1-65535)	Enter the data driven group expiry time value.
Querier State	This allows the Switch to be specified as an MLD Querier (sends MLD query packets) or a Non-Querier (does not send MLD query packets). Set to enable or disable.
Fast Done	Enable or disable the fast done feature.
State	Used to enable or disable MLD snooping for the specified VLAN. This field is *Disabled* by default.
Report Suppression	Enable or disable the report suppression features.
Data Driven Learning State	Enable or disable data driven learning of MLD snooping groups.
Data Driven Learning Aged Out	Enable or disable the age out function for data driven entries.
Version	Specify the version of MLD packet that will be sent by this port.
Querier Role	Displays the querier role.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the Modify Router Port link, the following page will appear:

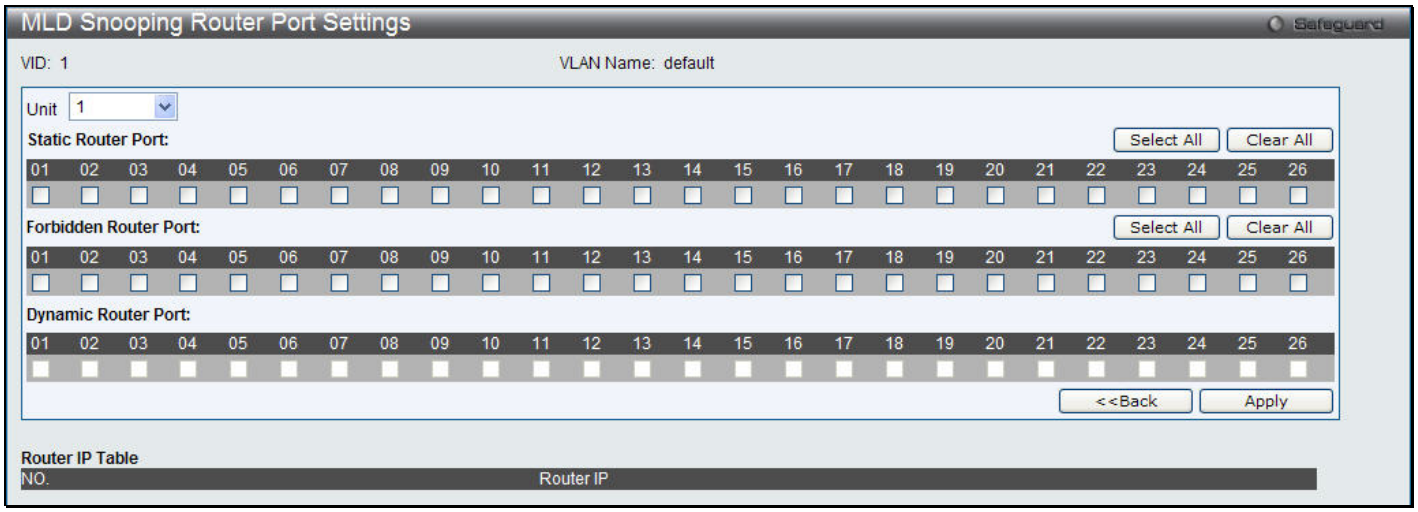


Figure 4-56 MLD Snooping Router Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Static Router Port	This section is used to designate a range of ports as being connected to multicast-enabled routers. This will ensure that all packets with such a router as its destination will reach the multicast-enabled router regardless of the protocol.
Forbidden Router Port	This section is used to designate a range of ports as being not connected to multicast-enabled routers. This ensures that the forbidden router port will not become a router port to forward the packet to the destined router.
Dynamic Router Port	Displays router ports that have been dynamically configured.
Ports	Select the appropriate ports individually to include them in the Router Port configuration.

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

MLD Snooping Rate Limit Settings

Users can configure the rate limit of the MLD control packet that the Switch can process on a specific port or VLAN in this page.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Rate Limit Settings**, as shown below:

Figure 4-57 MLD Snooping Rate Limit Settings window

The fields that can be configured are described below:

Parameter	Description
Port List	Enter the port list here.
VID List	Enter the VID list value here.
Rate Limit	Configure the rate limit of MLD control packet that the Switch can process on a specific port/VLAN. The rate is specified in packet per second. The packet that exceeds the limited rate will be dropped. Selecting the No Limit option lifts the rate limit requirement.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Edit** button to re-configure the specific entry.

MLD Snooping Static Group Settings

This page used to configure the MLD snooping multicast group static members.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Static Group Settings**, as shown below:

Figure 4-58 MLD Snooping Static Group Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The name of the VLAN on which the static group resides.
VID List	The ID of the VLAN on which the static group resides.
IPv6 Address	Specify the multicast group IPv6 address.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Create** button to add a static group.

Click the **Delete** button to delete a static group.

Click the **View All** button to display all the existing entries.

Click the **Edit** button to re-configure the specific entry.

After clicking the **Edit** button, the following page will appear:

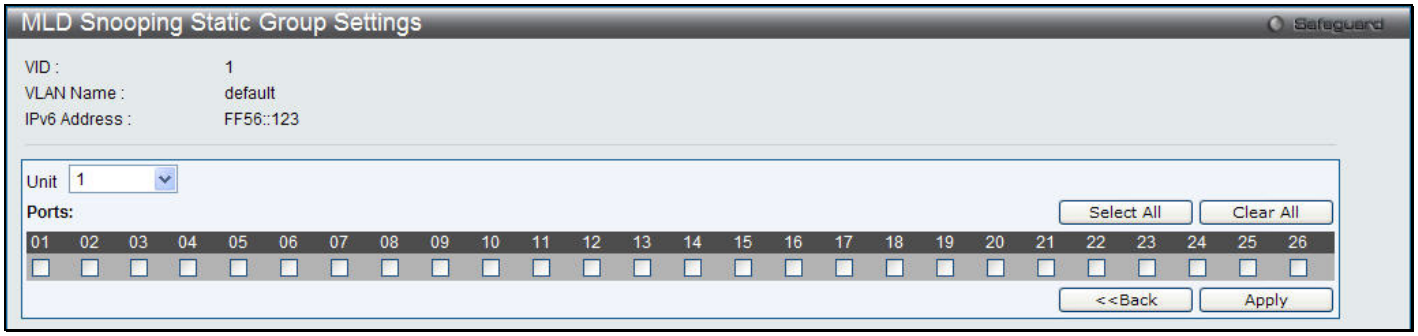


Figure 4-59 MLD Snooping Static Group Settings – Edit window

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

MLD Router Port

Users can display which of the Switch's ports are currently configured as router ports in IPv6. A router port configured by a user (using the console or Web-based management interfaces) is displayed as a static router port, designated by S. A router port that is dynamically configured by the Switch is designated by D, while a Forbidden port is designated by F.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Router Port**, as shown below:

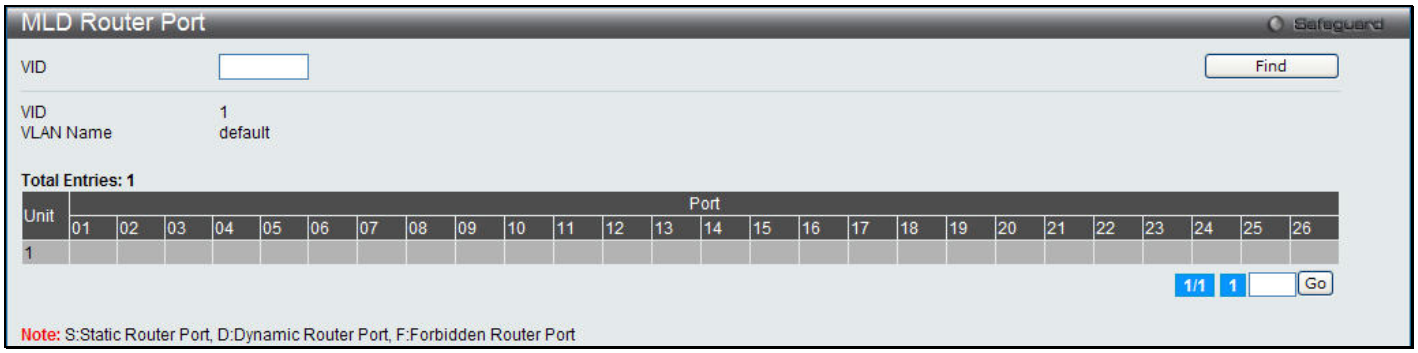


Figure 4-60 MLD Router Port window

Enter a VID (VLAN ID) in the field at the top of the window.

Click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

NOTE: The abbreviations used on this page are **Static Router Port (S)**, **Dynamic Router Port (D)** and **Forbidden Router Port (F)**.

MLD Snooping Group

Users can view MLD Snooping Groups present on the Switch. MLD Snooping is an IPv6 function comparable to IGMP Snooping for IPv4.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Group**, as shown below:

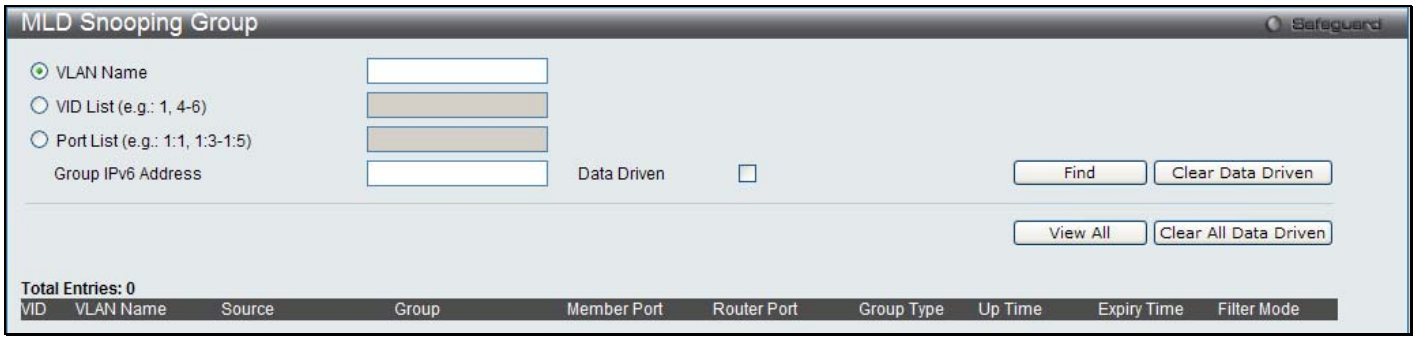


Figure 4-61 MLD Snooping Group window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the radio button and enter the VLAN name of the multicast group.
VID List	Click the radio button and enter a VLAN list of the multicast group.
Port List	Specify the port number(s) used to find a multicast group.
Group IPv6 Address	Enter the group IPv6 address used here. Select the Data Driven option to enable the data driven feature for this MLD snooping group.
Data Driven	If Data Driven is selected, only data driven groups will be displayed.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear Data Driven** button to delete the specific MLD snooping group which is learned by the Data Driven feature of the specified VLAN.

Click the **View All** button to display all the existing entries.

Click the **Clear All Data Driven** button to delete all MLD snooping groups which is learned by the Data Driven feature of specified VLANs.

MLD Snooping Forwarding Table

This page displays the Switch's current MLD snooping forwarding table. It provides an easy way for user to check the list of ports that the multicast group comes from and specific sources that it will be forwarded to. The packet comes from the source VLAN. They will be forwarded to the forwarding VLAN. The MLD snooping further restricts the forwarding ports.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Forwarding Table**, as shown below:

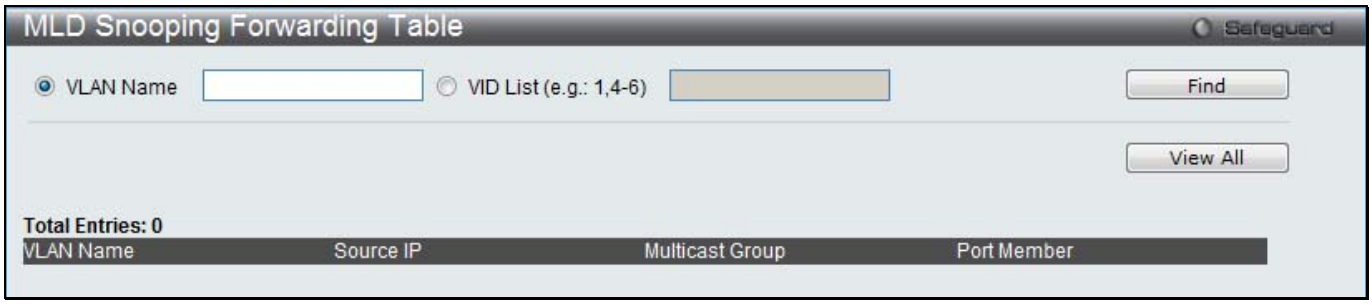


Figure 4-62 MLD Snooping Forwarding Table window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The name of the VLAN for which you want to view MLD snooping forwarding table information.
VID List	The ID of the VLAN for which you want to view MLD snooping forwarding table information.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

MLD Snooping Counter

This page displays the statistics counter for MLD protocol packets that are received by the Switch since MLD Snooping is enabled.

To view the following window, click **L2 Features > L2 Multicast Control > MLD Snooping > MLD Snooping Counter**, as shown below:

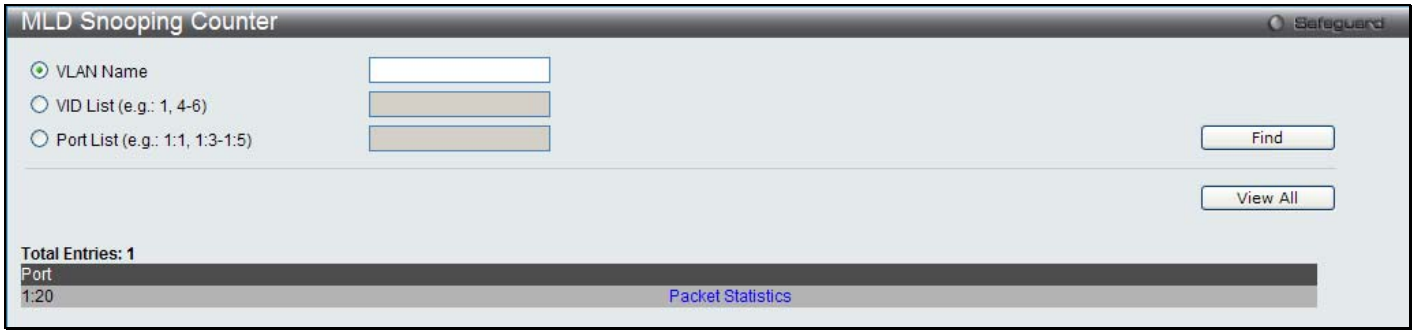


Figure 4-63 MLD Snooping Counter window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Specify a VLAN name to be displayed.
VID List	Specify a list of VLANs to be displayed.
Port List	Specify a list of ports to be displayed.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the Packet Statistics link to view the MLD Snooping Counter Settings for the specific entry.

After clicking the Packet Statistics link, the following page will appear:

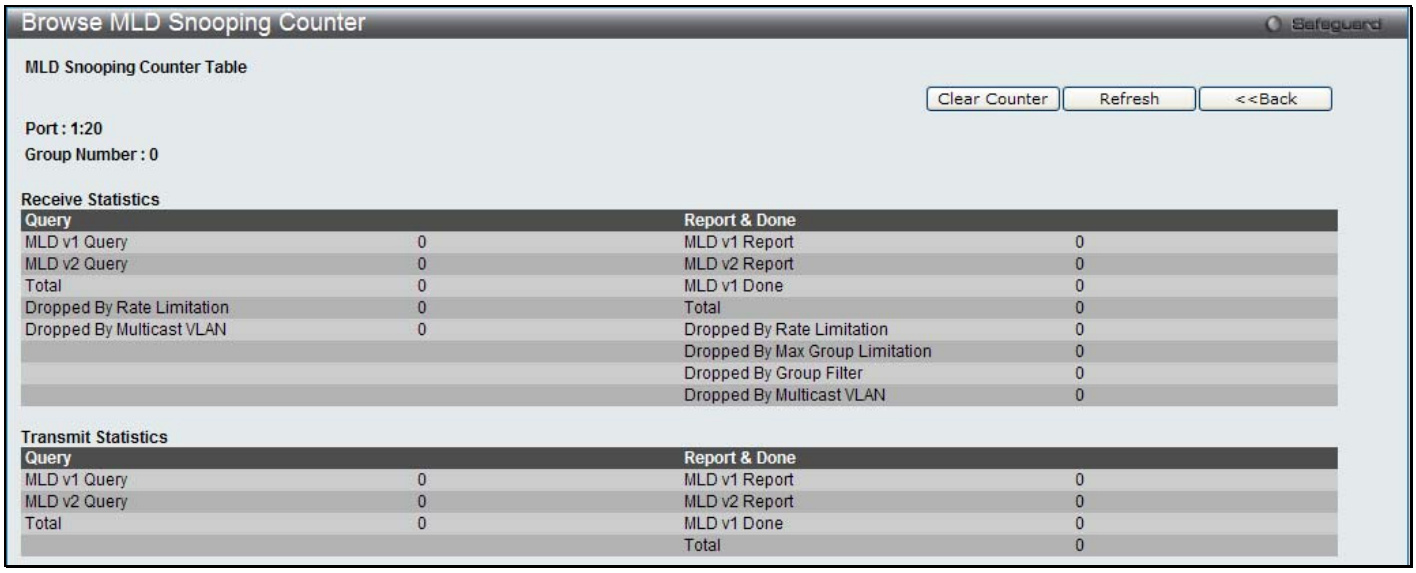


Figure 4-64 Browse MLD Snooping Counter window

Click the **Clear Counter** button to clear all the information displayed in the fields.

Click the **Refresh** button to refresh the display table so that new information will appear.

Click the **<<Back** button to return to the previous page.

Multicast VLAN

In a switching environment, multiple VLANs may exist. Every time when a multicast query passes through the Switch, the Switch must forward separate different copies of the data to each VLAN on the system, which, in turn, increases data traffic and may clog up the traffic path. To lighten the traffic load, multicast VLANs may be incorporated. These multicast VLANs will allow the Switch to forward this multicast traffic as one copy to recipients of the multicast VLAN, instead of multiple copies.

Regardless of other normal VLANs that are incorporated on the Switch, users may add any ports to the multicast VLAN where they wish multicast traffic to be sent. Users are to set up a source port, where the multicast traffic is entering the Switch, and then set the ports where the incoming multicast traffic is to be sent. The source port cannot be a recipient port and if configured to do so, will cause error messages to be produced by the Switch. Once properly configured, the stream of multicast data will be relayed to the receiver ports in a much more timely and reliable fashion.

Restrictions and Provisos:

The Multicast VLAN feature of this Switch does have some restrictions and limitations, such as:

1. Multicast VLANs can be implemented on edge and non-edge switches.
2. Member ports and source ports can be used in multiple ISM VLANs. But member ports and source ports cannot be the same port in a specific ISM VLAN.
3. The Multicast VLAN is exclusive with normal 802.1q VLANs, which means that VLAN IDs (VIDs) and VLAN Names of 802.1q VLANs and ISM VLANs cannot be the same. Once a VID or VLAN Name is chosen for any VLAN, it cannot be used for any other VLAN.
4. The normal display of configured VLANs will not display configured Multicast VLANs.
5. Once an ISM VLAN is enabled, the corresponding IGMP snooping state of this VLAN will also be enabled. Users cannot disable the IGMP feature for an enabled ISM VLAN.
6. One IP multicast address cannot be added to multiple ISM VLANs, yet multiple Ranges can be added to one ISM VLAN.

IGMP Multicast Group Profile Settings

Users can add a profile to which multicast address reports are to be received on specified ports on the Switch. This function will therefore limit the number of reports received and the number of multicast groups configured on the Switch. The user may set an IP Multicast address or range of IP Multicast addresses to accept reports (Permit) or deny reports (Deny) coming into the specified switch ports.

To view the following window, click **L2 Features > L2 Multicast Control > Multicast VLAN > IGMP Multicast Group Profile Settings**, as shown below:

Figure 4-65 IGMP Multicast Group Profile Settings window

The fields that can be configured are described below:

Parameter	Description
Profile Name	Enter a name for the IP Multicast Profile.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

Click the **View All** button to display all the existing entries.

Click the **Delete** button to remove the corresponding entry.

Click the Group List link to configure the Multicast Group Profile Address Settings for the specific entry.

After clicking the Group List link, the following page will appear:

Figure 4-66 Multicast Group Profile Multicast Address Settings window

The fields that can be configured are described below:

Parameter	Description

Multicast Address List	Enter the multicast address list value.

Click the **Add** button to add a new entry based on the information entered.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **Delete** button to remove the corresponding entry.

IGMP Snooping Multicast VLAN Settings

On this page the user can configure the IGMP snooping multicast VLAN parameters.

To view the following window, click **L2 Features > L2 Multicast Control > Multicast VLAN > IGMP Snooping Multicast Group VLAN Settings**, as shown below:

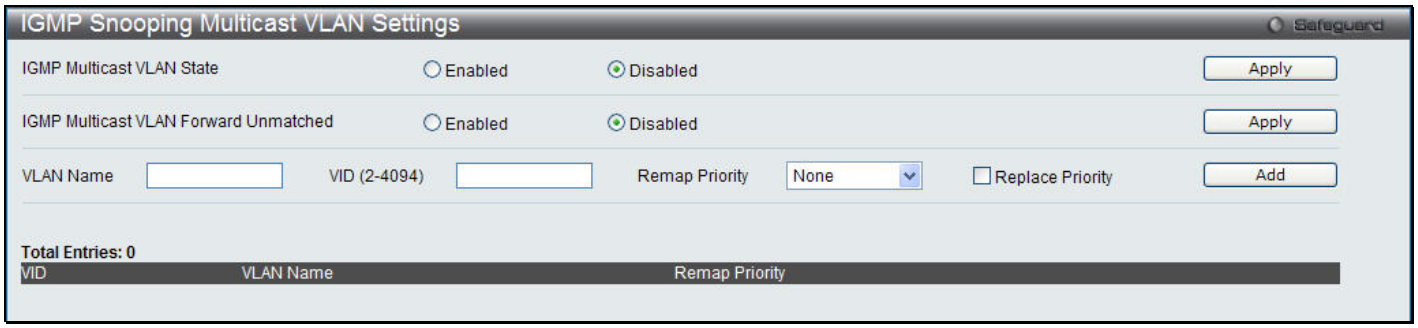


Figure 4-67 IGMP Snooping Multicast VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
IGMP Multicast VLAN State	Click the radio buttons to enable or disable the IGMP Multicast VLAN state.
IGMP Multicast VLAN Forward Unmatched	Click the radio buttons to enable or disable the IGMP Multicast VLAN Forwarding state.
VLAN Name	Enter the VLAN Name used.
VID	Enter the VID used.
Remap Priority	*0-7* – The remap priority value (0 to 7) to be associated with the data traffic to be forwarded on the multicast VLAN. *None* – If *None* is specified, the packet's original priority is used. The default setting is *None*.
Replace Priority	Specify that the packet's priority will be changed by the Switch, based on the remap priority. This flag will only take effect when the remap priority is set.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Add** button to add a new entry based on the information entered.

Click the **Edit** button to configure the IGMP Snooping Multicast VLAN Settings for the specific entry.

Click the **Delete** button to remove the specific entry.

Click the Profile List link to configure the IGMP Snooping Multicast VLAN Settings for the specific entry.

After clicking the **Edit** button, the following page will appear:

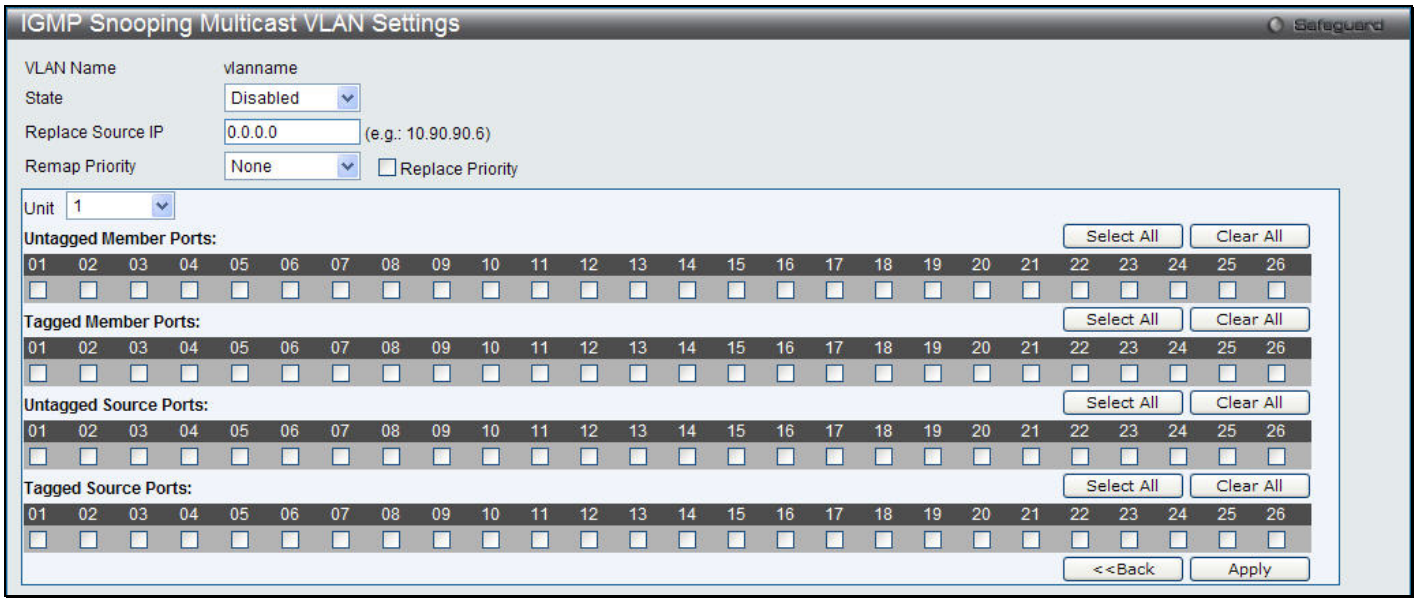


Figure 4-68 IGMP Snooping Multicast VLAN Settings – Edit window

The fields that can be configured are described below:

Parameter	Description
State	Use the drop-down menu to enable or disable the state.
Replace Source IP	With the IGMP snooping function, the IGMP report packet sent by the host will be forwarded to the source port. Before forwarding of the packet, the source IP address in the join packet needs to be replaced by this IP address. If none is specified, the source IP address will not be replaced.
Remap Priority	*0-7* – The remap priority value (0 to 7) to be associated with the data traffic to be forwarded on the multicast VLAN. *None* – If *None* is specified, the packet's original priority is used. The default setting is *None*.
Replace Priority	Specify that the packet's priority will be changed by the Switch, based on the remap priority. This flag will only take effect when the remap priority is set.
Unit	Select a unit to be configured.
Untagged Member Ports	Specify the untagged member port of the multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.
Tagged Member Ports	Specify the tagged member port of the multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.
Untagged Source Ports	Specify the source port or range of source ports as untagged members of the multicast VLAN. The PVID of the untagged source port is automatically changed to the multicast VLAN. Source ports must be either tagged or untagged for any single multicast VLAN, i.e. both types cannot be members of the same multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.
Tagged Source Ports	Specify the source port or range of source ports as tagged members of the multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the Profile List link, the following page will appear:

Figure 4-69 IGMP Snooping Multicast VLAN Group List Settings window

The fields that can be configured are described below:

Parameter	Description
VID	Display the VLAN ID.
VLAN Name	Display the VLAN name.
Profile Name	Use the drop-down menu to select the IGMP Snooping Multicast VLAN Group Profile name.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specific entry.

Click the Show IGMP Snooping Multicast VLAN Entries link to view the IGMP Snooping Multicast VLAN Settings.

MLD Multicast Group Profile Settings

Users can add, delete, or configure the MLD multicast group profile on this page.

To view the following window, click **L2 Features > L2 Multicast Control > Multicast VLAN > MLD Multicast Group Profile Settings**, as shown below:

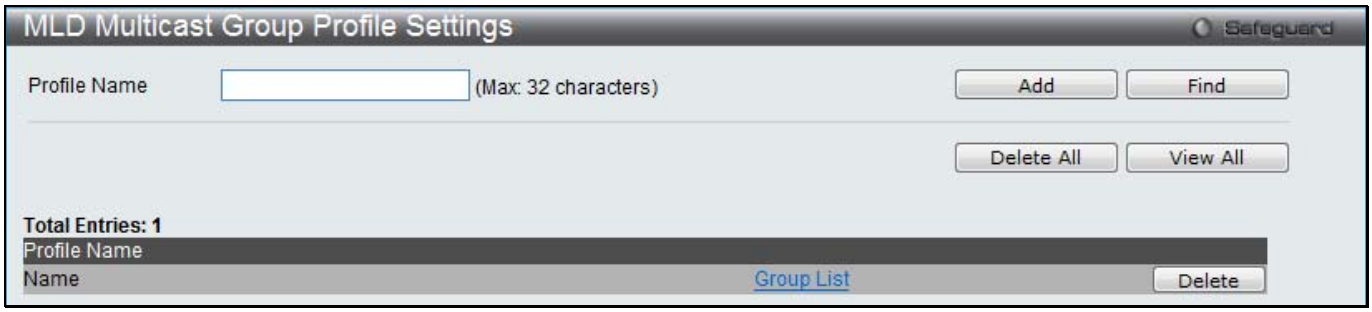


Figure 4-70 MLD Multicast Group Profile Settings window

The fields that can be configured are described below:

Parameter	Description
Profile Name	Enter the MLD Multicast Group Profile name.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

Click the **View All** button to display all the existing entries.

Click the Group List link to configure the Multicast Group Profile Multicast Address Settings for the specific entry.

Click the **Delete** button to remove the specific entry.

After clicking the Group List link, the following page will appear:

Figure 4-71 Multicast Group Profile Multicast Address Settings window

The fields that can be configured are described below:

Parameter	Description
Multicast Address List	Enter the multicast address list.

Click the **Add** button to add a new entry based on the information entered.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **Delete** button to remove the specific entry.

MLD Snooping Multicast VLAN Settings

Users can add, delete, or configure the MLD snooping multicast VLAN on this page.

To view the following window, click **L2 Features > L2 Multicast Control > Multicast VLAN > MLD Snooping Multicast Group VLAN Settings**, as shown below:

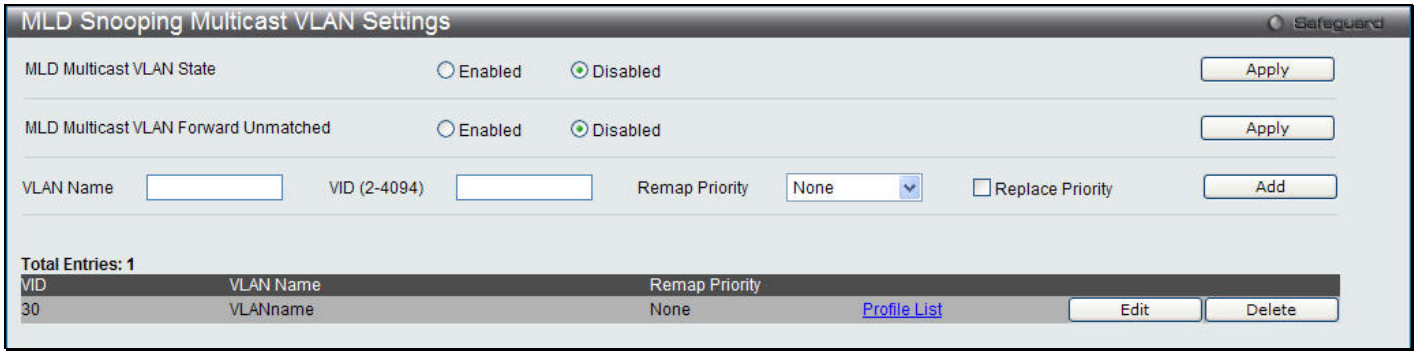


Figure 4-72 MLD Snooping Multicast VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
MLD Multicast VLAN State	Click the radio buttons to enable or disable the MLD multicast VLAN state.
MLD Multicast VLAN Forward Unmatched	Click the radio buttons to enable or disable the MLD multicast VLAN Forward Unmatched state.
VLAN Name	Enter the VLAN name used.

VID	Enter the VID value used.
Remap Priority	The user can select this option to enable the Remap Priority feature. Specify the remap priority (0 to 7) to be associated with the data traffic to be forwarded on the multicast VLAN. If *None* is specified, the packet's original priority will be used. The default setting is *None*.
Replace Priority	Tick the check box to specify that the packet's priority will be changed by the Switch, based on the remap priority. This flag will only take effect when the remap priority is set.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Add** button to add a new entry based on the information entered.

Click the **Edit** button to configure the MLD Snooping Multicast VLAN Settings for the specific entry.

Click the **Delete** button to remove the specific entry.

Click the Profile List link to configure the MLD Snooping Multicast VLAN Settings for the specific entry.

After clicking the **Edit** button, the following page will appear:

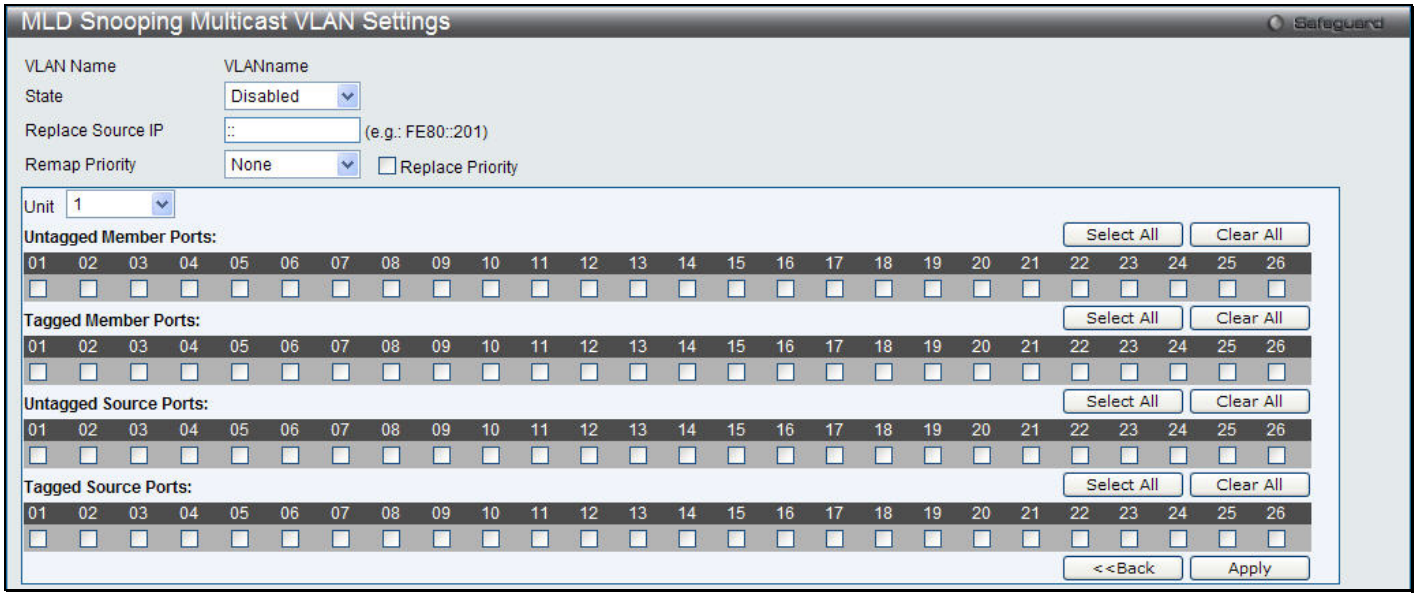


Figure 4-73 MLD Snooping Multicast VLAN Settings – Edit window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	This option will display the VLAN name of the VLAN configured.
State	Use the drop-down menu to enable or disable the state.
Replace Source IP	With the MLD snooping function, the MLD report packet sent by the host will be forwarded to the source port. Before forwarding of the packet, the source IP address in the join packet needs to be replaced by this IP address. If none is specified, the source IP address will not be replaced.
Remap Priority	*0-7* – The remap priority value (0 to 7) to be associated with the data traffic to be forwarded on the multicast VLAN. *None* – If *None* is specified, the packet's original priority is used. The default setting is *None*.
Replace Priority	Tick the check box to specify that the packet's priority will be changed by the Switch, based on the remap priority. This flag will only take effect when the remap priority is set.

Untagged Member Ports	Specify the untagged member port of the multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.
Tagged Member Ports	Specify the tagged member port of the multicast VLAN. Click the **Select All** button to select all the ports or click the **Clear All** button to unselect all the ports.
Untagged Source Ports	Specify the source port or range of source ports as untagged members of the multicast VLAN. The PVID of the untagged source port is automatically changed to the multicast VLAN. Source ports must be either tagged or untagged for any single multicast VLAN, i.e. both types cannot be members of the same multicast VLAN
Tagged Source Ports	Specify the source port or range of source ports as tagged members of the multicast VLAN.

Click the **Select All** button to select all the ports for configuration.

Click the **Clear All** button to unselect all the ports for configuration.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the Profile List link, the following page will appear:

Figure 4-74 MLD Snooping Multicast VLAN Group List Settings window

The fields that can be configured are described below:

Parameter	Description
VID	Display the VLAN ID.
VLAN Name	Display the VLAN name.
Profile Name	Use the drop-down menu to select the IGMP Snooping Multicast VLAN Group Profile name.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specific entry.

Click the Show MLD Snooping Multicast VLAN Entries link to view the MLD Snooping Multicast VLAN Settings.

Multicast Filtering

IPv4 Multicast Filtering

IPv4 Multicast Profile Settings

Users can add a profile to which multicast address(s) reports are to be received on specified ports on the Switch. This function will therefore limit the number of reports received and the number of multicast groups configured on the Switch. The user may set an IPv4 Multicast address or range of IPv4 Multicast addresses to accept reports (Permit) or deny reports (Deny) coming into the specified switch ports.

To view the following window, click **L2 Features > Multicast Filtering > IPv4 Multicast Filtering > IPv4 Multicast Profile Settings**, as shown below:

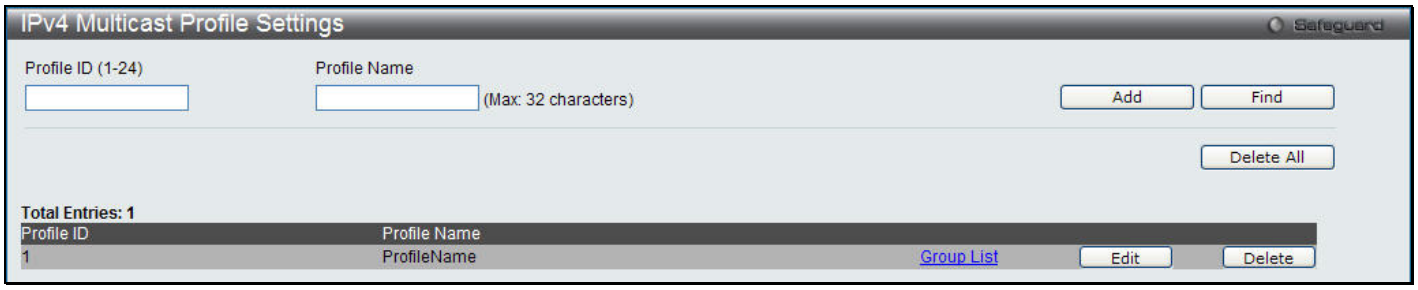


Figure 4-75 IPv4 Multicast Profile Settings window

The fields that can be configured are described below:

Parameter	Description
Profile ID	Enter a profile ID between *1* and *24*.
Profile Name	Enter a name for the IP Multicast Profile.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

Click the Group List link to configure the multicast address group list settings for the specific entry.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

After clicking the Group List link, the following page will appear:

Figure 4-76 Multicast Address Group List Settings window

The fields that can be configured are described below:

Parameter	Description
Profile ID	Display the profile ID.
Profile Name	Display the profile name.
Multicast Address List	Enter the multicast address list here.

Click the **Add** button to add a new entry based on the information entered.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

IPv4 Limited Multicast Range Settings

Users can configure the ports and VLANs on the Switch that will be involved in the Limited IPv4 Multicast Range. The user can configure the range of multicast ports that will be accepted by the source ports to be forwarded to the receiver ports.

To view the following window, click **L2 Features > Multicast Filtering > IPv4 Multicast Filtering > IPv4 Limited Multicast Range Settings**, as shown below:

Figure 4-77 IPv4 Limited Multicast Range Settings window

The fields that can be configured are described below:

Parameter	Description
Ports / VID List	Select the appropriate port(s) or VLAN IDs used for the configuration.
Access	Assign access permissions to the ports selected. Options listed are *Permit* and *Deny*.
Profile ID / Profile Name	Use the drop-down menu to select the profile ID or profile name used and then assign *Permit* or *Deny* access to them.

Click the **Apply** button to accept the changes made.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specific entry.

Click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

IPv4 Max Multicast Group Settings

Users can configure the ports and VLANs on the Switch that will be a part of the maximum filter group, up to a maximum of 1024.

To view the following window, click **L2 Features > Multicast Filtering > IPv4 Multicast Filtering > IPv4 Max Multicast Group Settings**, as shown below:

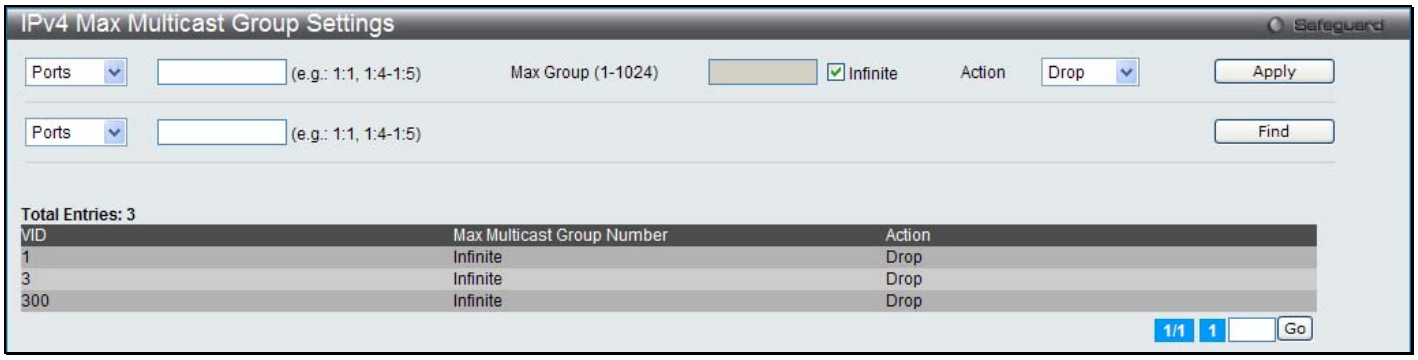


Figure 4-78 IPv4 Max Multicast Group Settings window

The fields that can be configured are described below:

Parameter	Description
Ports / VID List	Select the appropriate port(s) or VLAN IDs used for the configuration here.
Max Group (1-1024)	If the check box Infinite is not ticked, the user can enter a Max Group value.
Infinite	Tick the check box to enable or disable the use of the Infinite value.
Action	Use the drop-down menu to select the appropriate action for this rule. The user can select *Drop* to initiate the drop action or the user can select *Replace* to initiate the replace action.

Click the **Apply** button to accept the changes made.

Click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

Multicast Filtering Mode

Users can configure the multicast filtering mode.

To view the following window, click **L2 Features > Multicast Filtering > Multicast Filtering Mode**, as shown below:

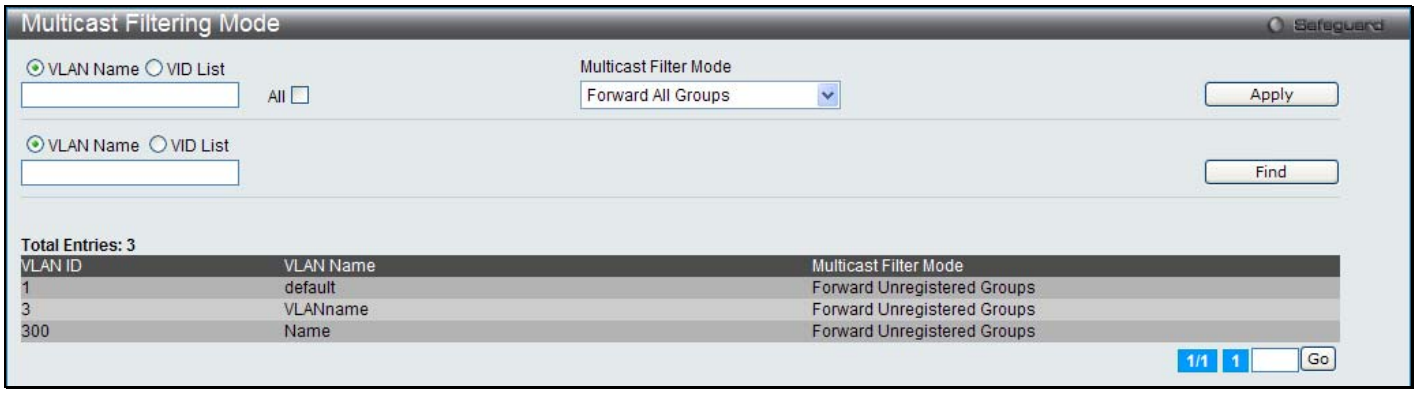


Figure 4-79 Multicast Filtering Mode window

The fields that can be configured are described below:

Parameter	Description
VLAN Name/VID List	The VLAN to which the specified filtering action applies. Tick the All check box to apply this feature to all the VLANs.
Multicast Filtering Mode	This drop-down menu allows you to select the action the Switch will take when it receives a multicast packet that requires forwarding to a port in the specified VLAN.

	Forward All Groups – This will instruct the Switch to forward all multicast packets to the specified VLAN. *Forward Unregistered Groups* – The multicast packets whose destination is a registered multicast group will be forwarded within the range of ports specified above. *Filter Unregistered Groups* – The multicast packets whose destination is a registered multicast group will be forwarded within the range of ports specified above.

Click the **Apply** button to accept the changes made.

Click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

ERPS Settings

ERPS (Ethernet Ring Protection Switching) is the first industry standard (ITU-T G.8032) for Ethernet ring protection switching. It is achieved by integrating mature Ethernet operations, administration, and maintenance (OAM) * functions and a simple automatic protection switching (APS) protocol for Ethernet ring networks. ERPS provides sub-50ms protection for Ethernet traffic in a ring topology. It ensures that there are no loops formed at the Ethernet layer.

One link within a ring will be blocked to avoid a Loop (RPL, Ring Protection Link). When the failure happens, protection switching blocks the failed link and unblocks the RPL. When the failure clears, protection switching blocks the RPL again and unblocks the link on which the failure is cleared.

G.8032 Terms and Concepts

The ERPS ring is formed by connecting all east and west ports of the switches in the ring. Administrators have to manually configure the blocked port to prevent the loop. See below for a detailed explanation of ERPS terms:

RPL (Ring Protection Link) – The link, designated by ERPS mechanism, that is blocked during the Idle state to prevent loops on a Bridged ring.

RPL Owner – The node connected to RPL that blocks traffic on RPL during the Idle state and unblocks during the Protected state.

R-APS (Ring – Automatic Protection Switching) – Protocol messages defined in Y.1731 and G.8032 used to coordinate the protection actions over the ring through RAPS VLAN (R-APS Channel).

RAPS VLAN (R-APS Channel) – A separate ring-wide VLAN for transmission of R-APS messages.

Protected VLAN – The service traffic VLANs for transmission of normal network traffic.

Ring Topology

ERPS supports Ethernet ring topology, as shown in the diagram below:

- Single ring (a)
- Two single rings with a shared node (b)
- Multi-ring: Rings share a common link and nodes (c)

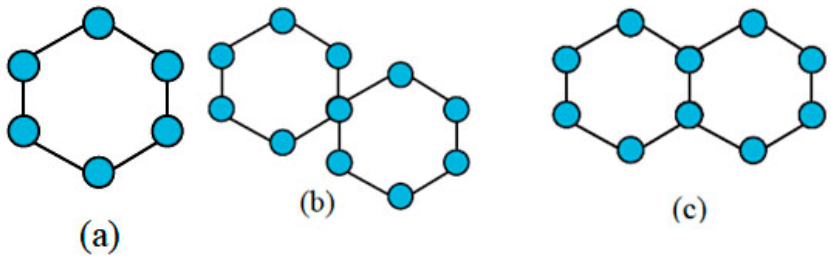


Figure 4-80 Ethernet ring topologies supported by ERPS

Sub-ring

In topology (c), multiple rings share the same physical link. Only one of the rings uses the physical link (primary ring) while the other ring(s) will build-up virtual channels upon the physical link. Those rings, including the virtual link, will be the sub-rings of the primary ring.

Each ring will have its own RPL owner and port, and every ring should belong to a different RAPS VLAN.

This page is used to enable the ERPS function on the Switch.

NOTE: STP and LBD should be disabled on the ring ports before enabling ERPS. ERPS cannot be enabled before the R-APS VLAN is created, and ring ports, RPL port, and RPL owner are configured. Note that these parameters cannot be changed when ERPS is enabled.

To view the following window, click **L2 Features > ERPS Settings**, as shown below:

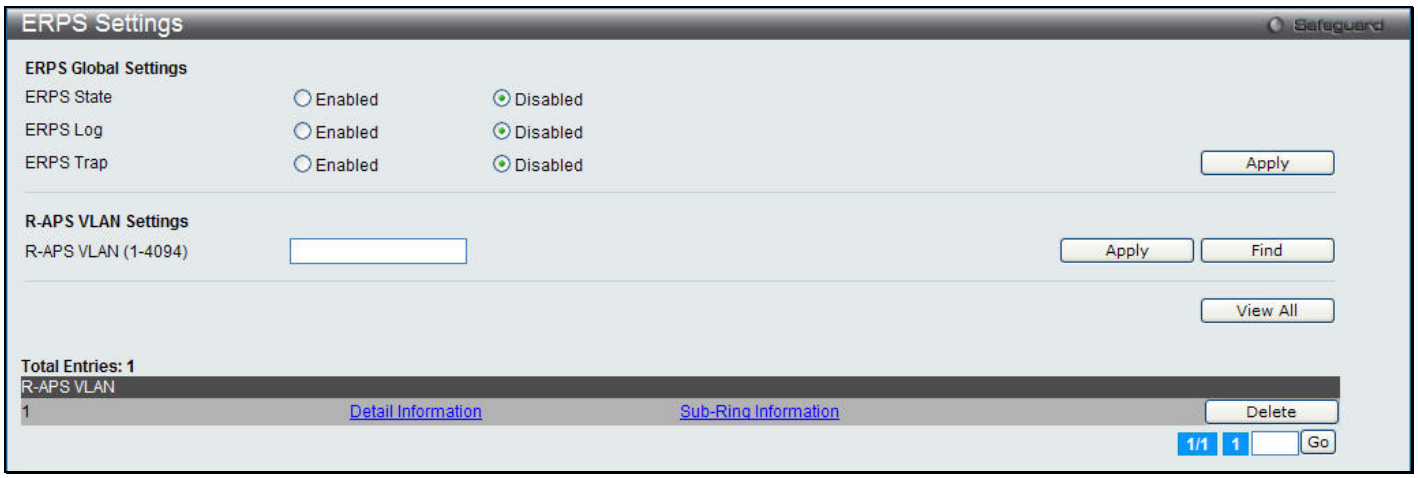


Figure 4-81 ERPS Settings window

The fields that can be configured are described below:

Parameter	Description
ERPS State	Click the radio buttons to enable or disable the ERPS State. The default is Disabled.
ERPS Log	Click the radio buttons to enable or disable the ERPS Log. The default is Disabled.
ERPS Trap	Click the radio buttons to enable or disable the ERPS Trap. The default is Disabled.
R-APS VLAN	Specify the VLAN which will be the R-APS VLAN.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Find** button search the entered R-APS VLAN information.

Click the **View All** button to see all the entries.

Click the **Delete** button to remove the specific entry.

Click the Detail Information link to see ERPS information.

Click the Sub-Ring Information link to see more detailed information.

After clicking the Detail Information link, the following page will appear:

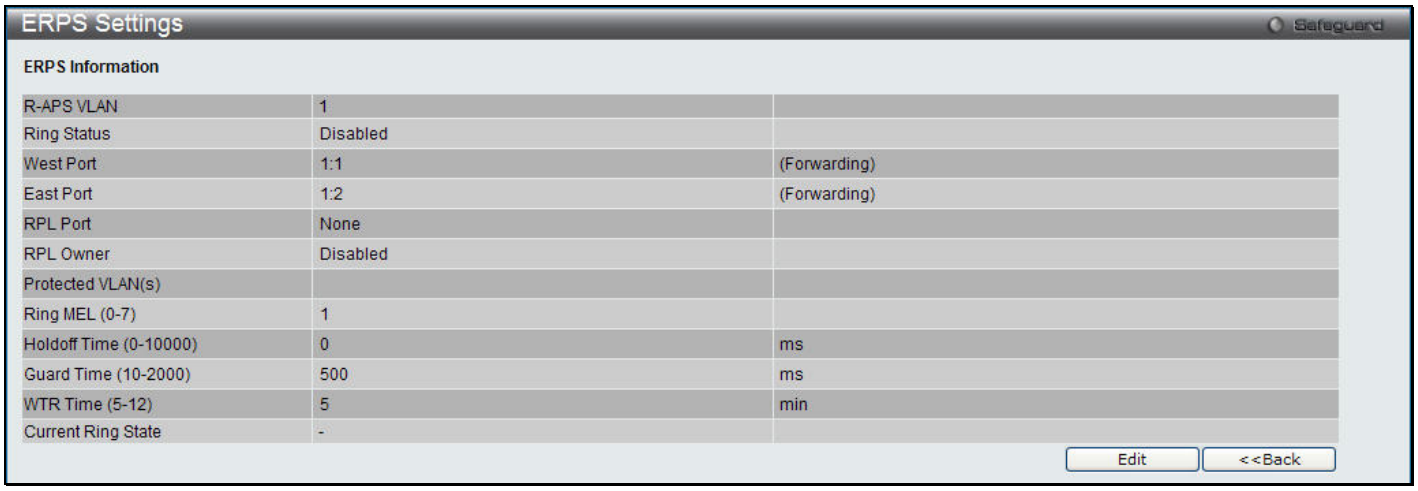


Figure 4-82 ERPS Settings - Detail Information window

The fields that can be configured are described below:

Parameter	Description
Ring Status	Tick the check box and use the drop-down menu to enable or disable the ring status.
West Port	Tick the check box to configure the information. Use the Unit drop-down menu to select a unit to be configured, and then use the next drop-down menu to specify the port as the west ring port, or select *Virtual Channel* to specify the west port on virtual channel.
East Port	Tick the check box to configure the information. Use the Unit drop-down menu to select a unit to be configured, and then use the next drop-down menu to specify the port as the east ring port, or select *Virtual Channel* to specify the east port on virtual channel.
RPL Port	Tick the check box and use the drop-down menu to select one of the R-APS VLAN ring ports as the RPL port. Select *None* to have no RPL port.
RPL Owner	Tick the check box and use the drop-down menu to enable or disable the device as an RPL owner node.
Protected VLAN(s) (e.g.: 4-6)	Tick the check box, select the Add radio button and enter the VLAN ID to add the VLAN into protected VLAN group. Tick the check box, select the Delete radio button and enter the VLAN ID to remove the VLAN into protected VLAN group.
Ring MEL (0-7)	Tick the check box and enter the ring MEL of the R-APS function from *0* to *7*. The default is *1*.
Holdoff Time (0-10000)	Tick the check box and enter the holdoff time of the R-APS function from 0 to *10000* milliseconds. The default is *0* milliseconds.
Guard Time (10-2000)	Tick the check box and enter the guard time of the R-APS function from *10* to *2000* milliseconds. The default is *500* milliseconds.
WTR Time (5-12)	Tick the check box and enter the WTR time of the R-APS function from *5* to *12* minutes. The default is *5* minutes.

Click the **Edit** button to configure the information within the table.

Click the **Apply** button to implement the changes made.

Click the **<<Back** button to go back to the previous page.

After clicking the Sub-Ring Information link, the following page will appear:

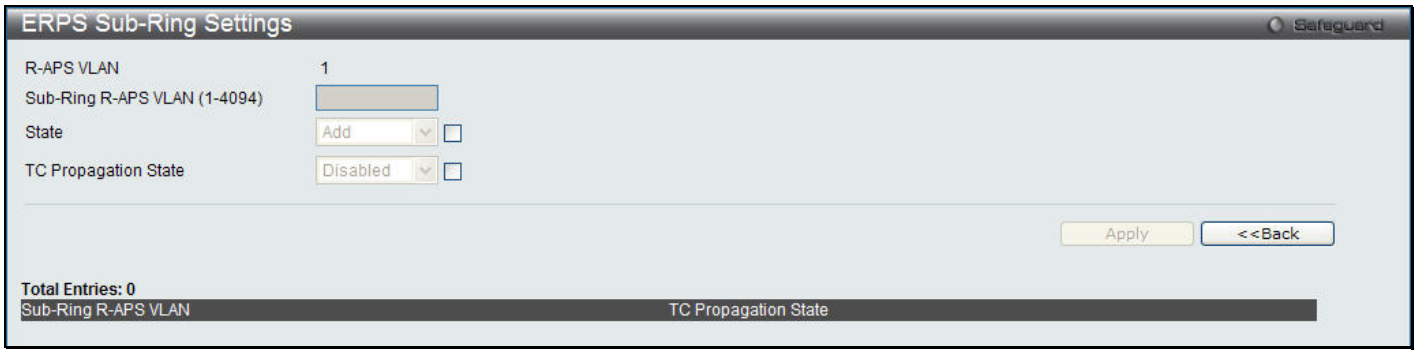


Figure 4-83 ERPS Sub-ring Settings window

The fields that can be configured are described below:

Parameter	Description
Sub-ring R-APS VLAN	Enter the VLAN ID of a sub-ring connected to another ring.
State	Tick the check box and select *Add* or *Delete* from the drop-down menu to add or remove the sub-ring to this ring.
TC Propagation State	Tick the check box and use the drop-down menu to enable or disable the propagation state of topology change for the sub-ring. When *Enabled*, the switch will flush the FDB when the topology changes.

Click the **Apply** button to implement the changes made.

Click the **<<Back** button to go back to the previous page.

LLDP

LLDP Global Settings

On this page the user can configure the LLDP global parameters.

To view the following window, click **L2 Features > LLDP > LLDP Global Settings**, as shown below:

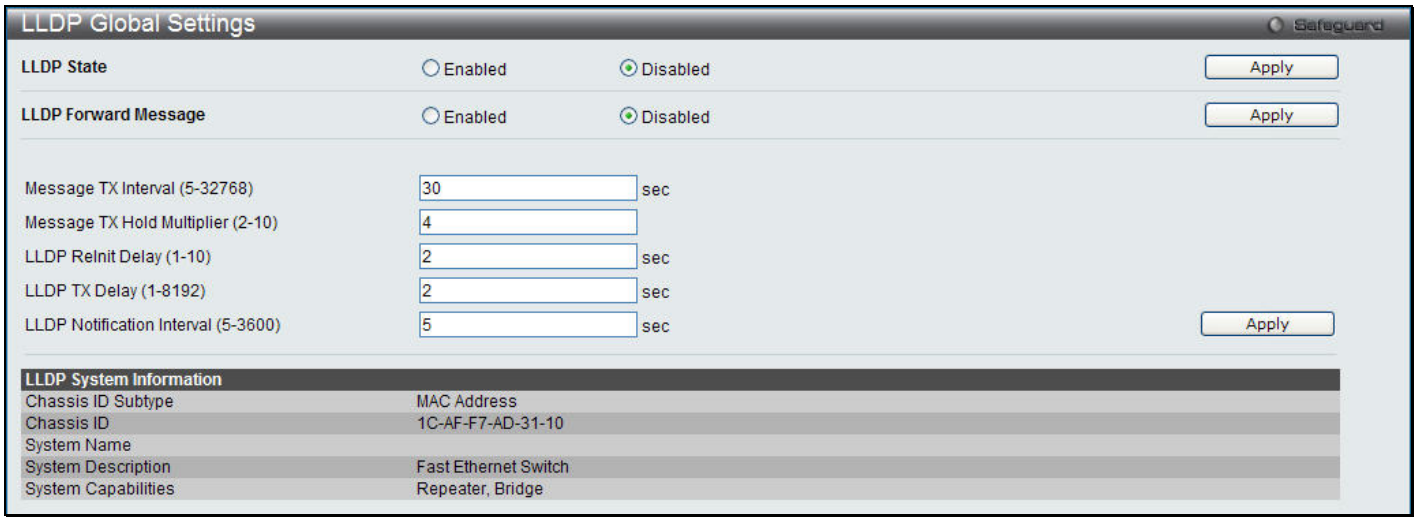


Figure 4-84 LLDP Global Settings window

The fields that can be configured are described below:

Parameter	Description
LLDP State	Click the radio buttons to enable or disable the LLDP feature.
LLDP Forward Message	When LLDP is disabled this function controls the LLDP packet forwarding message based on individual ports. If LLDP is enabled on a port it will flood the LLDP packet to all ports that have the same port VLAN and will advertise to other stations attached to the same IEEE 802 LAN.
Message TX Interval (5-32768)	This interval controls how often active ports retransmit advertisements to their neighbors. To change the packet transmission interval, enter a value in seconds (*5* to *32768*).
Message TX Hold Multiplier (2-10)	This function calculates the Time-to-Live for creating and transmitting the LLDP advertisements to LLDP neighbors by changing the multiplier used by an LLDP Switch. When the Time-to-Live for an advertisement expires the advertised data is then deleted from the neighbor Switch's MIB.
LLDP ReInit Delay (1-10)	The LLDP re-initialization delay interval is the minimum time that an LLDP port will wait before reinitializing after receiving an LLDP disable command. To change the LLDP re-init delay, enter a value in seconds (*1* to *10*).
LLDP TX Delay (1-8192)	LLDP TX Delay allows the user to change the minimum time delay interval for any LLDP port which will delay advertising any successive LLDP advertisements due to change in the LLDP MIB content. To change the LLDP TX Delay, enter a value in seconds (*1* to *8192*).
LLDP Notification Interval (5-3600)	LLDP Notification Interval is used to send notifications to configured SNMP trap receiver(s) when an LLDP change is detected in an advertisement received on the port from an LLDP neighbor. To set the LLDP Notification Interval, enter a value in seconds (*5* to *3600*).

Click the **Apply** button to accept the changes made for each individual section.

LLDP Port Settings

On this page the user can configure the LLDP port parameters.

To view the following window, click **L2 Features > LLDP > LLDP Port Settings**, as shown below:

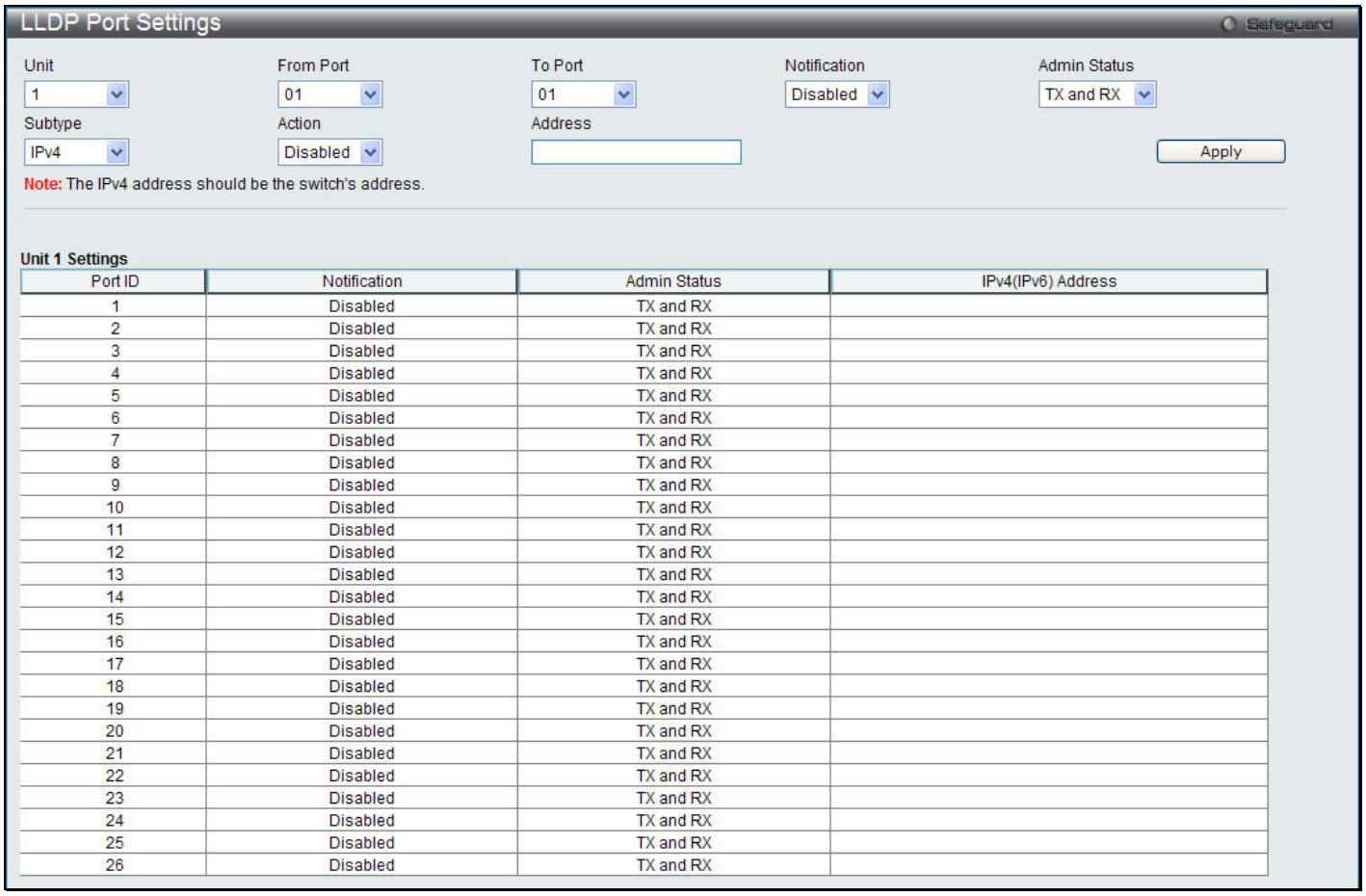


Figure 4-85 LLDP Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menu to select the ports used for this configuration.
Notification	Use the pull-down menu to enable or disable the status of the LLDP notification. This function controls the SNMP trap. However, it cannot implement traps on SNMP when the notification is disabled.
Admin Status	This function controls the local LLDP agent and allows it to send and receive LLDP frames on the ports. This option contains *TX*, *RX*, *TX and RX* or *Disabled*. *TX* - the local LLDP agent can only transmit LLDP frames. *RX* - the local LLDP agent can only receive LLDP frames. *TX And RX* - the local LLDP agent can both transmit and receive LLDP frames. *Disabled* - the local LLDP agent can neither transmit nor receive LLDP frames. The default value is TX And RX.
Subtype	Use the drop-down menu to select the type of the IP address information will be sent.
Action	Use the drop-down menu to enable or disable the action field.
Address	Enter the IP address that will be sent.

Click the **Apply** button to accept the changes made.

NOTE: The IPv4 or IPv6 address entered here should be an existing LLDP management IP address.

LLDP Management Address List

On this page the user can view the LLDP management address list.

To view the following window, click **L2 Features > LLDP > LLDP management Address List**, as shown below:

Figure 4-86 LLDP Management Address List window

The fields that can be configured are described below:

Parameter	Description
IPv4/IPv6	Use the drop-down menu to select either IPv4 or IPv6.
Address	Enter the management IP address or the IPv6 address of the entity you wish to search for. The IPv4 address is a management IP address, so the IP information will be sent with the frame.

Click the **Find** button to locate a specific entry based on the information entered.

LLDP Basic TLVs Settings

TLV stands for Type-length-value, which allows the specific sending information as a TLV element within LLDP packets. This window is used to enable the settings for the Basic TLVs Settings. An active LLDP port on the Switch always included mandatory data in its outbound advertisements. There are four optional data types that can be configured for an individual port or group of ports to exclude one or more of these data types from outbound LLDP advertisements. The mandatory data type includes four basic types of information (end of LLDPDU TLV, chassis ID TLV, port ID TLV, and Time to Live TLV). The mandatory data types cannot be disabled. There are also four data types which can be optionally selected. These include Port Description, System Name, System Description and System Capability.

To view the following window, click **L2 Features > LLDP > LLDP Basic TLVs Settings**, as shown below:

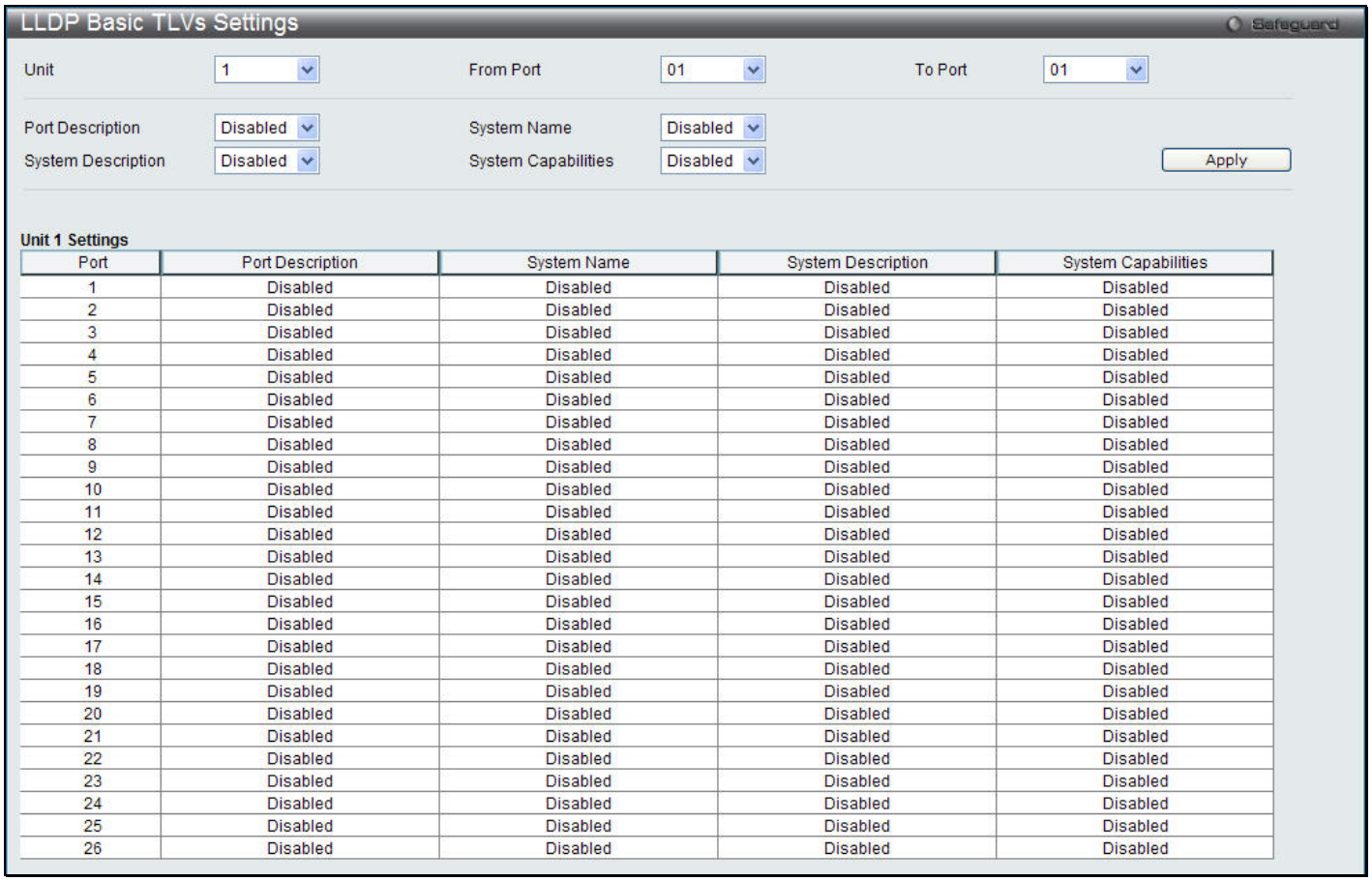


Figure 4-87 LLDP Basic TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Select the port range to use for this configuration.
Port Description	Use the drop-down menu to enable or disable the Port Description option.
System Name	Use the drop-down menu to enable or disable the System Name option.
System Description	Use the drop-down menu to enable or disable the System Description option.
System Capabilities	Use the drop-down menu to enable or disable the System Capabilities option.

Click the **Apply** button to accept the changes made.

LLDP Dot1 TLVs Settings

LLDP Dot1 TLVs are organizationally specific TLVs which are defined in IEEE 802.1 and used to configure an individual port or group of ports to exclude one or more of the IEEE 802.1 organizational port VLAN ID TLV data types from outbound LLDP advertisements.

To view the following window, click **L2 Features > LLDP > LLDP Dot1 TLVs Settings**, as shown below:

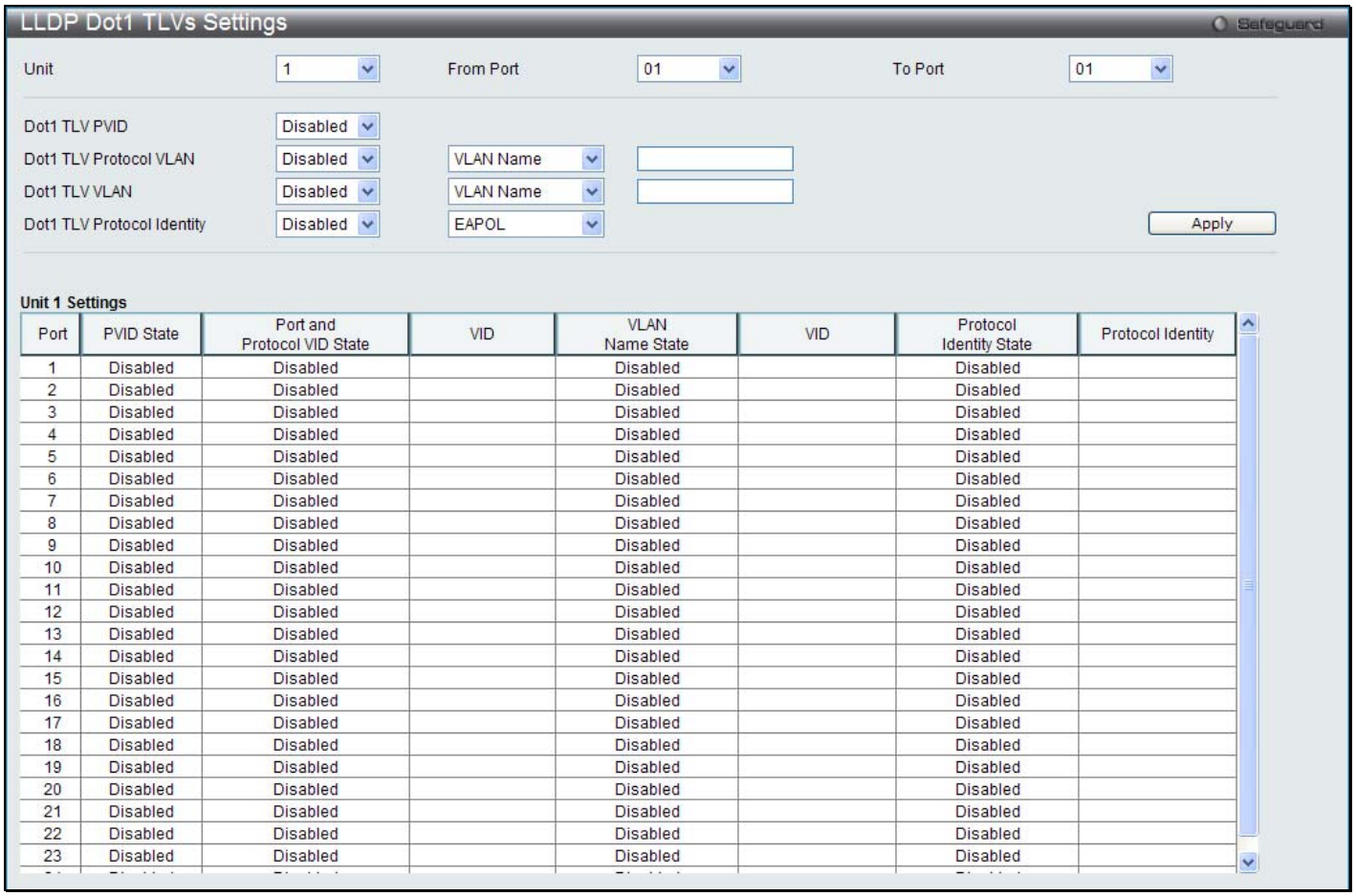


Figure 4-88 LLDP Dot1 TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
Dot1 TLV PVID	Use the drop-down menu to enable or disable and configure the Dot1 TLV PVID option.
Dot1 TLV Protocol VLAN	Use the drop-down menu to enable or disable, and configure the Dot1 TLV Protocol VLAN option. After enabling this option, the user can select to use *VLAN Name*, *VID List* or *All* in the next drop-down menu. After selecting this, the user can enter either the VLAN Name or VID List value in the space provided.
Dot1 TLV VLAN	Use the drop-down menu to enable or disable, and configure the Dot1 TLV VLAN option. After enabling this option, the user can select to use *VLAN Name*, *VID List* or *All* in the next drop-down menu. After selecting this, the user can enter either the VLAN Name or VID List value in the space provided.
Dot1 TLV Protocol Identity	Use the drop-down menu to enable or disable, and configure the Dot1 TLV Protocol Identity option. After enabling this option, the user can select to use *EAPOL*, *LACP*, *GVRP*, *STP*, or *All*.

Click the **Apply** button to accept the changes made.

LLDP Dot3 TLVs Settings

This window is used to configure an individual port or group of ports to exclude one or more IEEE 802.3 organizational specific TLV data type from outbound LLDP advertisements.

To view the following window, click **L2 Features > LLDP > LLDP Dot3 TLVs Settings**, as shown below:

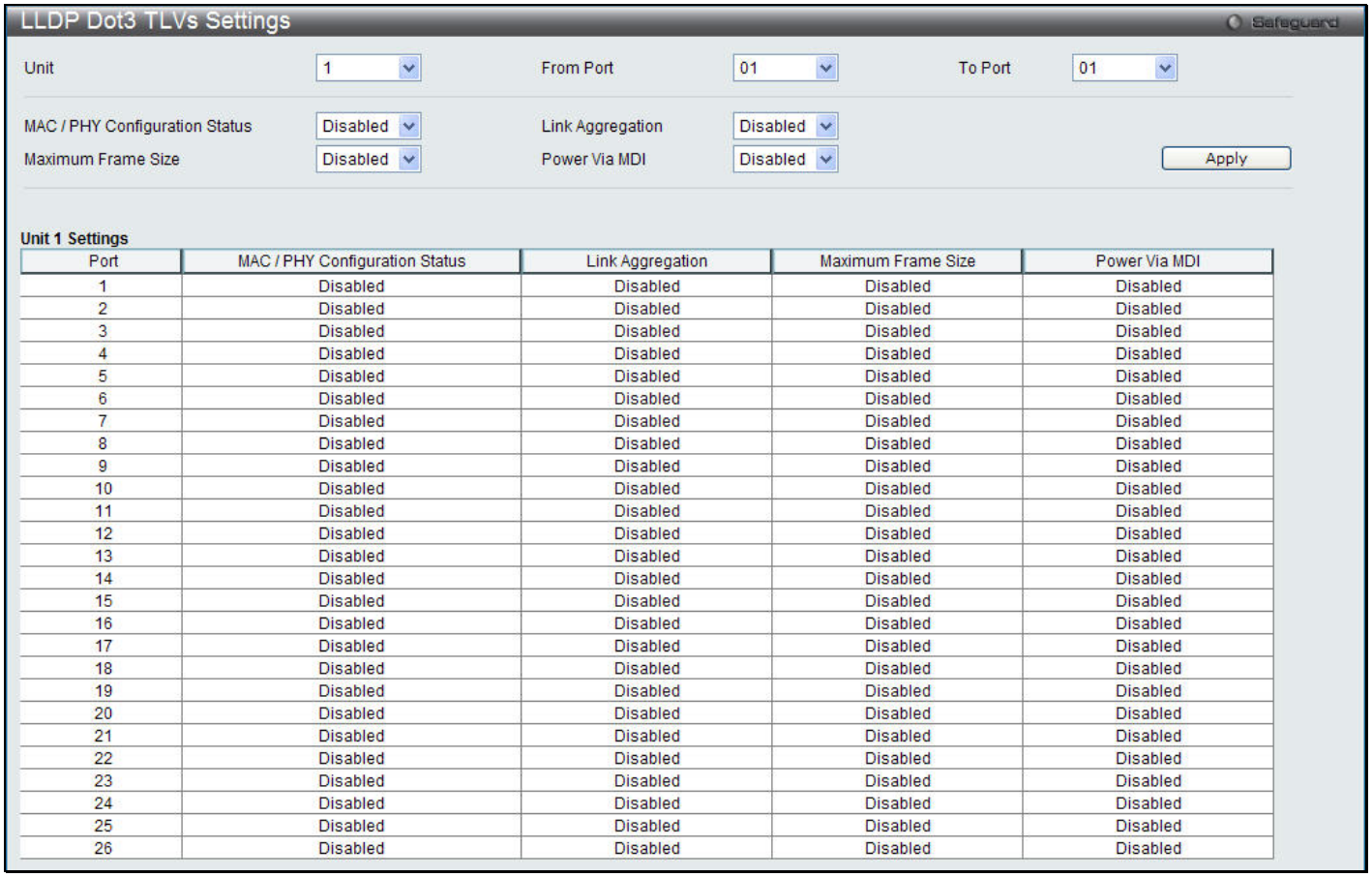


Figure 4-89 LLDP Dot3 TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
MAC / PHY Configuration Status	This TLV optional data type indicates that the LLDP agent should transmit the MAC/PHY configuration/status TLV. This indicates it is possible for two ends of an IEEE 802.3 link to be configured with different duplex and/or speed settings and still establish some limited network connectivity. More precisely, the information includes whether the port supports the auto-negotiation function, whether the function is enabled, whether it has auto-negotiated advertised capability, and what is the operational MAU type. The default state is *Disabled*.
Link Aggregation	The Link Aggregation option indicates that LLDP agents should transmit 'Link Aggregation TLV'. This indicates the current link aggregation status of IEEE 802.3 MACs. More precisely, the information should include whether the port is capable of doing link aggregation, whether the port is aggregated in an aggregated link, and what is the aggregated port ID. The default state is *Disabled*.

Maximum Frame Size	The Maximum Frame Size indicates that LLDP agent should transmit 'Maximum-frame-size TLV. The default state is *Disabled*.
Power Via MDI	Use the drop-down menu to enable or disable power via MDI.

Click the **Apply** button to accept the changes made.

LLDP Statistic System

The LLDP Statistics System page allows you an overview of the neighbor detection activity, LLDP Statistics and the settings for individual ports on the Switch. Select a **Port** number from the drop-down menu and click the **Find** button to view statistics for a certain port.

To view the following window, click **L2 Features > LLDP > LLDP Statistic System**, as shown below:

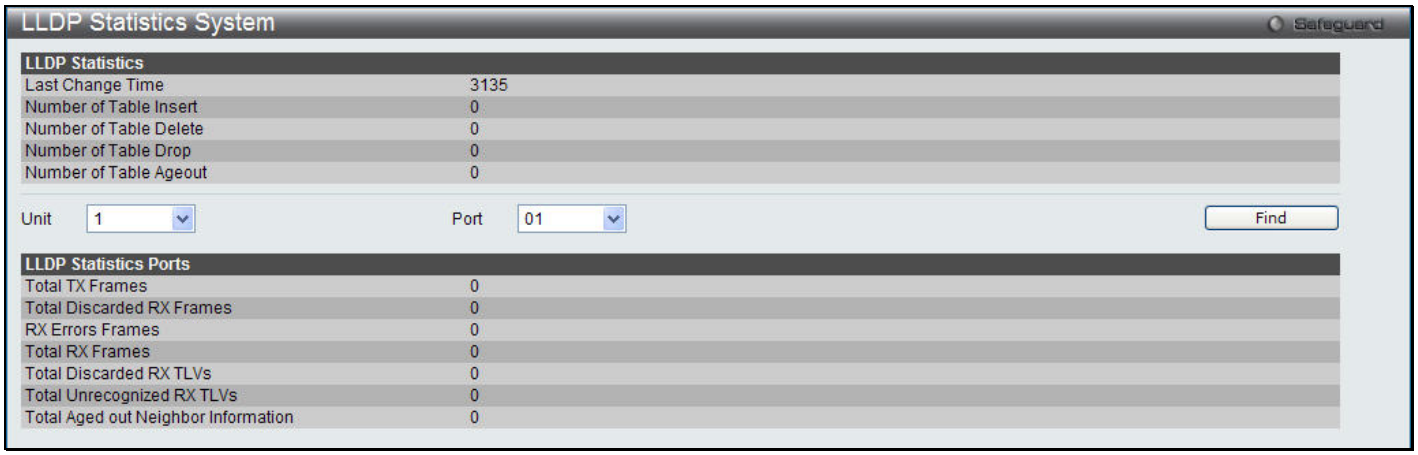
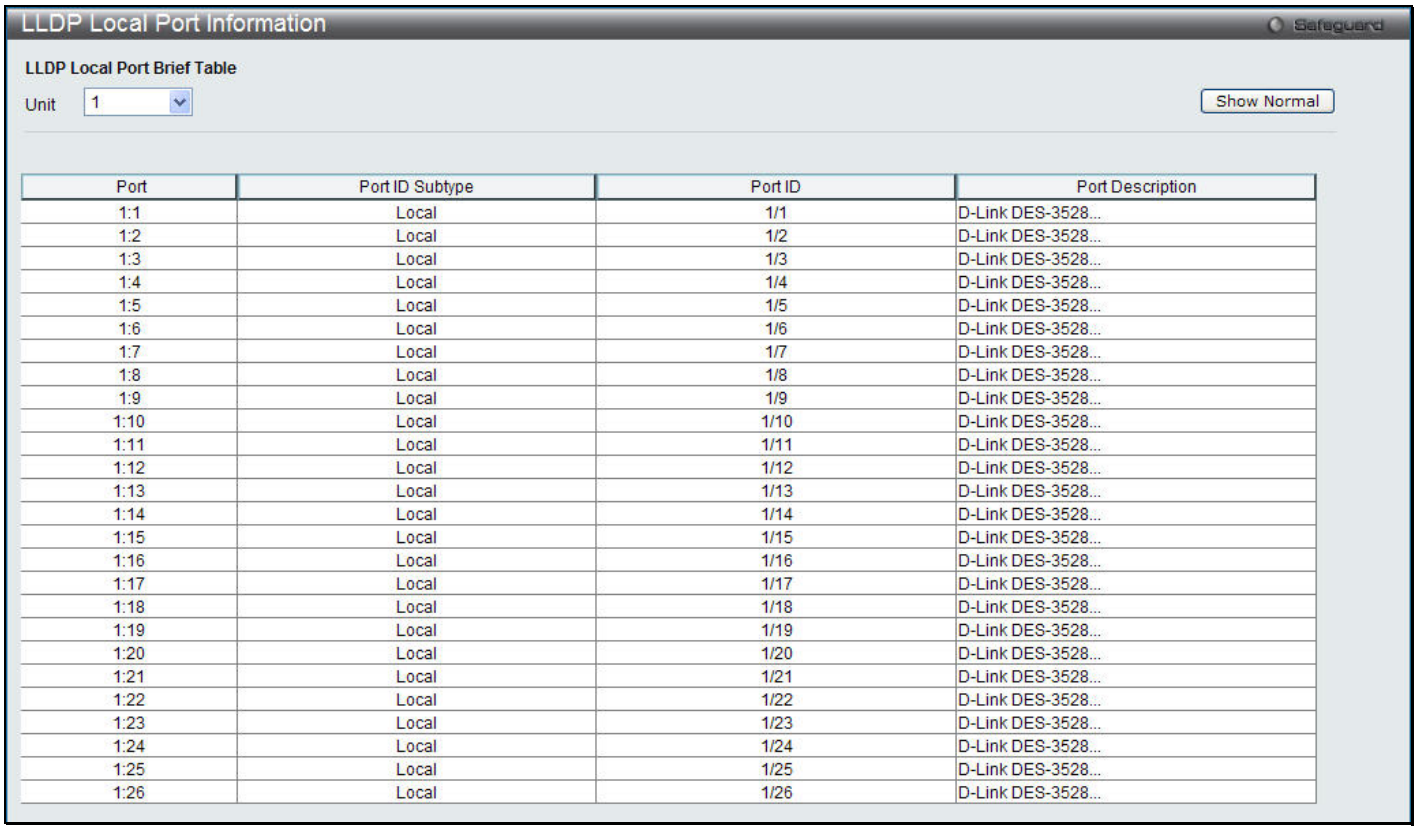


Figure 4-90 LLDP Statistics System window

LLDP Local Port Information

The LLDP Local Port Information page displays the information on a per port basis currently available for populating outbound LLDP advertisements in the local port brief table shown below.

To view the following window, click **L2 Features > LLDP > LLDP Local Port Information**, as shown below:



Port	Port ID Subtype	Port ID	Port Description
1:1	Local	1/1	D-Link DES-3528...
1:2	Local	1/2	D-Link DES-3528...
1:3	Local	1/3	D-Link DES-3528...
1:4	Local	1/4	D-Link DES-3528...
1:5	Local	1/5	D-Link DES-3528...
1:6	Local	1/6	D-Link DES-3528...
1:7	Local	1/7	D-Link DES-3528...
1:8	Local	1/8	D-Link DES-3528...
1:9	Local	1/9	D-Link DES-3528...
1:10	Local	1/10	D-Link DES-3528...
1:11	Local	1/11	D-Link DES-3528...
1:12	Local	1/12	D-Link DES-3528...
1:13	Local	1/13	D-Link DES-3528...
1:14	Local	1/14	D-Link DES-3528...
1:15	Local	1/15	D-Link DES-3528...
1:16	Local	1/16	D-Link DES-3528...
1:17	Local	1/17	D-Link DES-3528...
1:18	Local	1/18	D-Link DES-3528...
1:19	Local	1/19	D-Link DES-3528...
1:20	Local	1/20	D-Link DES-3528...
1:21	Local	1/21	D-Link DES-3528...
1:22	Local	1/22	D-Link DES-3528...
1:23	Local	1/23	D-Link DES-3528...
1:24	Local	1/24	D-Link DES-3528...
1:25	Local	1/25	D-Link DES-3528...
1:26	Local	1/26	D-Link DES-3528...

Figure 4-91 LLDP Local Port Information window

To view the normal LLDP Local Port information page per port, click the **Show Normal** button.
To view the brief LLDP Local Port information page per port, click the **Show Brief** button.

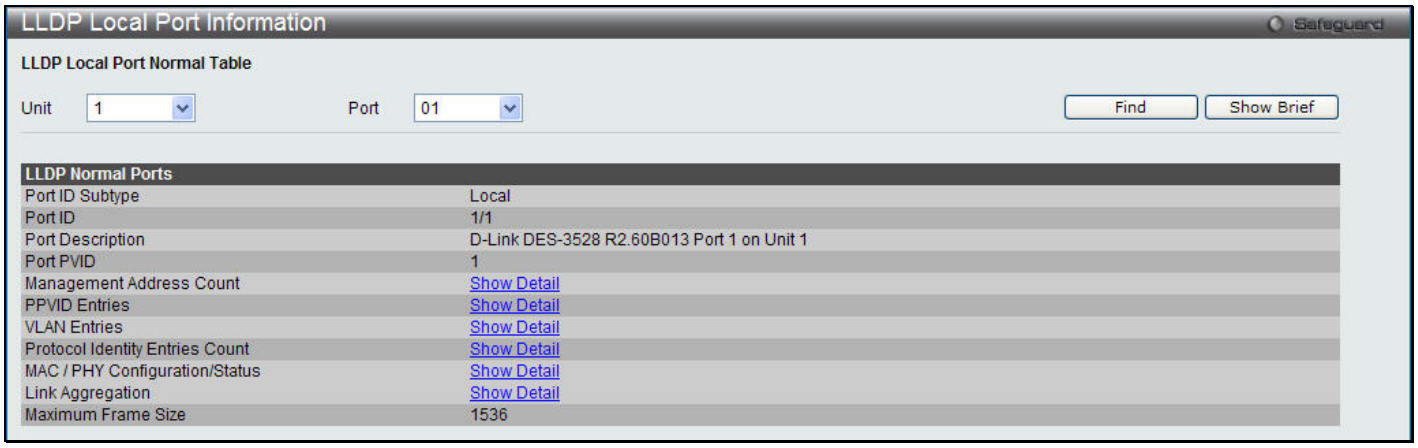


Figure 4-92 LLDP Local Port Information – Show Normal window

Select a **Port** number and click the **Find** button to locate a specific entry.
To view more details about, for example, the **Management Address Count**, click on the Show Detail hyperlink.

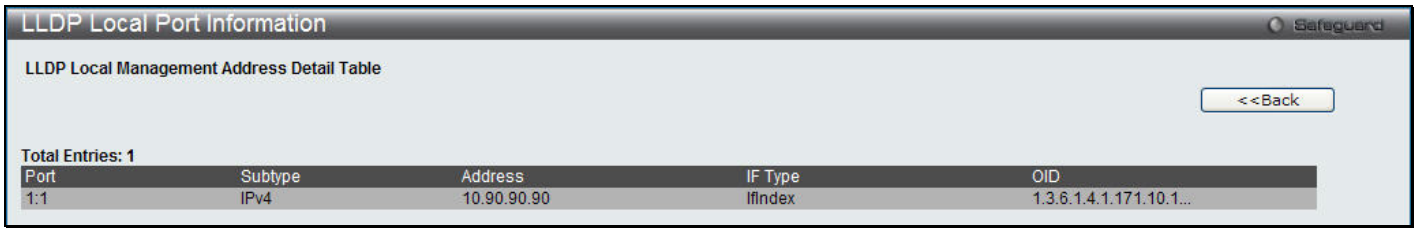


Figure 4-93 LLDP Local Port Information – Show Detail window

Click the **<<Back** button to return to the previous page.

LLDP Remote Port Information

This page displays port information learned from the neighbors. The Switch receives packets from a remote station but is able to store the information as local.

To view the following window, click **L2 Features > LLDP > LLDP Remote Port Information**, as shown below:

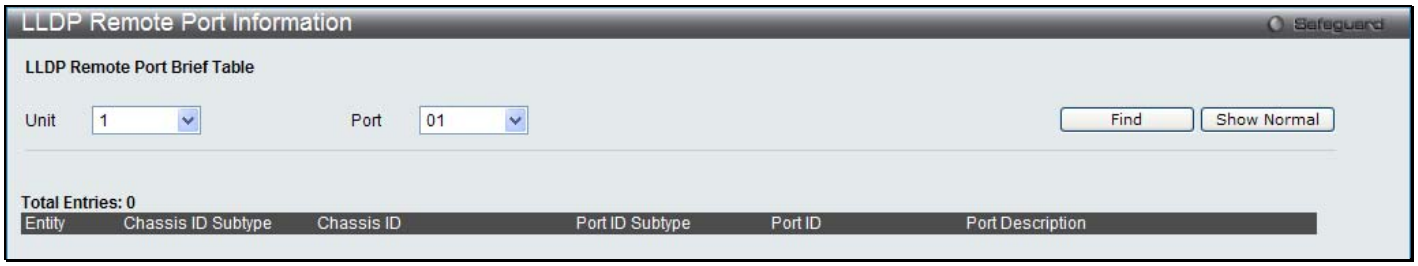


Figure 4-94 LLDP Remote Port Information window

Select a **Port** number and click the **Find** button to locate a specific entry.

To view the normal LLDP Remote Port information page per port, click the **Show Normal** button.

Figure 4-95 LLDP Remote Port Information – Show Normal window

Click the **<<Back** button to return to the previous page.

Chapter 5 L3 Features

Local Route Settings
IPv4 Static/Default Route Settings
IPv4 Route Table
IPv6 Static/Default Route Settings
IPv6 Route Table
Policy Route Settings
IP Forwarding Table

Local Route Settings

This window is used to configure the IPv4 and IPv6 local route settings.
To view the following window, click **L3 Features > Local Route Settings**, as shown below:

Figure 5-1 Local Route Settings window

The fields that can be configured are described below:

Parameter	Description
IPv4 Local Route	Click the radio buttons to enable or disable IPv4 local route. The function is enabled by default.
IPv6 Local Route	Click the radio buttons to enable or disable IPv6 local route. The function is disabled by default.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: IPv4 and IPv6 static routes are mutually exclusive and cannot be created at the same time on DES-3528/DES-3552 Series switches.

IPv4 Static/Default Route Settings

The Switch supports static routing for IPv4 and IPv6 formatted addressing. Users can create up to 16 static route entries for IPv4 or 16 static route entries for IPv6. For IPv4 static routes, once a static route has been set, the Switch will send an ARP request packet to the next hop router that has been set by the user. Once an ARP response has been retrieved by the Switch from that next hop, the route becomes enabled. However, if the ARP entry already exists, an ARP response will not be sent.

NOTE: IPv4 and IPv6 static routes are mutually exclusive and cannot be created at the same time on DES-3528/DES-3552 Series switches.

The Switch also supports a floating static route, which means that the user may create an alternative static route to a different next hop. This secondary next hop device route is considered as a backup static route for when the primary static route is down. If the primary route is lost, the backup route will uplink and its status will become Active.

To view the following window, click **L3 Features > IPv4 Static/Default Route Settings**, as shown below:

Figure 5-2 IPv4 Static/Default Route Settings window

The fields that can be configured are described below:

Parameter	Description
IP Address	This field allows the entry of an IPv4 address to be assigned to the Static or Default route.
Netmask	This field allows the entry of a subnet mask to be applied to the corresponding subnet mask of the IP address.
Gateway	This field allows the entry of a Gateway IP Address to be applied to the corresponding gateway of the IP address.
Metric (1-65535)	Represents the metric value of the IP interface entered into the table. This field may read a number between *1* and *65535*.
Backup State	Each IP address can only have one primary route, while other routes should be assigned to the backup state. When the primary route failed, switch will try the backup routes according to the order learnt by the routing table until route success. The field represents the Backup state that the Static and Default Route is configured for.

Click the **Apply** button to accept the changes made.

IPv4 Route Table

The IP routing table stores all the external routes information of the Switch. On this page the user can view all the external route information on the Switch.

To view the following window, click **L3 Features > IPv4 Route Table**, as shown below:

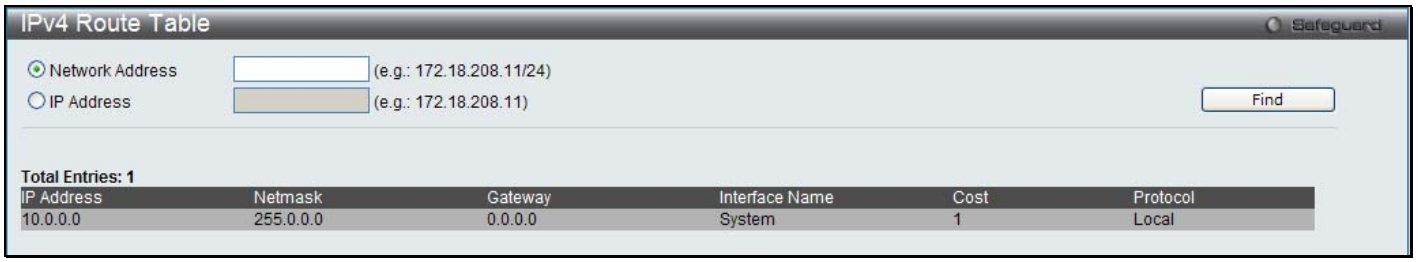


Figure 5-3 IPv4 Route Table window

The fields that can be configured are described below:

Parameter	Description
Network Address	Click the radio buttons and enter the network address.
IP Address	Click the radio buttons and enter the IP address.

Click the **Find** button to locate a specific entry based on the information entered.

IPv6 Static/Default Route Settings

A static entry of an IPv6 address can be entered into the Switch's routing table for IPv6 formatted addresses.

To view the following window, click **L3 Features > IPv6 Static/Default Route Settings**, as shown below:

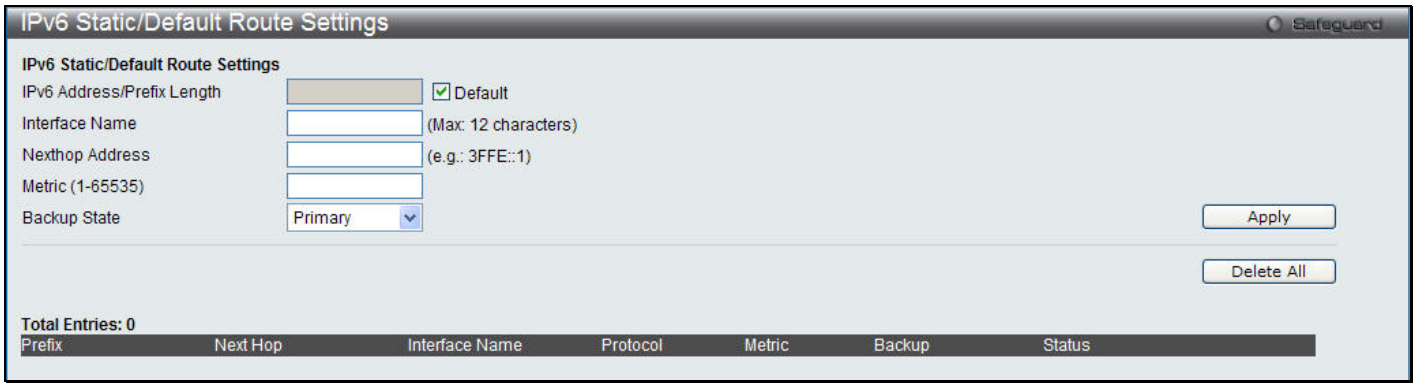


Figure 5-4 IPv6 Static/Default Route Settings window

The fields that can be configured are described below:

Parameter	Description
IPv6 Address/Prefix Length	The IPv6 address and corresponding Prefix Length of the IPv6 Static or Default Route entry.
Interface Name	The IP Interface where the static IPv6 route is created.
Nexthop Address	The corresponding IPv6 address for the next hop Gateway address in IPv6 format.
Metric (1-65535)	The metric of the IPv6 interface entered into the table representing the number of routers between the Switch and the IPv6 address above. Metric values allowed are between *1* and *65535*.
Backup State	Each IP address can only have one primary route, while other routes should be assigned to the backup state. When the primary route fails, the Switch will try the backup routes according to the order learned by the routing table until route success. This field represents the backup state for the IPv6 configured. This field may be *Primary* or *Backup*.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

IPv6 Route Table

This window displays the IPv6 route information.

To view the following window, click **L3 Features > IPv6 Route Table**, as shown below:

Figure 5-5 IPv6 Route Table window

The fields that can be configured are described below:

Parameter	Description
Network Address	Enter the IPv6 network address.

Click the **Find** button to locate a specific entry based on the information entered.

Policy Route Settings

This window is use to configure the policy route information.

To view the following window, click **L3 Features > Policy Route Settings**, as shown below:

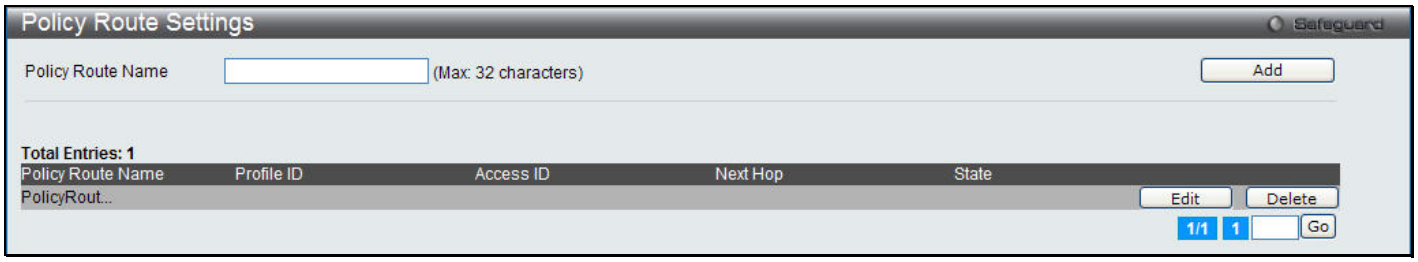


Figure 5-6 Policy Route Settings window

The fields that can be configured are described below:

Parameter	Description
Policy Route Name	Enter a name with maximum 32 characters for the policy route.

Click the **Add** button to add the entry.

Click the **Edit** button to configure the specific entry.

Click the **Delete** button to remove the specific entry.

Click the **Edit** button to see the window as shown below.

Figure 5-7 Policy Route Settings - Edit window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-14)	Enter an ACL profile ID.
Access ID (1-128)	Enter an ACL access ID.
Next Hop IPv4 Address	Enter an IP address routing next hop.
State	Use the drop-down menu to enable or disable the rule.

Click the **Apply** button to implement the changes made.

Click the **<<Back** button to go back to the previous window.

IP Forwarding Table

The IP forwarding table stores all the direct connected IP information. On this page the user can view all the direct connected IP information.

To view the following window, click **L3 Features > IP Forwarding Table**, as shown below:

Figure 5-8 IP Forwarding Table

Click the IP Address, Interface Name or Port radio button, enter the information and click the **Find** button to locate a specific entry based on the information entered.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

Chapter 6 QoS

802.1p Settings
Bandwidth Control
Traffic Control Settings
DSCP
HOL Blocking Prevention
Scheduling Settings
SRED

The Switch supports 802.1p priority queuing Quality of Service. The following section discusses the implementation of QoS (Quality of Service) and benefits of using 802.1p priority queuing.

Advantages of QoS

QoS is an implementation of the IEEE 802.1p standard that allows network administrators a method of reserving bandwidth for important functions that require a large bandwidth or have a high priority, such as VoIP (voice-over Internet Protocol), web browsing applications, file server applications or video conferencing. Not only can a larger bandwidth be created, but other less critical traffic can be limited, so excessive bandwidth can be saved. The Switch has separate hardware queues on every physical port to which packets from various applications can be mapped to, and, in turn prioritized. View the following map to see how the Switch implements basic 802.1p priority queuing.

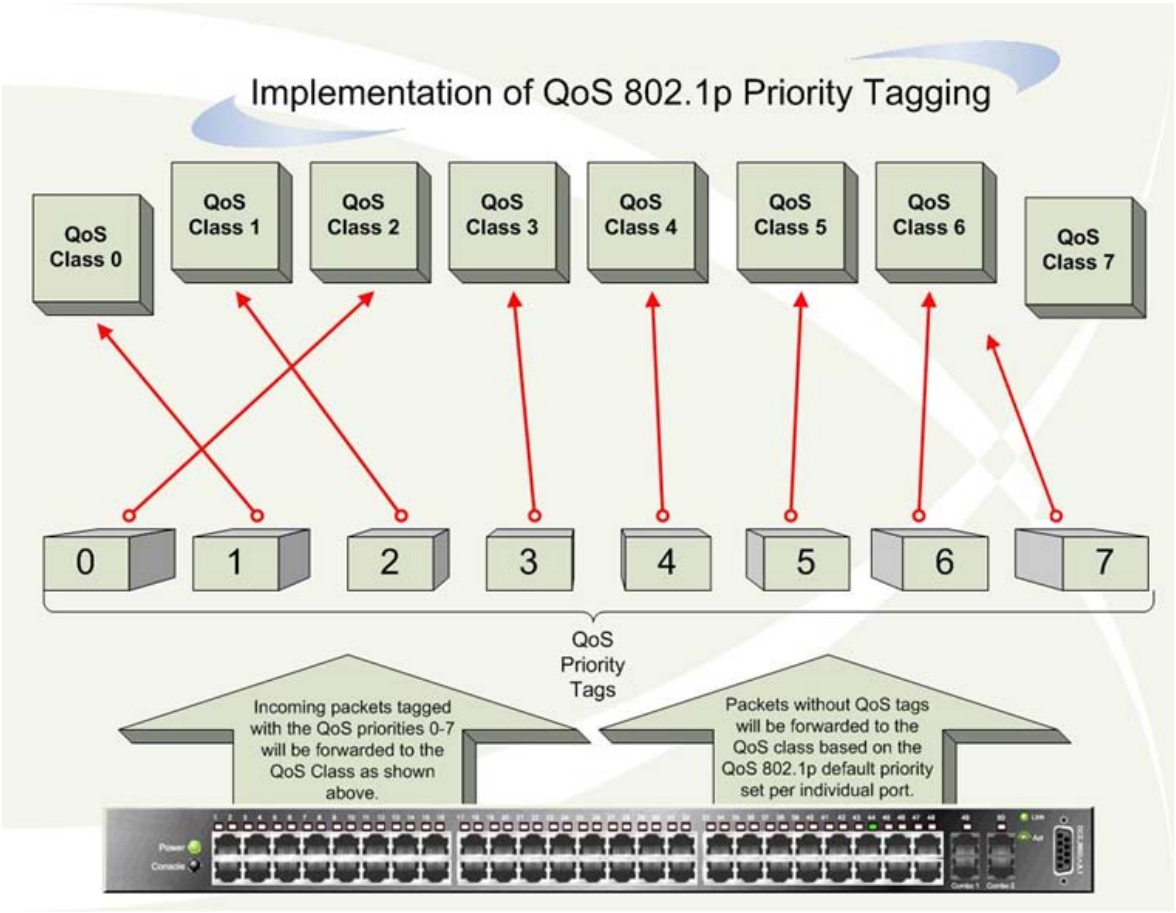


Figure 6-1 Mapping QoS on the Switch

The picture above shows the 802.1p user priority setting for the Switch. As Class-7 is used for stacking function, Class-6 has the highest priority of the seven priority classes of service on the Switch. In order to implement QoS, the user is required to instruct the Switch to examine the header of a packet to see if it has the proper identifying tag. Then the user may forward these tagged packets to designated classes of service on the Switch where they will be emptied, based on priority.

For example, let's say a user wishes to have a video conference between two remotely set computers. The administrator can add priority tags to the video packets being sent out, utilizing the Access Profile commands. Then, on the receiving end, the administrator instructs the Switch to examine packets for this tag, acquires the tagged packets and maps them to a class queue on the Switch. Then in turn, the administrator will set a priority for this queue so that will be emptied before any other packet is forwarded. This result in the end user receiving all packets sent as quickly as possible, thus prioritizing the queue and allowing for an uninterrupted stream of packets, which optimizes the use of bandwidth available for the video conference.

Understanding QoS

The Switch supports 802.1p priority queuing. The Switch has eight priority queues. These priority queues are numbered from 7 (Class 6) — the highest priority queue — to 0 (Class 0) — the lowest priority queue. Class 7 is for stacking function. The eight priority tags specified in IEEE 802.1p (p0 to p7) are mapped to the Switch's priority queues as follows:

- Priority 0 is assigned to the Switch's Q2 queue.
- Priority 1 is assigned to the Switch's Q0 queue.
- Priority 2 is assigned to the Switch's Q1 queue.
- Priority 3 is assigned to the Switch's Q3 queue.
- Priority 4 is assigned to the Switch's Q4 queue.
- Priority 5 is assigned to the Switch's Q5 queue.
- Priority 6 is assigned to the Switch's Q6 queue.
- Priority 7 is assigned to the Switch's Q6 queue.

For strict priority-based scheduling, any packets residing in the higher priority classes of service are transmitted first. Multiple strict priority classes of service are emptied based on their priority tags. Only when these classes are empty, are packets of lower priority transmitted.

For weighted round-robin queuing, the number of packets sent from each priority queue depends upon the assigned weight. For a configuration of seven CoS queues, A to H with their respective weight value: 7 to 1, the packets are sent in the following sequence: A1, B1, C1, D1, E1, F1, G1, A2, B2, C2, D2, E2, F2, A3, B3, C3, D3, E3, A4, B4, C4, D4, A5, B5, C5, A6, B6, A7, A1, B1, C1, D1, E1, F1, G1

For weighted round-robin queuing, if each CoS queue has the same weight value, then each CoS queue has an equal opportunity to send packets just like round-robin queuing.

Remember that the Switch has eight configurable priority queues (and seven Classes of Service) for each port on the Switch.

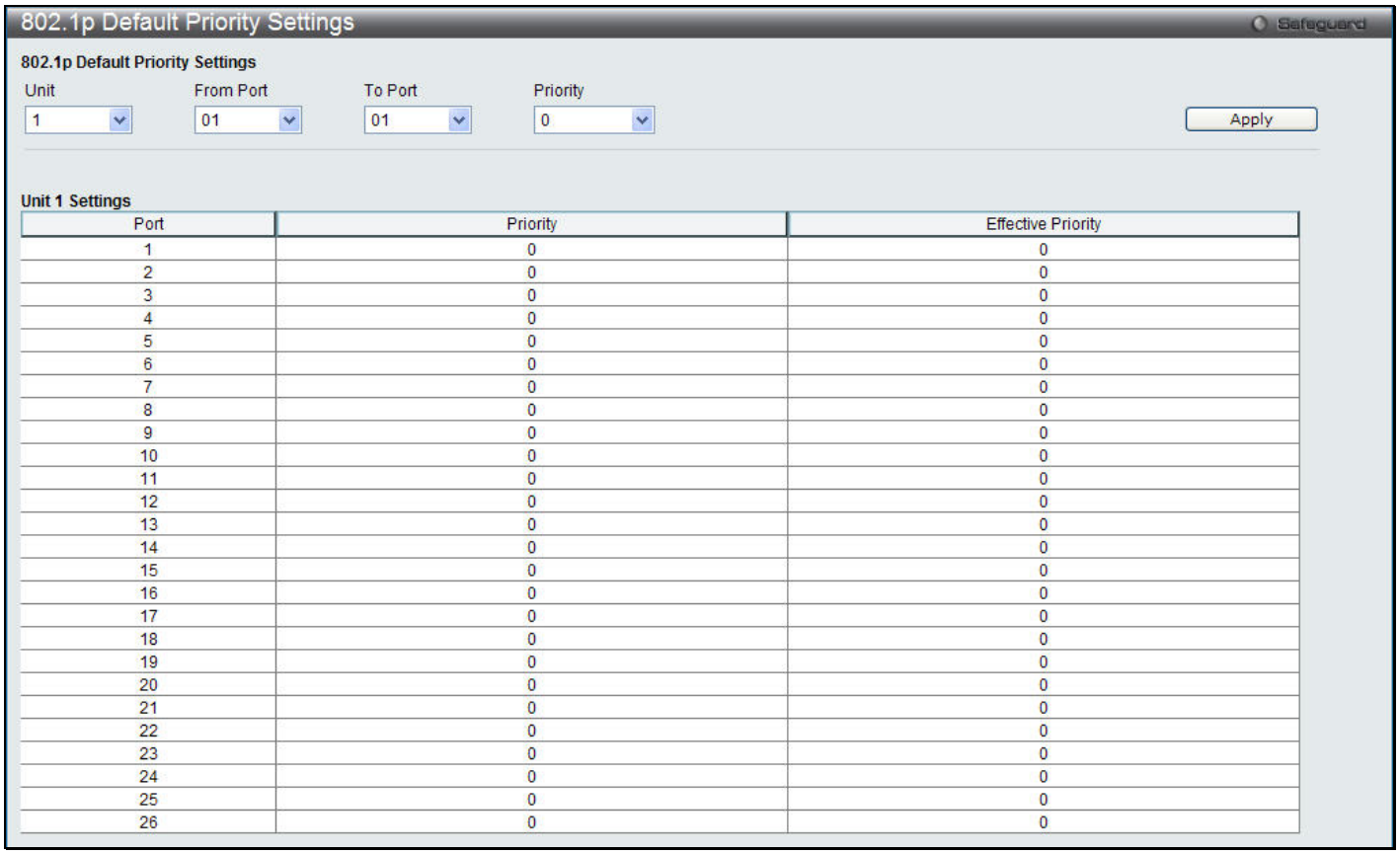
NOTICE: The Switch contains eight classes of service for each port on the Switch. One of these classes is reserved for internal use on the Switch and is therefore not configurable. All references in the following section regarding classes of service will refer to only the seven classes of service that may be used and configured by the administrator.

802.1p Settings

802.1p Default Priority Settings

The Switch allows the assignment of a default 802.1p priority to each port on the Switch. This page allows the user to assign a default 802.1p priority to any given port on the Switch that will insert the 802.1p priority tag to untagged packets received. The priority and effective priority tags are numbered from *0*, the lowest priority, to *7*, the highest priority. The effective priority indicates the actual priority assigned by RADIUS. If the RADIUS assigned value exceeds the specified limit, the value will be set at the default priority. For example, if the RADIUS assigns a limit of 8 and the default priority is 0, the effective priority will be 0.

To view the following window, click **QoS > 802.1p Settings > 802.1p Default Priority Settings**, as shown below:



Port	Priority	Effective Priority
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0

Figure 6-2 802.1p Default Priority Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports to use.
Priority	Use the drop-down menu to select a value from *0* to *7*.

Click the **Apply** button to accept the changes made.

802.1p User Priority Settings

The Switch allows the assignment of a class of service to each of the 802.1p priorities.

To view the following window, click **QoS > 802.1p Settings > 802.1p User Priority Settings**, as shown below:

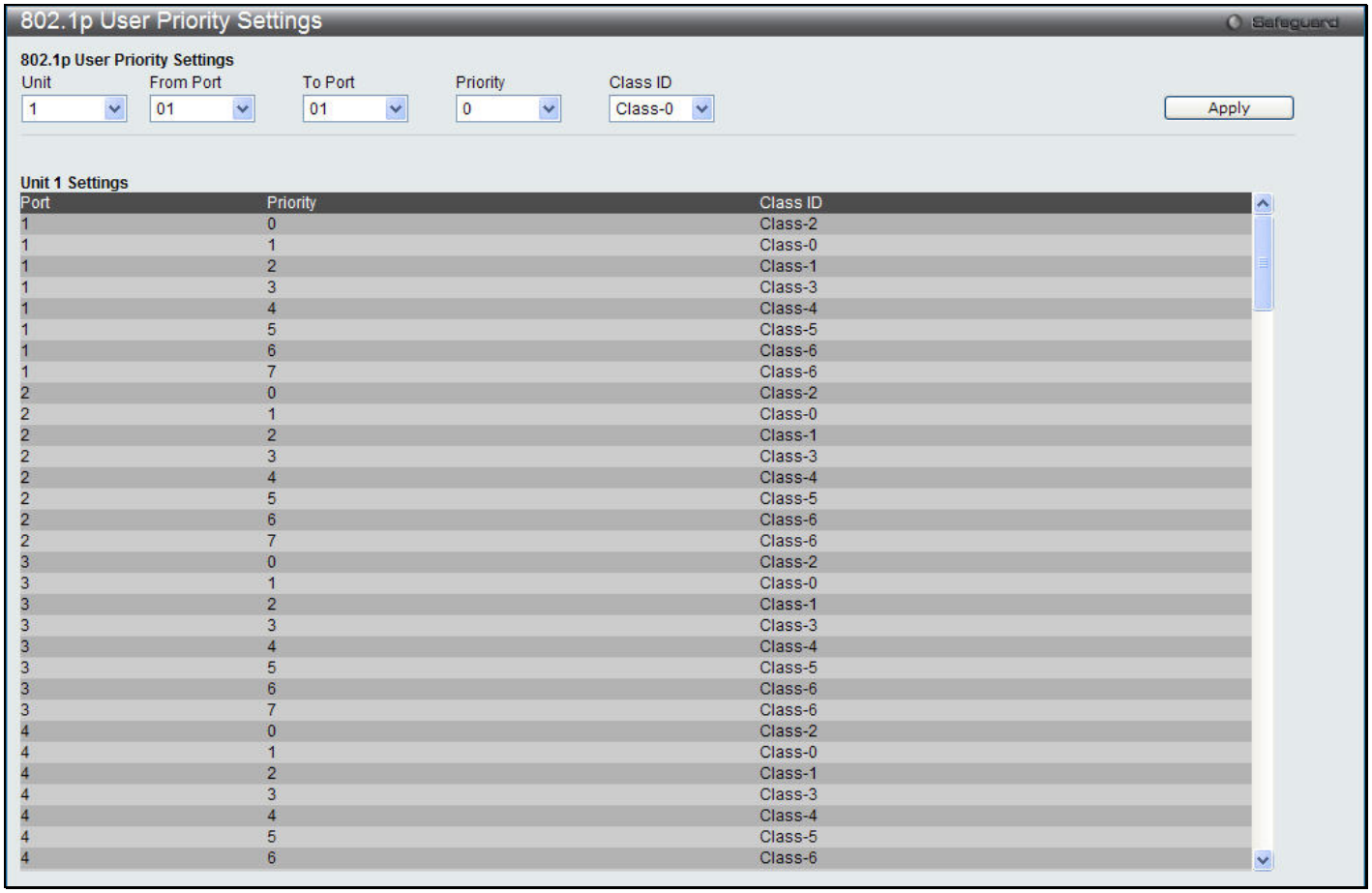


Figure 6-3 802.1p User Priority Settings window

The fields that can be configured are described below:

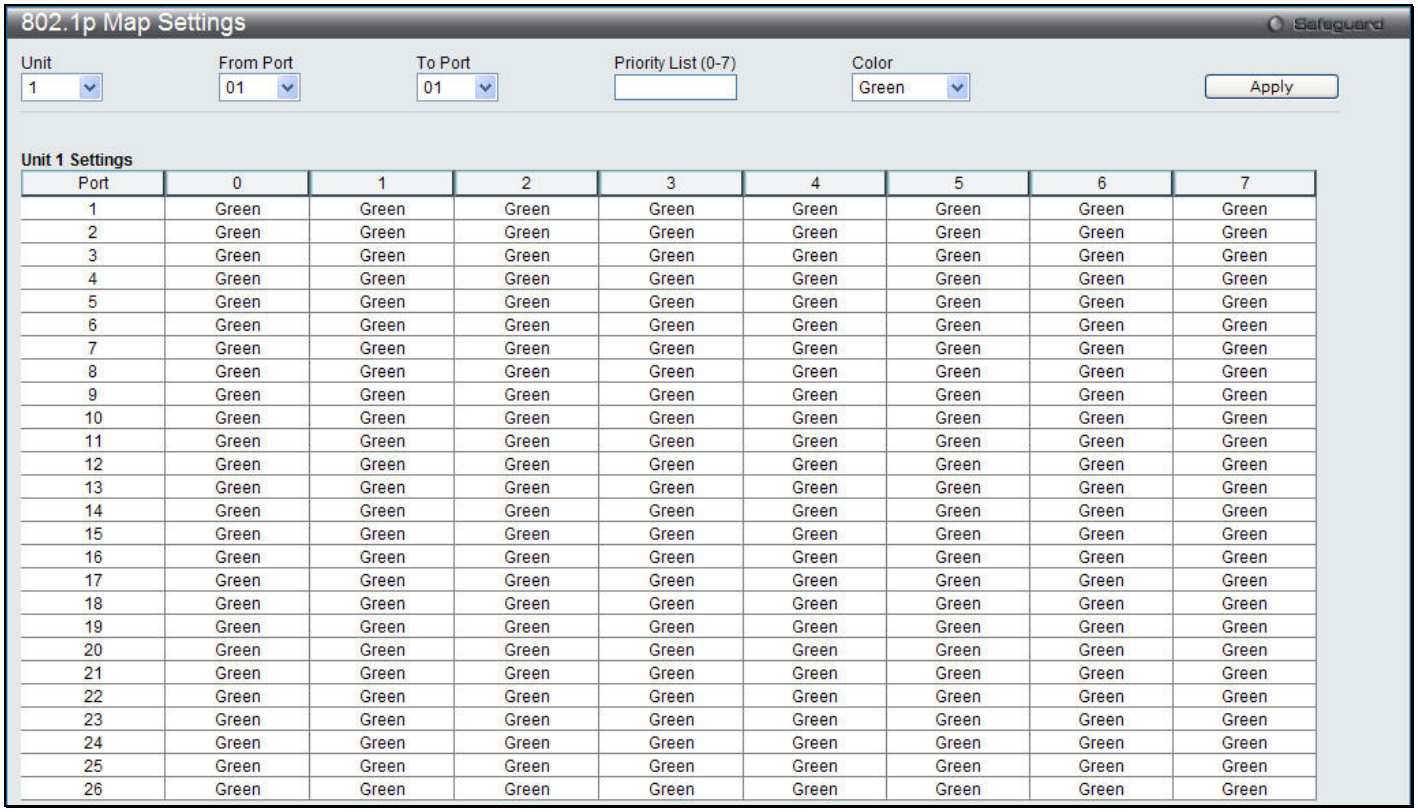
Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the starting and ending ports to use.
Priority	Use the drop-down menu to select a value from *0* to *7*.
Class ID	Once a priority has been assigned to the port groups on the Switch, then a Class may be assigned to each of the eight levels of 802.1p priorities using the drop-down menus on this window. User priority mapping is not only for the default priority configured in the last page, but also for all the incoming tagged packets with 802.1p tag.

Click the **Apply** button to accept the changes made.

802.1p Map Settings

This window is used to enable 802.1p Map Settings.

To view the following window, click **QoS > 802.1p Settings > 802.1p Map Settings**, as shown below:



Port	0	1	2	3	4	5	6	7
1	Green	Green	Green	Green	Green	Green	Green	Green
2	Green	Green	Green	Green	Green	Green	Green	Green
3	Green	Green	Green	Green	Green	Green	Green	Green
4	Green	Green	Green	Green	Green	Green	Green	Green
5	Green	Green	Green	Green	Green	Green	Green	Green
6	Green	Green	Green	Green	Green	Green	Green	Green
7	Green	Green	Green	Green	Green	Green	Green	Green
8	Green	Green	Green	Green	Green	Green	Green	Green
9	Green	Green	Green	Green	Green	Green	Green	Green
10	Green	Green	Green	Green	Green	Green	Green	Green
11	Green	Green	Green	Green	Green	Green	Green	Green
12	Green	Green	Green	Green	Green	Green	Green	Green
13	Green	Green	Green	Green	Green	Green	Green	Green
14	Green	Green	Green	Green	Green	Green	Green	Green
15	Green	Green	Green	Green	Green	Green	Green	Green
16	Green	Green	Green	Green	Green	Green	Green	Green
17	Green	Green	Green	Green	Green	Green	Green	Green
18	Green	Green	Green	Green	Green	Green	Green	Green
19	Green	Green	Green	Green	Green	Green	Green	Green
20	Green	Green	Green	Green	Green	Green	Green	Green
21	Green	Green	Green	Green	Green	Green	Green	Green
22	Green	Green	Green	Green	Green	Green	Green	Green
23	Green	Green	Green	Green	Green	Green	Green	Green
24	Green	Green	Green	Green	Green	Green	Green	Green
25	Green	Green	Green	Green	Green	Green	Green	Green
26	Green	Green	Green	Green	Green	Green	Green	Green

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	A consecutive group of ports may be configured starting with the selected port.
Priority List (0-7)	Enter the priority list from *0* to *7*.
Color	Specify the color *Red*, *Yellow* or *Green*.

Click the **Apply** button to accept the changes made.

Bandwidth Control

The bandwidth control settings are used to place a ceiling on the transmitting and receiving data rates for any selected port.

Bandwidth Control Settings

The Effective RX/TX Rate refers to the actual bandwidth of the Switch port, if it does not match the configured rate. This usually means that the bandwidth has been assigned by a higher priority resource, such as a RADIUS server.

To view the following window, click **QoS > Bandwidth Control > Bandwidth Control Settings**, as shown below:

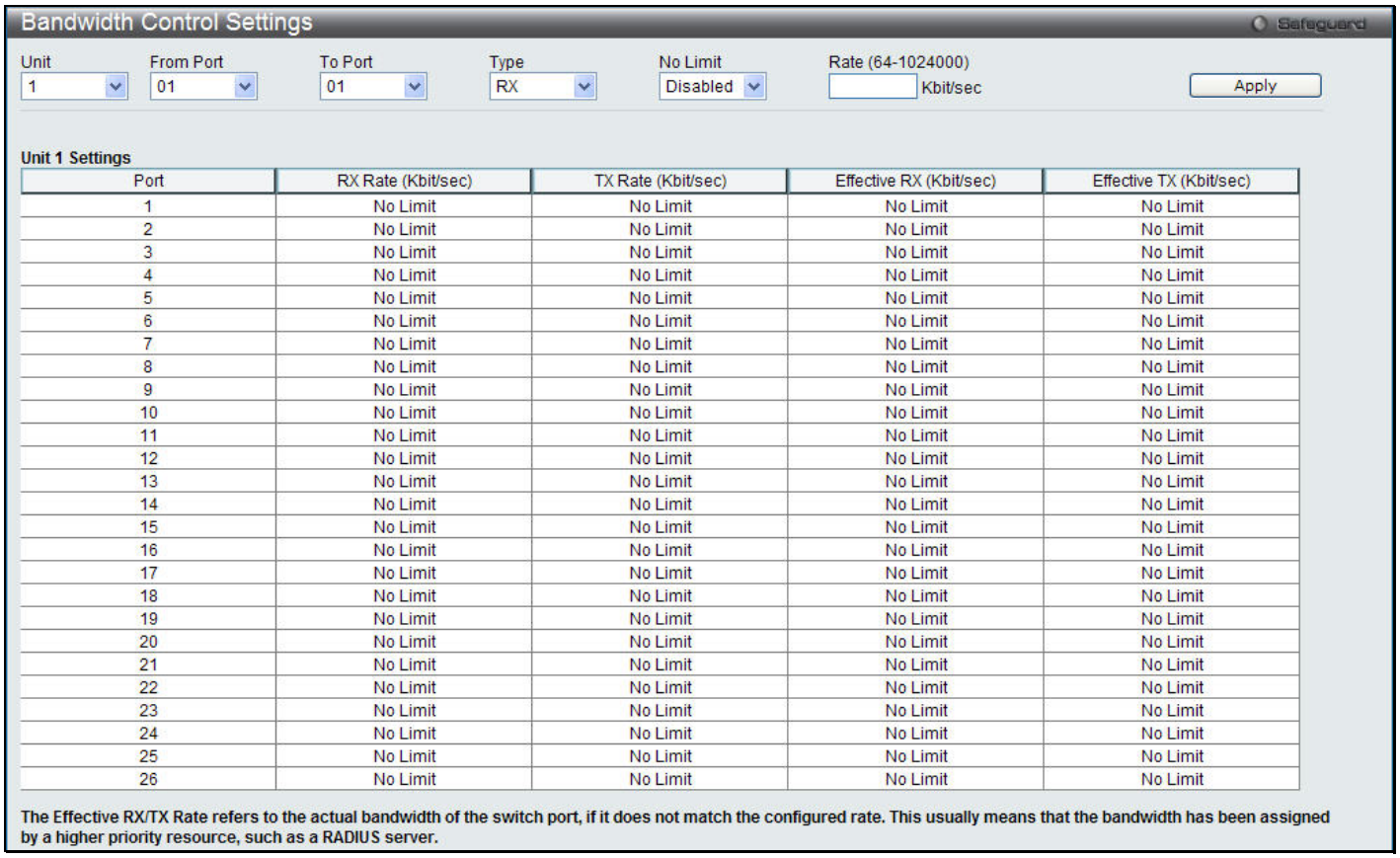


Figure 6-4 Bandwidth Control Settings window

The fields that can be configured or viewed are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
Type	This drop-down menu allows a selection between *RX* (receive), *TX* (transmit), and *Both*. This setting will determine whether the bandwidth ceiling is applied to receiving, transmitting, or both receiving and transmitting packets.
No Limit	This drop-down menu allows the user to specify that the selected port will have no bandwidth limit or not. **NOTE:** If the configured number is larger than the port speed, it means no bandwidth limit.

Rate (64-1024000)	This field allows the input of the data rate that will be the limit for the selected port. The user may choose a rate between *64* and *1024000* Kbits per second.
Effective RX	If a RADIUS server has assigned the RX bandwidth, then it will be the effective RX bandwidth. The authentication with the RADIUS sever can be per port or per user. For per user authentication, there may be multiple RX bandwidths assigned if there are multiple users attached to this specific port. The final RX bandwidth will be the largest one among these multiple RX bandwidths.
Effective TX	If a RADIUS server has assigned the TX bandwidth, then it will be the effective TX bandwidth. The authentication with the RADIUS sever can be per port or per user. For per user authentication, there may be multiple TX bandwidths assigned if there are multiple users attached to this specific port. The final TX bandwidth will be the largest one among these multiple TX bandwidths.

Click the **Apply** button to accept the changes made.

Queue Bandwidth Control Settings

To view this window, click **QoS > Bandwidth Control > Queue Bandwidth Control Settings**, as shown below.

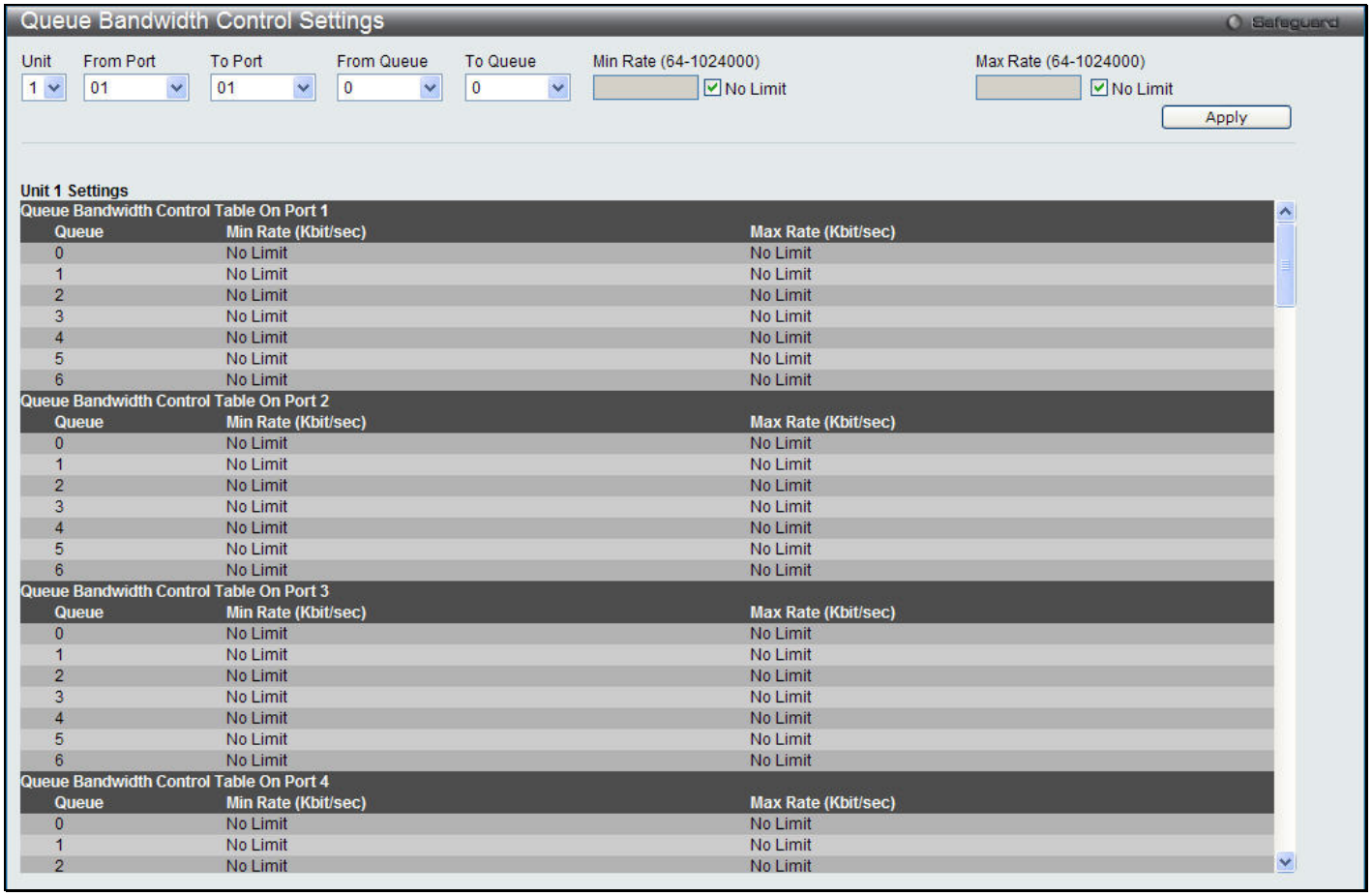


Figure 6-5 Queue Bandwidth Control Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
From Queue / To Queue	Use the drop-down menu to select the queue range to use for this configuration.
Min Rate (64-1024000)	Enter the minimum rate for the queue. For no limit, tick the No Limit check box.
Max Rate (64-1024000)	Enter the maximum rate for the queue. For no limit, tick the No Limit check box.

Click the **Apply** button to accept the changes made.

NOTE: The minimum granularity of queue bandwidth control is 64Kbit/sec. The system will adjust the number to the multiple of 64 automatically.

Traffic Control Settings

On a computer network, packets such as Multicast packets and Broadcast packets continually flood the network as normal procedure. At times, this traffic may increase due to a malicious end station on the network or a malfunctioning device, such as a faulty network card. Thus, switch throughput problems will arise and consequently affect the overall performance of the Switch network. To help rectify this packet storm, the Switch will monitor and control the situation.

Packet storms are monitored to determine if too many packets are flooding the network based on threshold levels provided by the user. Once a packet storm has been detected, the Switch will drop overload packets coming into the Switch until the storm has subsided. This method can be utilized by selecting the *Drop* option of the Action parameter in the window below.

The Switch will also scan and monitor packets coming into the Switch by monitoring the Switch's chip counter. This method is only viable for Broadcast and Multicast storms because the chip only has counters for these two types of packets. Once a storm has been detected (that is, once the packet threshold set below has been exceeded), the Switch will shut down the port to all incoming traffic, with the exception of STP BPDU packets, for a time period specified using the Count Down parameter.

If a Time Interval parameter times-out for a port configured for traffic control and a packet storm continues, that port will be placed in Shutdown Forever mode, which will cause a warning message to be sent to the Trap Receiver. Once in Shutdown Forever mode, the method of recovering the port is to manually recoup it using the **Port Settings** window (**System Configuration > Port Configuration > Port Settings**) or automatic recovering after the time period that is configured in the Traffic Auto Recover Time field. Select the disabled port and return its State to *Enabled* status. To utilize this method of Storm Control, choose the *Shutdown* option of the Action parameter in the window below.

Use this window to enable or disable storm control and adjust the threshold for multicast and broadcast storms.

To view the following window, click **QoS > Traffic Control Settings**, as shown below:

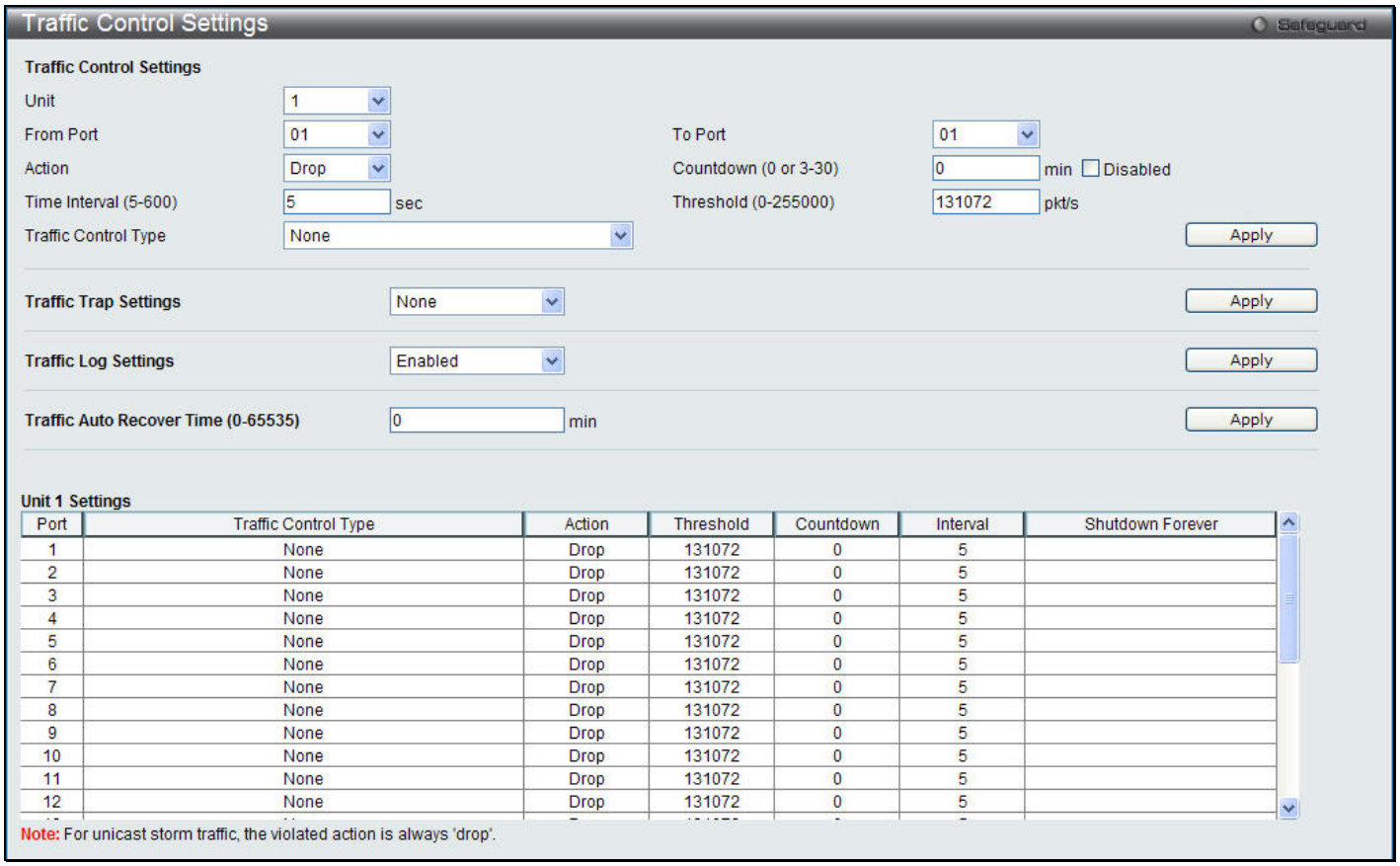


Figure 6-6 Traffic Control Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
Action	Select the method of traffic control from the pull-down menu. The choices are: *Drop* – Utilizes the hardware Traffic Control mechanism, which means the Switch's hardware will determine the Packet Storm based on the Threshold value stated and drop packets until the issue is resolved. *Shutdown* – Utilizes the Switch's software Traffic Control mechanism to determine the Packet Storm occurring. Once detected, the port will deny all incoming traffic to the port except STP BPDU packets, which are essential in keeping the Spanning Tree operational on the Switch. If the Count Down timer has expired and yet the Packet Storm continues, the port will be placed in Shutdown Forever mode and is no longer operational until the port recovers after 5 minutes automatically or the user manually resets the port using the **Port Settings** window (**Configuration> Port Configuration> Port Settings**). Choosing this option obligates the user to configure the Time Interval setting as well, which will provide packet count samplings from the Switch's chip to determine if a Packet Storm is occurring.
Count Down (0 or 3-30)	The Count Down timer is set to determine the amount of time, in minutes, that the Switch will wait before shutting down the port that is experiencing a traffic storm. This parameter is only useful for ports configured as *Shutdown* in their Action field and therefore will not operate for hardware-based Traffic Control implementations. The possible time settings for this field are *0* and *3* to *30* minutes. Entering *0* means never go into Shutdown mode. Tick the Disabled check box to go into Shutdown mode

	immediately.
Time Interval (5-600)	The Time Interval will set the time between Multicast and Broadcast packet counts sent from the Switch's chip to the Traffic Control function. These packet counts are the determining factor in deciding when incoming packets exceed the Threshold value. The Time Interval may be set between *5* and *600* seconds, with a default setting of *5* seconds.
Threshold (0-255000)	Specifies the maximum number of packets per second that will trigger the Traffic Control function to commence. The configurable threshold range is from *0-255000* with a default setting of *131072* packets per second.
Traffic Control Type	Specifies the desired Storm Control Type: *None*, *Broadcast*, *Multicast*, *Unknown Unicast*, *Broadcast* + *Multicast*, *Broadcast* + *Unknown Unicast*, *Multicast* + *Unknown Unicast*, and *Broadcast* + *Multicast* + *Unknown Unicast*.
Traffic Trap Settings	Enable sending of Storm Trap messages when the type of action taken by the Traffic Control function in handling a Traffic Storm is one of the following: *None* – Will send no Storm trap warning messages regardless of action taken by the Traffic Control mechanism. *Storm Occurred* – Will send Storm Trap warning messages upon the occurrence of a Traffic Storm only. *Storm Cleared* – Will send Storm Trap messages when a Traffic Storm has been cleared by the Switch only. *Both* – Will send Storm Trap messages when a Traffic Storm has been both detected and cleared by the Switch. This function cannot be implemented in the hardware mode. (When *Drop* is chosen for the Action parameter)
Traffic Log Settings	Use the drop-down menu to enable or disable traffic log.
Traffic Auto Recover Time (0-65535)	Enter a time for traffic auto recovery.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: Traffic Control cannot be implemented on ports that are set for Link Aggregation (Port Trunking).

NOTE: Ports that are in the Shutdown mode will be seen as Discarding in Spanning Tree windows and implementations though these ports will still be forwarding BPDUs to the Switch's CPU.

NOTE: Ports that are in Shutdown Forever mode will be seen as link down in all windows and screens until the user recovers these ports.

NOTE: The minimum granularity of storm control on a GE port is 1pps.

DSCP

DSCP Trust Settings

This page is to configure the DSCP trust state of ports. When ports are under the DSCP trust mode, the Switch will insert the priority tag to untagged packets by using the DSCP Map settings instead of the default port priority.

To view the following window, click **QoS > DSCP > DSCP Trust Settings**, as shown below:

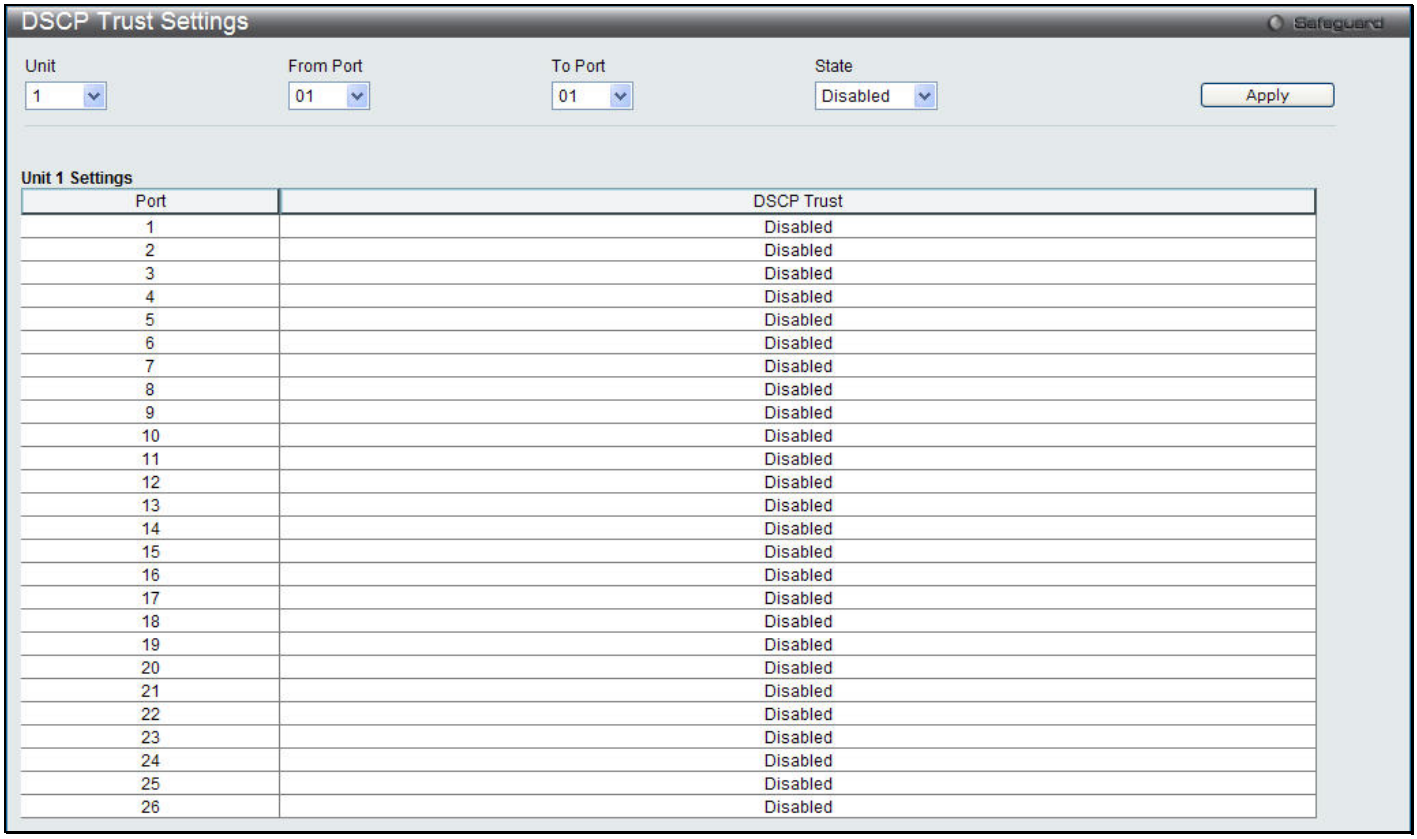


Figure 6-7 DSCP Trust Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select a range of port to configure.
State	Enable/disable to trust DSCP. By default, DSCP trust is disabled.

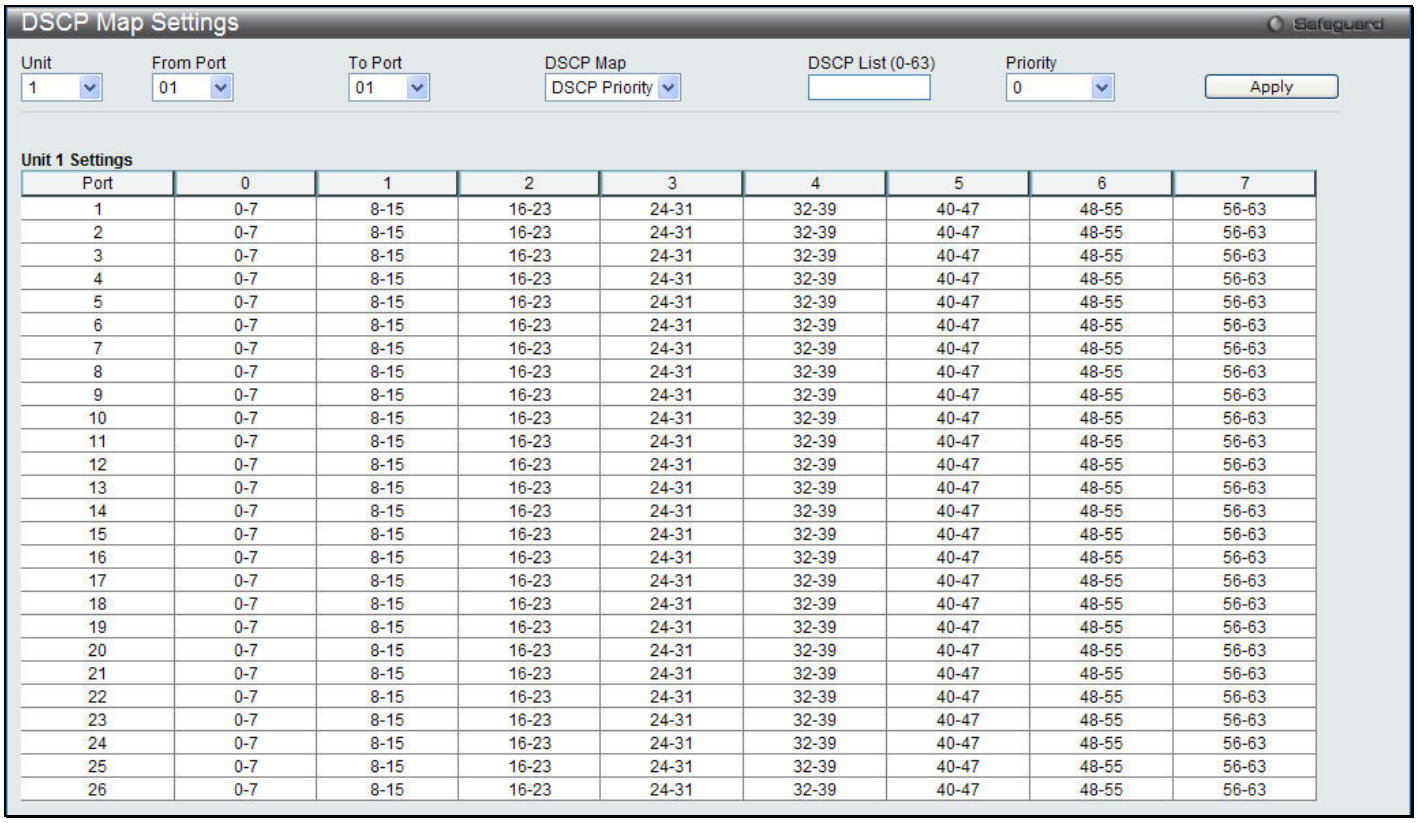
Click the **Apply** button to accept the changes made.

DSCP Map Settings

The mapping of DSCP to queue will be used to determine the priority of the packet (which will be then used to determine the scheduling queue) when the port is in DSCP trust state.

The DSCP-to-DSCP mapping is used in the swap of DSCP of the packet when the packet is ingresses to the port. The remaining processing of the packet will base on the new DSCP. By default, the DSCP is mapped to the same DSCP.

To view the following window, click **QoS > DSCP > DSCP Map Settings**, as shown below:



Port	0	1	2	3	4	5	6	7
1	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
2	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
3	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
4	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
5	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
6	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
7	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
8	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
9	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
10	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
11	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
12	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
13	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
14	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
15	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
16	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
17	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
18	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
19	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
20	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
21	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
22	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
23	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
24	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
25	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
26	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63

Figure 6-8 DSCP Map Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select a range of port to configure.
DSCP Map	Use the drop-down menu to select one of three options: *DSCP Priority* – Specify a list of DSCP values to be mapped to a specific priority. *DSCP DSCP* – Specify a list of DSCP value to be mapped to a specific DSCP. *DSCP Color* - Specify a list of DSCP values to be mapped to a specific color.
DSCP List (0-63)	Enter a DSCP List value.
Priority	Use the drop-down menu to select a Priority value.

Click the **Apply** button to accept the changes made.

To view the following window, click **QoS > DSCP > DSCP Map Settings** and select **DSCP DSCP** from the DSCP Map drop-down menu, as shown below:

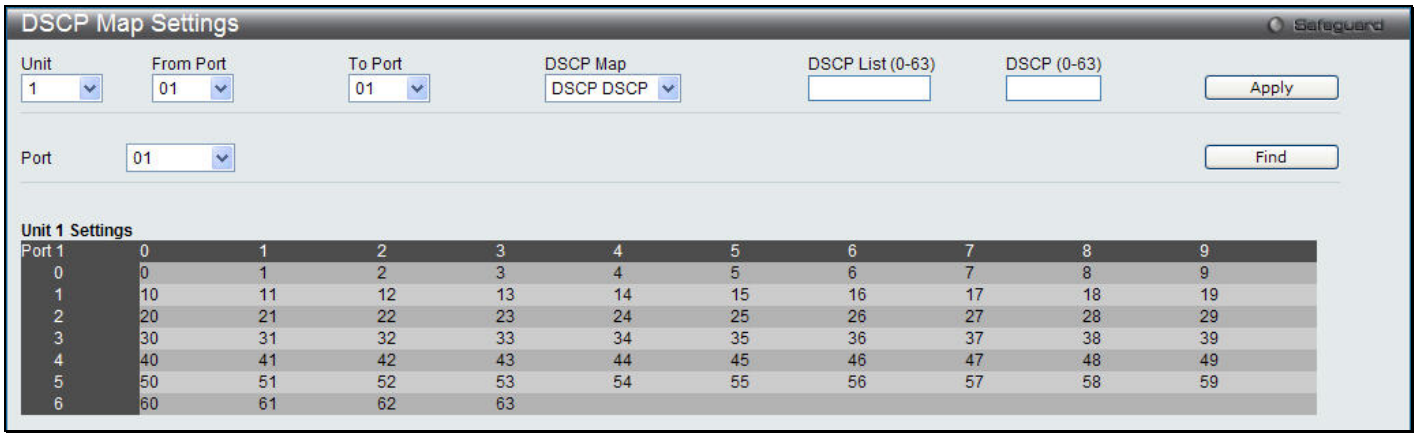


Figure 6-9 DSCP Map Settings - DSCP DSCP window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select a range of port to configure.
DSCP Map	Use the drop-down menu to select one of two options: *DSCP Priority* – Specify a list of DSCP values to be mapped to a specific priority. *DSCP DSCP* – Specify a list of DSCP value to be mapped to a specific DSCP. *DSCP Color* - Specify a list of DSCP values to be mapped to a specific color.
DSCP List (0-63)	Enter a DSCP List value.
DSCP (0-63)	Enter a DSCP value. This appears when selecting **DSCP DSCP** in the DSCP Map drop-down menu.

Click the **Apply** button to accept the changes made.

To view the following window, click **QoS > DSCP > DSCP Map Settings** and select **DSCP Color** from the DSCP Map drop-down menu, as shown below:

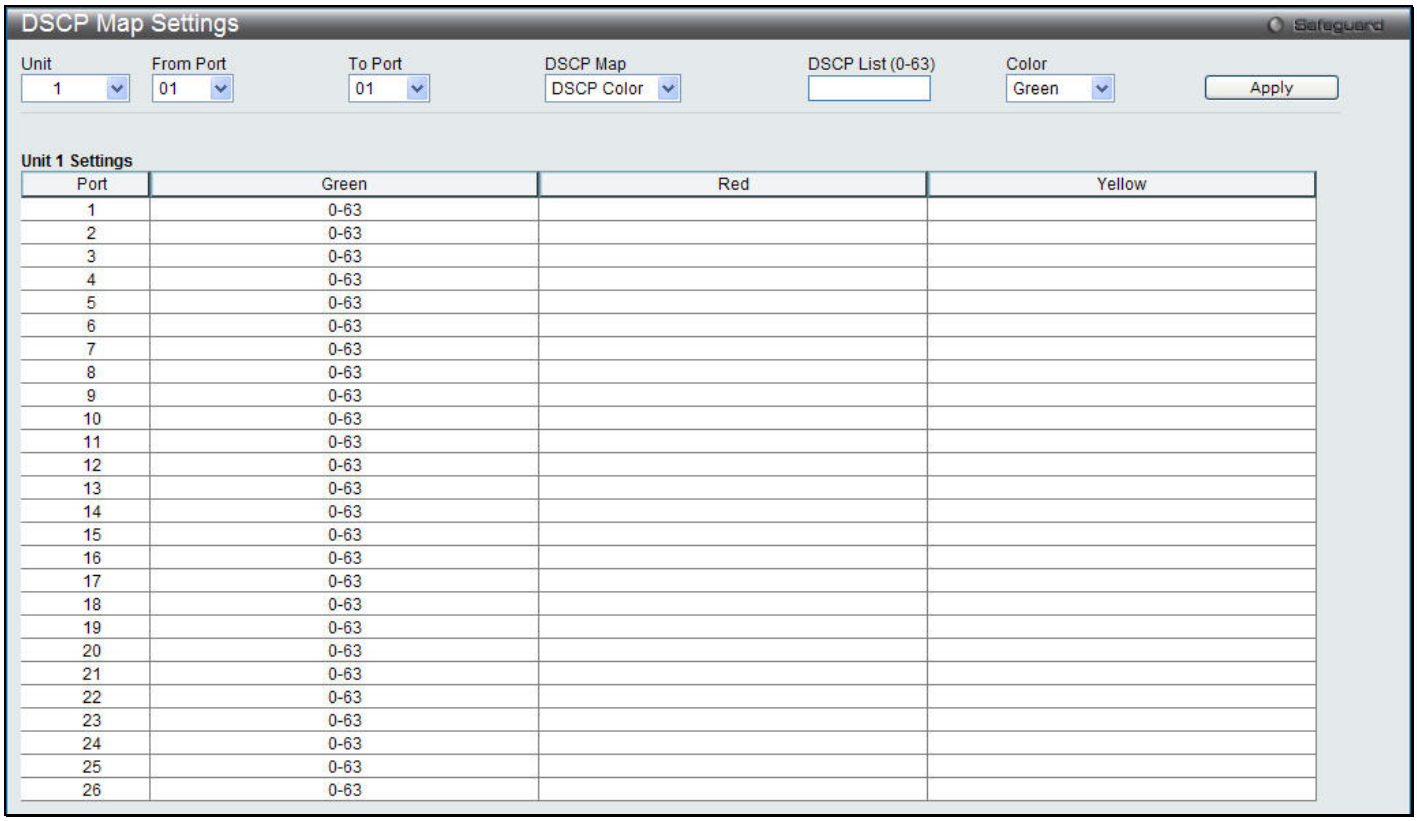


Figure 6-10 DSCP Map Settings - DSCP Color window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menu to select a range of port to configure.
DSCP Map	Use the drop-down menu to select one of two options: *DSCP Priority* – Specify a list of DSCP values to be mapped to a specific priority. *DSCP DSCP* – Specify a list of DSCP value to be mapped to a specific DSCP. *DSCP Color* - Specify a list of DSCP values to be mapped to a specific color.
DSCP List (0-63)	Enter a DSCP List value.
Color	Use the drop-down menu to specify the result color of the mapping.

Click the **Apply** button to accept the changes made.

HOL Blocking Prevention

HOL (Head of Line) Blocking happens when one of the destination ports of a broadcast or multicast packet are busy. The Switch will hold this packet in the buffer while the other destination port will not transmit the packet even they are not busy.

The HOL Blocking Prevention will ignore the busy port and forward the packet directly to have lower latency and better performance.

On this page the user can enable or disable HOL Blocking Prevention.

To view the following window, click **QoS > HOL Blocking Prevention**, as shown below:

Figure 6-11 HOL blocking Prevention window

The fields that can be configured are described below:

Parameter	Description
HOL Blocking Prevention State	Click the radio buttons to enable of disable the HOL blocking prevention global settings.

Click the **Apply** button to accept the changes made.

Scheduling Settings

QoS Scheduling

This window specifies the rotation mechanism regarding to the packets in the seven hardware priority queue are being handled and emptied.

To view this window, click **QoS > Scheduling Settings > QoS Scheduling**, as shown below:

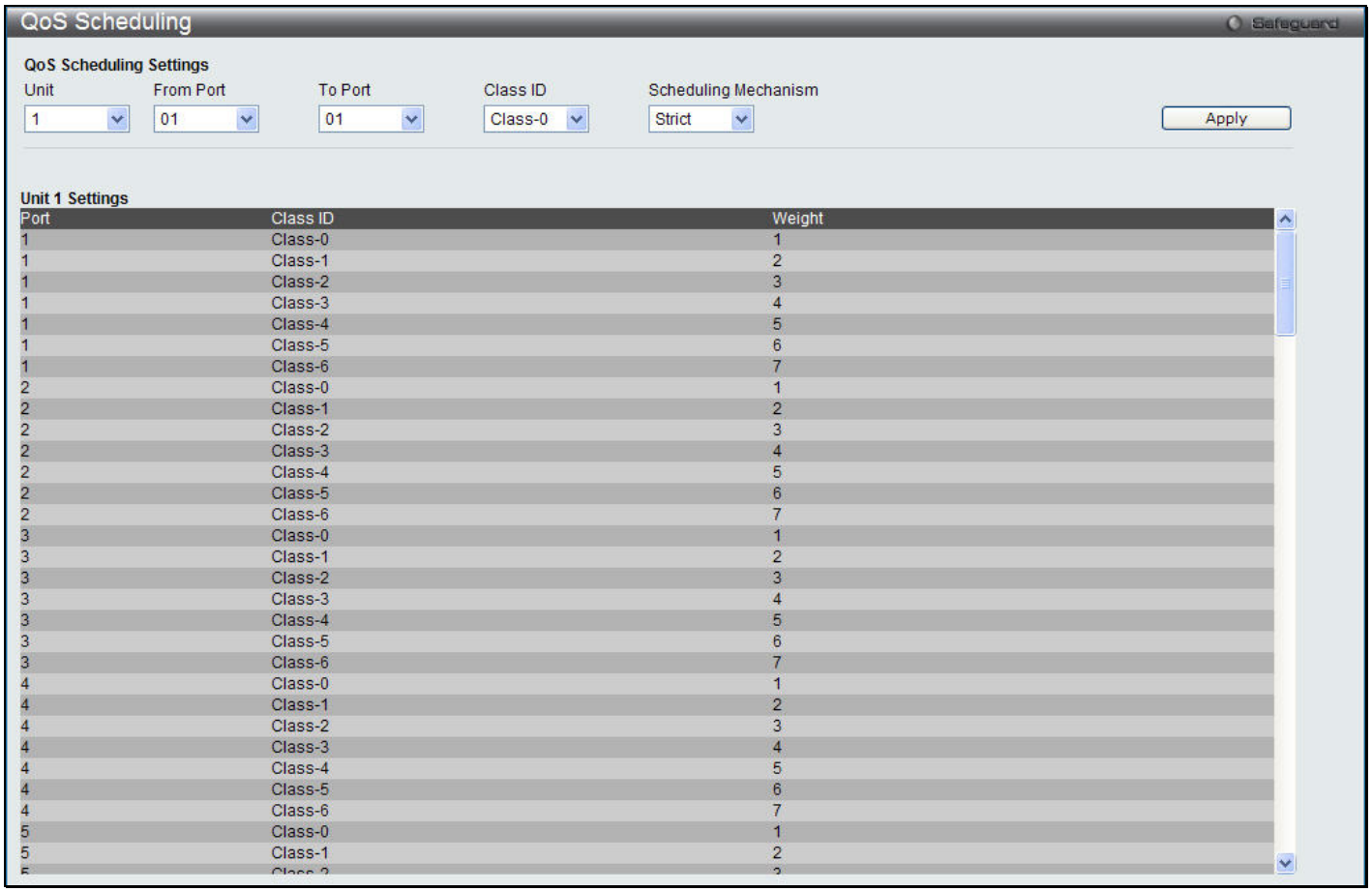


Figure 6-12 QoS Scheduling window

The following parameters can be configured:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Enter the port or port list to configure.
Class ID	Select the Class ID, from *0* to *6* to configure for the QoS parameters.
Scheduling Mechanism	*Strict* – Select to have the queue always in the strict mode. *Weight* – Use the weighted round-robin (*WRR*) algorithm to handle packets in an even distribution in priority classes of service.

Click the **Apply** button to accept the changes made.

QoS Scheduling Mechanism

Changing the output scheduling used for the hardware queues in the Switch can customize QoS. As with any changes to QoS implementation, careful consideration should be given to how network traffic in lower priority queues are affected. Changes in scheduling may result in unacceptable levels of packet loss or significant transmission delays. If you choose to customize this setting, it is important to monitor network performance, especially during peak demand, as bottlenecks can quickly develop if the QoS settings are not suitable.

To view this window, click **QoS > Scheduling Settings > QoS Scheduling Mechanism**, as shown below:

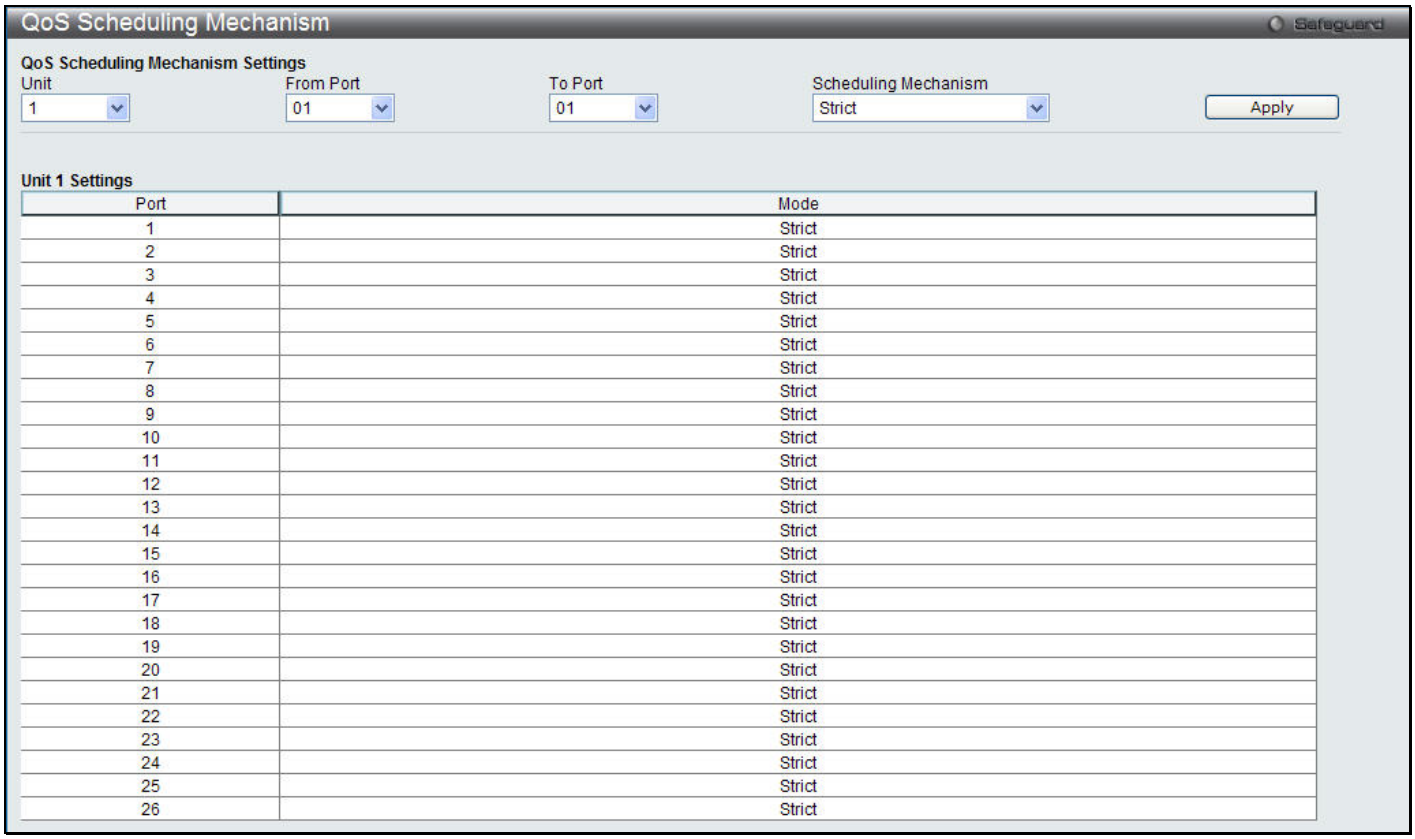


Figure 6-13 QoS Scheduling Mechanism window

The following parameters can be configured:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Enter the port or port list to configure.
Scheduling Mechanism	*Strict* – The highest class of service is the first to process traffic. That is, the highest class of service will finish before other queues empty. *Weighted Round Robin* – Use the weighted round-robin algorithm to handle packets in an even distribution in priority classes of service.

Click the **Apply** button to accept the changes made.

NOTE: The settings you assign to the queues, numbers 0-7, represent the IEEE 802.1p priority tag number. Do not confuse these settings with port numbers.

SRED

Random Early Detection (RED) is a congestion avoidance mechanism at the gateway in packet switched networks. RED gateways keep the average queue size low while allowing occasional bursts of packets in the queue. Simple random early detection (sRED) is a simplified RED mechanism based on ASIC capability. The Switch provides support for sRED through active queue management by probabilistic dropping of incoming colored packets.

Active queue management is a class of algorithms that attempt to proactively drop or mark frames before congestion becomes excessive. The goal is to detect the onset of persistent congestion and take proactive action so that TCP sources contributing to the congestion back off gracefully, insuring good network utilization while minimizing frame loss.

This proactive approach starts discarding specific colored packets before the packet buffer becomes full. If this queue depth is less than the threshold, there is minimal (or no) congestion and the packet is enquired. If congestion is detected the packet is dropped or queued based on the DSCP.

Simple RED process packets based on colored packets. All packets is green color by default, and you can assigned packet color through three ways:

- Map DSCP to three colors.
- Map 802.1p priority to three colors.
- Flow meter action, assigned conform packets green color, assigned exceed packets yellow color and violate packets red color.

When a packet arrives, the following events occur:

- The current queue length is calculated by hardware.
- If the current queue length is less than the minimum queue threshold, the arriving packet is queued.
- If the current queue length is between the minimum queue threshold and the maximum threshold, the packet is either dropped or queued, depending on the packet drop probability. sRED use configurable drop rate for different color at special threshold.
- If the average queue length is greater than the maximum threshold, the packet is automatically dropped.

SRED Settings

This window is used to configure sRED settings.

To view this window, click **QoS > SRED > SRED Settings**, as shown below:

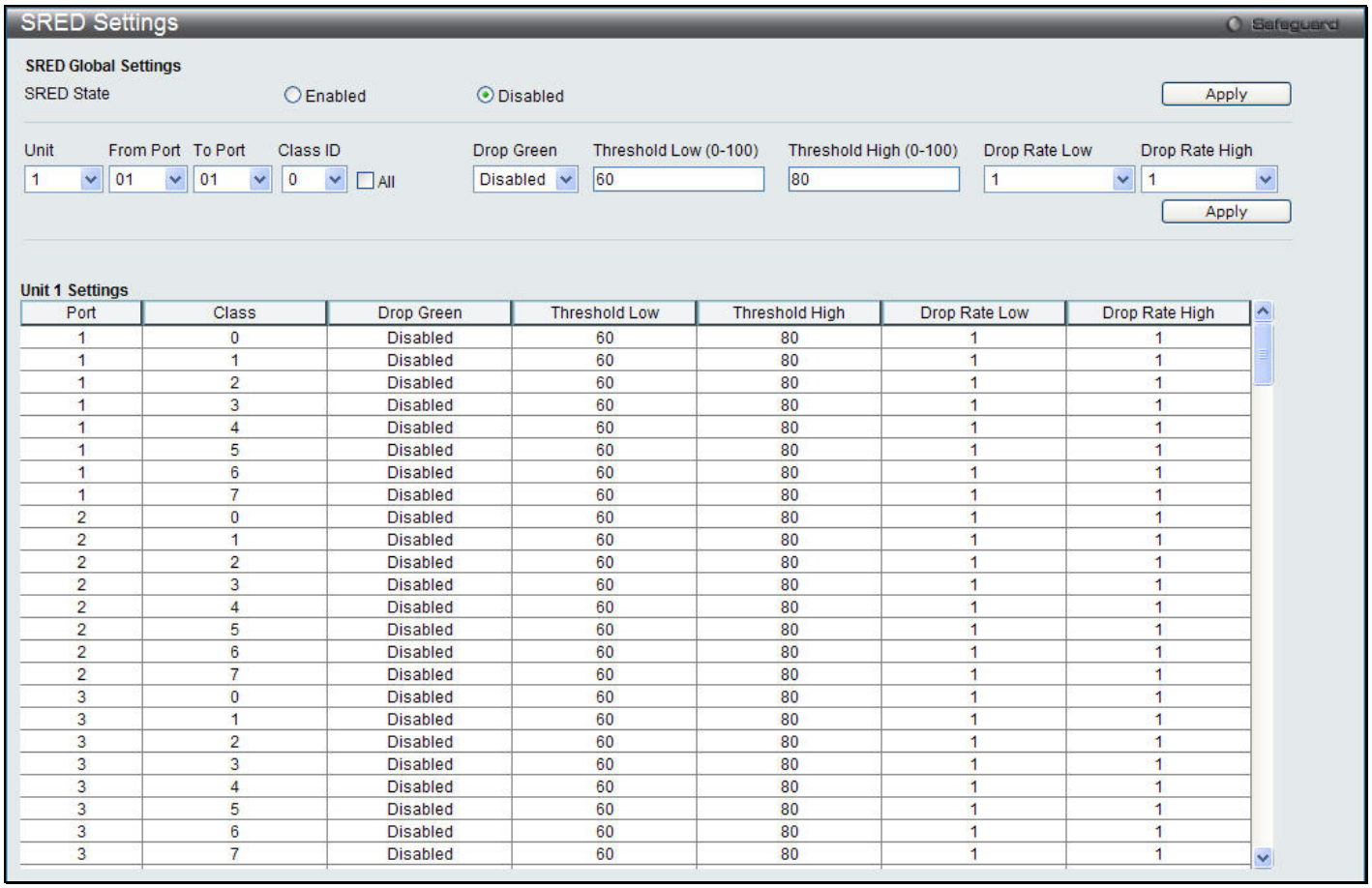


Figure 6-14 SRED Settings window

The following parameters can be configured:

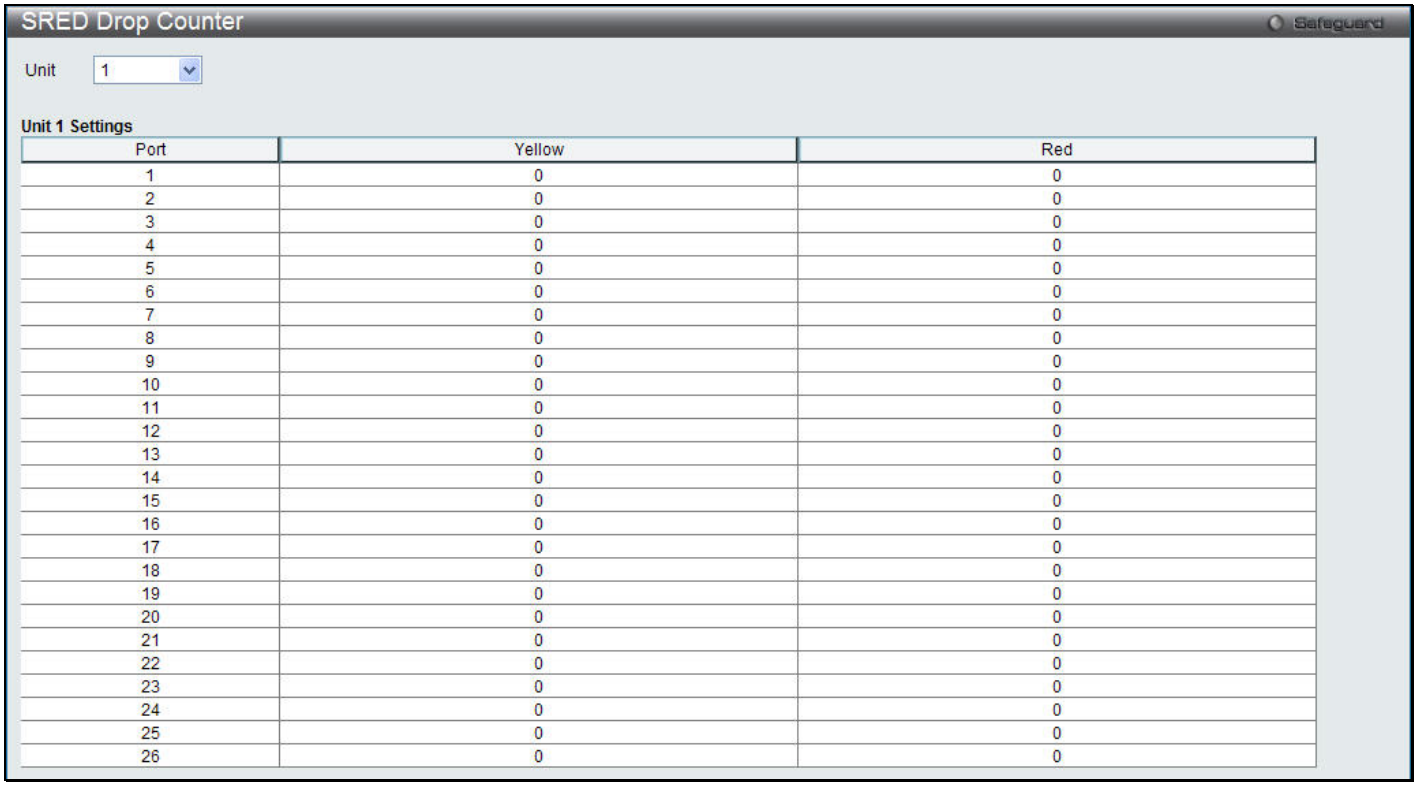
Parameter	Description
SRED State	Click the radio buttons to enable or disable sRED.
Unit	Select the unit to configure.
From Port / To Port	Enter the port or port list to configure.
Class ID	Use the drop-down menu to select the class ID. Tick the All check box to apply to all class ID.
Drop Green	Select *Disable* to drop red colored packets if the queue depth is above the low threshold, and drop yellow colored packets if the queue depth is above the high threshold. Select *Enable* to drop yellow and red colored packets if the queue depth is above the low threshold, and drop green colored packets if the queue depth is above the high threshold.
Threshold Low (0-100)	Specify the low percent of space utilized. By default, the value is *60*. The range is *0* to *100*.
Threshold High (0-100)	Specify the high percent of queue space utilized. By default, the value is *80*. The range is *0* to *100*.
Drop Rate Low	Specify the drop rate of the low threshold.
Drop Rate High	Specify the drop rate of the high threshold.

Click the **Apply** button to accept the changes made for each individual section.

SRED Drop Counter

This window is used to display sRED drop counter.

To view this window, click **QoS > SRED > SRED Drop Counter**, as shown below:



Port	Yellow	Red
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0

Figure 6-15 SRED Drop Counter window

The fields that can be configured are described below:

Parameter	Description
Unit	Use the drop-down menu to select a unit.

Chapter 7 ACL

ACL Configuration Wizard
Access Profile List
CPU Access Profile List
ACL Finder
ACL Flow Meter

ACL Configuration Wizard

The ACL Configuration Wizard will aid the user in the creation of access profiles and ACL Rules automatically by simply inputting the address or service type and the action needed. It saves administrators a lot of time.

To view this window, click **ACL > ACL Configuration Wizard**, as shown below:

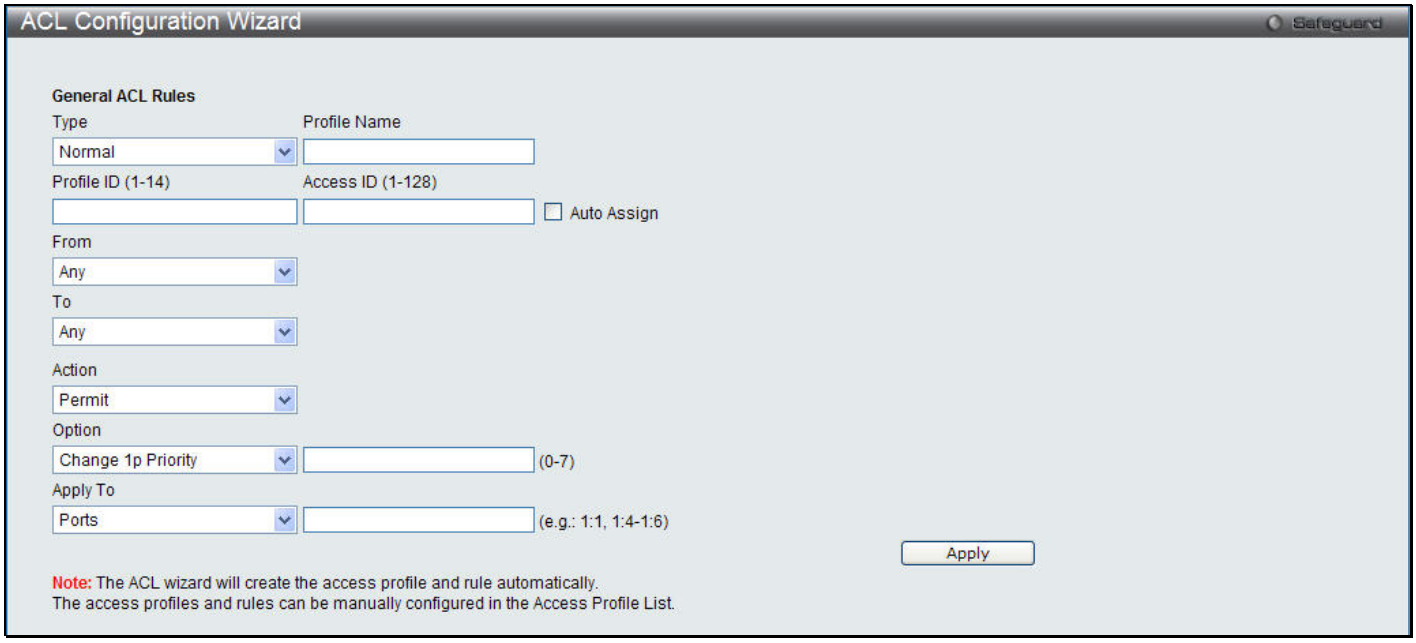


Figure 7-1 ACL Configuration Wizard window

The fields that can be configured are described below:

Parameter	Description
Type	Select one of two general ACL Rule types: *Normal* – Selecting this option will create a Normal ACL Rule. *CPU* – Selecting this option will create a CPU ACL Rule.
Profile Name	After selecting to configure a Normal type rule, enter the Profile Name for the new rule here.
Profile ID (1-14)	Enter the Profile ID for the new rule.
Access ID (1-128)	Enter the Access ID for the new rule. Selecting the Auto Assign option will allow the Switch to automatically assign an unused access ID to this rule.
From / To	This rule can be created to apply to four different categories: *Any* – Selecting this option will include any starting category to this rule. *MAC Address* – Selecting this option will allow the user to enter a range of MAC addresses

	for this rule. *IPv4 Address* – Selecting this option will allow the user to enter a range of IPv4 addresses for this rule. *IPv6* – Selecting this option will allow the user to enter a range of IPv6 addresses for this rule.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select *Mirror* to specify that packets that match the access profile are mirrored to a port defined in the mirror port section. Port Mirroring must be enabled and a target port must be set.
Option	After selecting the Permit action, the user can select one of the following options: *Change 1p Priority* – Enter the 1p priority value. *Replace DSCP* – Enter the DSCP value. *Replace ToS Precedence* – Enter the ToS Precedence value.
Apply To	Select and enter the object that this rule will be applied to. *Ports* – Enter a port number or a port range. *VLAN Name* – Enter the VLAN name. *VLAN ID* – Enter the VID.

Click the **Apply** button to accept the changes made.

NOTE: The Switch will use one minimum mask to cover all the terms that user input, however, some extra bits may also be masked at the same time. To optimize the ACL profile and rules, please use manual configuration.

Access Profile List

Access profiles allow you to establish criteria to determine whether the Switch will forward packets based on the information contained in each packet's header.

To view Access Profile List window, click **ACL > Access Profile List**, as shown below:

The Switch supports four Profile Types, Ethernet ACL, IPv4 ACL, IPv6 ACL, and Packet Content ACL.

Creating an access profile is divided into two basic parts. The first is to specify which part or parts of a frame the Switch will examine, such as the MAC source address or the IP destination address. The second part is entering the criteria the Switch will use to determine what to do with the frame. The entire process is described below in two parts.

Users can display the currently configured Access Profiles on the Switch.

NOTE: By default, R2.60 supports only 12 ACL profiles and 1536 rules as compared to support for 14 profiles and 1792 rules in R2.01. As a consequence, some ACL settings in previous configuration files may be lost after firmware upgrade. To have access to all 14 ACL profiles and 1792 rules, disable the local routing feature and reload the configuration.

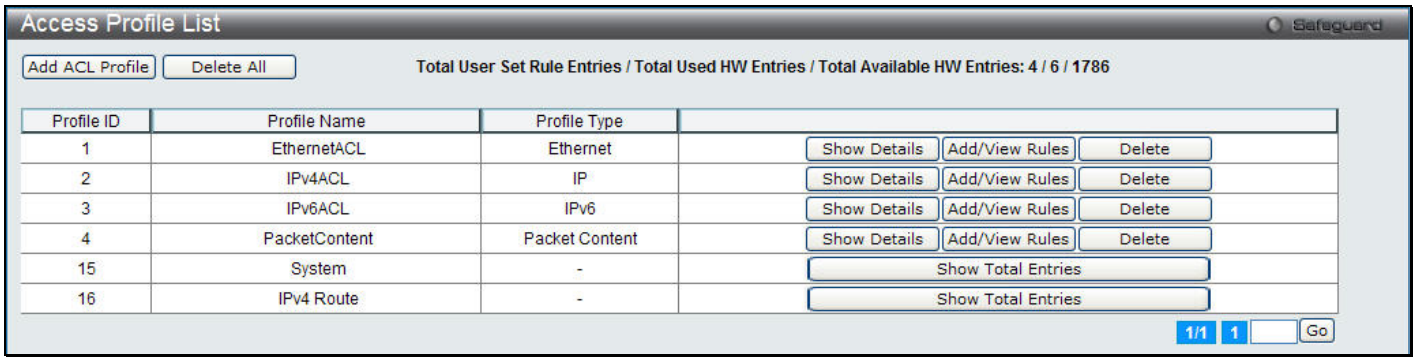


Figure 7-2 Access Profile List window

Click the **Add ACL Profile** button to add an entry to the **Access Profile List**.
Click the **Delete All** button to remove all access profiles from this table.
Click the **Show Details** button to display the information of the specific profile ID entry.
Click the **Add/View Rules** button to view or add ACL rules within the specified profile ID.
Click the **Delete** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

There are four **Add Access Profile** windows;

- one for Ethernet (or MAC address-based) profile configuration,
- one for IPv6 address-based profile configuration,
- one for IPv4 address-based profile configuration, and
- one for packet content profile configuration.

Add an Ethernet ACL Profile

The window shown below is the Add ACL Profile window for Ethernet. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:

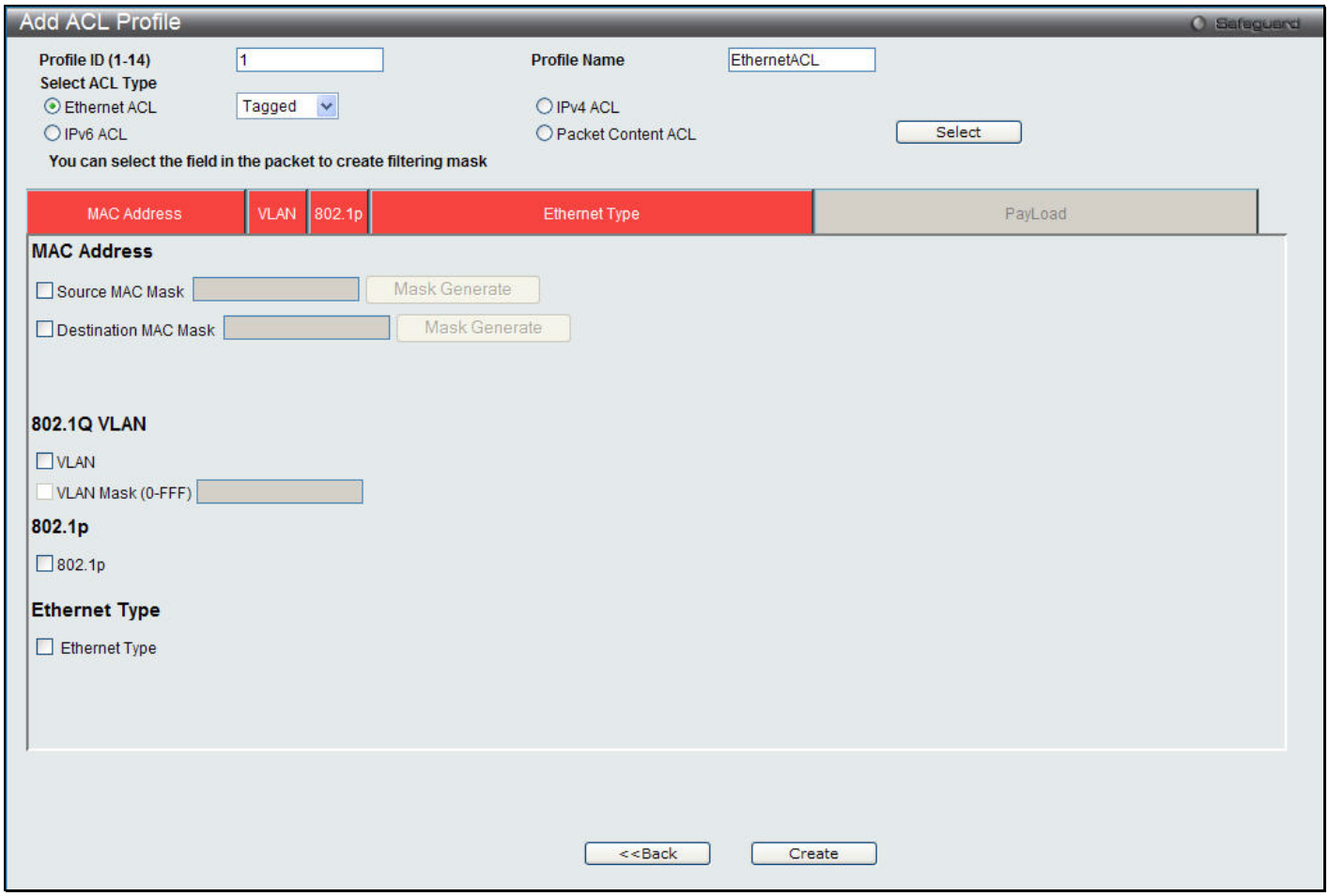


Figure 7-3 Add ACL Profile window (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID	Enter a unique identifier number for this profile set. This value can be set from *1* to *14.*
Profile Name	Enter a profile name for the profile created.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IPv4 address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to instruct the Switch to examine the packet content in each frame's header.
Source MAC Mask	Enter a MAC address mask for the source MAC address.
Destination MAC Mask	Enter a MAC address mask for the destination MAC address.
802.1Q VLAN	Selecting this option instructs the Switch to examine the 802.1Q VLAN identifier of each packet header and use this as the full or partial criterion for forwarding.
802.1p	Selecting this option instructs the Switch to examine the 802.1p priority value of each

	packet header and use this as the, or part of the criterion for forwarding.
Ethernet Type	Selecting this option instructs the Switch to examine the Ethernet type value in each frame's header.

Click the **Select** button to select an ACL type. Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following window will appear:

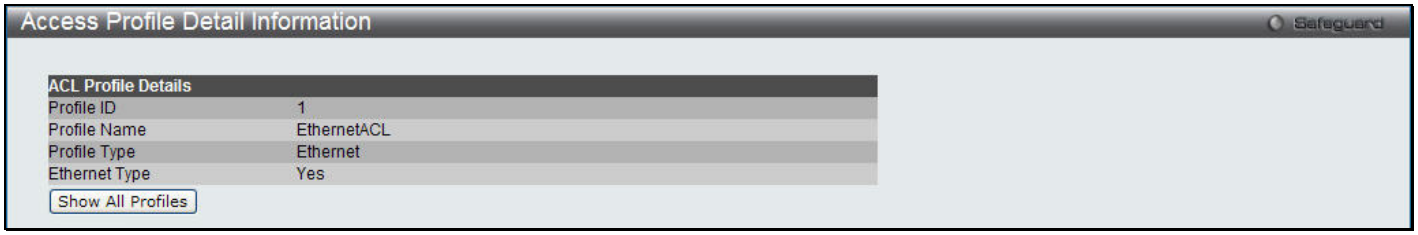


Figure 7-4 Access Profile Detail Information window (Ethernet ACL)

Click the **Show All Profiles** button to navigate back to the **Access Profile List** window.

After clicking the **Add/View Rules** button, the following window will appear:

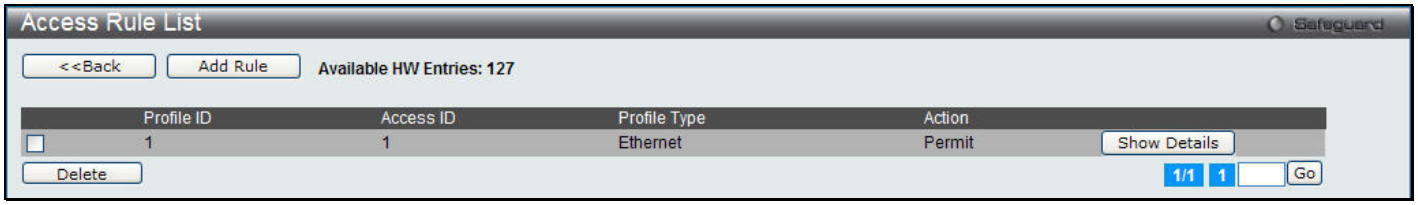


Figure 7-5 Access Rule List window (Ethernet ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

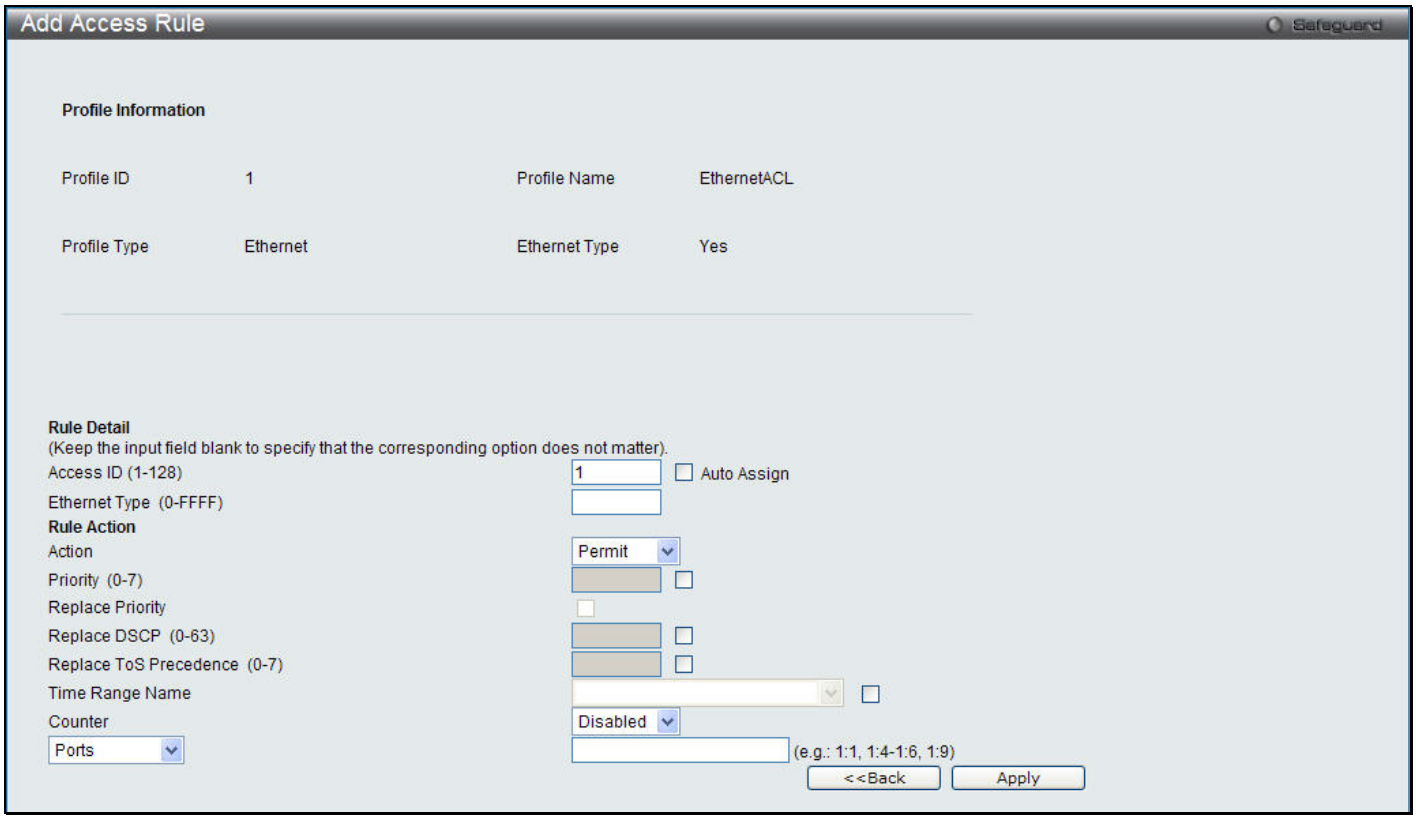


Figure 7-6 Add Access Rule window (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-128)	Type in a unique identifier number for this access. This value can be set from *1* to *128*. Tick the Auto Assign check box to instruct the Switch to automatically assign an Access ID for the rule being created.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select *Mirror* to specify that packets that match the access profile are mirrored to a port defined in the config mirror port command. Port Mirroring must be enabled and a target port must be set.
Priority (0-7)	Tick the corresponding check box if you want to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
Replace Priority	Tick this check box to replace the Priority value in the adjacent field.
Replace DSCP (0-63)	Select this option to instruct the Switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field. When an ACL rule is added to change both the priority and DSCP of an IPv4 packet, only one of them can be modified due to a chip limitation. Currently the priority is changed when both the priority and DSCP are set to be modified.

Replace ToS Precedence (0-7)	Specify that the IP precedence of the outgoing packet is changed with the new value. If used without an action priority, the packet is sent to the default TC.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Counter	Select the counter. By checking the counter, the administrator can see how many times that the rule was hit.
Ports	When a range of ports is to be configured, the Auto Assign check box MUST be ticked in the Access ID field of this window. If not, the user will be presented with an error message and the access rule will not be configured.
VLAN Name	Specify the VLAN name to apply to the access rule.
VLAN ID	Specify the VLAN ID to apply to the access rule.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:

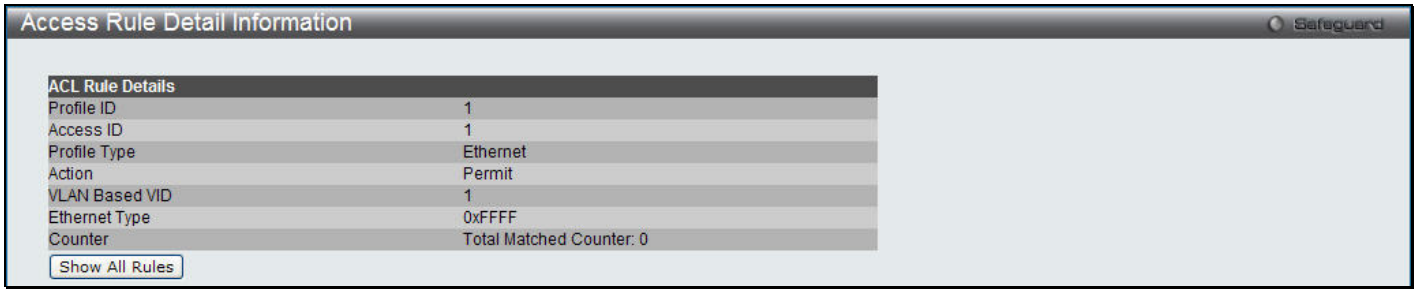


Figure 7-7 Access Rule Detail Information window (Ethernet ACL)

Click the **Show All Rules** button to navigate back to the Access Rule List.

Adding an IPv4 ACL Profile

The window shown below is the Add ACL Profile window for IPv4. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:

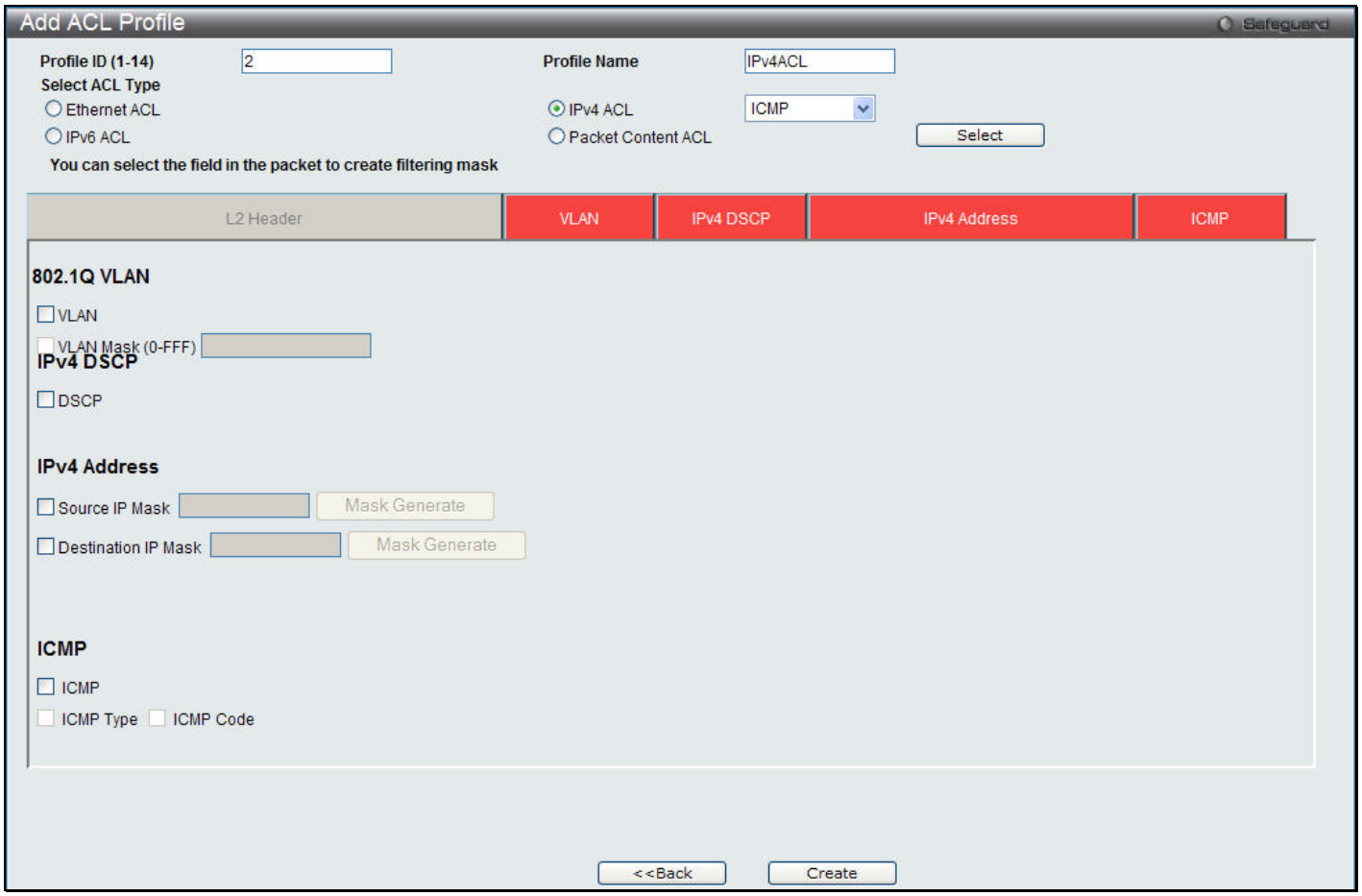


Figure 7-8 Add ACL Profile window (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID	Enter a unique identifier number for this profile set. This value can be set from *1* to *14.*
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IPv4 address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to instruct the Switch to examine the packet content in each frame's header.
802.1Q VLAN	Selecting this option instructs the Switch to examine the 802.1Q VLAN identifier of each packet header and use this as the full or partial criterion for forwarding.
IPv4 DSCP	Selecting this option instructs the Switch to examine the DiffServ Code part of each packet header and use this as the, or part of the criterion for forwarding.
IPv4 Source IP Mask	Enter an IP address mask for the source IP address.
IPv4 Destination IP Mask	Enter an IP address mask for the destination IP address.

Protocol	Selecting this option instructs the Switch to examine the protocol type value in each frame's header. Then the user must specify what protocol(s) to include according to the following guidelines: Select *ICMP* to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header. Select *Type* to further specify that the access profile will apply an ICMP type value, or specify Code to further specify that the access profile will apply an ICMP code value. Select *IGMP* to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header. Select *Type* to further specify that the access profile will apply an IGMP type value. Select *TCP* to use the TCP port number contained in an incoming packet as the forwarding criterion. Selecting TCP requires that you specify a source port mask and/or a destination port mask. *Source Port Mask* - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter. *Destination Port Mask* - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter. *TCP Flag Bits* - The user may also identify which flag bits to filter. Flag bits are parts of a packet that determine what to do with the packet. The user may filter packets by filtering certain flag bits within the packets, by checking the boxes corresponding to the flag bits of the TCP field. The user may choose among URG (urgent), ACK (acknowledgement), PSH (push), RST (reset), SYN (synchronize) and FIN (finish), or tick the Check All box to select all of them. Select *UDP* to use the UDP port number contained in an incoming packet as the forwarding criterion. Selecting UDP requires that you specify a source port mask and/or a destination port mask. *Source Port Mask* - Specify a UDP port mask for the source port in hex form (hex 0x0-0xffff). *Destination Port Mask* - Specify a UDP port mask for the destination port in hex form (hex 0x0-0xffff). Select *Protocol ID* - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xff. *Protocol ID Mask* - Specify that the rule applies to the IP protocol ID traffic. *User Define* - Specify the Layer 4 part mask

Click the **Select** button to select an ACL type. Click the **Create** button to create a profile.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

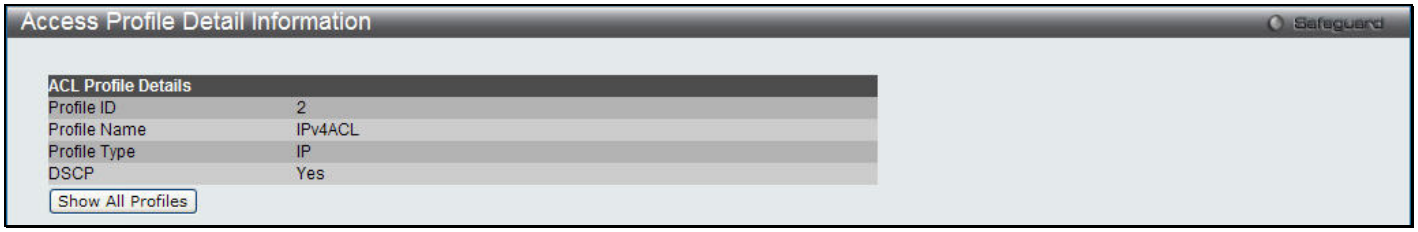


Figure 7-9 Access Profile Detail Information window (IPv4 ACL)

Click the **Show All Profiles** button to navigate back to the **Access Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

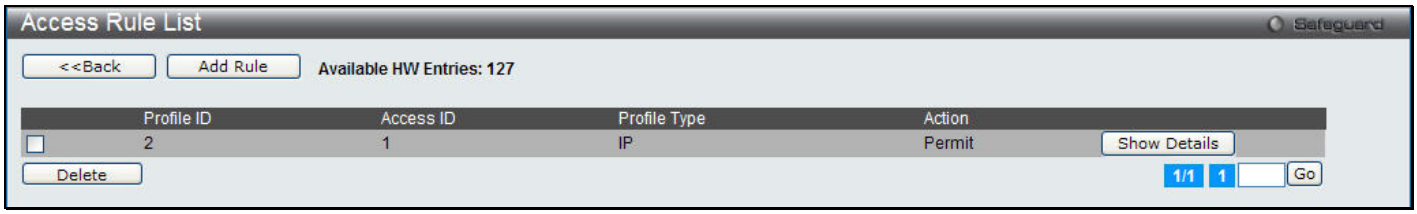


Figure 7-10 Access Rule List window (IPv4 ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

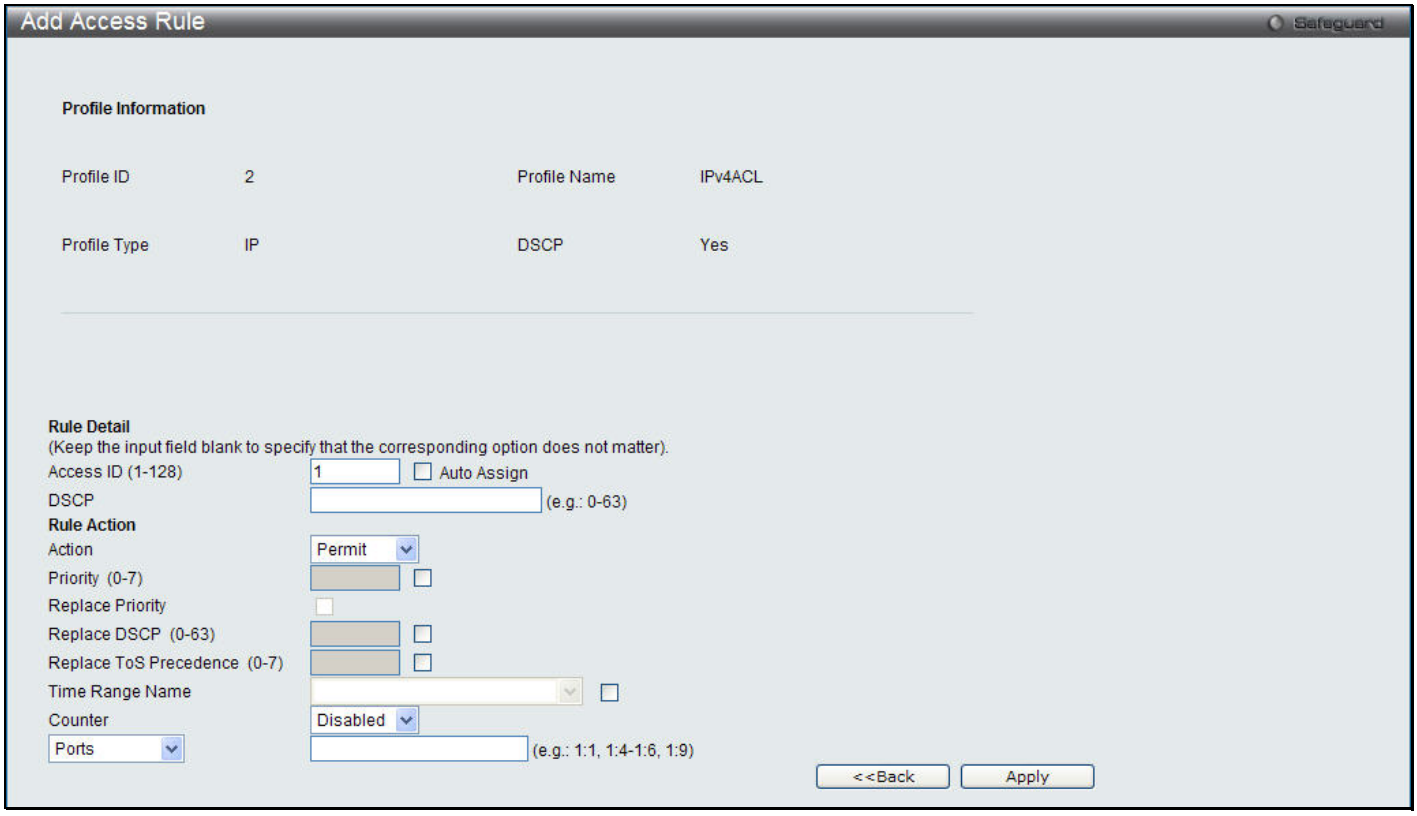


Figure 7-11 Add Access Rule (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-128)	Type in a unique identifier number for this access. This value can be set from *1* to *128*. Tick the Auto Assign check box to instruct the Switch to automatically assign an Access ID for the rule being created.

Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select *Mirror* to specify that packets that match the access profile are mirrored to a port defined in the config mirror port command. Port Mirroring must be enabled and a target port must be set.
Priority (0-7)	Tick the corresponding check box if you want to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
Replace Priority	Tick this check box to replace the Priority value in the adjacent field.
Replace DSCP (0-63)	Select this option to instruct the Switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field. When an ACL rule is added to change both the priority and DSCP of an IPv4 packet, only one of them can be modified due to a chip limitation. Currently the priority is changed when both the priority and DSCP are set to be modified.
Replace ToS Precedence (0-7)	Specify that the IP precedence of the outgoing packet is changed with the new value. If used without an action priority, the packet is sent to the default TC.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Counter	Select the counter. By checking the counter, the administrator can see how many times that the rule was hit.
Ports	When a range of ports is to be configured, the Auto Assign check box MUST be ticked in the Access ID field of this window. If not, the user will be presented with an error message and the access rule will not be configured. Ticking the All Ports check box will denote all ports on the Switch.
VLAN Name	Specify the VLAN name to apply to the access rule.
VLAN ID	Specify the VLAN ID to apply to the access rule.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:

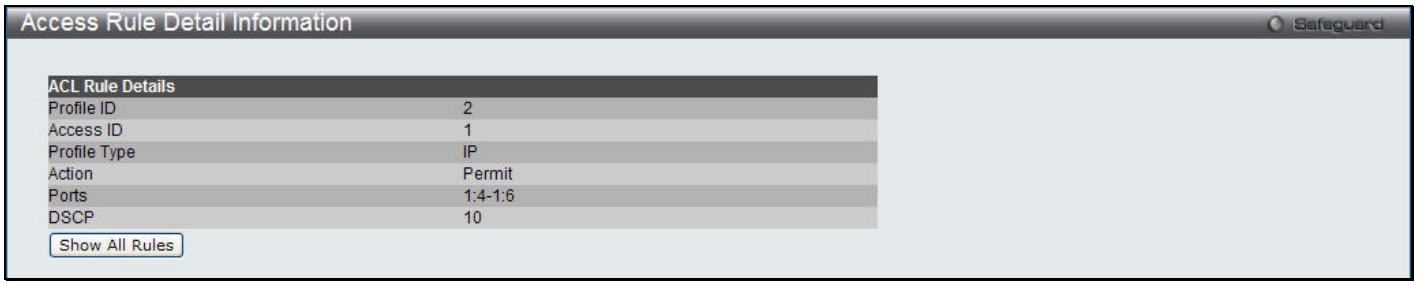


Figure 7-12 Access Rule Detail Information (IPv4 ACL)

Click the **Show All Rules** button to navigate back to the Access Rule List.

Adding an IPv6 ACL Profile

The window shown below is the Add ACL Profile window for IPv6. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:

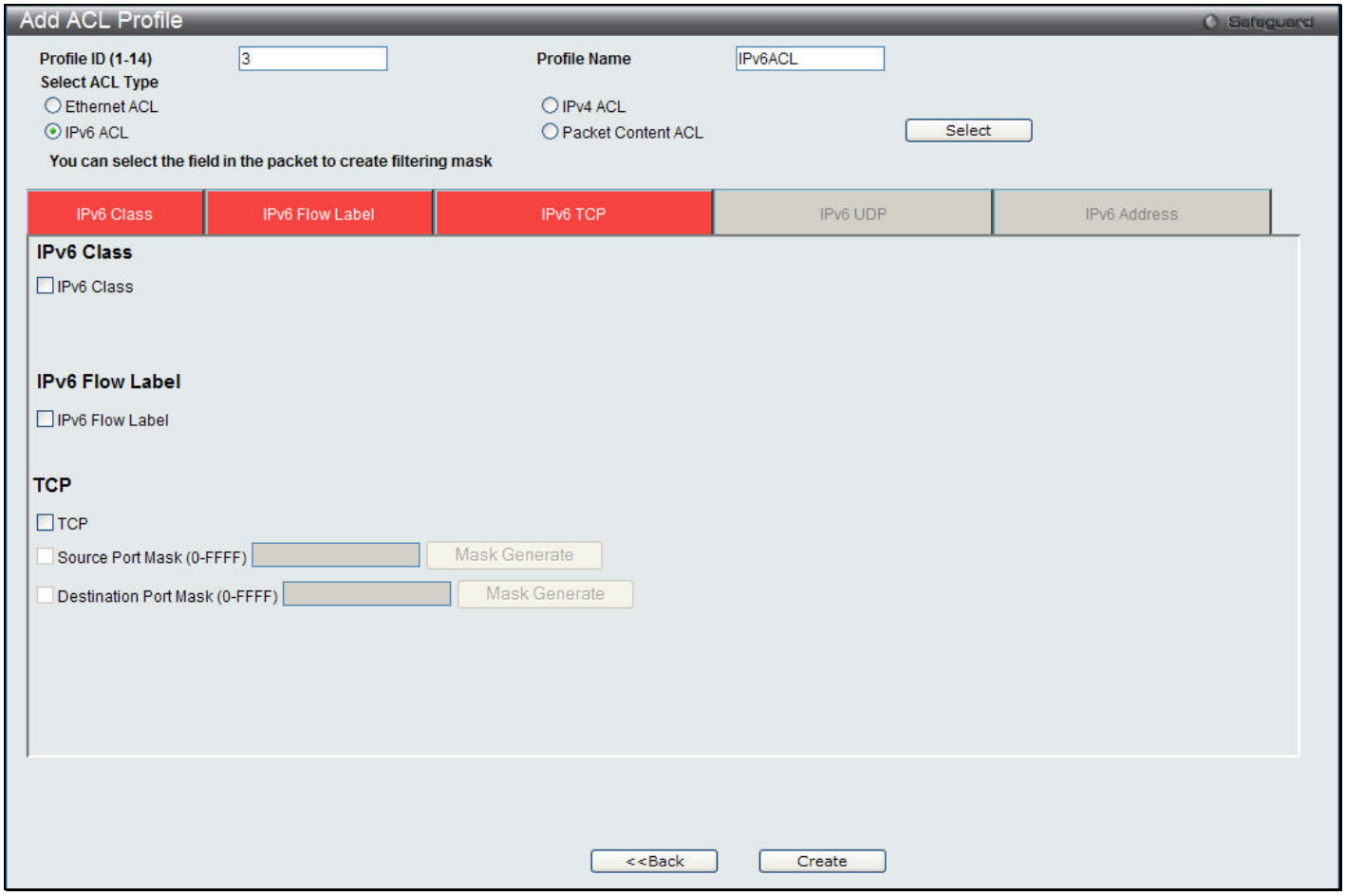


Figure 7-13 Add ACL Profile window (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID	Enter a unique identifier number for this profile set. This value can be set from *1* to *14.*
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IPv4 address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to instruct the Switch to examine the packet content in each frame's header.

IPv6 Class	Ticking this check box will instruct the Switch to examine the *class* field of the IPv6 header. This class field is a part of the packet header that is similar to the Type of Service (ToS) or Precedence bits field in IPv4.
IPv6 Flow Label	Ticking this check box will instruct the Switch to examine the *flow label* field of the IPv6 header. This flow label field is used by a source to label sequences of packets such as non-default quality of service or real time service packets.
IPv6 TCP	*Source Port Mask* – Specify that the rule applies to the range of TCP source ports. *Destination Port Mask* – Specify the range of the TCP destination port range.
IPv6 UDP	*Source Port Mask* – Specify the range of the TCP source port range. *Destination Port Mask* – Specify the range of the TCP destination port mask.
IPv6 Source Mask	The user may specify an IPv6 address mask for the source IPv6 address by ticking the corresponding check box and entering the IPv6 address mask.
IPv6 Destination Mask	The user may specify an IPv6 address mask for the destination IPv6 address by ticking the corresponding check box and entering the IPv6 address mask.

Click the **Select** button to select an ACL type.
Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

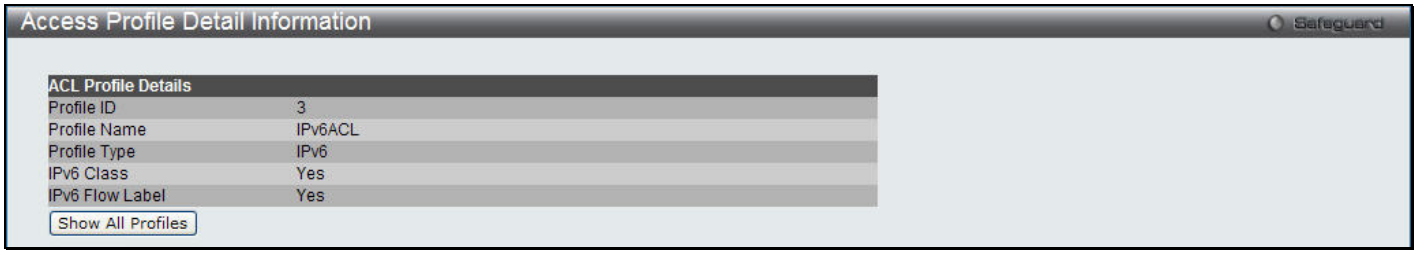


Figure 7-14 Access Profile Detail Information window (IPv6 ACL)

Click the **Show All Profiles** button to navigate back to the **Access Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

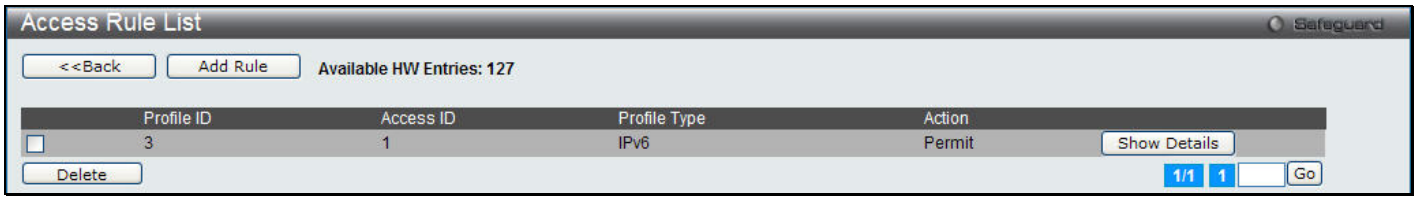


Figure 7-15 Access Rule List window (IPv6 ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

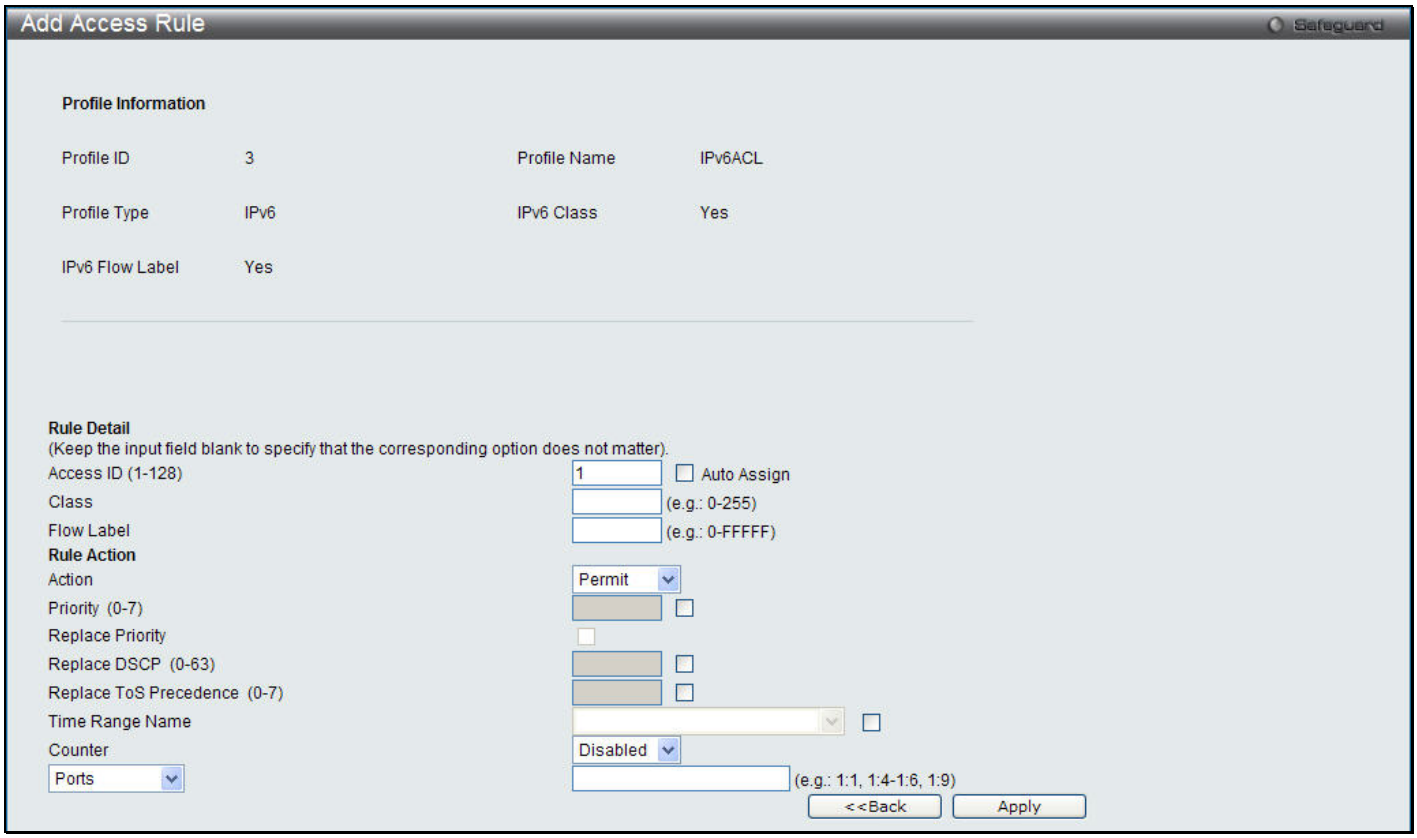


Figure 7-16 Add Access Rule (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-128)	Type in a unique identifier number for this access. This value can be set from *1* to *128*. Tick the Auto Assign check box to instruct the Switch to automatically assign an Access ID for the rule being created.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that packets that match the access profile are not forwarded by the Switch and will be filtered. Select *Mirror* to specify that packets that match the access profile are mirrored to a port defined in the config mirror port command. Port Mirroring must be enabled and a target port must be set.
Priority (0-7)	Tick the corresponding check box to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
Replace Priority	Tick this check box to replace the Priority value in the adjacent field.
Replace DSCP (0-63)	Select this option to instruct the Switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field. When an ACL rule is added to change both the priority and DSCP of an IPv6 packet, only one of them can be modified due to a chip limitation. Currently the priority is changed when both the priority and DSCP are set to be modified.

Replace ToS Precedence (0-7)	Specify that the IP precedence of the outgoing packet is changed with the new value. If used without an action priority, the packet is sent to the default TC.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Counter	Select the counter. By checking the counter, the administrator can see how many times that the rule was hit.
Ports	When a range of ports is to be configured, the Auto Assign check box MUST be ticked in the Access ID field of this window. If not, the user will be presented with an error message and the access rule will not be configured. Ticking the All Ports check box will denote all ports on the Switch.
VLAN Name	Specify the VLAN name to apply to the access rule.
VLAN ID	Specify the VLAN ID to apply to the access rule.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:

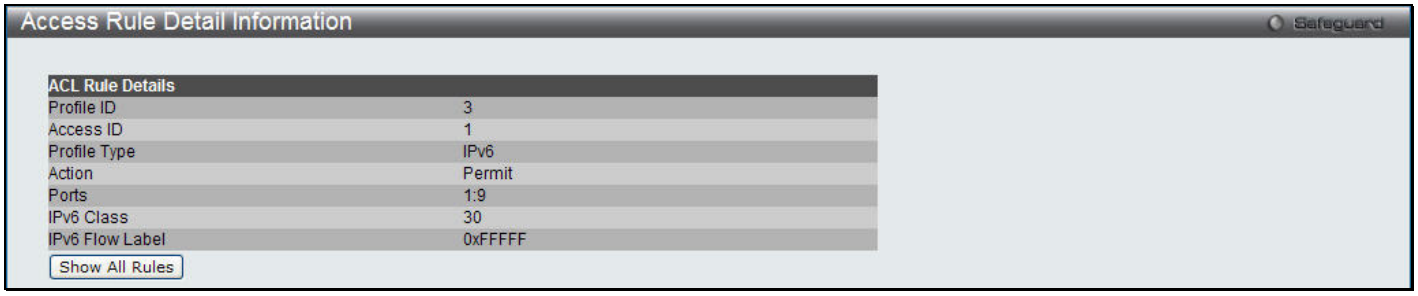


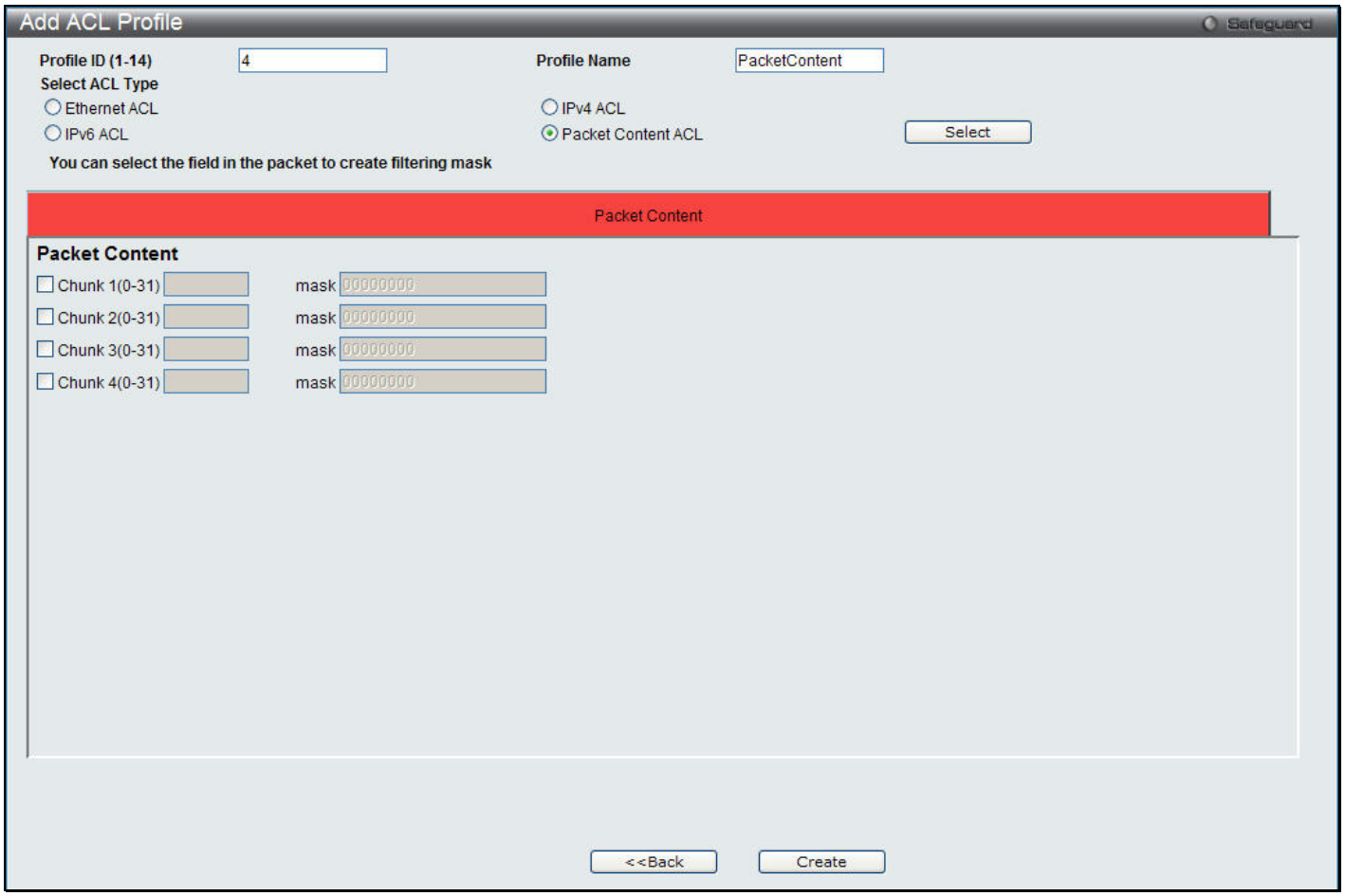
Figure 7-17 Access Rule Detail Information (IPv6 ACL)

Click the **Show All Rules** button to navigate back to the Access Rule List.

Adding a Packet Content ACL Profile

The window shown below is the Add ACL Profile window for Packet Content: To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more fields to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:



.

Figure 7-18 Add ACL Profile (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID	Enter a unique identifier number for this profile set. This value can be set from *1* to *14*.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IPv4 address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to instruct the Switch to examine the packet content in each frame's header.
Packet Content	Allows users to examine up to four specified offset_chunks within a packet at one time and specifies the frame content offset and mask. There are four chunk offsets and masks that can be configured. A chunk mask presents four bytes. Four offset_chunks can be selected from a possible 32 predefined offset_chunks as described below: offset_chunk_1, offset_chunk_2, offset_chunk_3, offset_chunk_4.

chunk0	chunk1	chunk2	……	chunk29	chunk30	chunk31
B126, B127, B0, B1	B2, B3, B4, B5	B6, B7, B8, B9	……	B114, B115, B116, B117	B118, B119, B120, B121	B122, B123, B124, B125

Example:
offset_chunk_1 0 0xffffffff will match packet byte offset 126,127,0,1

offset_chunk_1 0 0x0000ffff will match packet byte offset,0,1

NOTE: Only one packet_content_mask profile can be created.

With this advanced unique Packet Content Mask (also known as Packet Content Access Control List - ACL), the D-Link xStack® switch family can effectively mitigate some network attacks like the common ARP Spoofing attack that is wide spread today. This is why the Packet Content ACL is able to inspect any specified content of a packet in different protocol layers.

Click the **Select** button to select an ACL type.
Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

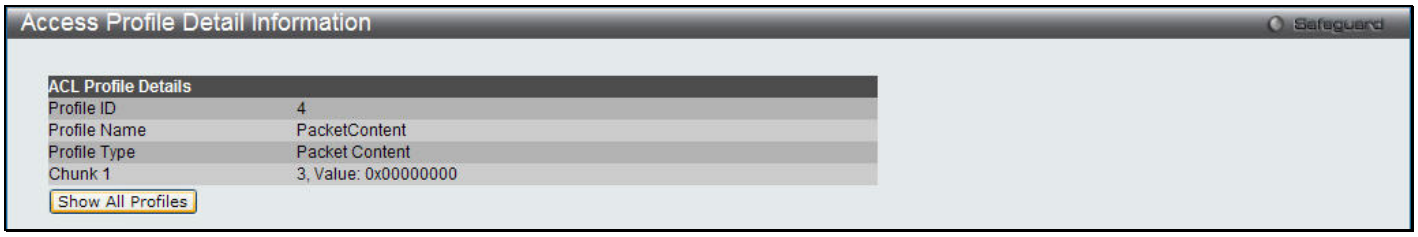


Figure 7-19 Access Profile Detail Information (Packet Content ACL)

Click the **Show All Profiles** button to navigate back to the **Access Profile List** Page.

NOTE: Address Resolution Protocol (ARP) is the standard for finding a host's hardware address (MAC address). However, ARP is vulnerable as it can be easily spoofed and utilized to attack a LAN (i.e. an ARP spoofing attack). For a more detailed explanation on how ARP protocol works and how to employ D-Link's unique Packet Content ACL to prevent ARP spoofing attack, please see Appendix E at the end of this manual.

After clicking the **Add/View Rules** button, the following page will appear:

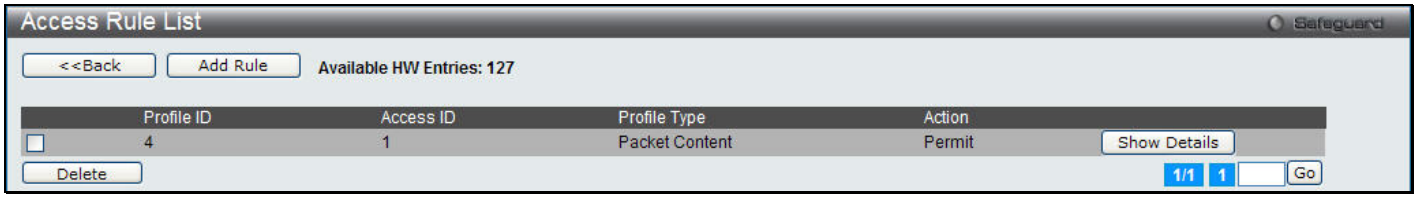


Figure 7-20 Access Rule List (Packet Content ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

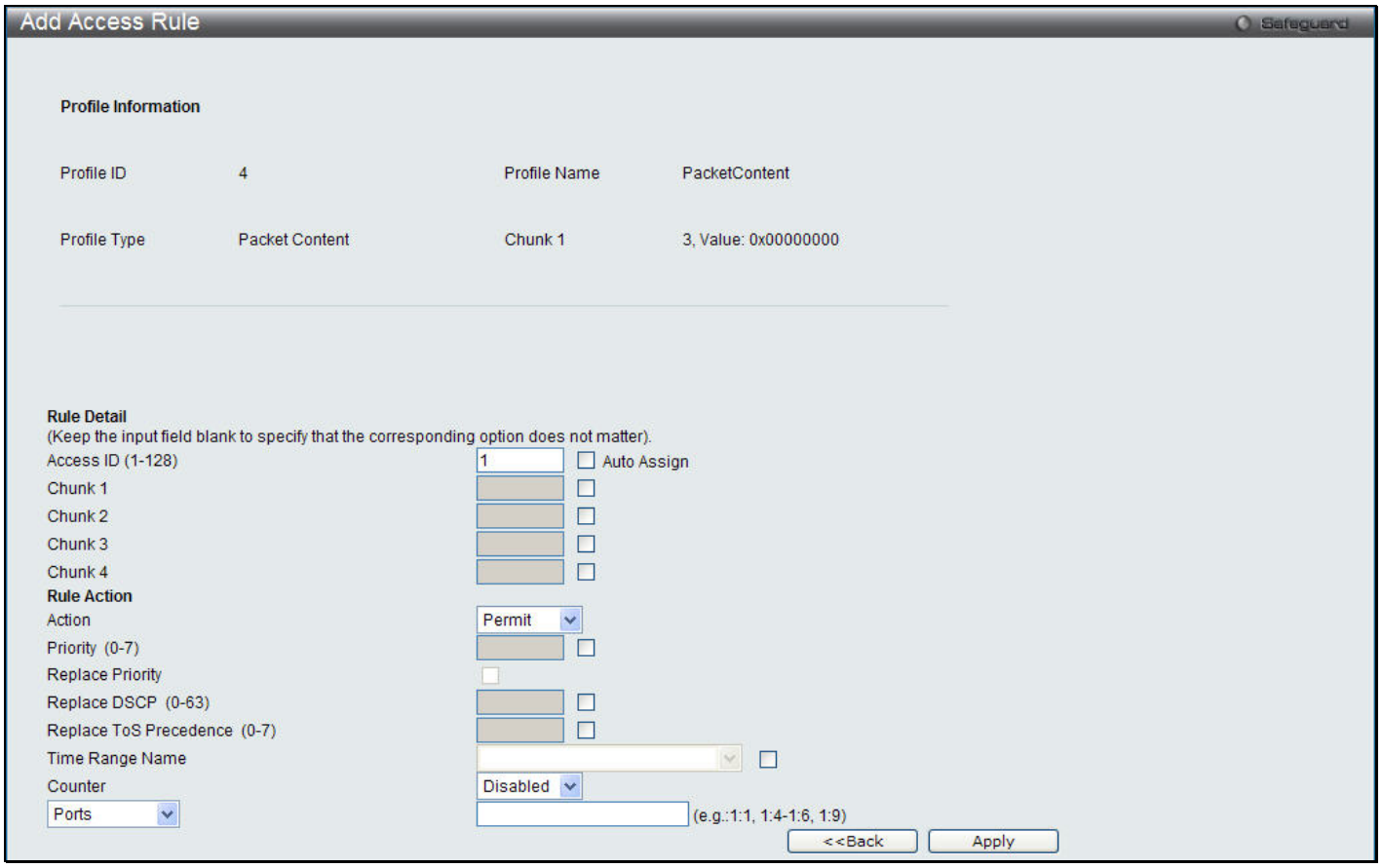


Figure 7-21 Add Access Rule (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-128)	Type in a unique identifier number for this access. This value can be set from *1* to *128.* Tick the Auto Assign check box to instruct the Switch to automatically assign an Access ID for the rule being created.
Chunk	Tick the check box and enter the chunk value.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select *Mirror* to specify that packets that match the access profile are mirrored to a port defined in the config mirror port command. Port Mirroring must be enabled and a target port must be set.
Priority (0-7)	Tick the corresponding check box if you want to re-write the 802.1p default priority of a packet to the value entered in the Priority field, which meets the criteria specified

	previously in this command, before forwarding it on to the specified CoS queue. Otherwise, a packet will have its incoming 802.1p user priority re-written to its original value before being forwarded by the Switch. For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.
Replace Priority	Tick this check box to replace the Priority value in the adjacent field.
Replace DSCP (0-63)	Select this option to instruct the Switch to replace the DSCP value (in a packet that meets the selected criteria) with the value entered in the adjacent field. When an ACL rule is added to change both the priority and DSCP of an IPv4 packet, only one of them can be modified due to a chip limitation. Currently the priority is changed when both the priority and DSCP are set to be modified.
Replace ToS Precedence (0-7)	Specify that the IP precedence of the outgoing packet is changed with the new value. If used without an action priority, the packet is sent to the default TC.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Counter	Select the counter. By checking the counter, the administrator can see how many times that the rule was hit.
Ports	When a range of ports is to be configured, the Auto Assign check box MUST be ticked in the Access ID field of this window. If not, the user will be presented with an error message and the access rule will not be configured. Ticking the All Ports check box will denote all ports on the Switch.
VLAN Name	Specify the VLAN name to apply to the access rule.
VLAN ID	Specify the VLAN ID to apply to the access rule.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:

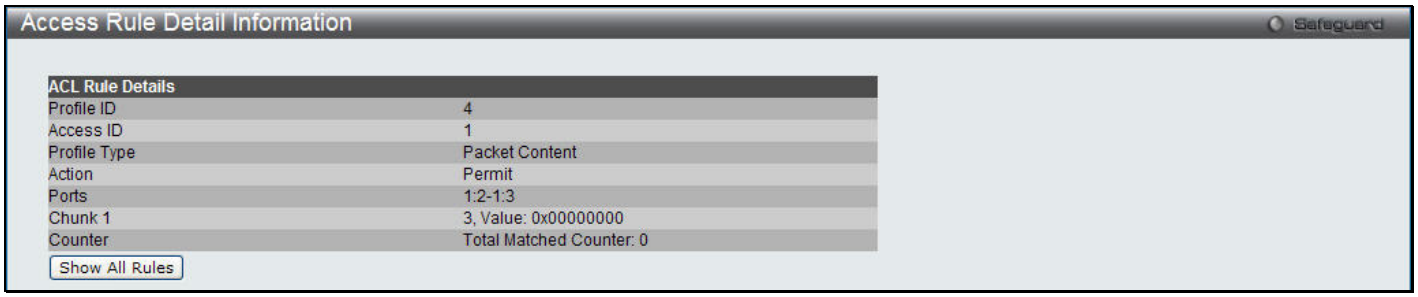


Figure 7-22 Access Rule Detail Information (Packet Content ACL)

Click the **Show All Rules** button to navigate back to the Access Rule List.

CPU Access Profile List

Due to a chipset limitation and needed extra switch security, the Switch incorporates CPU Interface filtering. This added feature increases the running security of the Switch by enabling the user to create a list of access rules for packets destined for the Switch's CPU interface. Employed similarly to the Access Profile feature previously mentioned, CPU interface filtering examines Ethernet, IP and Packet Content Mask packet headers destined for the CPU and will either forward them or filter them, based on the user's implementation. As an added feature for the CPU Filtering, the Switch allows the CPU filtering mechanism to be enabled or disabled globally, permitting the user to create various lists of rules without immediately enabling them.

NOTE: CPU Interface Filtering is used to control traffic access to the Switch directly such as protocols transition or management access. A CPU interface filtering rule won't impact normal L2/3 traffic forwarding. However, a improper CPU interface filtering rule may cause the network to become unstable.

To view CPU Access Profile List window, click **ACL > CPU Access Profile List**, as shown below:

Creating an access profile for the CPU is divided into two basic parts. The first is to specify which part or parts of a frame the Switch will examine, such as the MAC source address or the IP destination address. The second part is entering the criteria the Switch will use to determine what to do with the frame. The entire process is described below.

Users may globally enable or disable the CPU Interface Filtering State mechanism by using the radio buttons to change the running state. Choose Enabled to enable CPU packets to be scrutinized by the Switch and Disabled to disallow this scrutiny.

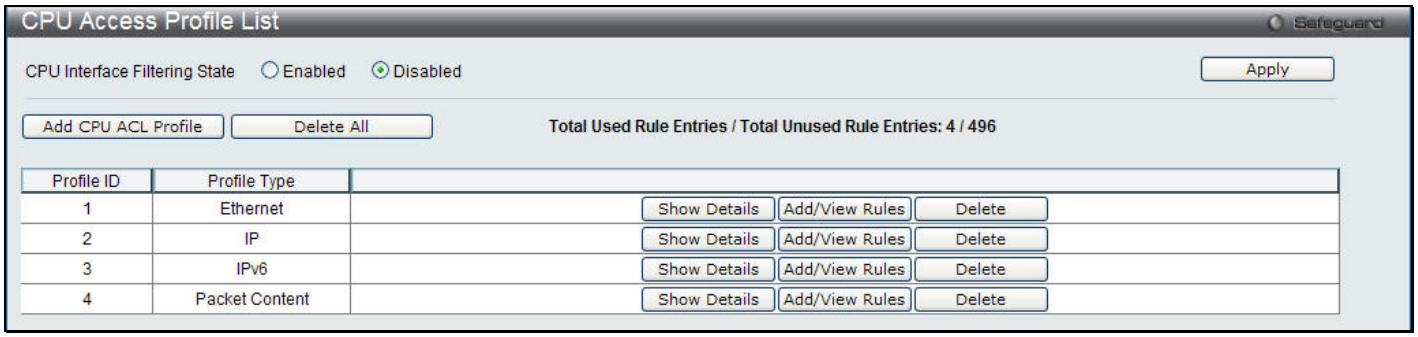


Figure 7-23 CPU Access Profile List window

The fields that can be configured are described below:

Parameter	Description
CPU Interface Filtering State	Enable or disable the CPU interface filtering state.

Click the **Apply** button to accept the changes made.

Click the **Add CPU ACL Profile** button to add an entry to the **CPU ACL Profile List**.
Click the **Delete All** button to remove all access profiles from this table.
Click the **Show Details** button to display the information of the specific profile ID entry.
Click the **Add/View Rules** button to view or add CPU ACL rules within the specified profile ID.
Click the **Delete** button to remove the specific entry.

There are four **Add CPU ACL Profile** windows;

- one for Ethernet (or MAC address-based) profile configuration,
- one for IPv6 address-based profile configuration,
- one for IPv4 address-based profile configuration, and
- one for packet content profile configuration.

Adding a CPU Ethernet ACL Profile

The window shown below is the Add CPU ACL Profile window for Ethernet. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

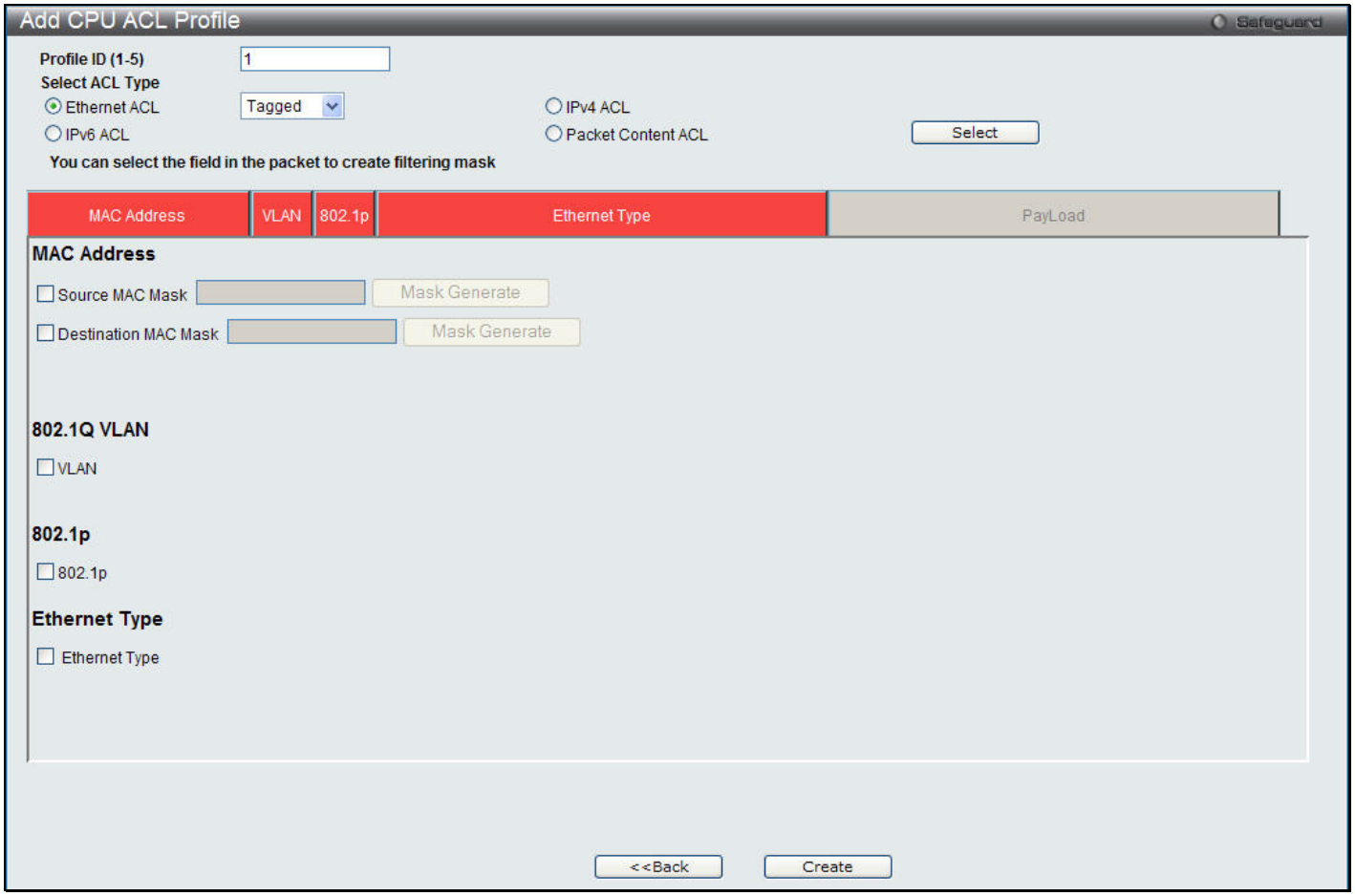


Figure 7-24 Add CPU ACL Profile (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-5)	Enter a unique identifier number for this profile set. This value can be set from *1* to *5*.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content mask. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IP address in each frame's

	header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to specify a mask to hide the content of the packet header.
Source MAC Mask	Enter a MAC address mask for the source MAC address.
Destination MAC Mask	Enter a MAC address mask for the destination MAC address.
802.1Q VLAN	Selecting this option instructs the Switch to examine the VLAN identifier of each packet header and use this as the full or partial criterion for forwarding.
802.1p	Selecting this option instructs the Switch to specify that the access profile will apply only to packets with this 802.1p priority value.
Ethernet Type	Selecting this option instructs the Switch to examine the Ethernet type value in each frame's header.

Click the **Select** button to select an CPU ACL type.
Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

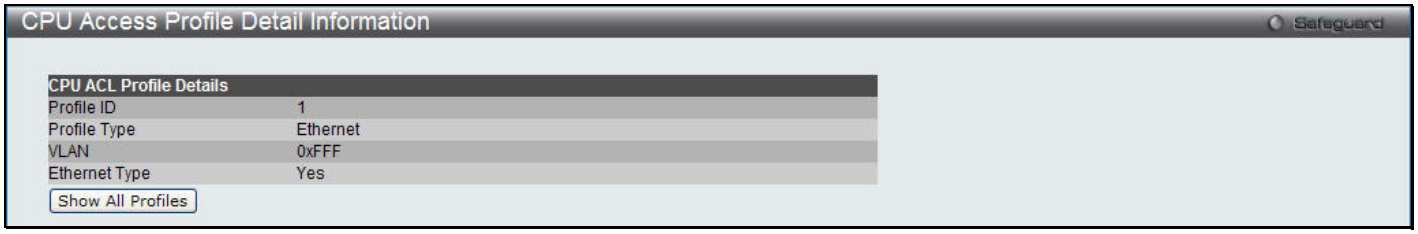


Figure 7-25 CPU Access Profile Detail Information (Ethernet ACL)

Click the **Show All Profiles** button to navigate back to the **CPU ACL Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

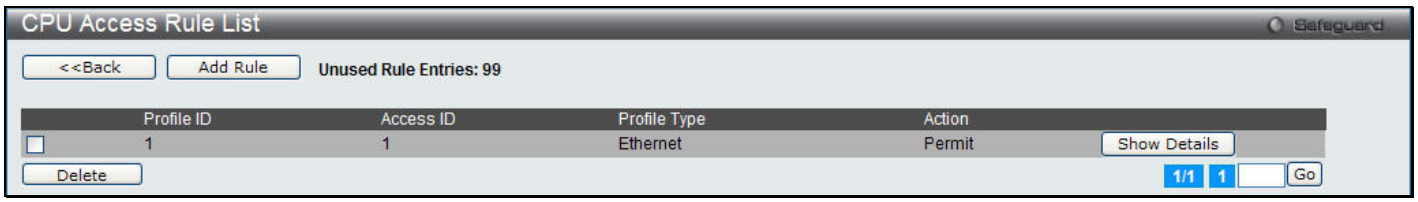


Figure 7-26 CPU Access Rule List (Ethernet ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

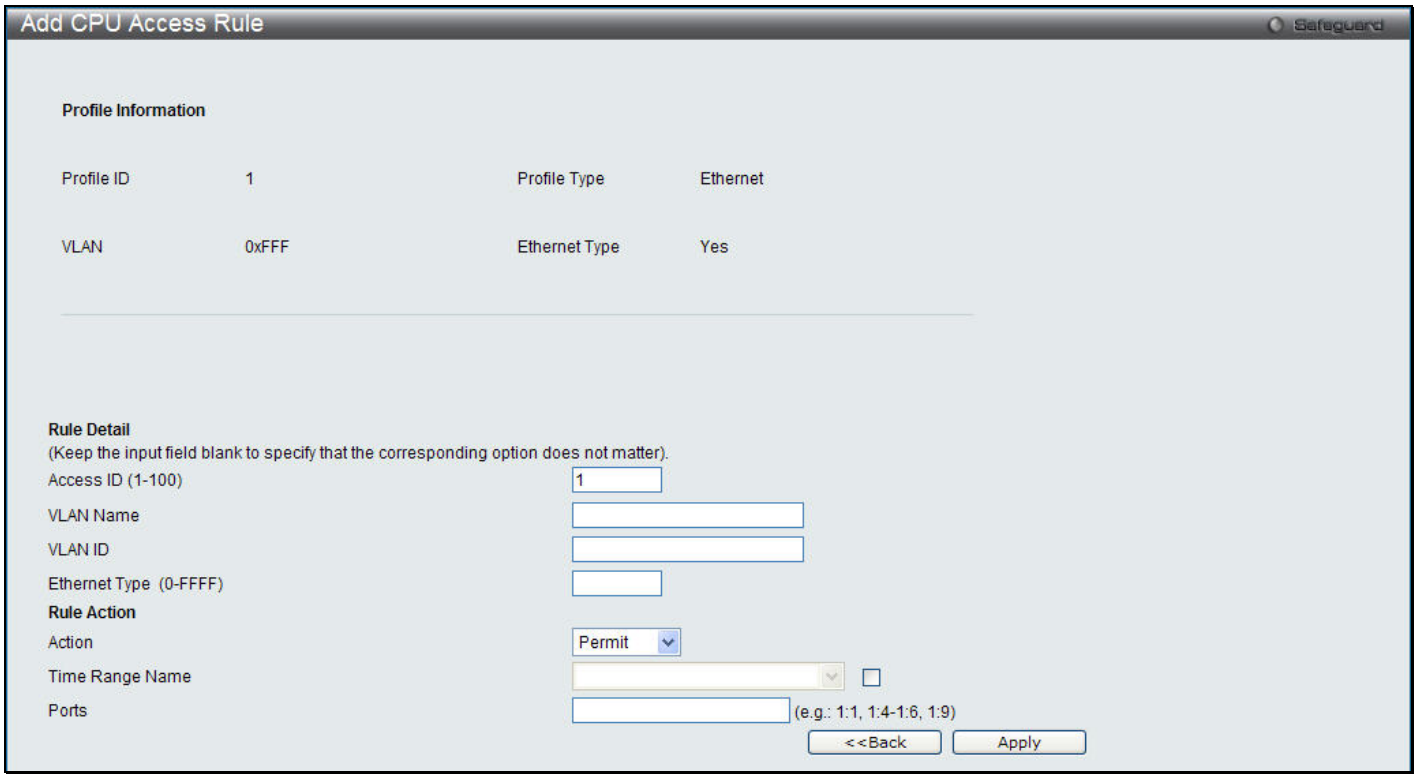


Figure 7-27 Add CPU Access Rule (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-100)	Type in a unique identifier number for this access. This value can be set from *1* to *100*.
VLAN Name	Specify the VLAN name to apply to the access rule.
VLAN ID	Specify the VLAN ID to apply to the access rule.
Ethernet Type (0-FFFF)	Enter the appropriate Ethernet Type information.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Ports	Ticking the All Ports check box will denote all ports on the Switch.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

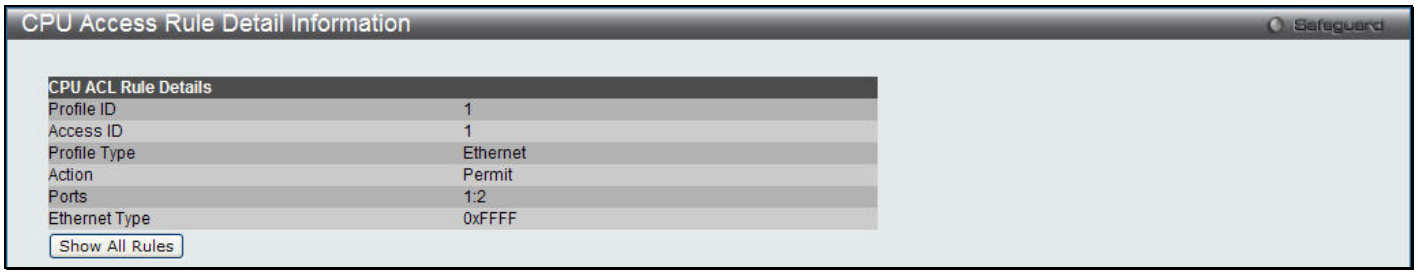


Figure 7-28 CPU Access Rule Detail Information (Ethernet ACL)

Click the **Show All Rules** button to navigate back to the CPU Access Rule List.

Adding a CPU IPv4 ACL Profile

The window shown below is the **Add CPU ACL Profile** window for IP (IPv4). To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

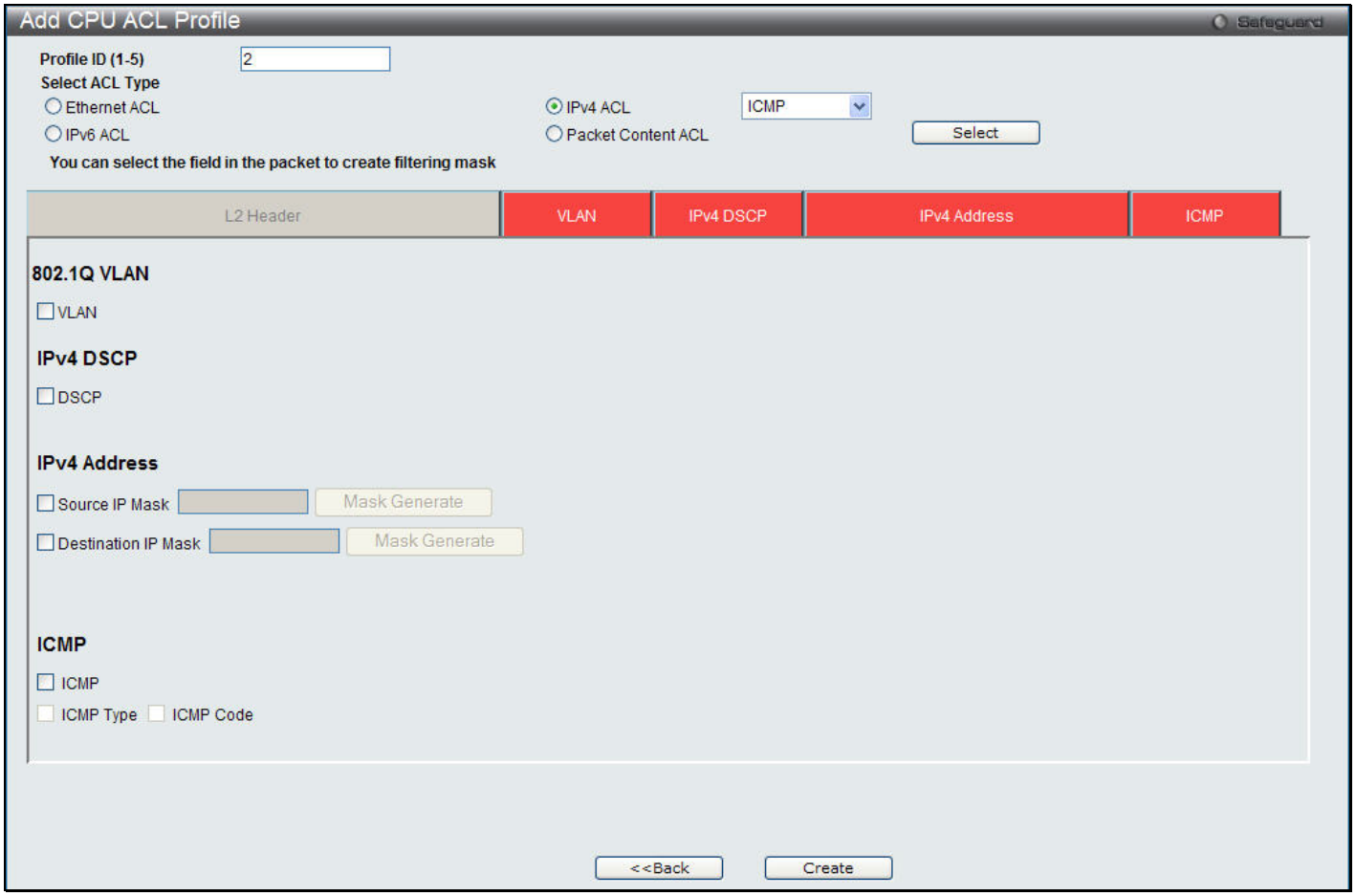


Figure 7-29 Add CPU ACL Profile (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-5)	Enter a unique identifier number for this profile set. This value can be set from *1* to *5*.

Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content mask. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IP address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to specify a mask to hide the content of the packet header.
802.1Q VLAN	Selecting this option instructs the Switch to examine the VLAN part of each packet header and use this as the, or part of the criterion for forwarding.
IPv4 DSCP	Selecting this option instructs the Switch to examine the DiffServ Code part of each packet header and use this as the, or part of the criterion for forwarding.
Source IP Mask	Enter an IP address mask for the source IP address.
Destination IP Mask	Enter an IP address mask for the destination IP address.
Protocol	Selecting this option instructs the Switch to examine the protocol type value in each frame's header. You must then specify what protocol(s) to include according to the following guidelines: Select *ICMP* to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header. Select *Type* to further specify that the access profile will apply an ICMP type value, or specify *Code* to further specify that the access profile will apply an ICMP code value. Select *IGMP* to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header. Select *Type* to further specify that the access profile will apply an IGMP type value. Select *TCP* to use the TCP port number contained in an incoming packet as the forwarding criterion. Selecting TCP requires a source port mask and/or a destination port mask is to be specified. The user may also identify which flag bits to filter. Flag bits are parts of a packet that determine what to do with the packet. The user may filter packets by filtering certain flag bits within the packets, by checking the boxes corresponding to the flag bits of the TCP field. *Source Port Mask* - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter. *Destination Port Mask* - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter. *TCP Flag Bits* - The user may also identify which flag bits to filter. Flag bits are parts of a packet that determine what to do with the packet. The user may filter packets by filtering certain flag bits within the packets, by checking the boxes corresponding to the flag bits of the TCP field. The user may choose among URG (urgent), ACK (acknowledgement), PSH (push), RST (reset), SYN (synchronize) and FIN (finish), or tick the Check All box to select all of them. Select *UDP* to use the UDP port number contained in an incoming packet as the forwarding criterion. Selecting UDP requires that you specify a source port mask and/or a destination port mask. *Source Port Mask* - Specify a UDP port mask for the source port in hex form (hex 0x0-0xffff).

	Destination Port Mask - Specify a UDP port mask for the destination port in hex form (hex 0x0-0xffff). Select *Protocol ID* - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xff). *Protocol ID Mask* – Specify that the rule applies to the IP Protocol ID Traffic. *User Define* – Specify the L4 part mask.

Click the **Select** button to select an CPU ACL type.
Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

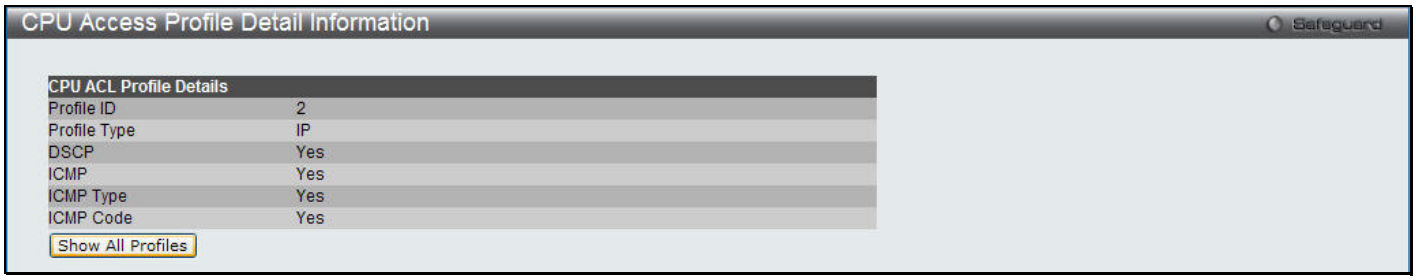


Figure 7-30 CPU Access Profile Detail Information (IPv4 ACL)

Click the **Show All Profiles** button to navigate back to the **CPU ACL Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

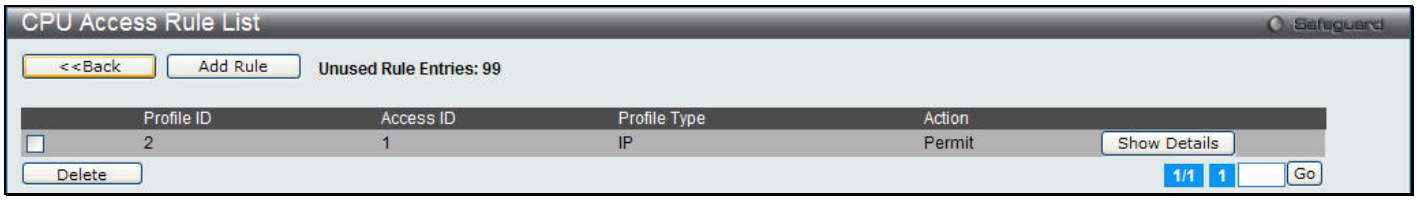


Figure 7-31 CPU Access Rule List (IPv4 ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

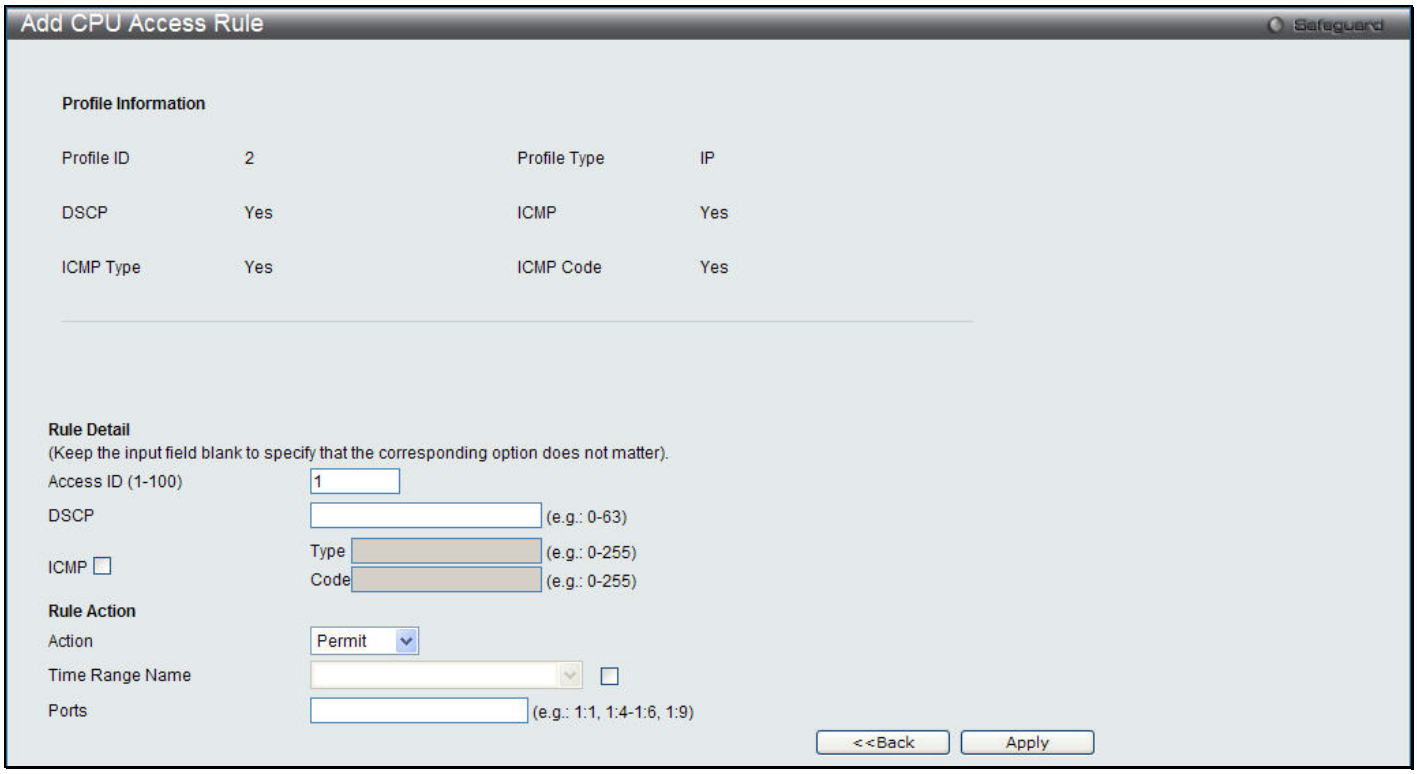


Figure 7-32 Add CPU Access Rule (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-100)	Type in a unique identifier number for this access. This value can be set from *1* to *100*.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Ports	Ticking the All Ports check box will denote all ports on the Switch.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

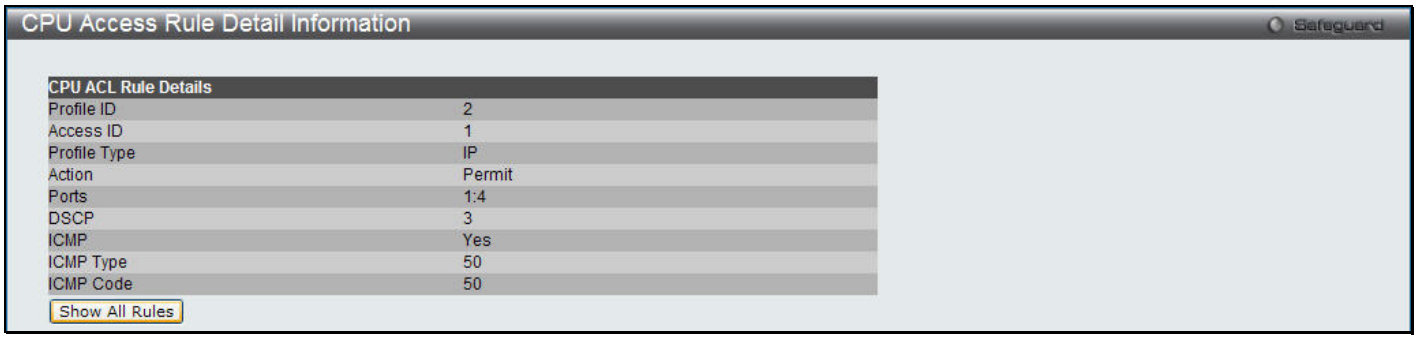


Figure 7-33 CPU Access Rule Detail Information (IPv4 ACL)

Click the **Show All Rules** button to navigate back to the CPU Access Rule List.

Adding a CPU IPv6 ACL Profile

The window shown below is the **Add CPU ACL Profile** window for IPv6. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

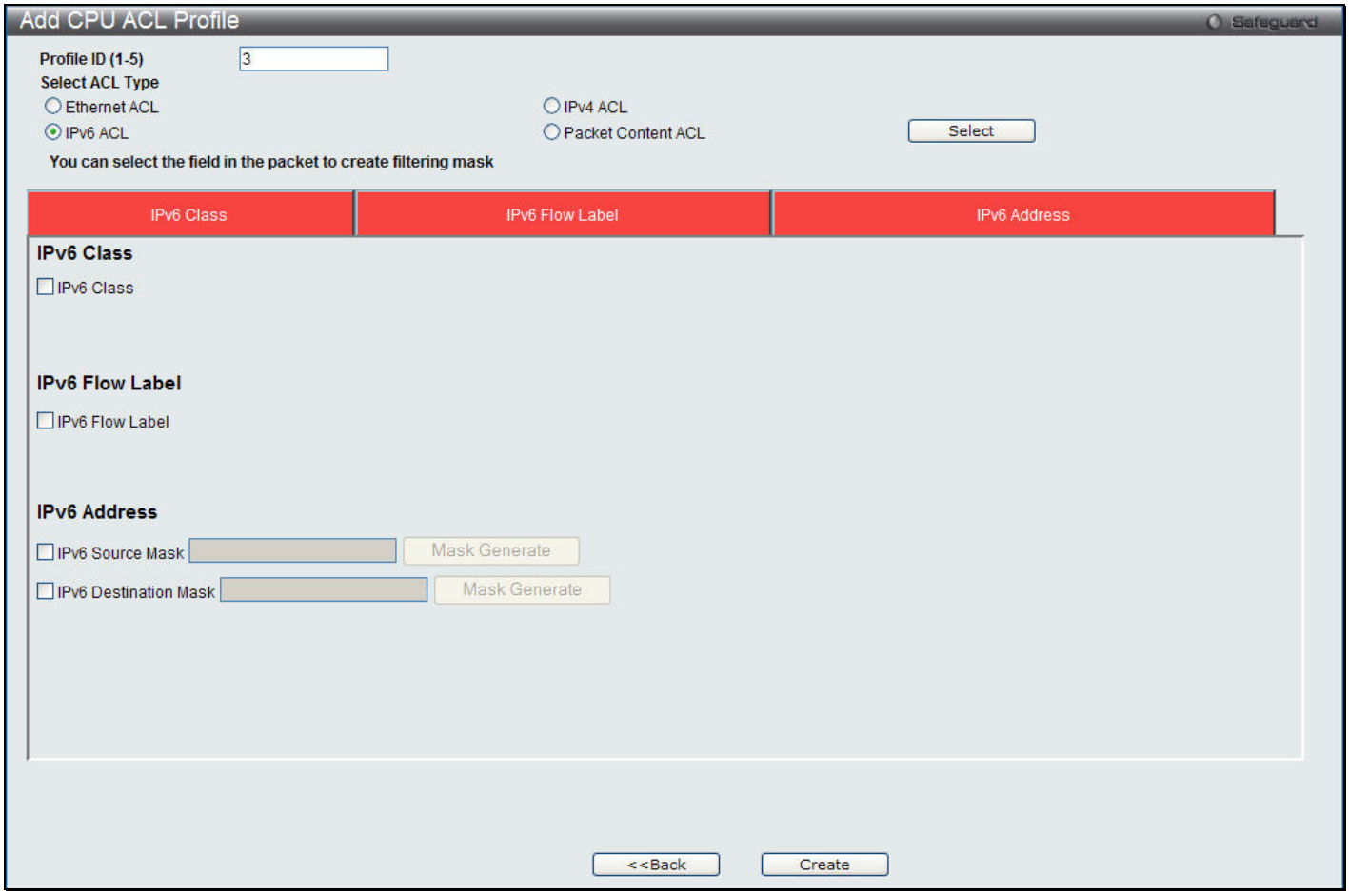


Figure 7-34 Add CPU ACL Profile (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-5)	Enter a unique identifier number for this profile set. This value can be set from *1* to*5.*
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content mask. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IP address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header.

	Select Packet Content ACL to specify a mask to hide the content of the packet header.
IPv6 Class	Checking this field will instruct the Switch to examine the *class* field of the IPv6 header. This class field is a part of the packet header that is similar to the Type of Service (ToS) or Precedence bits field in IPv4.
IPv6 Flow Label	Checking this field will instruct the Switch to examine the *flow label* field of the IPv6 header. This flow label field is used by a source to label sequences of packets such as non-default quality of service or real time service packets.
IPv6 Source Mask	The user may specify an IPv6 address mask for the source IPv6 address by checking the corresponding box and entering the IPv6 address mask.
IPv6 Destination Mask	The user may specify an IPv6 address mask for the destination IPv6 address by checking the corresponding box and entering the IPv6 address mask.

Click the **Select** button to select an CPU ACL type. Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

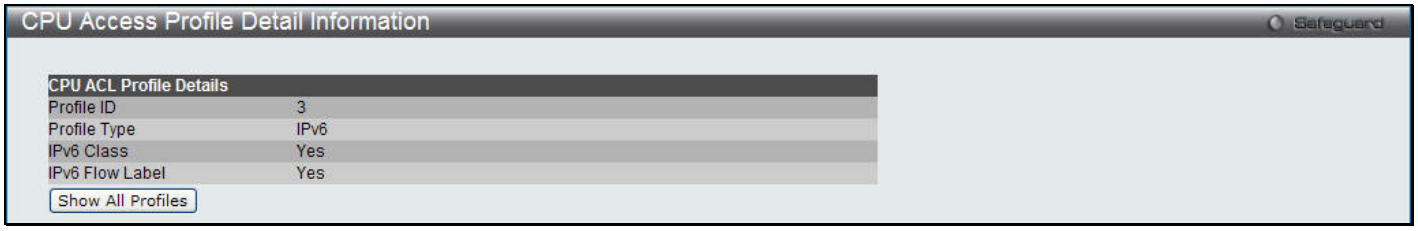


Figure 7-35 CPU Access Profile Detail Information (IPv6 ACL)

Click the **Show All Profiles** button to navigate back to the **CPU ACL Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

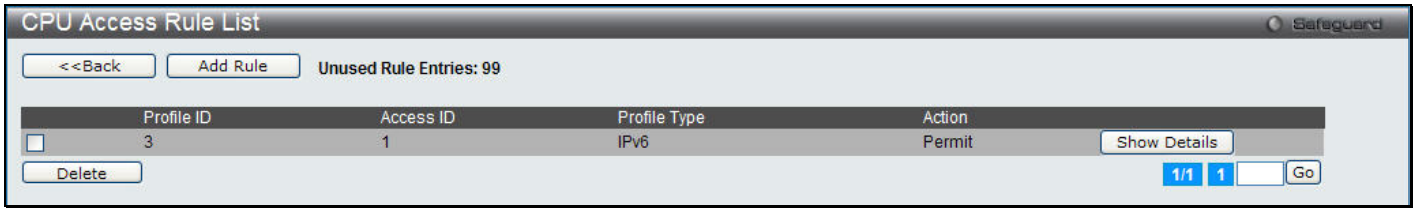


Figure 7-36 CPU Access Rule List (IPv6 ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

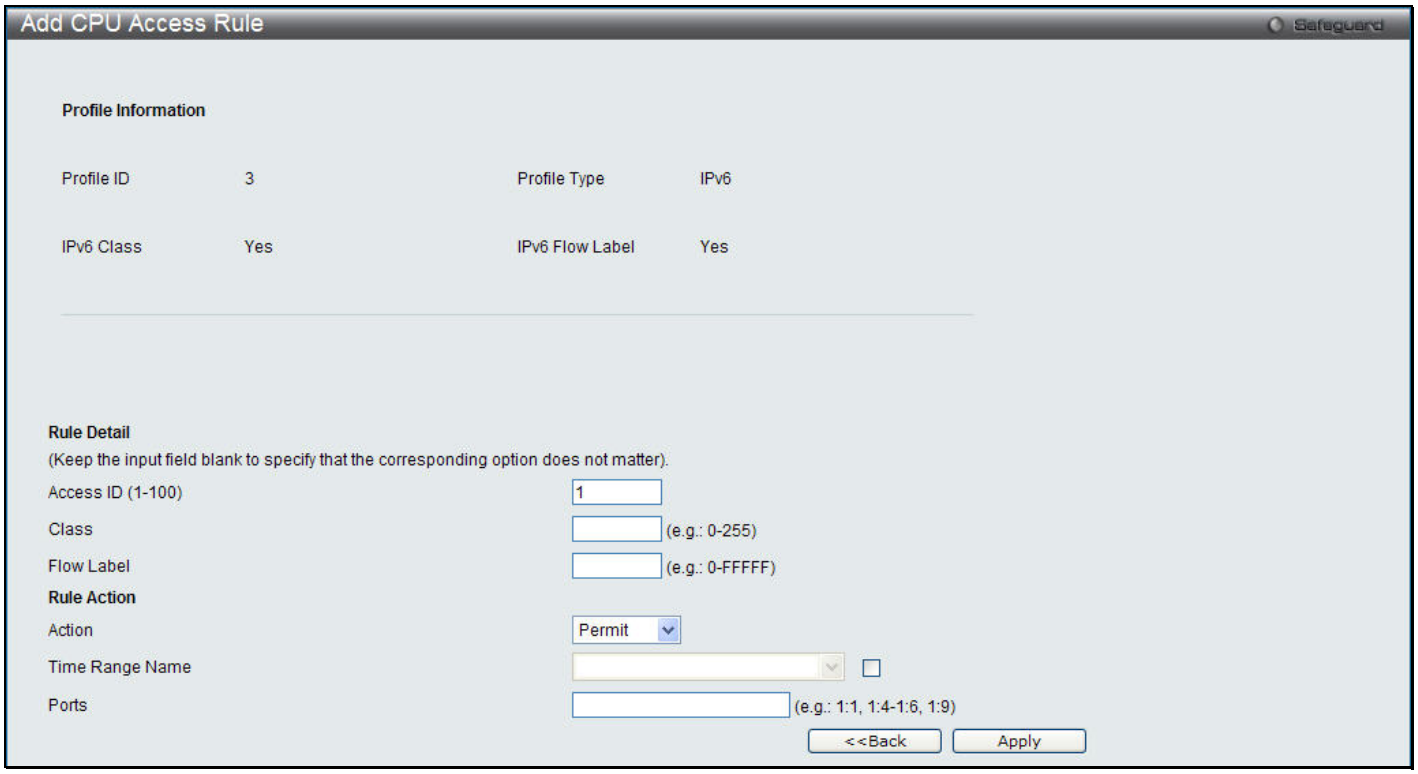


Figure 7-37 Add CPU Access Rule (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-100)	Enter a unique identifier number for this access. This value can be set from *1* to *100*.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
Flow Label	Configuring this field, in hex form, will instruct the Switch to examine the flow label field of the IPv6 header. This flow label field is used by a source to label sequences of packets such as non-default quality of service or real time service packets.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Ports	Ticking the All Ports check box will denote all ports on the Switch.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

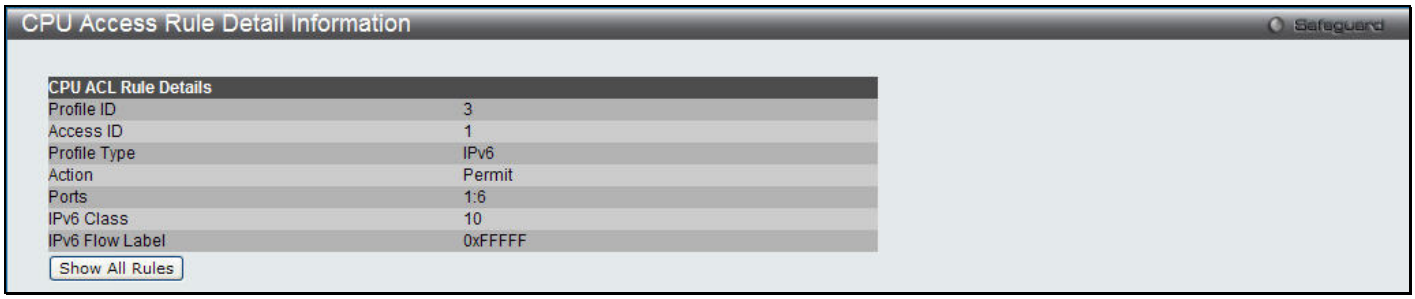


Figure 7-38 CPU Access Rule Detail Information (IPv6 ACL)

Click the **Show All Rules** button to navigate back to the CPU Access Rule List.

Adding a CPU Packet Content ACL Profile

The window shown below is the Add CPU ACL Profile window for Packet Content. To use specific filtering masks in this ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

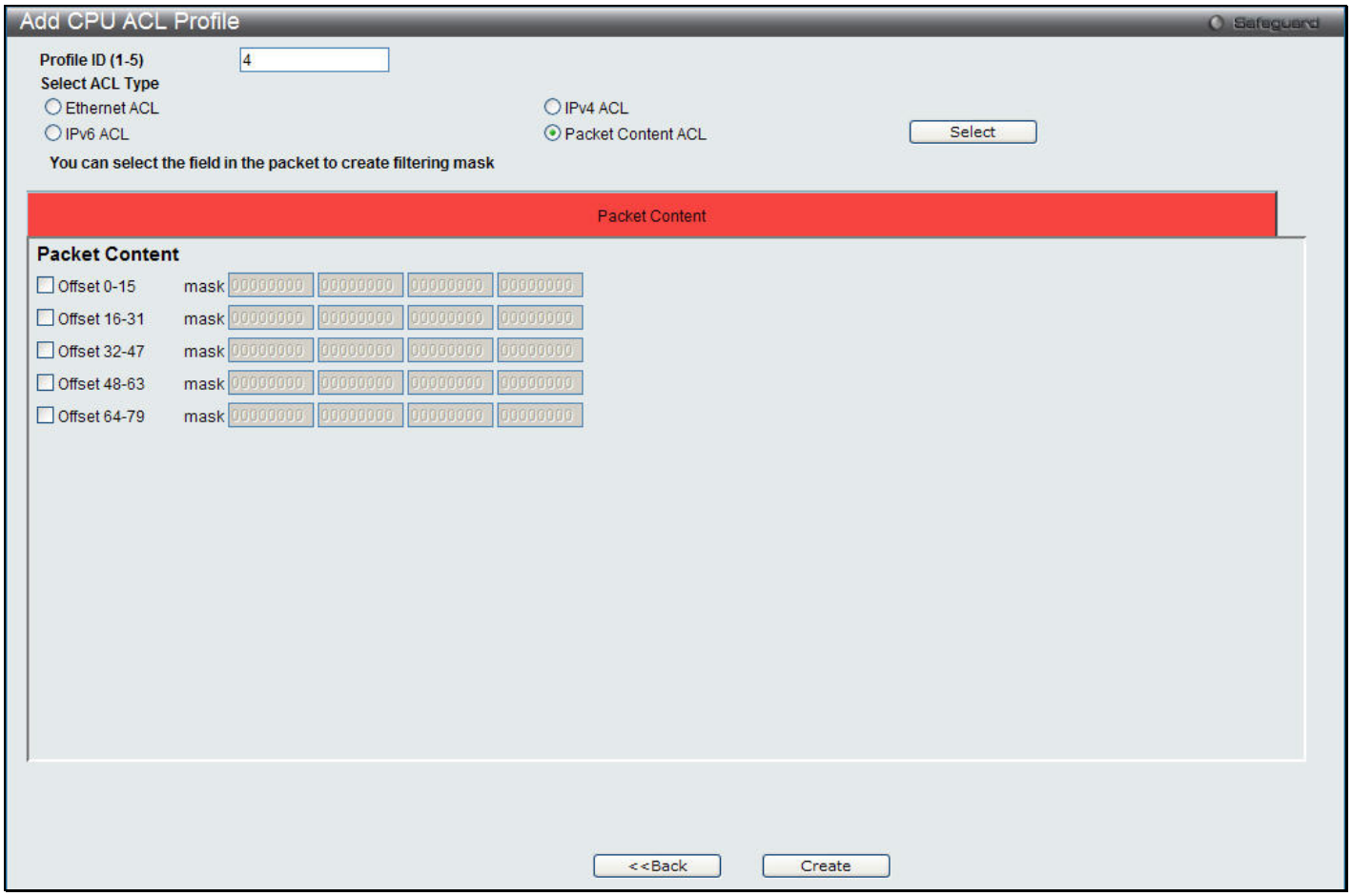


Figure 7-39 Add CPU ACL Profile (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-5)	Enter a unique identifier number for this profile set. This value can be set from *1* to*5.*
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, IPv6 address, or packet content mask. This will change the window according to the requirements for the type of profile. Select Ethernet ACL to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 ACL to instruct the Switch to examine the IP address in each frame's header. Select IPv6 ACL to instruct the Switch to examine the IPv6 address in each frame's header. Select Packet Content ACL to specify a mask to hide the content of the packet header.
Offset	This field will instruct the Switch to mask the packet header beginning with the offset value specified: *0-15* - Enter a value in hex form to mask the packet from the beginning of the packet to the 15th byte. *16-31* – Enter a value in hex form to mask the packet from byte 16 to byte 31. *32-47* – Enter a value in hex form to mask the packet from byte 32 to byte 47. *48-63* – Enter a value in hex form to mask the packet from byte 48 to byte 63. *64-79* – Enter a value in hex form to mask the packet from byte 64 to byte 79.

Click the **Select** button to select an CPU ACL type. Click the **Create** button to create a profile.
Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button, the following page will appear:

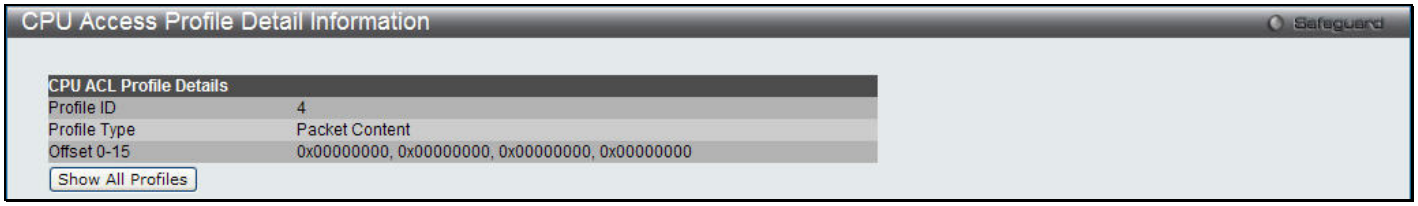


Figure 7-40 CPU Access Profile Detail Information (Packet Content ACL)

Click the **Show All Profiles** button to navigate back to the **CPU ACL Profile List** Page.

After clicking the **Add/View Rules** button, the following page will appear:

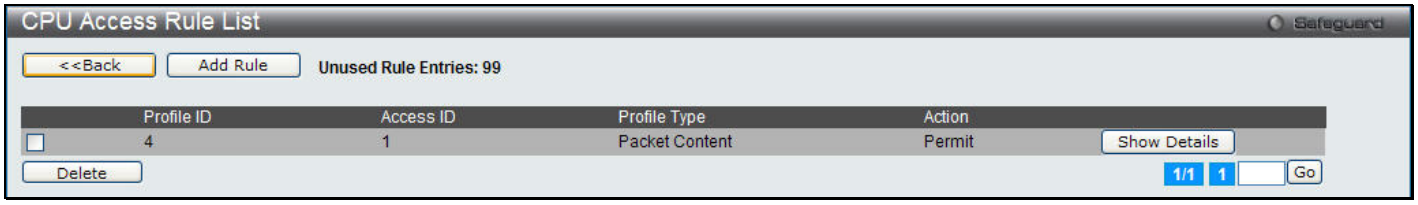


Figure 7-41 CPU Access Rule List (Packet Content ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.
Click the **<<Back** button to return to the previous page.
Click the **Show Details** button to view more information about the specific rule created.
Click the **Delete Rules** button to remove the specific entry.
Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Add Rule** button, the following page will appear:

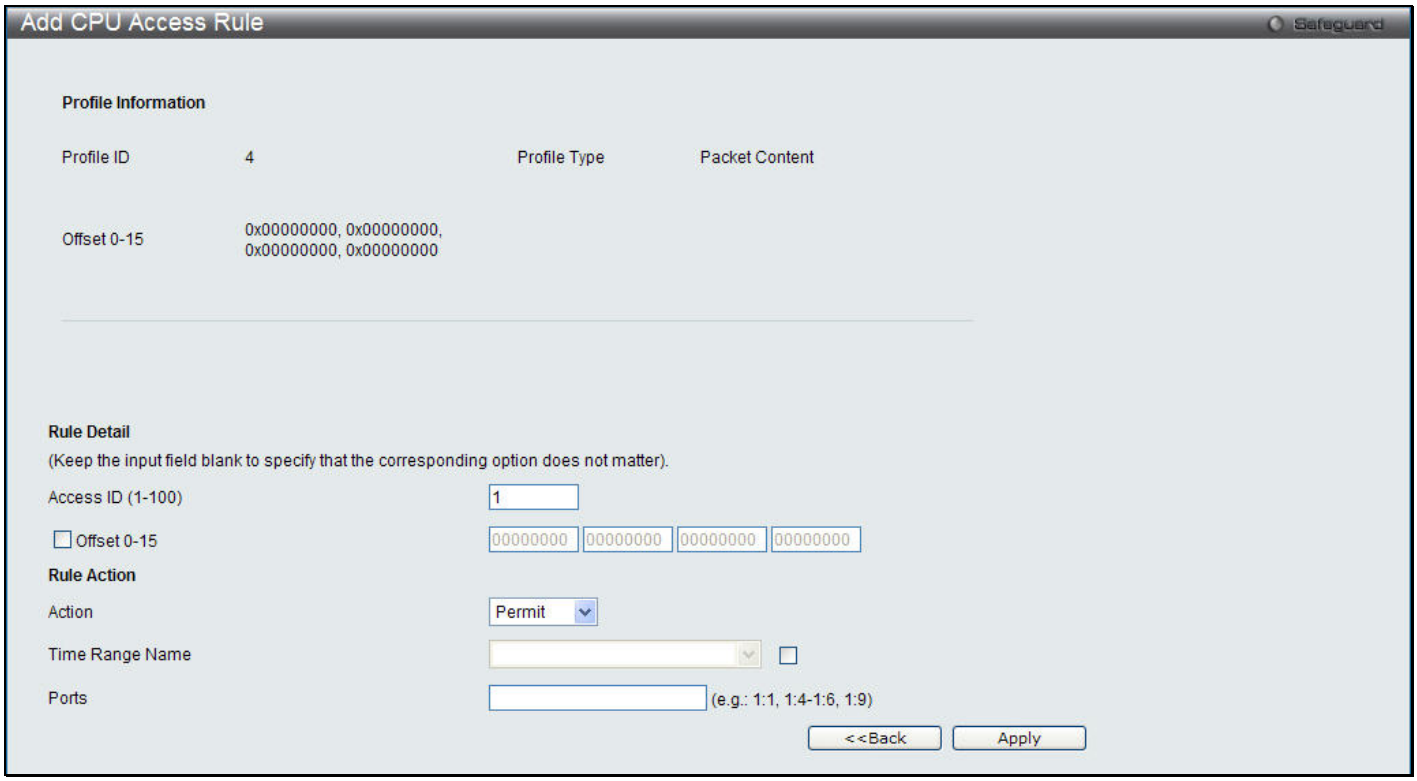


Figure 7-42 Add CPU Access Rule (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-100)	Type in a unique identifier number for this access. This value can be set from *1* to *100*.
Action	Select *Permit* to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select *Deny* to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
Offset	This field will instruct the Switch to mask the packet header beginning with the offset value specified: Offset 0-15 - Enter a value in hex form to mask the packet from the beginning of the packet to the 15th byte. Offset 16-31 - Enter a value in hex form to mask the packet from byte 16 to byte *31*. Offset 32-47 - Enter a value in hex form to mask the packet from byte 32 to byte 47. Offset 48-63 - Enter a value in hex form to mask the packet from byte 48 to byte 63. Offset 64-79 - Enter a value in hex form to mask the packet from byte 64 to byte 79.
Time Range Name	Tick the check box and enter the name of the Time Range settings that has been previously configured in the **Time Range Settings** window. This will set specific times when this access rule will be implemented on the Switch.
Ports	Ticking the All Ports check box will denote all ports on the Switch.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

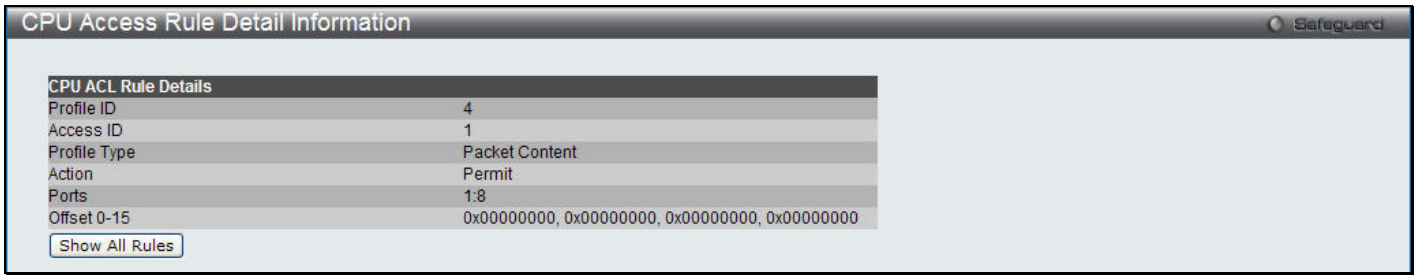


Figure 7-43 CPU Access Rule Detail Information (Packet Content ACL)

Click the **Show All Rules** button to navigate back to the CPU Access Rule List.

ACL Finder

The ACL rule finder helps you to identify any rules that have been assigned to a specific port and edit existing rules quickly.

To view this window, click **ACL > ACL Finder**, as shown below:

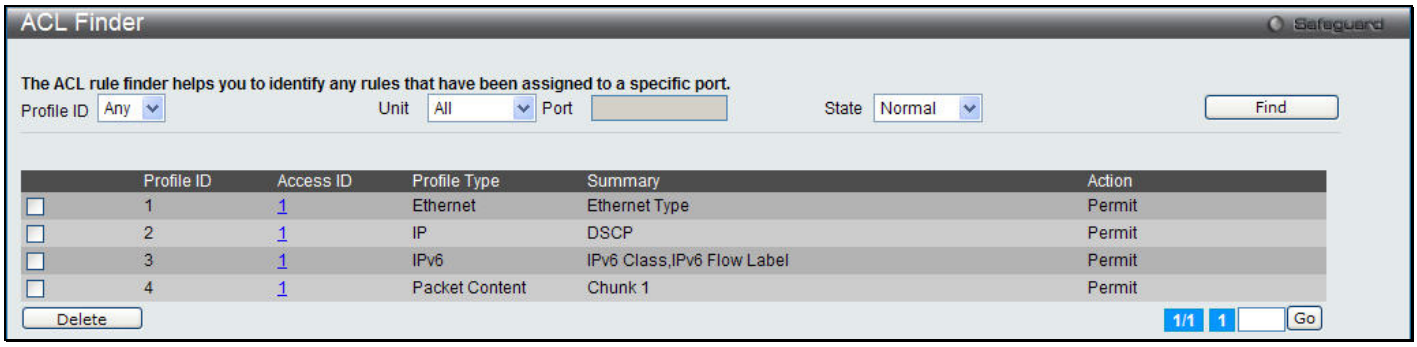


Figure 7-44 ACL Finder window

The fields that can be configured are described below:

Parameter	Description
Profile ID	Use the drop-down menu to select the Profile ID for the ACL rule finder to identify the rule.
Unit	Select the unit to configure.
Port	Enter the port number for the ACL rule finder to identify the rule.
State	Use the drop-down menu to select the state. If the state is set to Normal then it will allows the user to find normal ACL rules. If the state is set to *CPU* then it allows the user to find CPU ACL rules.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete** button to remove the specific entry selected.

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

ACL Flow Meter

This page is used to configure the flow-based metering function. The metering function supports three modes: single rate two color, single rate three color, and two rate three color. The access rule must be created before the parameters of this function can be applied.

For the single rate two color mode, users may set the preferred bandwidth for this rule, in Kbps and once the bandwidth has been exceeded, overflow packets will be dropped or be remarked to other DSCP, depending on the user configuration.

For single rate three color mode, users need to specify the committed rate in Kbps, the committed burst size and the excess burst size.

For the two rate three color mode, users need to specify the committed rate in Kbps, the committed burst size, the peak rate and the peak burst size.

The green color packet will be treated as the conforming action, the yellow color packet will be treated as the exceeding action, and the red color packet will be treated as the violating action.

Users may also choose to count conformed, exceeded and violated packets by selecting *Enabled* from the Counter drop-down menu. If the counter is enabled, the counter setting in the access profile will be enabled. Users may only enable two counters for one flow meter at any given time.

To view this window, click **ACL** > **ACL Flow Meter**, as shown below:

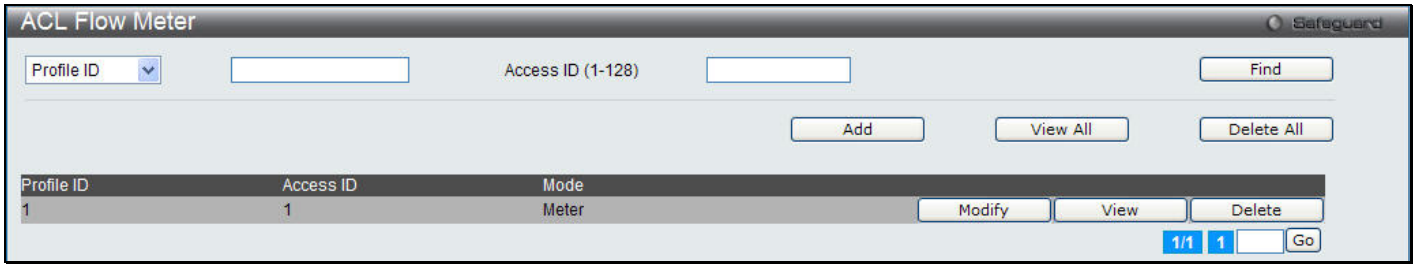


Figure 7-45 ACL Flow Meter window

The fields that can be configured or Viewed are described below:

Parameter	Description
Profile ID	Enter the Profile ID for the flow meter.
Profile Name	Enter the Profile Name for the flow meter.
Access ID (1-128)	Enter the Access ID for the flow meter.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Add** button to add a new entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the **Delete All** button to remove all the entries listed.

Click the **Modify** button to re-configure the specific entry.

Click the **View** button to display the information of the specific entry.

Click the **Delete** button to remove the specific entry.

After clicking the **Add** or **Modify** button, the following page will appear:

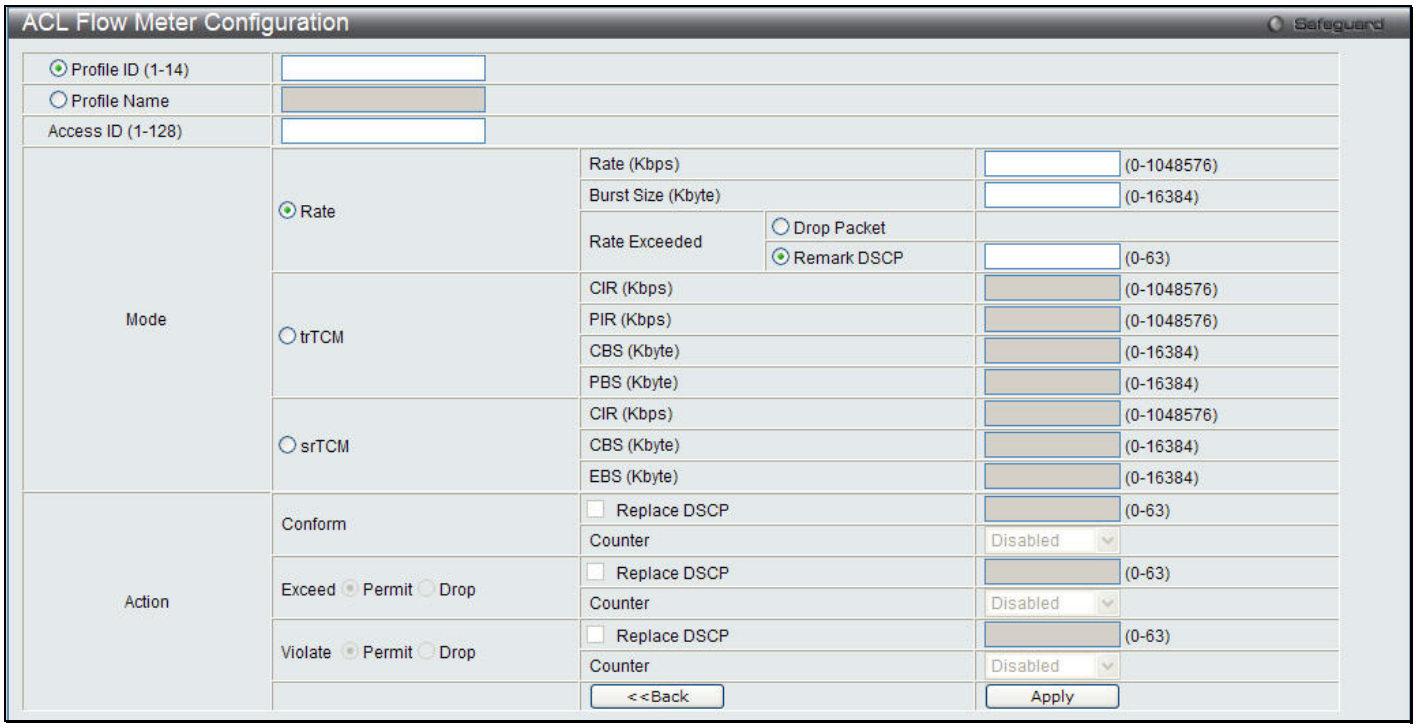


Figure 7-46 ACL Flow meter Configuration window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-14)	Enter the Profile ID for the flow meter.
Profile Name	Enter the Profile Name for the flow meter.
Access ID (1-128)	Enter the Access ID for the flow meter.
Mode	Rate – Specify the rate for single rate two color mode. *Rate* – Specify the committed bandwidth in Kbps for the flow. *Burst Size* – Specify the burst size for the single rate two color mode. The unit is in kilobyte. *Rate Exceeded* – Specify the action for packets that exceed the committed rate in single rate two color mode. The action can be specified as one of the following: *Drop Packet* – Drop the overload packets immediately. *Remark DSCP* – Mark the packet with a specified DSCP. trTCM – Specify the “two-rate three-color mode.” *CIR* – Specify the Committed information Rate. The unit is Kbps. CIR should always be equal or less than PIR. *PIR* – Specify the Peak information Rate. The unit is Kbps. PIR should always be equal to or greater than CIR. *CBS* – Specify the Committed Burst Size. The unit is in kilobyte. *PBS* – Specify the Peak Burst Size. The unit is in kilobyte. srTCM – Specify the “single-rate three-color mode”. *CIR* – Specify the Committed Information Rate. The unit is in kilobyte. *CBS* – Specify the Committed Burst Size. The unit is in kilobyte. *EBS* – Specify the Excess Burst Size. The unit is in kilobyte.
Action	Conform – This field denotes the green packet flow. Green packet flows may have their *DSCP*

	field rewritten to a value stated in this field. Users may also choose to count green packets by using counter parameter. *Replace DSCP* – Packets that are in the green flow may have their DSCP field rewritten using this parameter and entering the DSCP value to replace. *Counter* – Use this parameter to enable or disable the packet counter for the specified ACL entry in the green flow. Exceed – This field denotes the yellow packet flow. Yellow packet flows may have excess packets permitted through or dropped. Users may replace the DSCP field of these packets by checking its radio button and entering a new DSCP value in the allotted field. *Counter* – Use this parameter to enable or disable the packet counter for the specified ACL entry in the yellow flow. Violate – This field denotes the red packet flow. Red packet flows may have excess packets permitted through or dropped. Users may replace the DSCP field of these packets by checking its radio button and entering a new DSCP value in the allotted field. *Counter* – Use this parameter to enable or disable the packet counter for the specified ACL entry in the red flow.

Click the **<<Back** button to discard the changes made and return to the previous page.

Click the **Apply** button to accept the changes made.

After clicking the **View** button, the following page will appear:

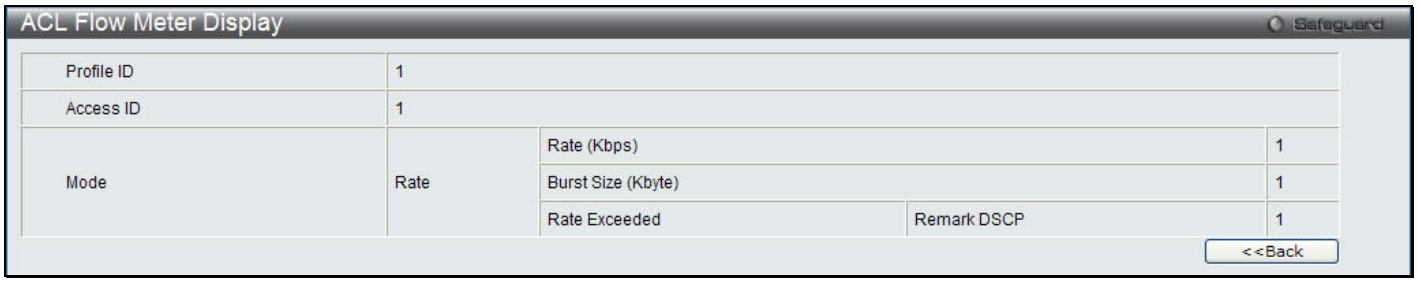


Figure 7-47 ACL Flow meter Display window

Click the **<<Back** button to return to the previous page.

Chapter 8 Security

802.1X
RADIUS
IP-MAC-Port Binding (IMPB)
MAC-based Access Control (MAC)
Web-based Access Control (WAC)
Japanese Web-based Access Control (JWAC)
Compound Authentication
Port Security
ARP Spoofing Prevention Settings
BPDU Attack Protection
Loopback Detection Settings
Traffic Segmentation Settings
NetBIOS Filtering Settings
DHCP Server Screening
Access Authentication Control
SSL Settings
SSH
Trusted Host Settings
Safeguard Engine Settings

802.1X

802.1X (Port-Based and Host-Based Access Control)

The IEEE 802.1X standard is a security measure for authorizing and authenticating users to gain access to various wired or wireless devices on a specified Local Area Network by using a Client and Server based access control model. This is accomplished by using a RADIUS server to authenticate users trying to access a network by relaying Extensible Authentication Protocol over LAN (EAPOL) packets between the Client and the Server. The following figure represents a basic EAPOL packet:

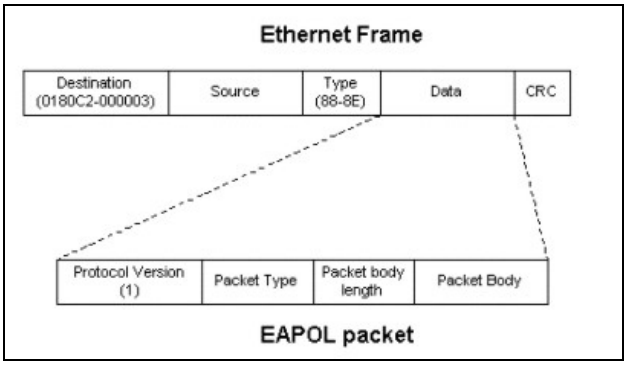


Figure 8-1 The EAPOL Packet

Utilizing this method, unauthorized devices are restricted from connecting to a LAN through a port to which the user is connected. EAPOL packets are the only traffic that can be transmitted through the specific port until authorization is granted. The 802.1X Access Control method has three roles, each of which are vital to creating and up keeping a stable and working Access Control security method.

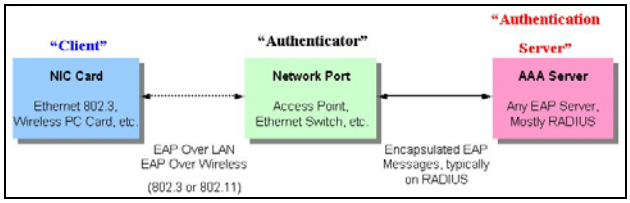


Figure 8-2 The three roles of 802.1X

The following section will explain the three roles of Client, Authenticator and Authentication Server in greater detail.

Authentication Server

The Authentication Server is a remote device that is connected to the same network as the Client and Authenticator, must be running a RADIUS Server program and must be configured properly on the Authenticator (Switch). Clients connected to a port on the Switch must be authenticated by the Authentication Server (RADIUS) before attaining any services offered by the Switch on the LAN. The role of the Authentication Server is to certify the identity of the Client attempting to access the network by exchanging secure information between the RADIUS server and the Client through EAPOL packets and, in turn, informs the Switch whether or not the Client is granted access to the LAN and/or switches services.

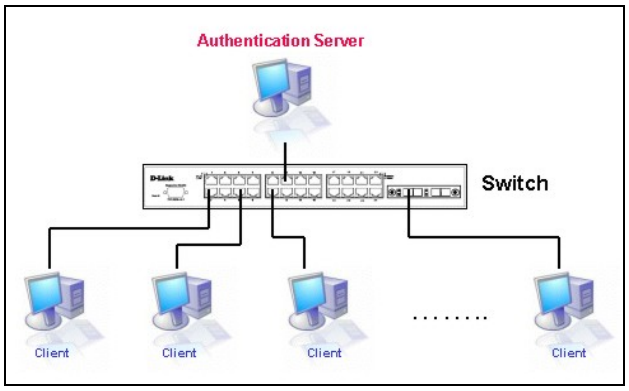


Figure 8-3 The Authentication Server

Authenticator

The Authenticator (the Switch) is an intermediary between the Authentication Server and the Client. The Authenticator serves two purposes when utilizing the 802.1X function. The first purpose is to request certification information from the Client through EAPOL packets, which is the only information allowed to pass through the Authenticator before access is granted to the Client. The second purpose of the Authenticator is to verify the information gathered from the Client with the Authentication Server, and to then relay that information back to the Client.

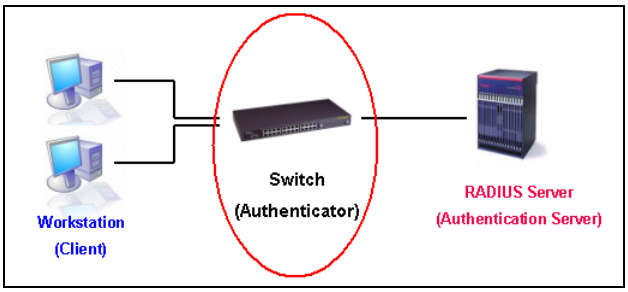


Figure 8-4 The Authenticator

Three steps must be implemented on the Switch to properly configure the Authenticator.

1. The 802.1X State must be *Enabled*. (**Security / 802.1X /802.1X Settings**)
2. The 802.1X settings must be implemented by port (**Security** / **802.1X** / **802.1X Settings**)
3. A RADIUS server must be configured on the Switch. (**Security** / **802.1X** / **Authentic RADIUS Server**)

Client

The Client is simply the end station that wishes to gain access to the LAN or switch services. All end stations must be running software that is compliant with the 802.1X protocol. For users running Windows XP and Windows Vista, that software is included within the operating system. All other users are required to attain 802.1X client software from an outside source. The Client will request access to the LAN and or Switch through EAPOL packets and, in turn will respond to requests from the Switch.

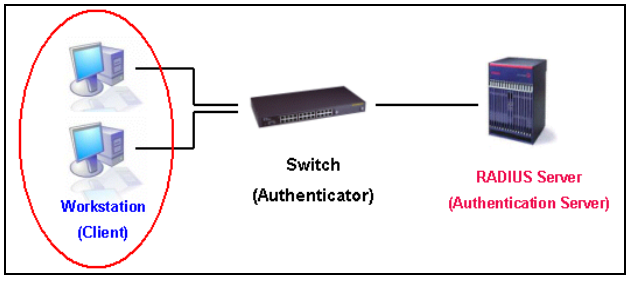


Figure 8-5 The Client

Authentication Process

Utilizing the three roles stated above, the 802.1X protocol provides a stable and secure way of authorizing and authenticating users attempting to access the network. Only EAPOL traffic is allowed to pass through the specified port before a successful authentication is made. This port is “locked” until the point when a Client with the correct username and password (and MAC address if 802.1X is enabled by MAC address) is granted access and therefore successfully “unlocks” the port. Once unlocked, normal traffic is allowed to pass through the port. The following figure displays a more detailed explanation of how the authentication process is completed between the three roles stated above.

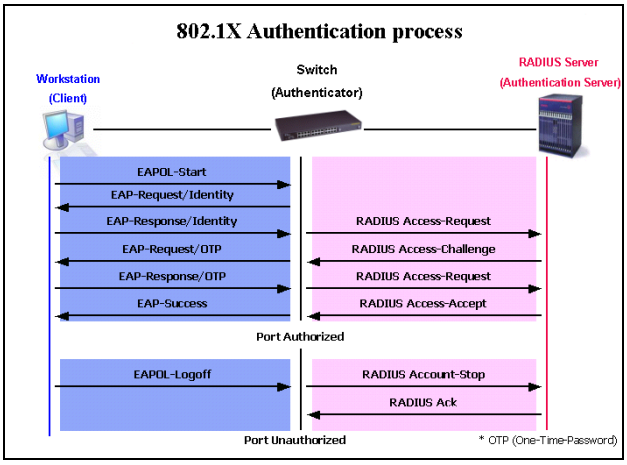


Figure 8-6 The 802.1X Authentication Process

The D-Link implementation of 802.1X allows network administrators to choose between two types of Access Control used on the Switch, which are:

1. Port-Based Access Control – This method requires only one user to be authenticated per port by a remote RADIUS server to allow the remaining users on the same port access to the network.
2. Host-Based Access Control – Using this method, the Switch will automatically learn up to a maximum of 448 MAC addresses by port and set them in a list. Each MAC address must be authenticated by the Switch using a remote RADIUS server before being allowed access to the Network.

Understanding 802.1X Port-based and Host-based Network Access Control

The original intent behind the development of 802.1X was to leverage the characteristics of point-to-point in LANs. As any single LAN segment in such infrastructures has no more than two devices attached to it, one of which is a Bridge Port. The Bridge Port detects events that indicate the attachment of an active device at the remote end of the link, or an active device becoming inactive. These events can be used to control the authorization state of the Port and initiate the process of authenticating the attached device if the Port is unauthorized. This is the Port-Based Network Access Control.

Port-based Network Access Control

Once the connected device has successfully been authenticated, the Port then becomes Authorized, and all subsequent traffic on the Port is not subject to access control restriction until an event occurs that causes the Port to become Unauthorized. Hence, if the Port is actually connected to a shared media LAN segment with more than one attached device, successfully authenticating one of the attached devices effectively provides access to the LAN for all devices on the shared segment. Clearly, the security offered in this situation is open to attack.

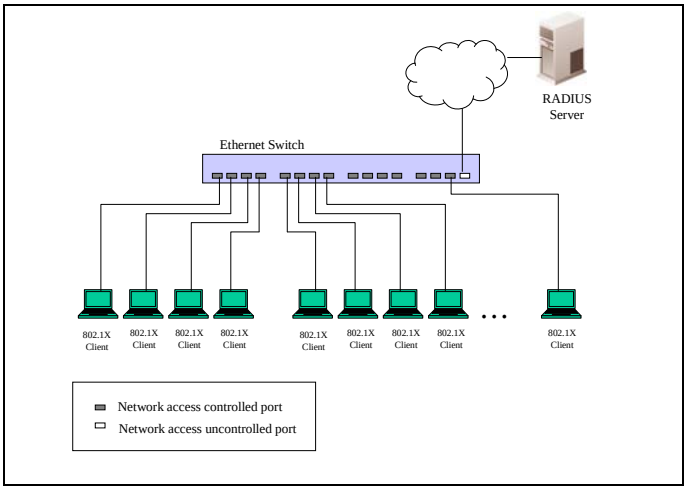


Figure 8-7 Example of Typical Port-based Configuration

Host-based Network Access Control

In order to successfully make use of 802.1X in a shared media LAN segment, it would be necessary to create “logical” Ports, one for each attached device that required access to the LAN. The Switch would regard the single physical Port connecting it to the shared media segment as consisting of a number of distinct logical Ports, each logical Port being independently controlled from the point of view of EAPOL exchanges and authorization state. The Switch learns each attached devices’ individual MAC addresses, and effectively creates a logical Port that the attached device can then use to communicate with the LAN via the Switch.

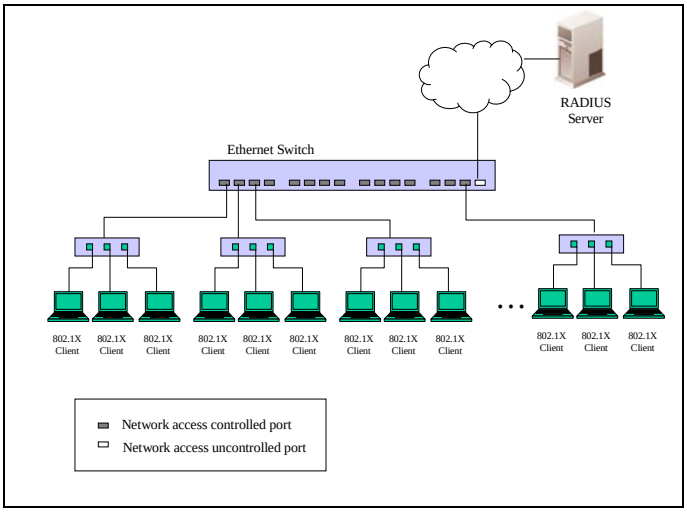


Figure 8-8 Example of Typical Host-based Configuration

802.1X Global Settings

Users can configure the 802.1X global parameter.

To view this window, click **Security > 802.1X > 802.1X Global Settings**, as shown below:

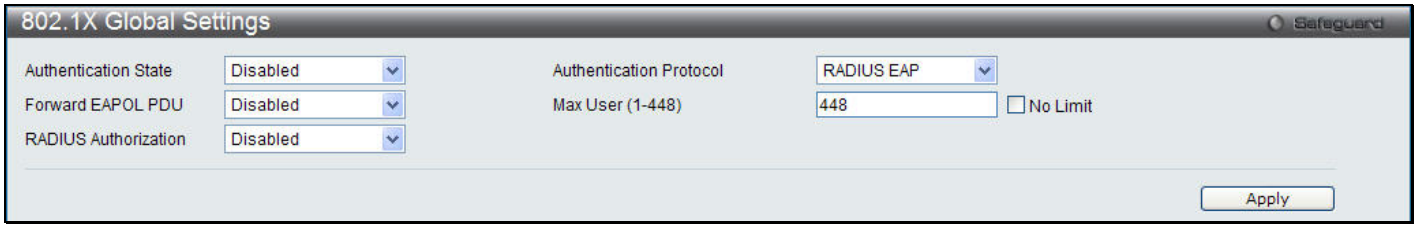


Figure 8-9 802.1X Global Settings window

The fields that can be configured are described below:

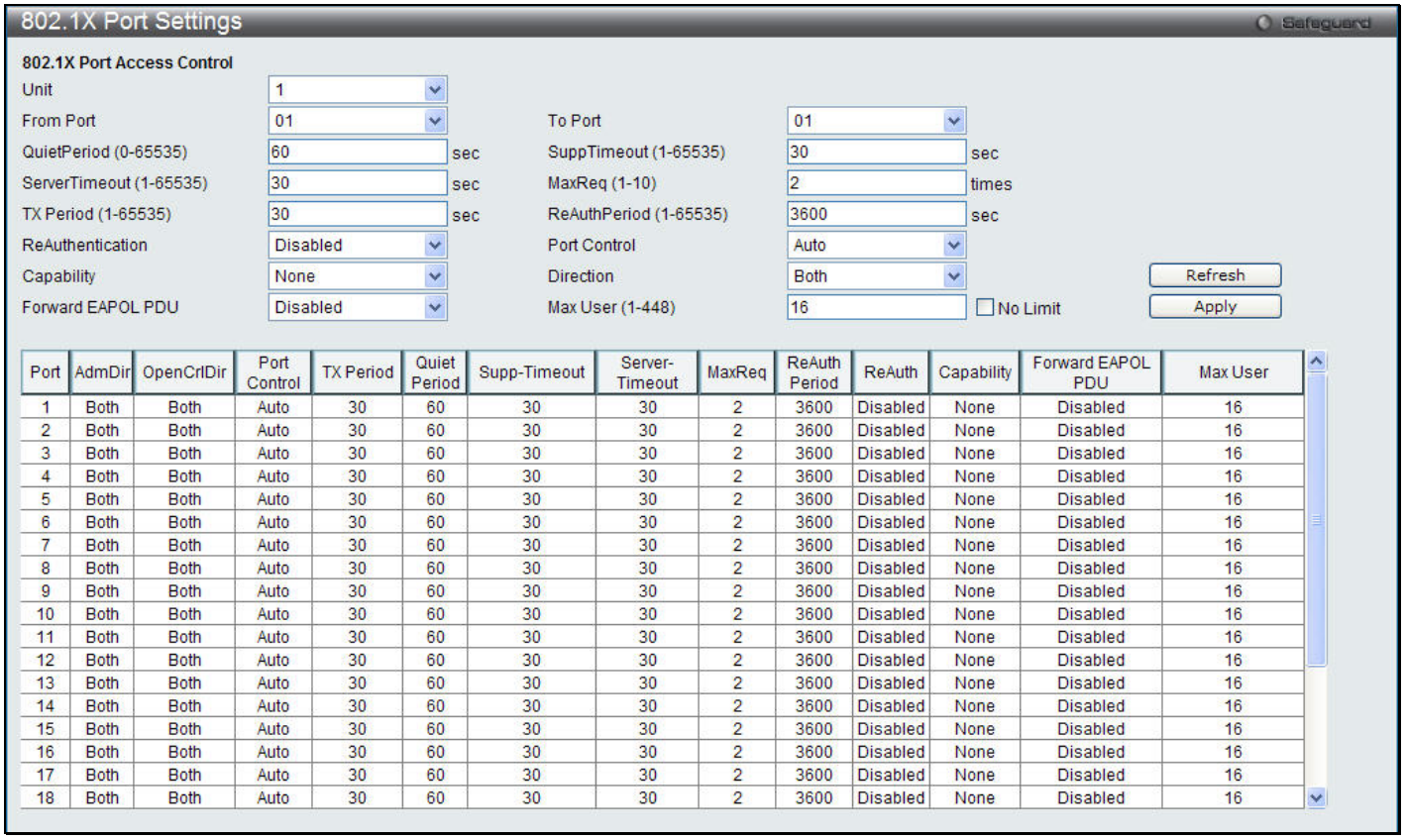
Parameter	Description
Authentication State	Choose the 802.1X authenticator state.
Authentication Protocol	Choose the authenticator protocol, *Local* or *RADIUS EAP*.
Forward EAPOL PDU	This is a global setting to control the forwarding of EAPOL PDU. When 802.1X functionality is disabled globally or for a port, and if 802.1X forward PDU is enabled both globally and for the port, a received EAPOL packet on the port will be flooded in the same VLAN to those ports for which 802.1X forward PDU is enabled and 802.1X is disabled (globally or just for the port). The default state is disabled.
Max Users (1-448)	Specifies the maximum number of users. The limit on the maximum users is *448* users.
RADIUS Authorization	This option is used to enable or disable acceptation of authorized configuration. When the authorization is enabled for 802.1X’s RADIUS, the authorized data assigned by the RADIUS server will be accepted if the global authorization network is enabled.

Click the **Apply** button to accept the changes made.

802.1X Port Settings

Users can configure the 802.1X authenticator port settings.

To view this window, click **Security > 802.1X > 802.1X Port Settings**, as shown below:



Port	AdmDir	OpenCrlDir	Port Control	TX Period	Quiet Period	Supp-Timeout	Server-Timeout	MaxReq	ReAuth Period	ReAuth	Capability	Forward EAPOL PDU	Max User
1	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
2	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
3	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
4	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
5	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
6	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
7	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
8	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
9	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
10	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
11	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
12	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
13	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
14	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
15	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
16	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
17	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16
18	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16

Figure 8-10 802.1X Port Settings

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the range of ports to configure.
QuietPeriod (0-65535)	This allows the user to set the number of seconds that the Switch remains in the quiet state following a failed authentication exchange with the client. The default setting is *60* seconds.
SuppTimeout (1-65535)	This value determines timeout conditions in the exchanges between the Authenticator and the client. The default setting is *30* seconds.
ServerTimeout (1-65535)	This value determines timeout conditions in the exchanges between the Authenticator and the authentication server. The default setting is *30* seconds.
MaxReq (1-10)	The maximum number of times that the Switch will retransmit an EAP Request to the client before it times out of the authentication sessions. The default setting is *2*.
TX Period (1-65535)	This sets the TxPeriod of time for the authenticator PAE state machine. This value determines the period of an EAP Request/Identity packet transmitted to the client. The default setting is *30* seconds.
ReAuthPeriod (1-	A constant that defines a nonzero number of seconds between periodic re-authentication

65535)	of the client. The default setting is *3600* seconds.
ReAuthentication	Determines whether regular re-authentication will take place on this port. The default setting is *Disabled*.
Port Control	This allows the user to control the port authorization state. Select *ForceAuthorized* to disable 802.1X and cause the port to transition to the authorized state without any authentication exchange required. This means the port transmits and receives normal traffic without 802.1X-based authentication of the client. If *ForceUnauthorized* is selected, the port will remain in the unauthorized state, ignoring all attempts by the client to authenticate. The Switch cannot provide authentication services to the client through the interface. If *Auto* is selected, it will enable 802.1X and cause the port to begin in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. The authentication process begins when the link state of the port transitions from down to up, or when an EAPOL-start frame is received. The Switch then requests the identity of the client and begins relaying authentication messages between the client and the authentication server. The default setting is *Auto*.
Capability	This allows the 802.1X Authenticator settings to be applied on a per-port basis. Select *Authenticator* to apply the settings to the port. When the setting is activated, a user must pass the authentication process to gain access to the network. Select *None* disable 802.1X functions on the port.
Direction	Sets the administrative-controlled direction to *Both* or *In.* If *Both* is selected, control is exerted over both incoming and outgoing traffic through the controlled port selected in the first field. If *In* is selected, the control is only exerted over incoming traffic through the port the user selected in the first field.
Forward EAPOL PDU	This is a global setting to control the forwarding of EAPOL PDU. When 802.1X functionality is disabled globally or for a port, and if 802.1X forward PDU is enabled both globally and for the port, a received EAPOL packet on the port will be flooded in the same VLAN to those ports for which 802.1X forward PDU is enabled and 802.1X is disabled (globally or just for the port). The default state is disabled.
Max User (1-448)	Specifies the maximum number of users. The maximum user limit is *448* users. The default is *16*. Tick the No Limit check box to have unlimited users.

Click the **Refresh** button to refresh the display table so that new entries will appear.

Click the **Apply** button to accept the changes made.

802.1X User Settings

Users can set different 802.1X users in switch's local database.

To view this window, click **Security > 802.1X > 802.1X User Settings**, as shown below:

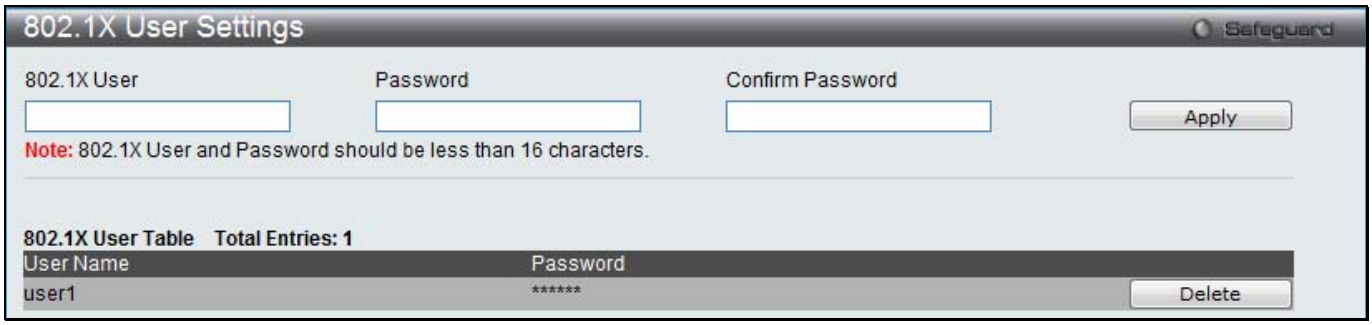


Figure 8-11 802.1X User Settings window

The fields that can be configured are described below:

Parameter	Description
802.1X User	Enter an 802.1X user's username.
Password	Enter an 802.1X user's password.
Confirm Password	Re-enter an 802.1X user's password.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

NOTE: The **802.1X User** and **Password** values should be less than 16 characters.

Guest VLAN Settings

On 802.1X security-enabled networks, there is a need for non- 802.1X supported devices to gain limited access to the network, due to lack of the proper 802.1X software or incompatible devices, such as computers running Windows 98 or older operating systems, or the need for guests to gain access to the network without full authorization or local authentication on the Switch. To supplement these circumstances, this switch now implements 802.1X Guest VLANs. These VLANs should have limited access rights and features separate from other VLANs on the network.

To implement 802.1X Guest VLANs, the user must first create a VLAN on the network with limited rights and then enable it as an 802.1X guest VLAN. Then the administrator must configure the guest accounts accessing the Switch to be placed in a Guest VLAN when trying to access the Switch. Upon initial entry to the Switch, the client wishing services on the Switch will need to be authenticated by a remote RADIUS Server or local authentication on the Switch to be placed in a fully operational VLAN.

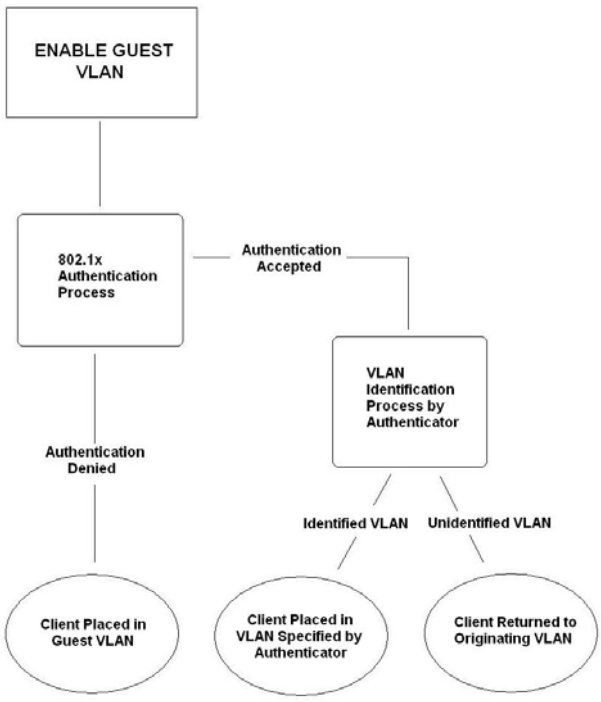


Figure 8-12 Guest VLAN Authentication Process

If authenticated and the authenticator possess the VLAN placement information, that client will be accepted into the fully operational target VLAN and normal switch functions will be open to the client. If the authenticator does not have

target VLAN placement information, the client will be returned to its originating VLAN. Yet, if the client is denied authentication by the authenticator, it will be placed in the Guest VLAN where it has limited rights and access. The adjacent figure should give the user a better understanding of the Guest VLAN process.

Limitations Using the Guest VLAN

1. Ports supporting Guest VLANs cannot be GVRP enabled and vice versa.
2. A port cannot be a member of a Guest VLAN and a static VLAN simultaneously.
3. Once a client has been accepted into the target VLAN, it can no longer access the Guest VLAN.

Remember, to set an 802.1X guest VLAN, the user must first configure a normal VLAN, which can be enabled here for guest VLAN status. Only one VLAN may be assigned as the 802.1X guest VLAN.

To view this window, click **Security > 802.1X > Guest VLAN Settings**, as shown below:

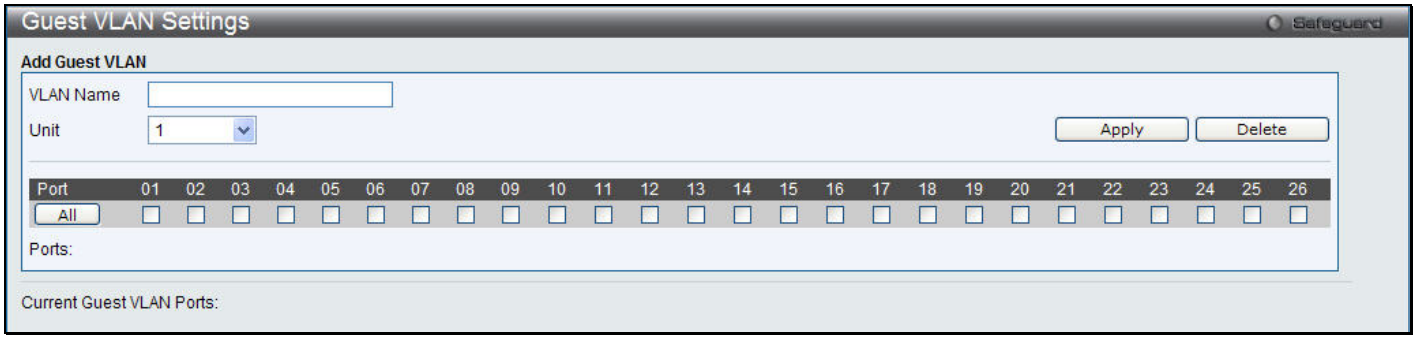


Figure 8-13 Guest VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Enter the pre-configured VLAN name to create as an 802.1X guest VLAN.
Unit	Use the drop-down menu to select a unit to configure.
Port	Set the ports to be enabled for the 802.1X guest VLAN. Click the **All** button to select all the ports.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry based on the information entered.

Authenticator State

The following section describes the 802.1X Authenticator State on the Switch. This window displays the Authenticator State for individual ports on a selected device. In Port-based mode if one of the attached hosts is successfully authorized, all hosts on the same port will be granted access to the network. If the port authorization fails, the specified port(s) will continue authenticating. In Host-based mode each user can individually authenticate and access the network.

To view this window, click **Security > 802.1X > Authenticator State**, as shown below:

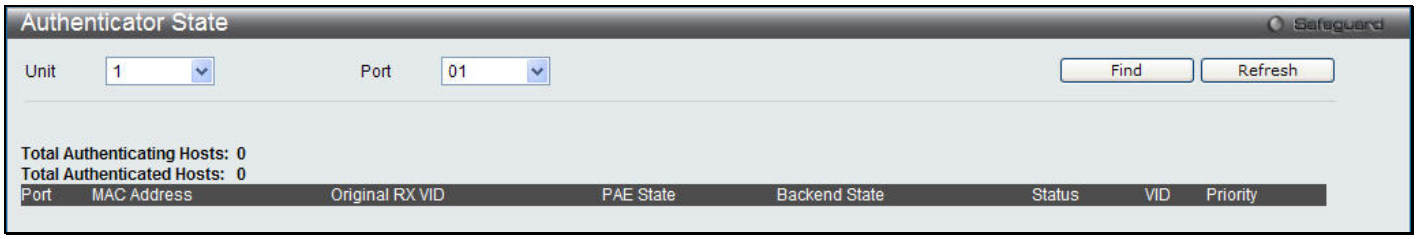


Figure 8-14 Authenticator State window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
Port	Select a port to be displayed.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Refresh** button to refresh the display table so that new entries will appear.

NOTE: The Authenticator State cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

Authenticator Statistics

This table contains the statistics objects for the Authenticator PAE associated with each port. An entry appears in this table for each port that supports the Authenticator function.

To view the Authenticator Statistics, click **Security > 802.1X > Authenticator Statistics**, as shown below:

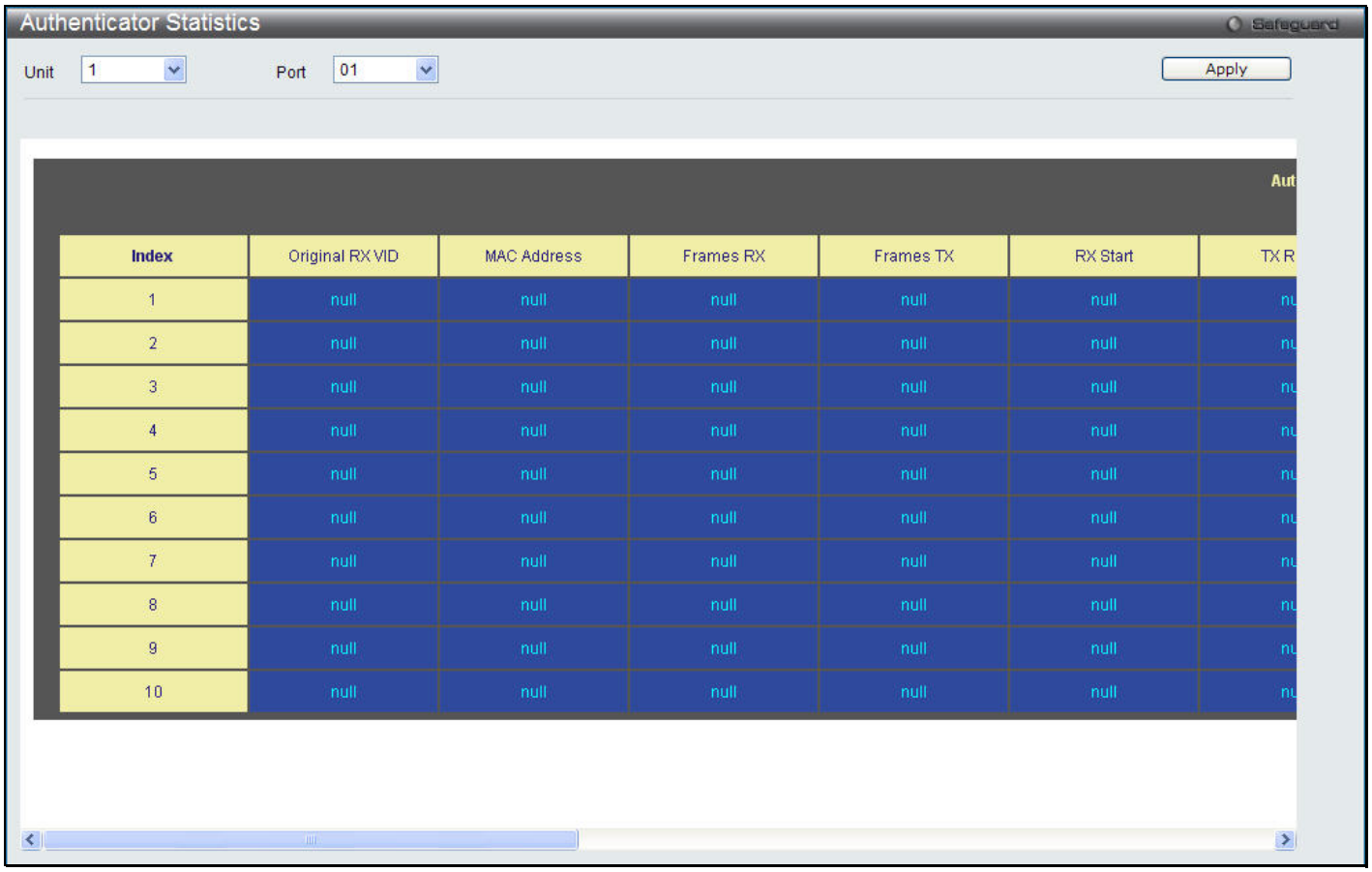


Figure 8-15 Authenticator Statistics window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
Port	Select the port to be displayed.

Click the **Apply** button to accept the changes made.

NOTE: The Authenticator State cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

Authenticator Session Statistics

This table contains the session statistics objects for the Authenticator PAE associated with each port. An entry appears in this table for each port that supports the Authenticator function.

To view this window, click **Security > 802.1X > Authenticator Session Statistics**, as shown below:

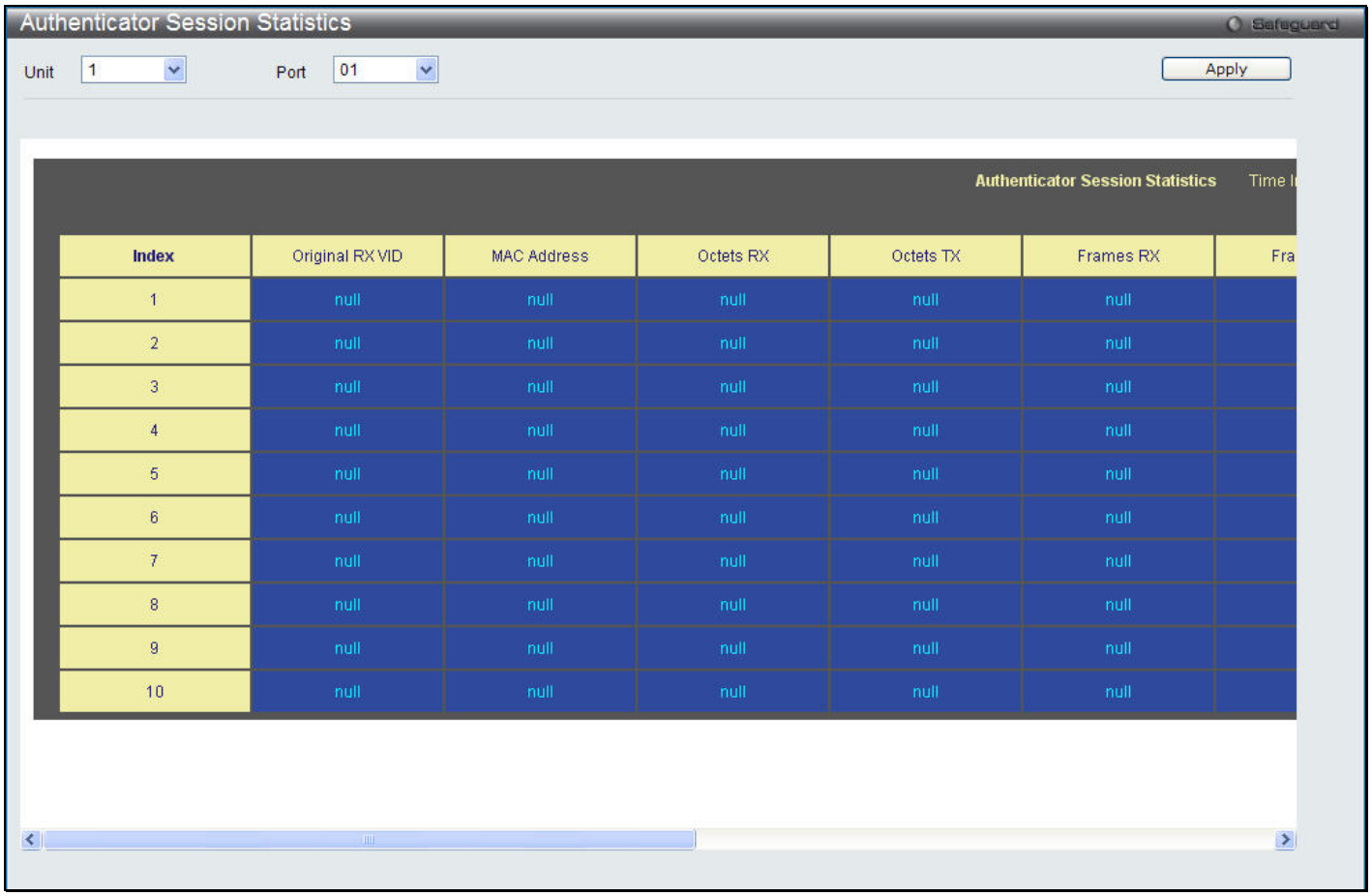


Figure 8-16 Authenticator Session Statistics window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
Port	Select the port to be displayed.

Click the **Apply** button to accept the changes made.

NOTE: The Authenticator State cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

Authenticator Diagnostics

This table contains the diagnostic information regarding the operation of the Authenticator associated with each port. An entry appears in this table for each port that supports the Authenticator function.

To view this window, click **Security > 802.1X > Authenticator Diagnostics**, as shown below:

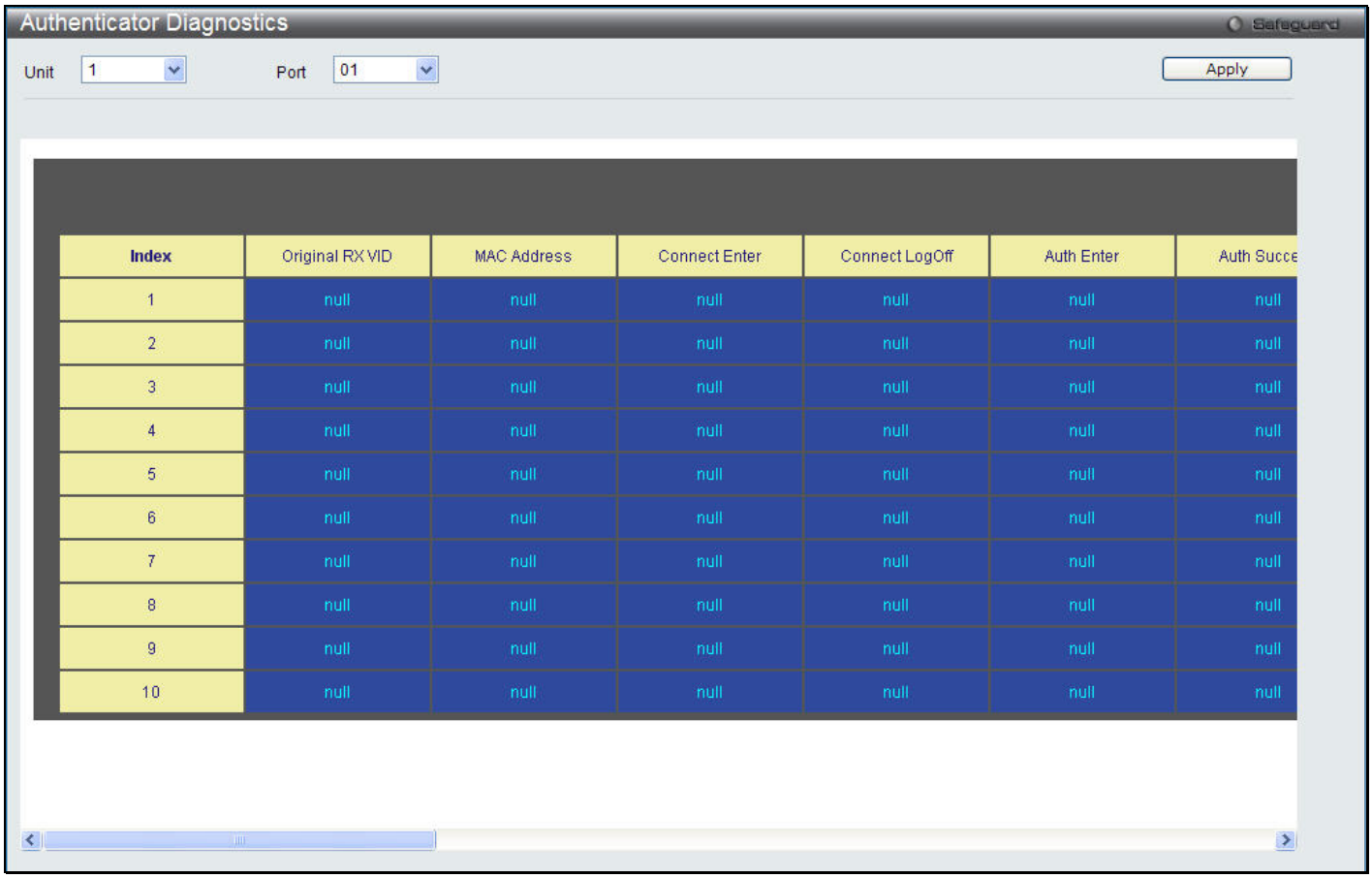


Figure 8-17 Authenticator Diagnostics window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
Port	Select the port to be displayed.

Click the **Apply** button to accept the changes made.

NOTE: The Authenticator Diagnostics cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

Initialize Port(s)

Existing 802.1X port and MAC settings are displayed and can be configured using the window below.

To view this window, click **Security > 802.1X > Initialize Port(s)**, as shown below.

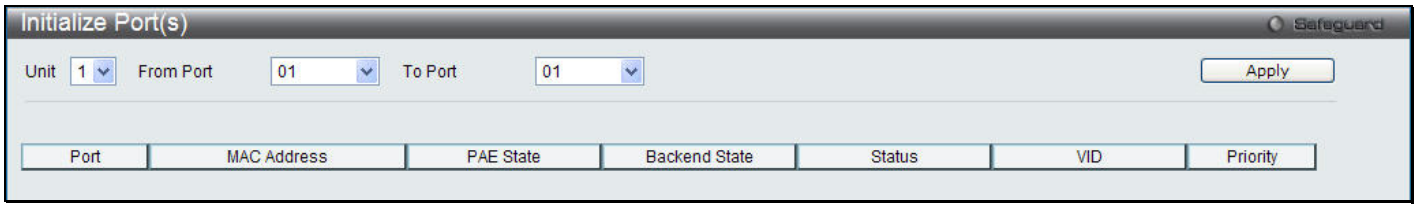


Figure 8-18 Initialize Port(s) window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
From Port / To Port	Select a port or range of ports to be displayed.

Click the **Apply** button to accept the changes made.

NOTE: The Initialize Port(s) cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

Reauthenticate Port(s)

This window displays reauthentication of a port or group of ports.

To view this window, click **Security > 802.1X > Reauthenticate Port(s)**, as shown below:

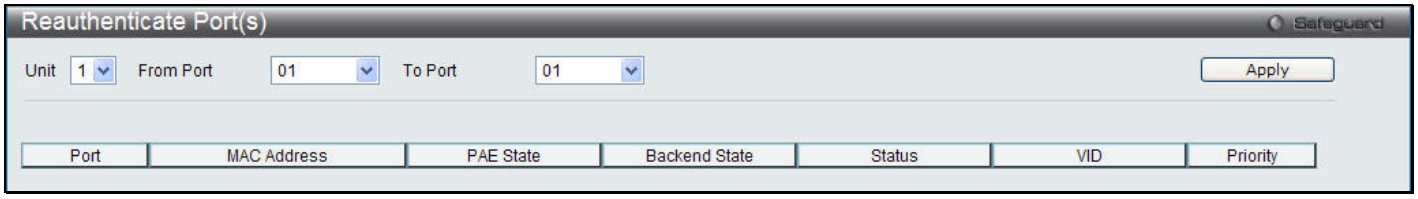


Figure 8-19 Reauthenticate Port(s) window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to be displayed.
From Port / To Port	Select a port or range of ports to be displayed.

Click the **Apply** button to see the current status of the reauthenticated port(s).

NOTE: The Reauthenticate Port(s) cannot be viewed on the Switch unless 802.1X is enabled. To enable 802.1X, go to **Security > 802.1X > 802.1X Global Settings**, and select *Enabled* from the Authentication State drop-down menu.

RADIUS

Authentication RADIUS Server Settings

The RADIUS feature of the Switch allows the user to facilitate centralized user administration as well as providing protection against a sniffing, active hacker.

To view this window, click **Security > RADIUS > Authentication RADIUS Server Settings**, as shown below:

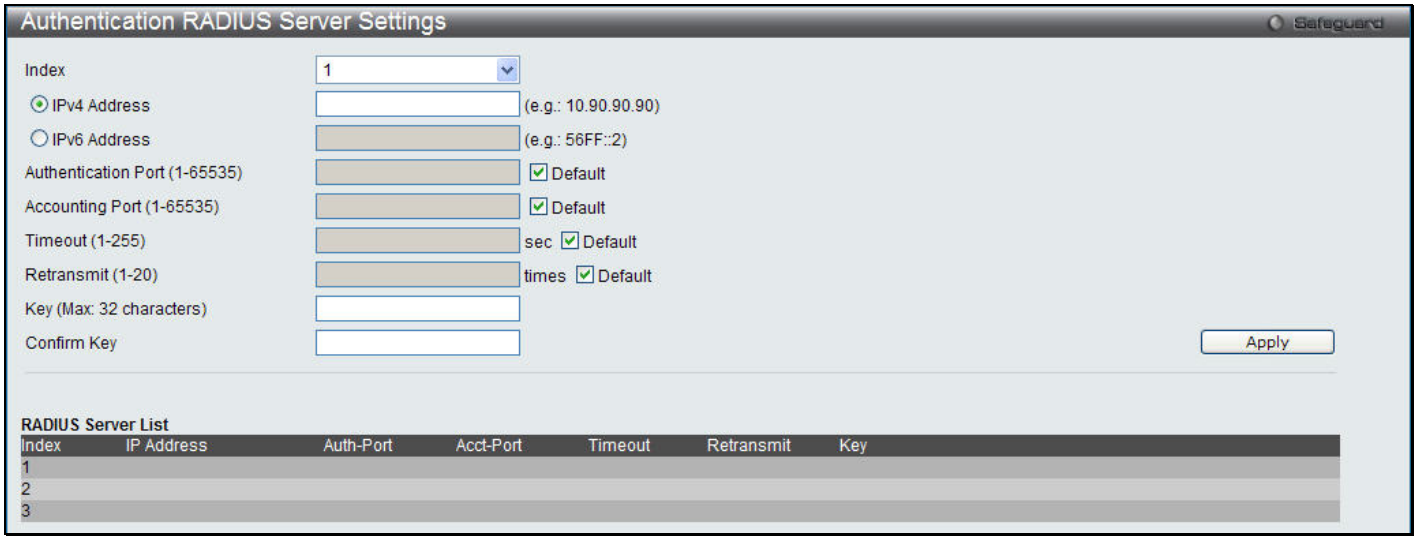


Figure 8-20 Authentication RADIUS Server Settings window

The fields that can be configured are described below:

Parameter	Description
Index	Choose the desired RADIUS server to configure: *1, 2* or *3* and select the IPv4 Address.
IPv4 Address	Click the radio button to enter the RADIUS server IP address.
IPv6 Address	Click the radio button to enter the RADIUS server IPv6 address.
Authentication Port (1-65535)	Set the RADIUS authentic server(s) UDP port which is used to transmit RADIUS data between the Switch and the RADIUS server. The default port is *1812*.
Accounting Port (1-65535)	Set the RADIUS account server(s) UDP port which is used to transmit RADIUS accounting statistics between the Switch and the RADIUS server. The default port is *1813*.
Timeout (1-255)	Set the RADIUS server age-out, in seconds.
Retransmit (1-20)	Set the RADIUS server retransmit time, in times.
Key (Max: 32 characters)	Set the key the same as that of the RADIUS server.
Confirm Key	Confirm the key is the same as that of the RADIUS server.

Click the **Apply** button to accept the changes made.

RADIUS Accounting Settings

Users can configure the state of the specified RADIUS accounting service.

To view this window, click **Security > RADIUS > RADIUS Accounting Settings**, as shown below:

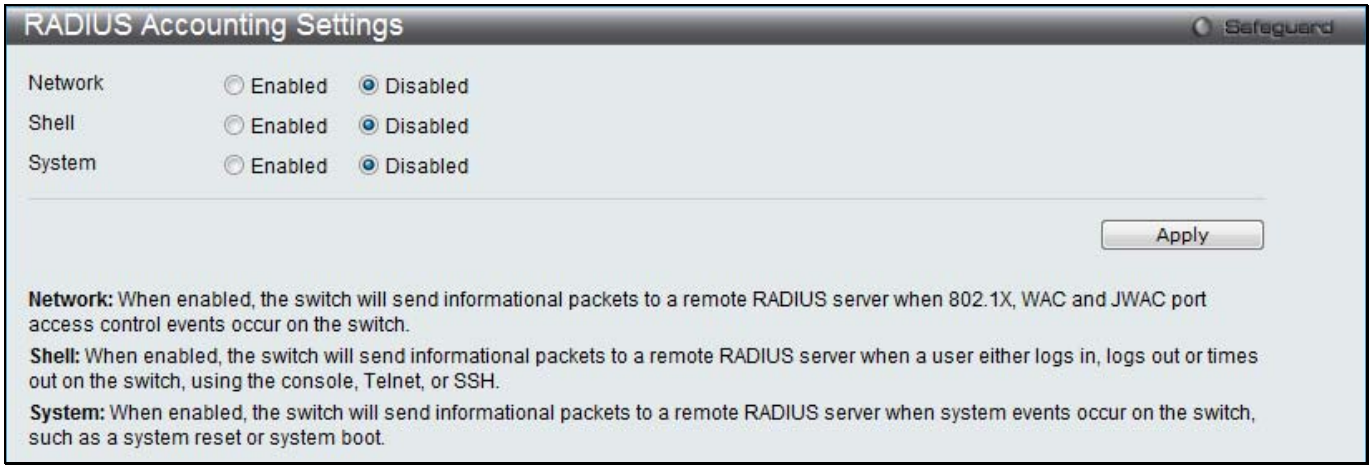


Figure 8-21 RADIUS Accounting Settings window

The fields that can be configured are described below:

Parameter	Description
Network	When enabled, the Switch will send informational packets to a remote RADIUS server when 802.1X, WAC and JWAC port access control events occur on the Switch.
Shell	When enabled, the Switch will send informational packets to a remote RADIUS server when a user either logs in, logs out or times out on the Switch, using the console, Telnet, or SSH.
System	When enabled, the Switch will send informational packets to a remote RADIUS server when system events occur on the Switch, such as a system reset or system boot.

Click the **Apply** button to accept the changes made.

RADIUS Authentication

Users can display information concerning the activity of the RADIUS authentication client on the client side of the RADIUS authentication protocol.

To view this window, click **Security > RADIUS > RADIUS Authentication**, as shown below:

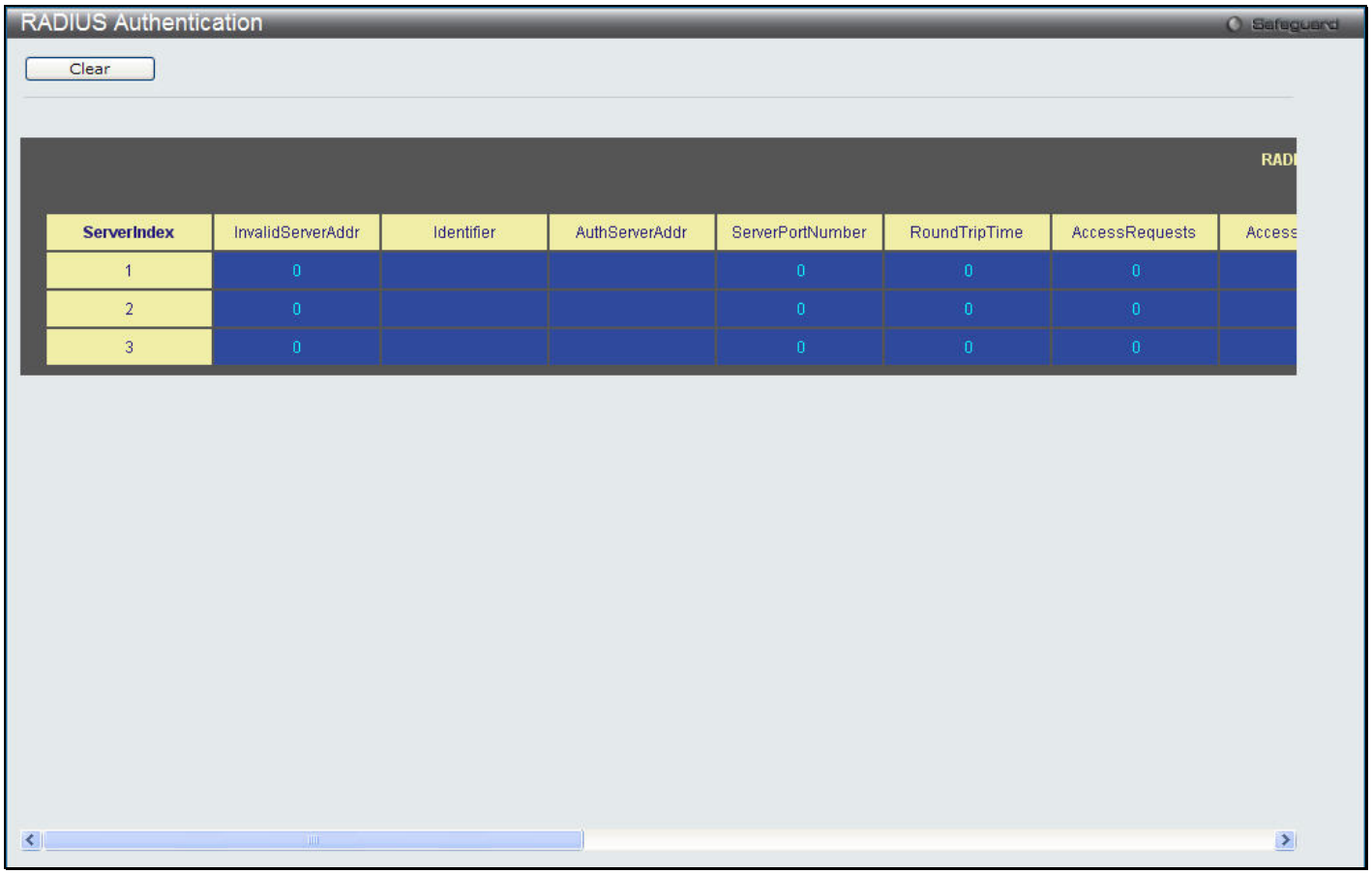


Figure 8-22 RAIUS Authentication window

The user may also select the desired time interval to update the statistics, between *1s* and *60s*, where "s" stands for seconds. The default value is one second.

The fields that can be configured are described below:

Parameter	Description
InvalidServerAddresses	The number of RADIUS Access-Response packets received from unknown addresses.
Identifier	The NAS-Identifier of the RADIUS authentication client.
ServerIndex	The identification number assigned to each RADIUS Authentication server that the client shares a secret with.
AuthServerAddress	The (conceptual) table listing the RADIUS authentication servers with which the client shares a secret.
ServerPortNumber	The UDP port the client is using to send requests to this server.
RoundTripTime	The time interval (in hundredths of a second) between the most recent Access-Reply/Access-Challenge and the Access-Request that matched it from this RADIUS authentication server.
AccessRequests	The number of RADIUS Access-Request packets sent to this server. This does not include retransmissions.
AccessRetransmissions	The number of RADIUS Access-Request packets retransmitted to this RADIUS authentication server.
AccessAccepts	The number of RADIUS Access-Accept packets (valid or invalid) received from this server.

AccessRejects	The number of RADIUS Access-Reject packets (valid or invalid) received from this server.
AccessChallenges	The number of RADIUS Access-Challenge packets (valid or invalid) received from this server.
AccessResponses	The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or Signature attributes or known types are not included as malformed access responses.
BadAuthenticators	The number of RADIUS Access-Response packets containing invalid authenticators or Signature attributes received from this server.
PendingRequests	The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response. This variable is incremented when an Access-Request is sent and decremented due to receipt of an Access-Accept, Access-Reject or Access-Challenge, a timeout or retransmission.
Timeouts	The number of authentication timeouts to this server. After a timeout the client may retry to the same server, send to a different server, or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as a Request as well as a timeout.
UnknownTypes	The number of RADIUS packets of unknown type which were received from this server on the authentication port
PacketsDropped	The number of RADIUS packets of which were received from this server on the authentication port and dropped for some other reason.

Click the **Clear** button to clear the current statistics shown.

RADIUS Account Client

Users can display managed objects used for managing RADIUS accounting clients, and the current statistics associated with them.

To view this window, click **Security > RADIUS > RADIUS Account Client**, as shown below:

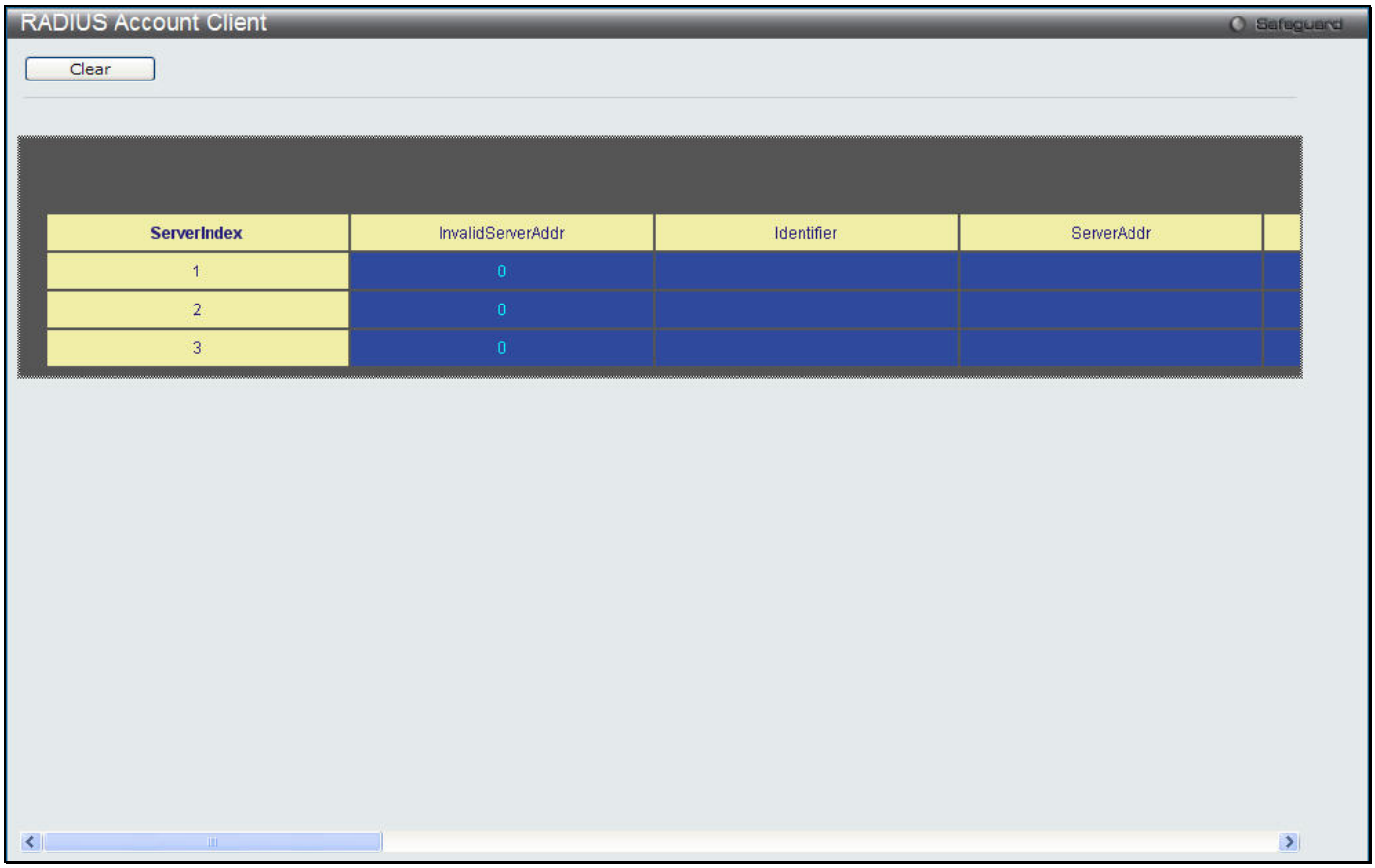


Figure 8-23 RADIUS Account Client window

The user may also select the desired time interval to update the statistics, between *1s* and *60s*, where "s" stands for seconds. The default value is one second.

The fields that can be configured are described below:

Parameter	Description
ServerIndex	The identification number assigned to each RADIUS Accounting server that the client shares a secret with.
InvalidServerAddr	The number of RADIUS Accounting-Response packets received from unknown addresses.
Identifier	The NAS-Identifier of the RADIUS accounting client.
ServerAddr	The (conceptual) table listing the RADIUS accounting servers with which the client shares a secret.
ServerPortNumber	The UDP port the client is using to send requests to this server.
RoundTripTime	The time interval between the most recent Accounting-Response and the Accounting-Request that matched it from this RADIUS accounting server.
Requests	The number of RADIUS Accounting-Request packets sent. This does not include retransmissions.
Retransmissions	The number of RADIUS Accounting-Request packets retransmitted to this RADIUS accounting server. Retransmissions include retries where the Identifier and Acct-Delay have been updated, as well as those in which they remain the same.
Responses	The number of RADIUS packets received on the accounting port from this server.

MalformedResponses	The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators and unknown types are not included as malformed accounting responses.
BadAuthenticators	The number of RADIUS Accounting-Response packets, which contained invalid authenticators, received from this server.
PendingRequests	The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response. This variable is incremented when an Accounting-Request is sent and decremented due to receipt of an Accounting-Response, a timeout or a retransmission.
Timeouts	The number of accounting timeouts to this server. After a timeout the client may retry to the same server, send to a different server, or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as an Accounting-Request as well as a timeout.
UnknownTypes	The number of RADIUS packets of unknown type which were received from this server on the accounting port.
PacketsDropped	The number of RADIUS packets, which were received from this server on the accounting port and dropped for some other reason.

Click the **Clear** button to clear the current statistics shown.

IP-MAC-Port Binding (IMPB)

The IP network layer uses a four-byte address. The Ethernet link layer uses a six-byte MAC address. Binding these two address types together allows the transmission of data between the layers. The primary purpose of IP-MAC-port binding is to restrict the access to a switch to a number of authorized users. Authorized clients can access a switch's port by either checking the pair of IP-MAC addresses with the pre-configured database or if DHCP snooping has been enabled in which case the switch will automatically learn the IP/MAC pairs by snooping DHCP packets and saving them to the IMPB white list. If an unauthorized user tries to access an IP-MAC binding enabled port, the system will block the access by dropping its packet. For the xStack® DES-3528/DES-3552 Series of switches, active and inactive entries use the same database. The maximum number of entries is 511. The creation of authorized users can be manually configured by CLI or Web. The function is port-based, meaning a user can enable or disable the function on the individual port.

IMPB Global Settings

Users can enable or disable the Trap/Log State, DHCP Snoop state, and ND Snooping State on the Switch. The Trap/Log field will enable and disable the sending of trap/log messages for IP-MAC-port binding. When enabled, the Switch will send a trap message to the SNMP agent and the Switch log when an ARP packet is received that doesn't match the IP-MAC-port binding configuration set on the Switch.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > IMPB Global Settings**, as shown below:

Figure 8-24 IMPB Global Settings window

The fields that can be configured are described below:

Parameter	Description
Trap / Log	This field will enable and disable the sending of trap/log messages for IP-MAC-port binding. When Enabled, the Switch will send a trap message to the SNMP agent and the Switch log when an ARP packet is received that doesn't match the IP-MAC-port binding configuration set on the Switch. The default is *Disabled*.
DHCP Snooping (IPv4)	Click the radio buttons to enable or disable DHCP snooping for IPv4. The default is Disabled.
DHCP Snooping (IPv6)	Click the radio buttons to enable or disable DHCP snooping for IPv6.
ND Snooping	Click the radio buttons to enable or disable ND snooping.
Recover Learning Ports	Enter the port numbers used to recover the learning port state. Tick the All check box to apply all ports.

Click the **Apply** button to accept the changes made for each individual section.

IMPB Port Settings

Select a port or a range of ports with the From Port and To Port fields. Enable or disable the port with the State, Allow Zero IP and Forward DHCP Packet field, and configure the port's Max Entry.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > IMPB Port Settings**, as shown below:

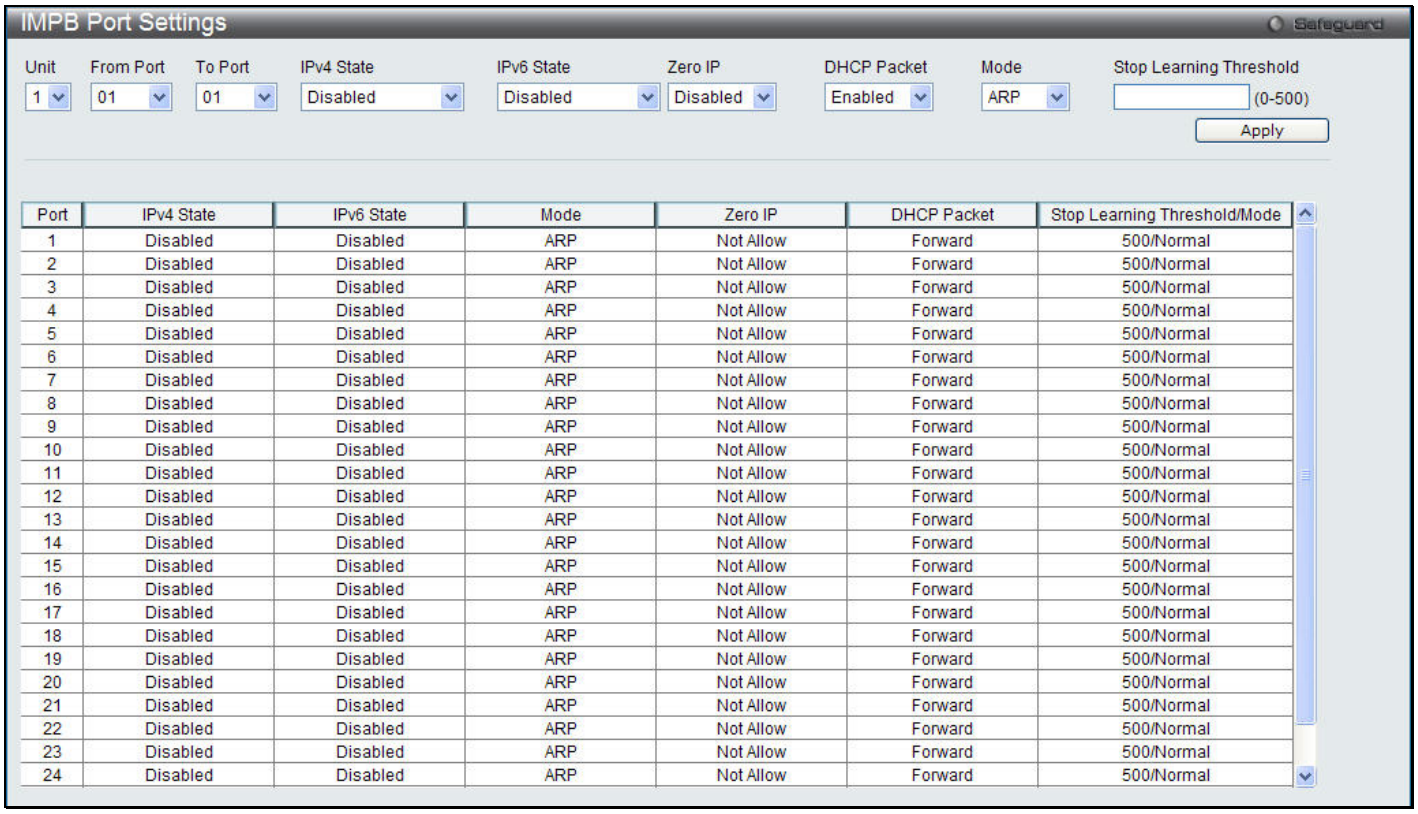


Figure 8-25 IMPB Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit you want to configure.

From Port / To Port	Select a range of ports to set for IP-MAC-port binding.
IPv4 State / IPv6 State	Use the pull-down menu to enable or disable these ports for IP-MAC-port binding.
Enabled (Strict)	This mode provides a stricter method of control. If the user selects this mode, all packets will be sent to the CPU, thus all packets will not be forwarded by the hardware until the S/W learns the entries for the ports. The port will check ARP and IP packets by IP-MAC-port binding entries. When the packet is found by the entry, the MAC address will be set to dynamic state. If the packet is not found by the entry, the packets will be dropped. The default mode is strict if not specified. The ports with strict mode will capture unicast DHCP packets through the ACL module. If configuring IP-MAC-port binding in strict mode when IP-MAC-port binding DHCP snooping is enabled, it will create an ACL profile and the rules according to the ports. If there is not enough profile or rule space for an ACL profile or rule table, it will return a warning message and will not create an ACL profile and rules to capture unicast DHCP packets.
Enabled (Loose)	This mode provides a looser way of control. If the user selects loose mode, ARP packets will be sent to the CPU. The packets will still be forwarded by the hardware until a specific source MAC address is blocked by the software. The port will check ARP packets by IP-MAC-port binding entries. When the packet is found by the entry, the MAC address will be set to dynamic state. If the packet is not found by the entry, the MAC address will be set to drop. Other packets will be bypassed.
Zero IP	Use the pull-down menu to enable or disable this feature. Allow zero IP configures the state which allows ARP packets with 0.0.0.0 source IP to bypass.
DHCP Packet	By default, the DHCP packet with broadcast DA will be flooded. When set to disable, the broadcast DHCP packet received by the specified port will not be forwarded in strict mode. This setting is effective when DHCP snooping is enabled, in the case when a DHCP packet which has been trapped by the CPU needs to be forwarded by the software. This setting controls the forwarding behavior in this situation.
Mode	Toggle between *ARP* and *ACL*. When configuring the port mode to ACL, the Switch will create an ACL access entry corresponding to the entries of this port. If the port changes to ARP, all the ACL access entries will be deleted automatically. The default mode is *ARP*.
Stop Learning Threshold	Enter the number of blocked entries on the port. The value is from *0* to *500*.

Click the **Apply** button to accept the changes made.

IMPB Entry Settings

This window is used to create static IP-MAC-binding port entries and view all IMPB entries on the Switch.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > IMPB Entry Settings**, as shown below:

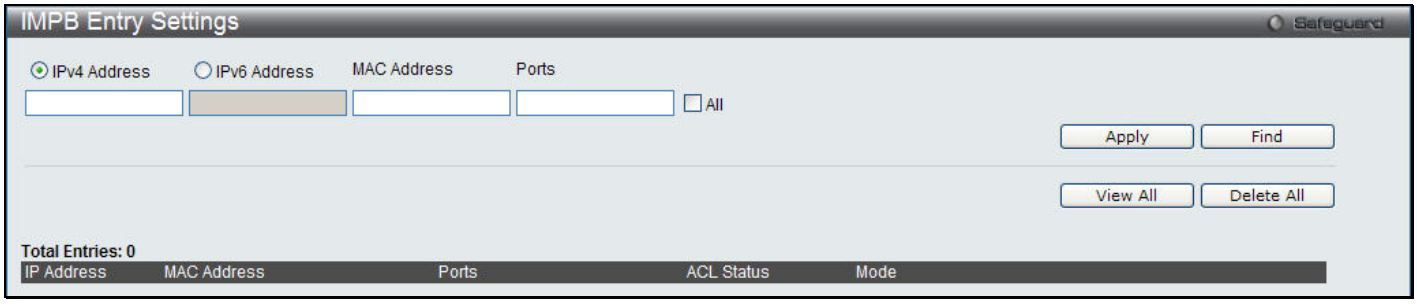


Figure 8-26 IMPB Entry Settings window

The fields that can be configured are described below:

Parameter	Description
IPv4 Address	Click the radio button to enter the IP address to bind to the MAC address set below.
IPv6 Address	Click the radio button to enter the IPv6 address to bind to the MAC address set below.
MAC Address	Enter the MAC address to bind to the IPv4 or IPv6 address set above.
Ports	Specify the Switch ports for which to configure this IP-MAC binding entry (IP Address + MAC Address). Tick the All check box to configure this entry for all ports on the Switch.

Click the **Apply** button to accept the changes made.
Click the **Find** button to locate a specific entry based on the information entered.
Click the **View All** button to display all the existing entries.
Click the **Delete All** button to remove all the entries listed.

MAC Block List

This window is used to view unauthorized devices that have been blocked by IP-MAC binding restrictions.
To view this window, click **Security > IP-MAC-Port Binding (IMPB) > MAC Block List**, as shown below:

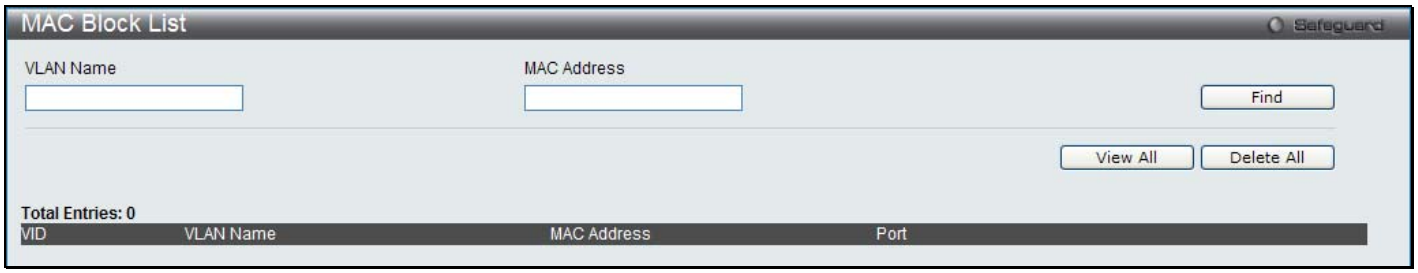


Figure 8-27 MAC Block List window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Enter a VLAN Name.
MAC Address	Enter a MAC address.

Click the **Find** button to find an unauthorized device that has been blocked by the IP-MAC binding restrictions
Click the **View All** button to display all the existing entries.
Click the **Delete All** button to remove all the entries listed.

DHCP Snooping

DHCP Snooping Maximum Entry Settings

Users can configure the maximum DHCP snooping entry for ports on this page.
To view this window, click **Security > IP-MAC-Port Binding (IMPB) > DHCP Snooping > DHCP Snooping Maximum Entry Settings**, as shown below:

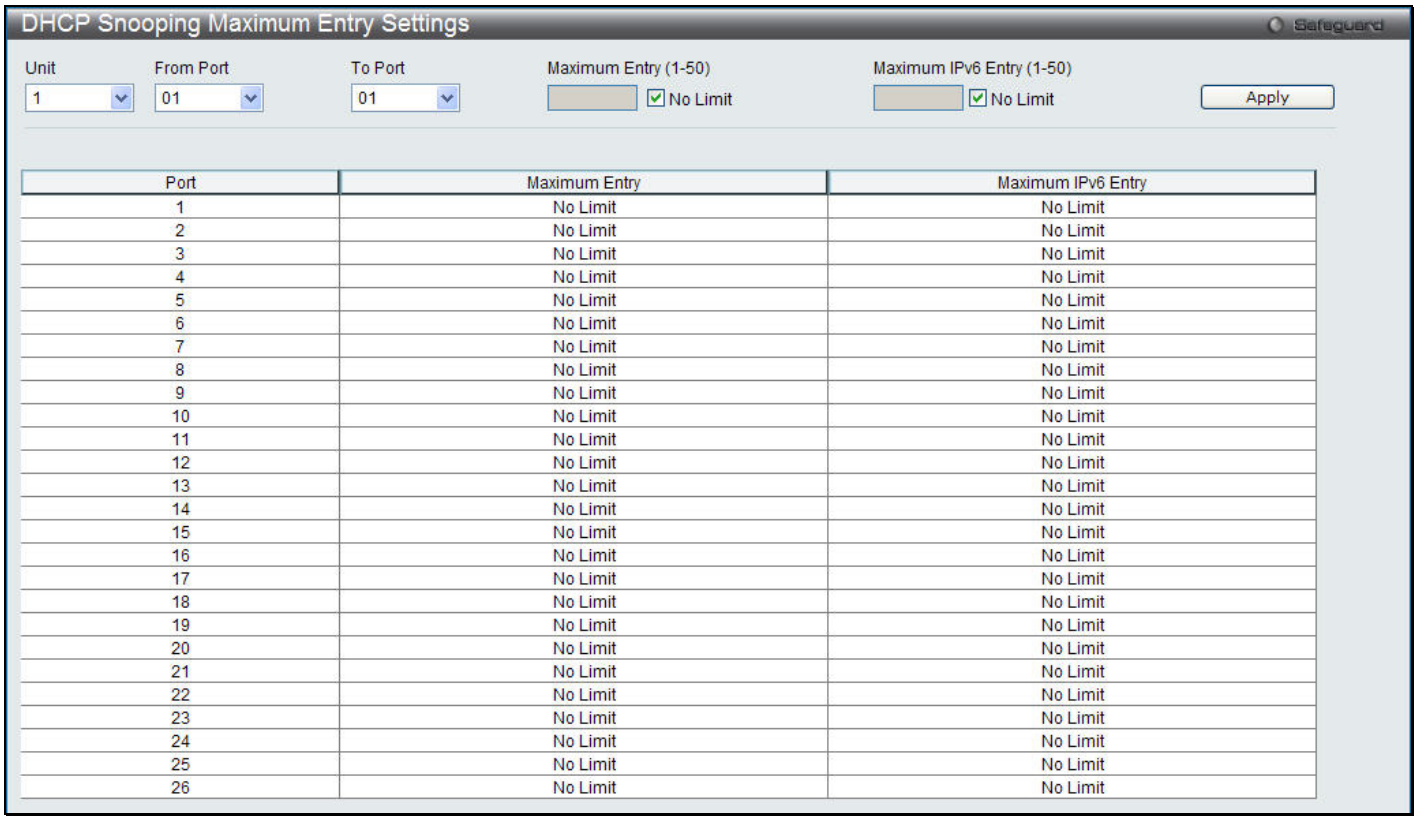


Figure 8-28 DHCP Snooping Maximum Entry Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menus to select a range of ports to use.
Maximum Entry (1-50)	Enter the maximum entry value. Tick the No Limit check box to have unlimited entries.
Maximum IPv6 Entry (1-50)	Enter the maximum IPv6 entry value. Tick the No Limit check box to have unlimited entries.

Click the **Apply** button to accept the changes made.

DHCP Snooping Entry

This window is used to view dynamic entries on specific ports.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > DHCP Snooping > DHCP Snooping Entry**, as shown below:

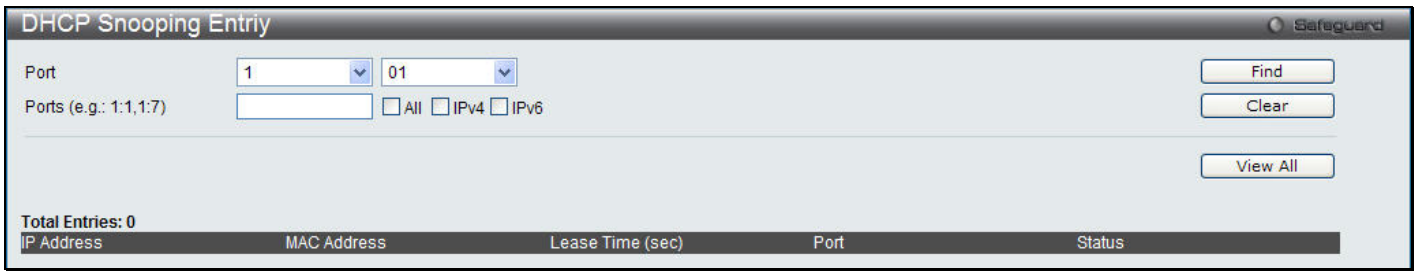


Figure 8-29 DHCP Snooping Entry window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select the desired port.
Ports (e.g.: 1:1, 1:7)	Specify the ports for which to view or clear DHCP snooping entries. Tick the All check box to view or clear entries for all ports. Tick the IPv4 check box to view or clear the ports with IPv4 entries. Tick the IPv6 check box to view or clear the ports with IPv6 entries.

Click the **Find** button to locate a specific entry based on the port number selected.

Click the **Clear** button to clear all the information entered in the fields.

Click the **View All** button to display all the existing entries.

ND Snooping

ND snooping is a security feature that provides network security by building and maintaining a ND snooping binding white list and by filtering “untrusted” hosts.

ND Snooping process is designed for stateless auto-configuration assigned IPv6 address and manually configured IPv6 address.

Whenever a host wants to assign an IPv6 address to its interface, it must perform Duplicate Address Detection first, which is composed of NDP packets. The NDP is also used to detect whether a host is still reachable. Such NDP packets can be used to determine whether to delete a binding or not.

The binding entries generally are not permanent. Each binding has a lifetime, and some event may trigger the binding deletion. When their lifetime expires, or the event happens, this mechanism will delete the corresponding entry, or perform some process.

ND Snooping Maximum Entry Settings

Users can configure the maximum ND snooping entry for ports on this page.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > ND Snooping > ND Snooping Maximum Entry Settings**, as shown below:

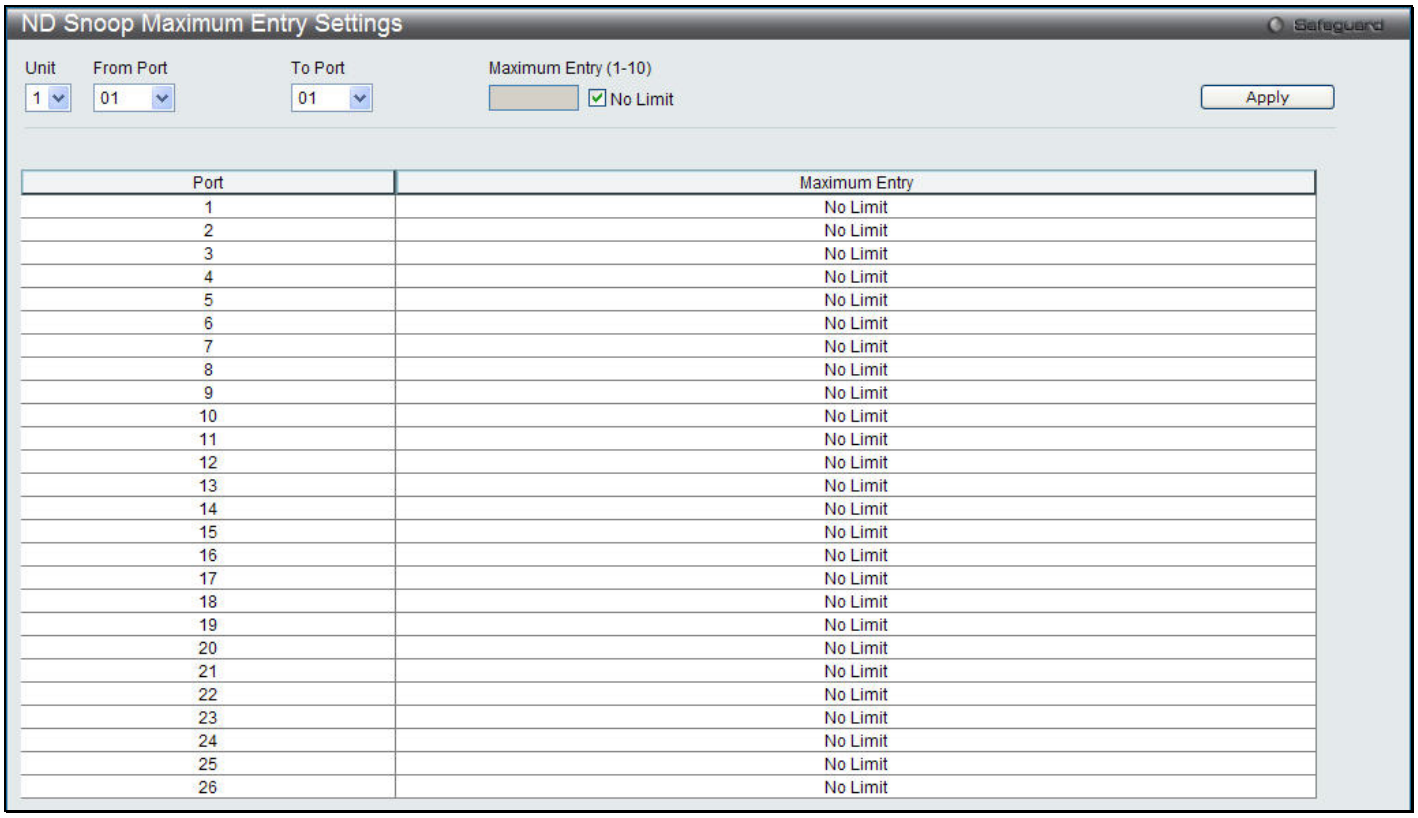


Figure 8-30 ND Snooping Maximum Entry Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menus to select a range of ports to use.
Maximum Entry (1-10)	Enter the maximum entry value. Tick the No Limit check box to have unlimited entries.

Click the **Apply** button to accept the changes made.

ND Snooping Entry

This window is used to display ND snooping status on specific ports.

To view this window, click **Security > IP-MAC-Port Binding (IMPB) > ND Snooping > ND Snooping Entry**, as shown below:

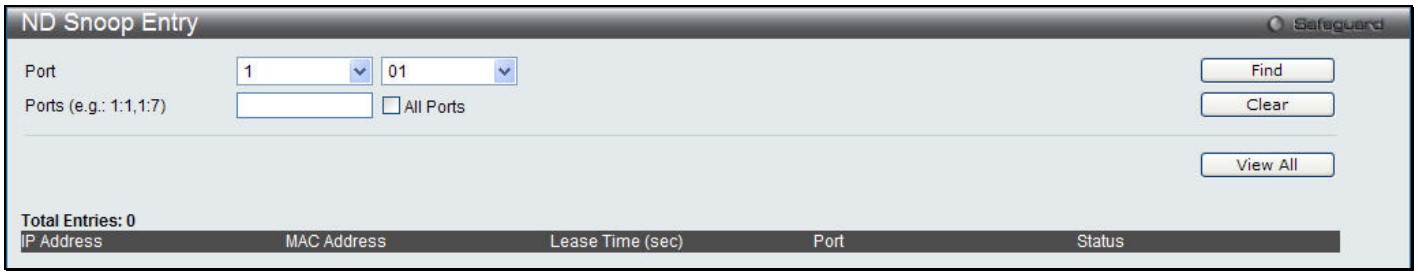


Figure 8-31 ND Snooping Entry window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select the desired port.
Ports (e.g.: 1:1, 1:7)	Specify the ports for which to view or clear ND snooping entries. Tick the All Ports check box to view or clear entries for all ports.

Click the **Find** button to locate a specific entry based on the port number selected.

Click the **Clear** button to clear all the information entered in the fields.

Click the **View All** button to display all the existing entries.

MAC-based Access Control (MAC)

MAC-based access control is a method to authenticate and authorize access using either a port or host. For port-based MAC, the method decides port access rights, while for host-based MAC, the method determines the MAC access rights.

A MAC user must be authenticated before being granted access to a network. Both local authentication and remote RADIUS server authentication methods are supported. In MAC-based access control, MAC user information in a local database or a RADIUS server database is searched for authentication. Following the authentication result, users achieve different levels of authorization.

Notes about MAC-based Access Control

There are certain limitations and regulations regarding MAC-based access control:

1. Once this feature is enabled for a port, the Switch will clear the FDB of that port.
2. If a port is granted clearance for a MAC address in a VLAN that is not a Guest VLAN, other MAC addresses on that port must be authenticated for access and otherwise will be blocked by the Switch.
3. Ports that have been enabled for Link Aggregation and Port Security cannot be enabled for MAC-based Authentication.
4. Ports that have been enabled for GVRP cannot be enabled for Guest VLAN.

MAC-based Access Control Settings

This window is used to set the parameters for the MAC-based access control function on the Switch. The user can set the running state, method of authentication, RADIUS password, view the Guest VLAN configuration to be associated with the MAC-based access control function of the Switch, and configure ports to be enabled or disabled for the MAC-based access control feature of the Switch. Please remember, ports enabled for certain other features, listed previously, and cannot be enabled for MAC-based access control.

To view this window, click **Security > MAC-based Access Control (MAC) > MAC-based Access Control Settings**, as shown below:

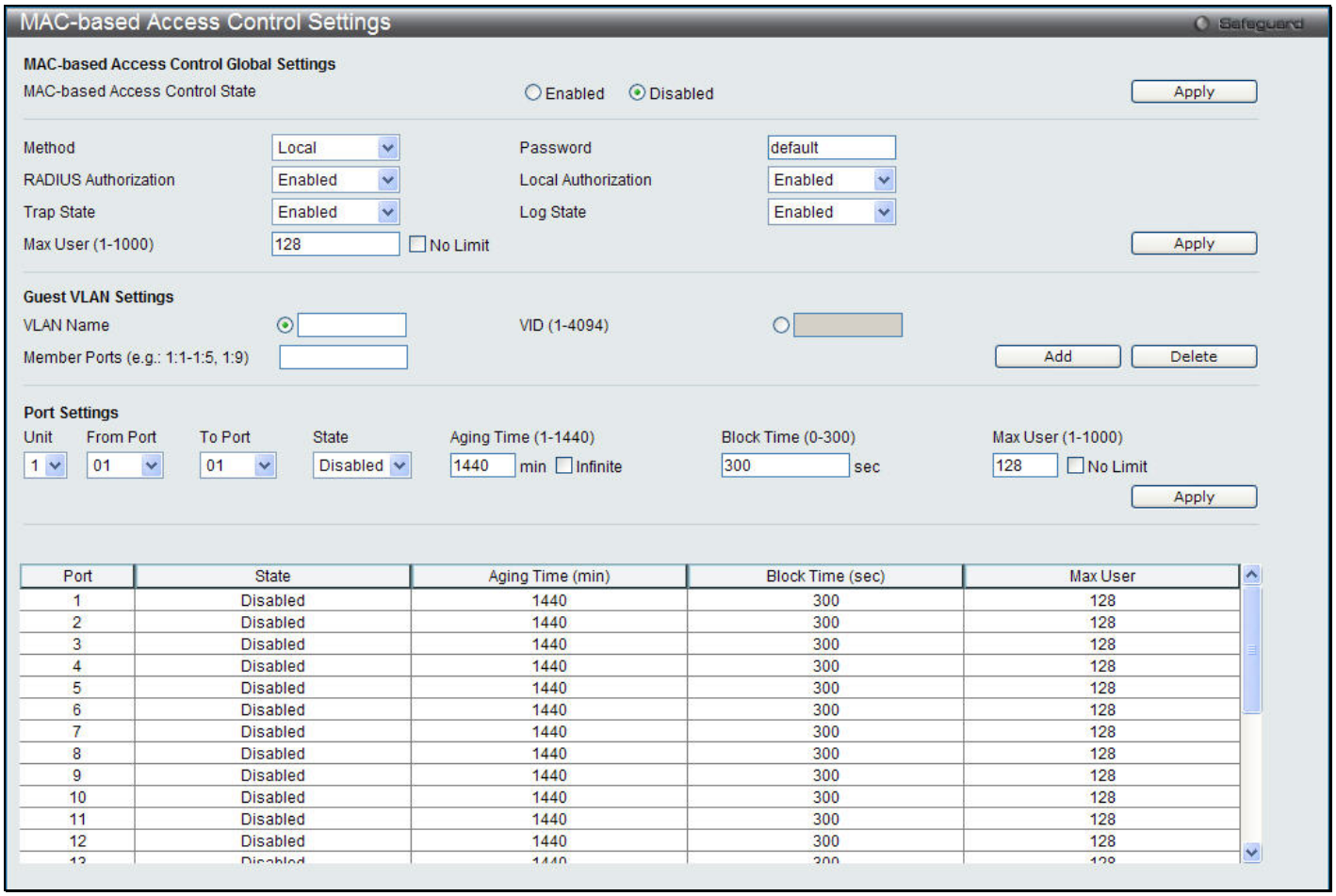


Figure 8-32 MAC-based Access Control Settings window

The fields that can be configured are described below:

Parameter	Description
MAC-based Access Control State	Toggle to globally enable or disable the MAC-based access control function on the Switch.
Method	Use this drop-down menu to choose the type of authentication to be used when authentication MAC addresses on a given port. The user may choose between the following methods: *Local* – Use this method to utilize the locally set MAC address database as the authenticator for MAC-based access control. This MAC address list can be configured in the MAC-based access control Local Database Settings window. *RADIUS* – Use this method to utilize a remote RADIUS server as the authenticator for MAC-based access control. Remember, the MAC list must be previously set on the RADIUS server.
Password	Enter the password for the RADIUS server, which is to be used for packets being sent requesting authentication. The default password is “default”.
RADIUS Authorization	Use the drop-down menu to enable or disable the use of RADIUS Authorization.
Local Authorization	Use the drop-down menu to enable or disable the use of Local Authorization.
Max User (1-1000)	Enter the maximum amount of users of the Switch. Tick No Limit to have unlimited users.
VLAN Name	Enter the name of the previously configured Guest VLAN being used for this function.

VLAN ID	Click the radio button and enter a Guest VLAN ID.
Member Ports	Enter the list of ports that have been configured for the Guest VLAN.
Unit	Select the unit to configure.
From Port	The beginning port of a range of ports to be configured for MAC-based access control.
To Port	The ending port of a range of ports to be configured for MAC-based access control.
State	Use this drop-down menu to enable or disable MAC-based access control on the port or range of ports selected in the Port Settings section of this window.
Aging Time (1-1440)	Enter a value between *1* and *1440* minutes. The default is *1440*.
Block Time (0-300)	Enter a value between *1* and *300* seconds. The default is *300*.
Max User (1-1000)	Enter the maximum user used for this configuration. When No Limit is selected, there will be no user limit applied to this rule.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Delete** button to remove the specific entry.

MAC-based Access Control Local Settings

Users can set a list of MAC addresses, along with their corresponding target VLAN, which will be authenticated for the Switch. Once a queried MAC address is matched in this window, it will be placed in the VLAN associated with it here. The Switch administrator may enter up to 128 MAC addresses to be authenticated using the local method configured here.

To view this window, click **Security > MAC-based Access Control (MAC) > MAC-based Access Control Local Settings**, as shown below:

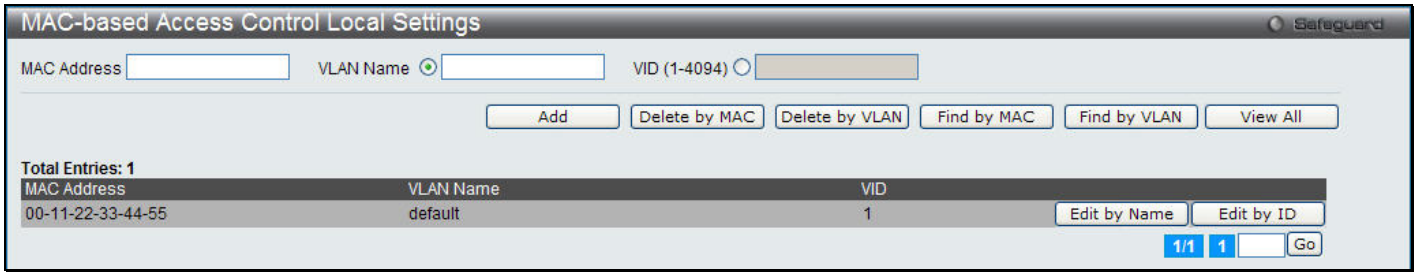


Figure 8-33 MAC-based Access Control Local Settings window

The fields that can be configured are described below:

Parameter	Description
MAC address	Enter the MAC address that will be added to the local authentication list here.
VLAN Name	Enter the VLAN name of the corresponding MAC address here.
VID (1-4094)	Enter the VLAN ID of the corresponding MAC address here.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete by MAC** button to remove the specific entry based on the MAC address entered.

Click the **Delete by VLAN** button to remove the specific entry based on the VLAN name or ID entered.

Click the **Find by MAC** button to locate a specific entry based on the MAC address entered.

Click the **Find by VLAN** button to locate a specific entry based on the VLAN name or ID entered.

Click the **View All** button to display all the existing entries.

To change the selected MAC address' VLAN Name, the user can click the **Edit by Name** button.

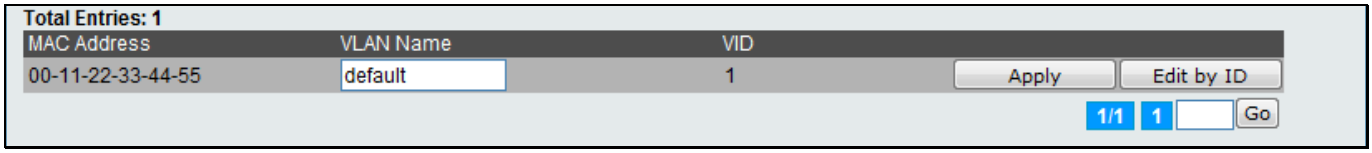


Figure 8-34 MAC-based Access Control Local Settings – Edit by Name window

To change the selected MAC address' VID value, the user can click the **Edit by ID** button.

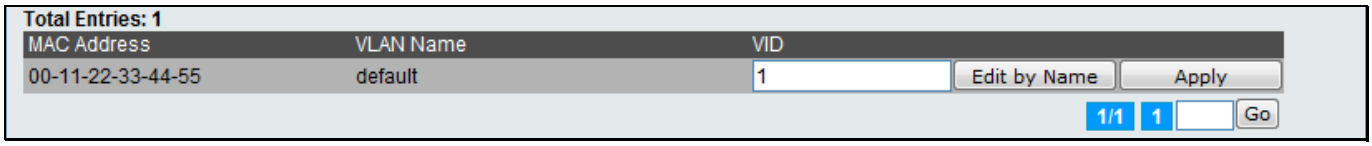


Figure 8-35 MAC-based Access Control Local Settings – Edit by ID window

Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

MAC-based Access Control Authentication State

Users can display MAC-based access control Authentication State information.

To view this window, click **Security > MAC-based Access Control (MAC) > MAC-based Access Control Authentication State**, as shown below:

Figure 8-36 MAC-based Access Control Authentication State window

To display MAC-based access control Authentication State information, enter a port number in the space provided and then click the **Find** button.

Click the **Clear by Port** button to clear all the information linked to the port number entered.

Click the **View All Hosts** button to display all the existing hosts.

Click the **Clear All hosts** button to clear out all the existing hosts.

Web-based Access Control (WAC)

Web-based Authentication Login is a feature designed to authenticate a user when the user is trying to access the Internet via the Switch. The authentication process uses the HTTP or HTTPS protocol. The Switch enters the authenticating stage when users attempt to browse Web pages (e.g., http://www.dlink.com) through a Web browser. When the Switch detects HTTP or HTTPS packets and this port is un-authenticated, the Switch will launch a pop-up user name and password window to query users. Users are not able to access the Internet until the authentication process is passed.

The Switch can be the authentication server itself and do the authentication based on a local database, or be a RADIUS client and perform the authentication process via the RADIUS protocol with a remote RADIUS server. The client user initiates the authentication process of WAC by attempting to gain Web access.

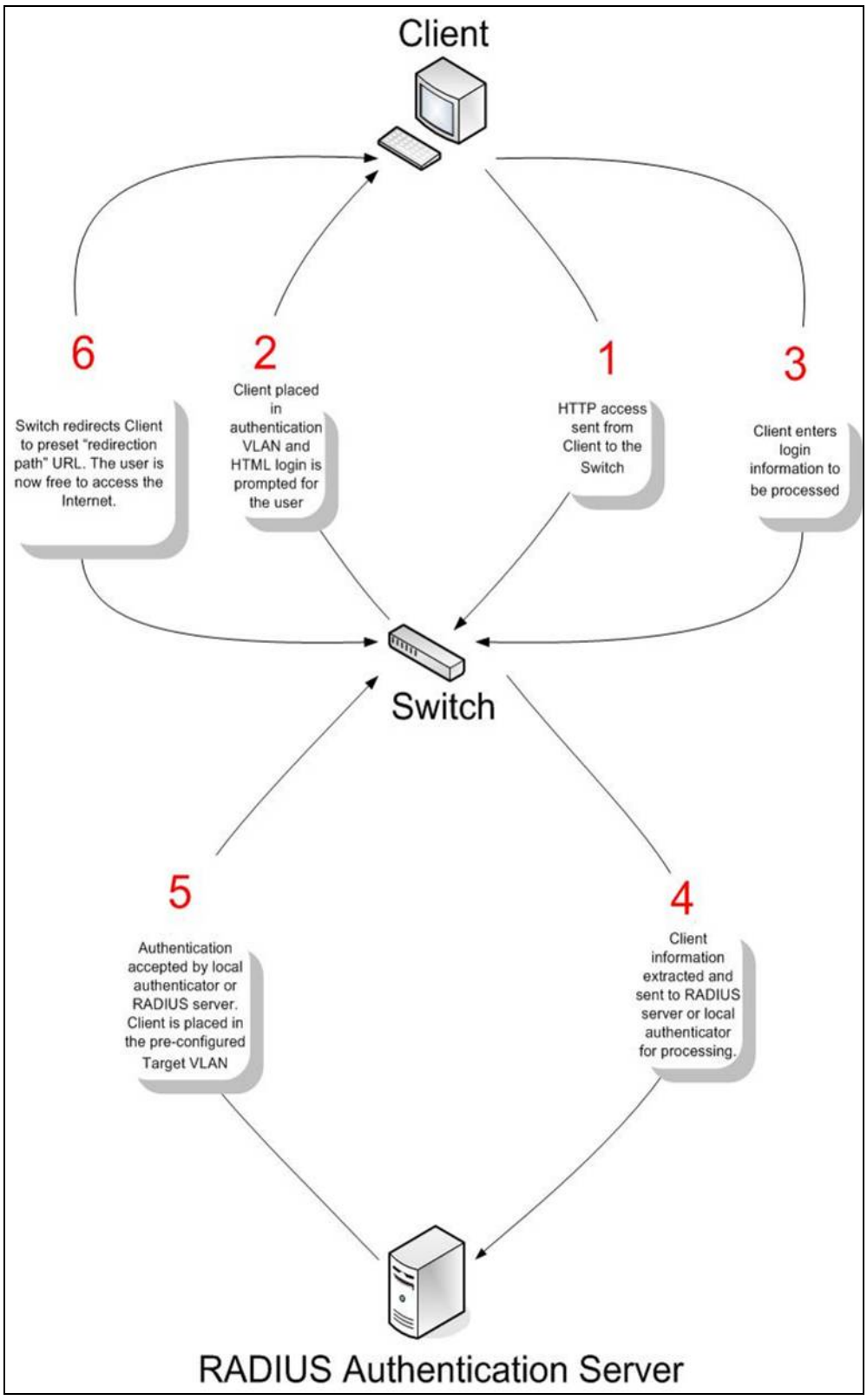
D-Link's implementation of WAC uses a virtual IP that is exclusively used by the WAC function and is not known by any other modules of the Switch. In fact, to avoid affecting a Switch's other features, WAC will only use a virtual IP address to communicate with hosts. Thus, all authentication requests must be sent to a virtual IP address but not to the IP address of the Switch's physical interface.

Virtual IP works like this, when a host PC communicates with the WAC Switch through a virtual IP, the virtual IP is transformed into the physical IPIF (IP interface) address of the Switch to make the communication possible. The host PC and other servers' IP configurations do not depend on the virtual IP of WAC. The virtual IP does not respond to any ICMP packets or ARP requests, which means it is not allowed to configure a virtual IP on the same subnet as the Switch's IPIF (IP interface) or the same subnet as the host PCs' subnet.

As all packets to a virtual IP from authenticated and authenticating hosts will be trapped to the Switch's CPU, if the virtual IP is the same as other servers or PCs, the hosts on the WAC-enabled ports cannot communicate with the server or PC which really own the IP address. If the hosts need to access the server or PC, the virtual IP cannot be the same as the one of the server or PC. If a host PC uses a proxy to access the Web, to make the authentication work properly the user of the PC should add the virtual IP to the exception of the proxy configuration. Whether or not a virtual IP is specified, users can access the WAC pages through the Switch's system IP. When a virtual IP is not specified, the authenticating Web request will be redirected to the Switch's system IP.

The Switch's implementation of WAC features a user-defined port number that allows the configuration of the TCP port for either the HTTP or HTTPS protocols. This TCP port for HTTP or HTTPs is used to identify the HTTP or HTTPs packets that will be trapped to the CPU for authentication processing, or to access the login page. If not specified, the default port number for HTTP is 80 and the default port number for HTTPS is 443. If no protocol is specified, the default protocol is HTTP.

The following diagram illustrates the basic six steps all parties go through in a successful Web Authentication process:



Conditions and Limitations

1. If the client is utilizing DHCP to attain an IP address, the authentication VLAN must provide a DHCP server or a DHCP relay function so that client may obtain an IP address.

2. Certain functions exist on the Switch that will filter HTTP packets, such as the Access Profile function. The user needs to be very careful when setting filter functions for the target VLAN, so that these HTTP packets are not denied by the Switch.
3. If a RADIUS server is to be used for authentication, the user must first establish a RADIUS Server with the appropriate parameters, including the target VLAN, before enabling Web Authentication on the Switch.

WAC Global Settings

Users can configure the Switch for the Web-based access control function.

To view this window, click **Security > Web-based Access Control (WAC) > WAC Global Settings**, as shown below:

Figure 8-37 WAC Global Settings window

The fields that can be configured are described below:

Parameter	Description
WAC Global State	Use this selection menu to either enable or disable the Web Authentication on the Switch.
Virtual IP	Enter a virtual IP address. This address is only used by WAC and is not known by any other modules of the Switch.
Virtual IPv6	Enter a virtual IPv6 address. This address is only used by WAC and is not known by any other modules of the Switch.
Redirection Path	Enter the URL of the website that authenticated users placed in the VLAN are directed to once authenticated.
Clear Redirection Path	Click the Yes or No radio button to enable or disable this option to clear the redirection path.
RADIUS Authorization	Use the drop-down menu to enable or disable this option to enable RADIUS Authorization or not.
Local Authorization	Use the drop-down menu to enable or disable this option to enable Local Authorization or not.
Method	Use this drop-down menu to choose the authenticator for Web-based Access Control. The user may choose: *Local* – Choose this parameter to use the local authentication method of the Switch as the authenticating method for users trying to access the network via the Switch. This is, in fact, the username and password to access the Switch configured using the **WAC User Settings** window (**Security > Web-based Access Control > WAC User Settings**) seen below. *RADIUS* – Choose this parameter to use a remote RADIUS server as the authenticating method for users trying to access the network via the switch. This RADIUS server must have already been pre-assigned by the administrator using the **Authentication RADIUS**

	Server Settings window.
HTTP(S) Port (1-65535)	Enter a HTTP port number. Port *80* is the default. *HTTP* – Specify that the TCP port will run the WAC HTTP protocol. The default value is 80. HTTP port cannot run at TCP port 443. *HTTPS* – Specify that the TCP port will run the WAC HTTPS protocol. The default value is 443. HTTPS cannot run at TCP port 80.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: A successful authentication should direct the client to the stated Web page. If the client does not reach this Web page, yet does not receive a Fail! Message, the client will already be authenticated and therefore should refresh the current browser window or attempt to open a different Web page.

WAC User Settings

Users can view and set local database user accounts for Web authentication.

To view this window, click **Security > Web-based Access Control (WAC) > WAC User Settings**, as shown below:

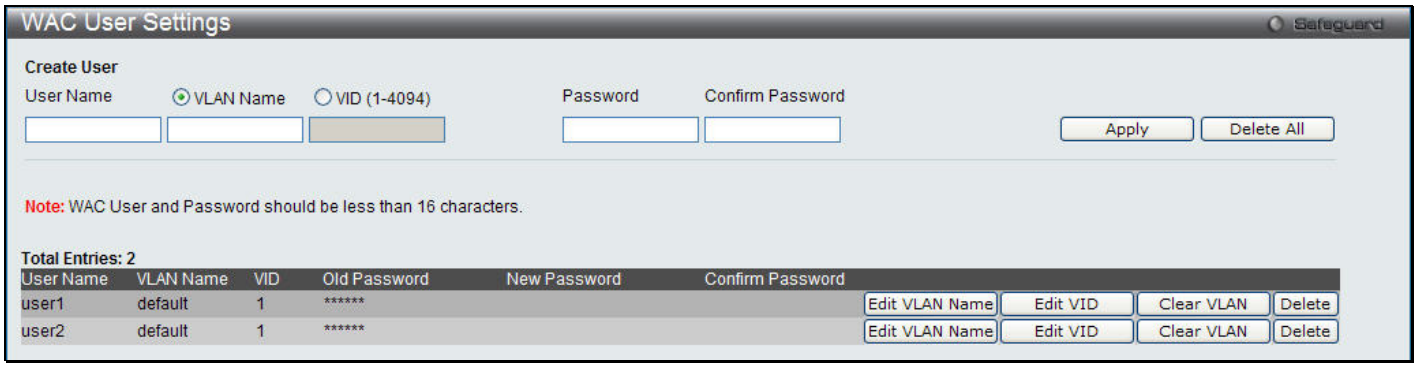


Figure 8-38 WAC User Settings window

The fields that can be configured are described below:

Parameter	Description
User Name	Enter the user name of up to 15 alphanumeric characters of the guest wishing to access the Web through this process. This field is for administrators who have selected *Local* as their Web-based authenticator.
VLAN Name	Click the button and enter a VLAN Name in this field.
VID (1-4094)	Click the button and enter a VID in this field.
Password	Enter the password the administrator has chosen for the selected user. This field is case-sensitive and must be a complete alphanumeric string. This field is for administrators who have selected *Local* as their Web-based authenticator.
Confirm Password	Retype the password entered in the previous field.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit VLAN Name** button to re-configure the specific entry's VLAN Name.

Click the **Edit VID** button to re-configure the specific entry's VLAN ID.

Click the **Clear VLAN** button to remove the VLAN information from the specific entry.

Click the **Delete** button to remove the specific entry.

WAC Port Settings

Users can view and set port configurations for Web authentication.

To view this window, click **Security > Web-based Access Control (WAC) > WAC Port Settings**, as shown below:

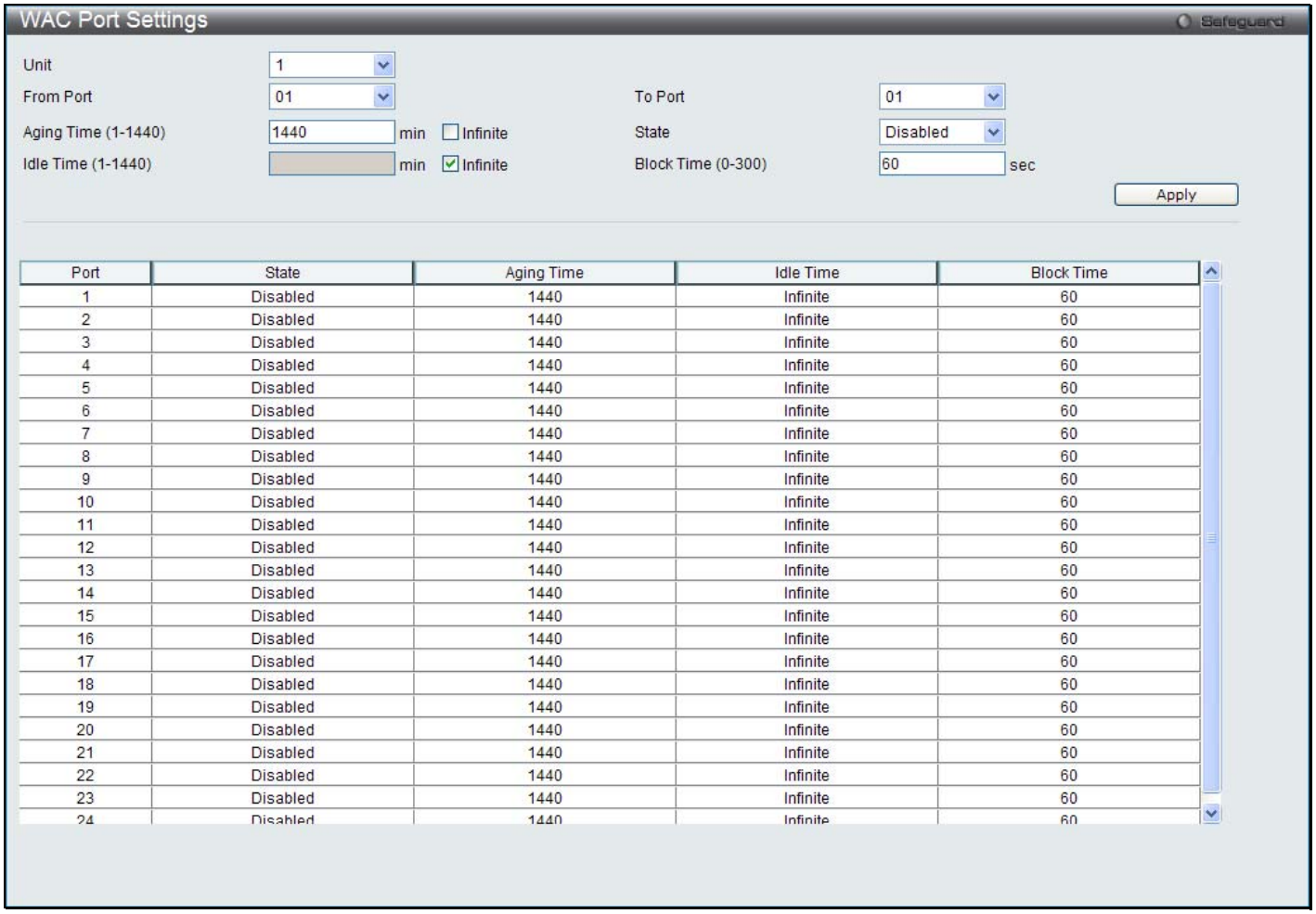


Figure 8-39 WAC Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port	Use this drop-down menu to select the beginning port of a range of ports to be enabled as WAC ports.
To Port	Use this drop-down menu to select the ending port of a range of ports to be enabled as WAC ports.
Aging Time (1-1440)	This parameter specifies the time period during which an authenticated host will remain in the authenticated state. Enter a value between *1*and *1440* minutes. Tick the **Infinite** check box to indicate the authenticated host will never age out on the port. The default value is *1440* minutes (24 hours).
State	Use this drop-down menu to enable the configured ports as WAC ports.
Idle Time (1-1440)	If there is no traffic during the Idle Time parameter, the host will be moved back to the unauthenticated state. Enter a value between *1* and *1440* minutes. Tick the Infinite check

	box to indicate the Idle state of the authenticated host on the port will never be checked. The default value is *infinite*.
Block Time (0-300)	This parameter is the period of time a host will be blocked if it fails to pass authentication. Enter a value between *0* and *300* seconds. The default value is *60* seconds.

Click the **Apply** button to accept the changes made.

WAC Authentication State

Users can view and delete the hosts for WAC authentication.

To view this window, click **Security > Web-based Access Control (WAC) > WAC Authentication State**, as shown below:

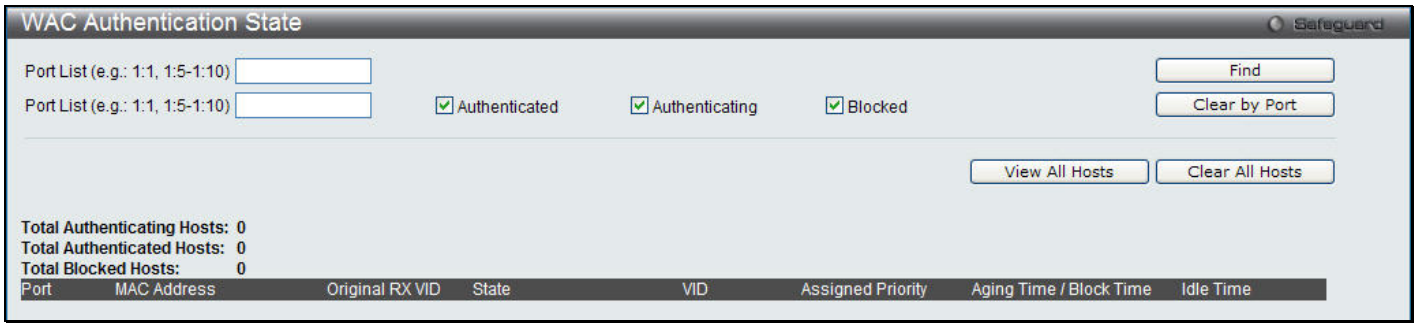


Figure 8-40 WAC Authentication State window

The fields that can be configured are described below:

Parameter	Description
Port List (e.g.: 1:1, 1:5-1:10)	Use the drop-down menus to select the desired range of ports and tick the appropriate check box(s), Authenticated, Authenticating, and Blocked.
Authenticated	Tick this check box to clear all authenticated users for a port.
Authenticating	Tick this check box to clear all authenticating users for a port.
Blocked	Tick this check box to clear all blocked users for a port.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear by Port** button to remove entry based on the port list entered.

Click the **View All Hosts** button to display all the existing entries.

Click the **Clear All Hosts** button to remove all the entries listed.

Japanese Web-based Access Control (JWAC)

The JWAC folder contains three windows: JWAC Global Settings, JWAC Port Settings, and JWAC User Settings.

JWAC Global Settings

Use this window to enable and configure Japanese Web-based Access Control on the Switch. Please note that JWAC and Web Authentication are mutually exclusive functions. That is, they cannot be enabled at the same time. To use the JWAC feature, computer users need to pass through two stages of authentication. The first stage is to do the authentication with the quarantine server and the second stage is the authentication with the Switch. For the second stage, the authentication is similar to Web Authentication. The RADIUS server will share the server configuration defined by the 802.1X command set.

To view this window, click **Security > JWAC > JWAC Global Settings**, as shown below:

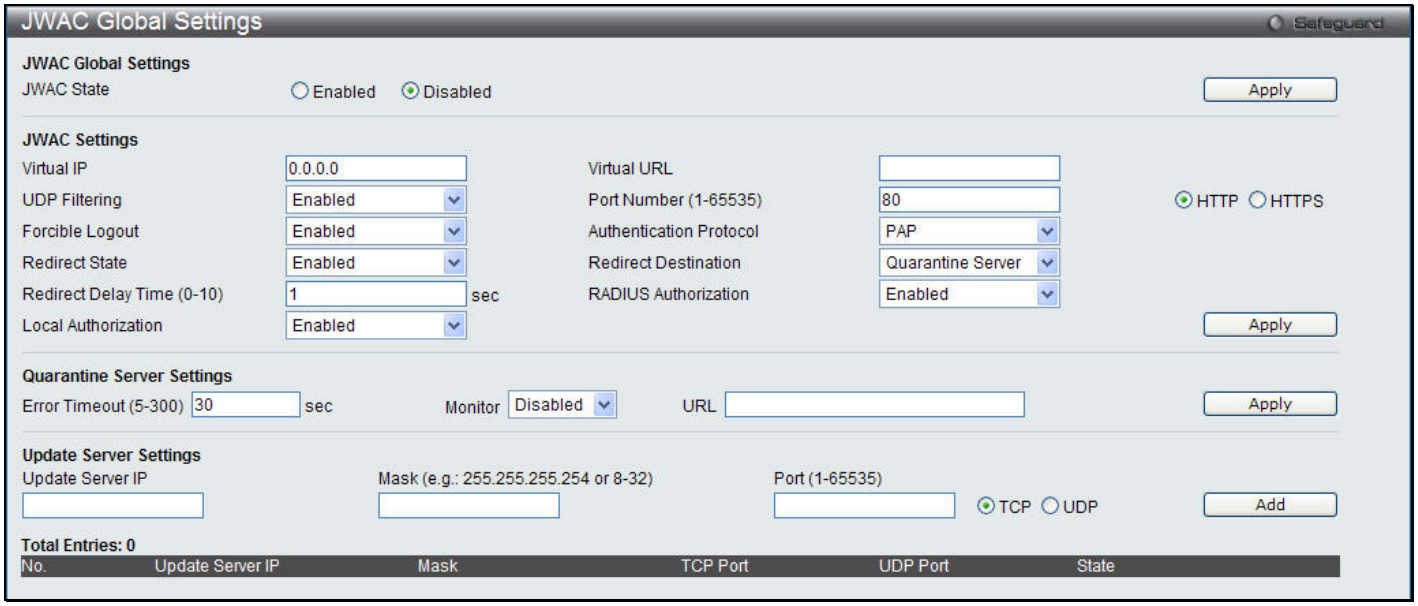


Figure 8-41 JWAC Global Settings

The fields that can be configured are described below:

Parameter	Description
JWAC State	Use this drop-down menu to either enable or disable JWAC on the Switch.
Virtual IP	Specify the JWAC Virtual IP address that is used to accept authentication requests from an unauthenticated host. Only requests sent to this IP will get a correct response. **NOTE:** This IP does not respond to ARP requests or ICMP packets.
Virtual URL	Specify the URL of Quarantine Server.
UDP Filtering	This parameter enables or disables JWAC UDP Filtering. When UDP Filtering is *Enabled*, all UDP and ICMP packets except DHCP and DNS packets from unauthenticated hosts will be dropped
Port Number (1-65535)	This parameter specifies the TCP port that the JWAC Switch listens to and uses to finish the authentication process.
Forcible Logout	This parameter enables or disables JWAC Forcible Logout. When Forcible Logout is *Enabled*, a Ping packet from an authenticated host to the JWAC Switch with TTL=1 will be regarded as a logout request, and the host will move back to the unauthenticated state.
Authentication Protocol	This parameter specifies the RADIUS protocol used by JWAC to complete a RADIUS authentication. The options include *Local*, *EAP MD5*, *PAP*, *CHAP*, *MS CHAP*, and *MS CHAPv2*.
Redirect State	This parameter enables or disables JWAC Redirect. When the redirect quarantine server is enabled, the unauthenticated host will be redirected to the quarantine server when it tries to access a random URL. When the redirect JWAC login page is enabled, the unauthenticated host will be redirected to the JWAC login page in the Switch to finish authentication. When redirect is disabled, only access to the quarantine server and the JWAC login page from the unauthenticated host are allowed, all other web access will be denied.

	NOTE: When enabling redirect to the quarantine server, a quarantine server must be configured first.
Redirect Destination	This parameter specifies the destination before an unauthenticated host is redirected to either the *Quarantine Server* or the *JWAC Login Page*.
Redirect Delay Time (0-10)	This parameter specifies the Delay Time before an unauthenticated host is redirected to the Quarantine Server or JWAC Login Page. Enter a value between *0* and *10* seconds. A value of *0* indicates no delay in the redirect.
RADIUS Authorization	Specifies to *Enable* or *Disable* RADIUS Authorization.
Local Authorization	Specifies to *Enable* or *Disable* Local Authorization.
Error Timeout (5-300)	This parameter is used to set the Quarantine Server Error Timeout. When the Quarantine Server Monitor is enabled, the JWAC Switch will periodically check if the Quarantine works okay. If the Switch does not receive any response from the Quarantine Server during the configured Error Timeout, the Switch then regards it as not working properly. Enter a value between *5* and *300* seconds.
Monitor	This parameter enables or disables the JWAC Quarantine Server Monitor. When *Enabled*, the JWAC Switch will monitor the Quarantine Server to ensure the server is okay. If the Switch detects no Quarantine Server, it will redirect all unauthenticated HTTP access attempts to the JWAC Login Page forcibly if the Redirect is enabled and the Redirect Destination is configured to be a Quarantine Server.
URL	This parameter specifies the JWAC Quarantine Server URL. If the Redirect is enabled and the Redirect Destination is the Quarantine Server, when an unauthenticated host sends the HTTP request packets to a random Web server, the Switch will handle this HTTP packet and send back a message to the host to allow it access to the Quarantine Server with the configured URL. When a computer is connected to the specified URL, the quarantine server will request the computer user to input the user name and password to complete the authentication process.
Update Server IP	This parameter specifies the Update Server IP address.
Mask (e.g.: 255.255.255.254 or 8-32)	This parameter specifies the Server IP net mask.
Port (1-65535)	The accessible TCP or UDP port for the specified update server network.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Add** button to add the Update Sever Settings information.

JWAC Port Settings

To view this window, click **Security > JWAC > JWAC Port Settings**, as shown below:

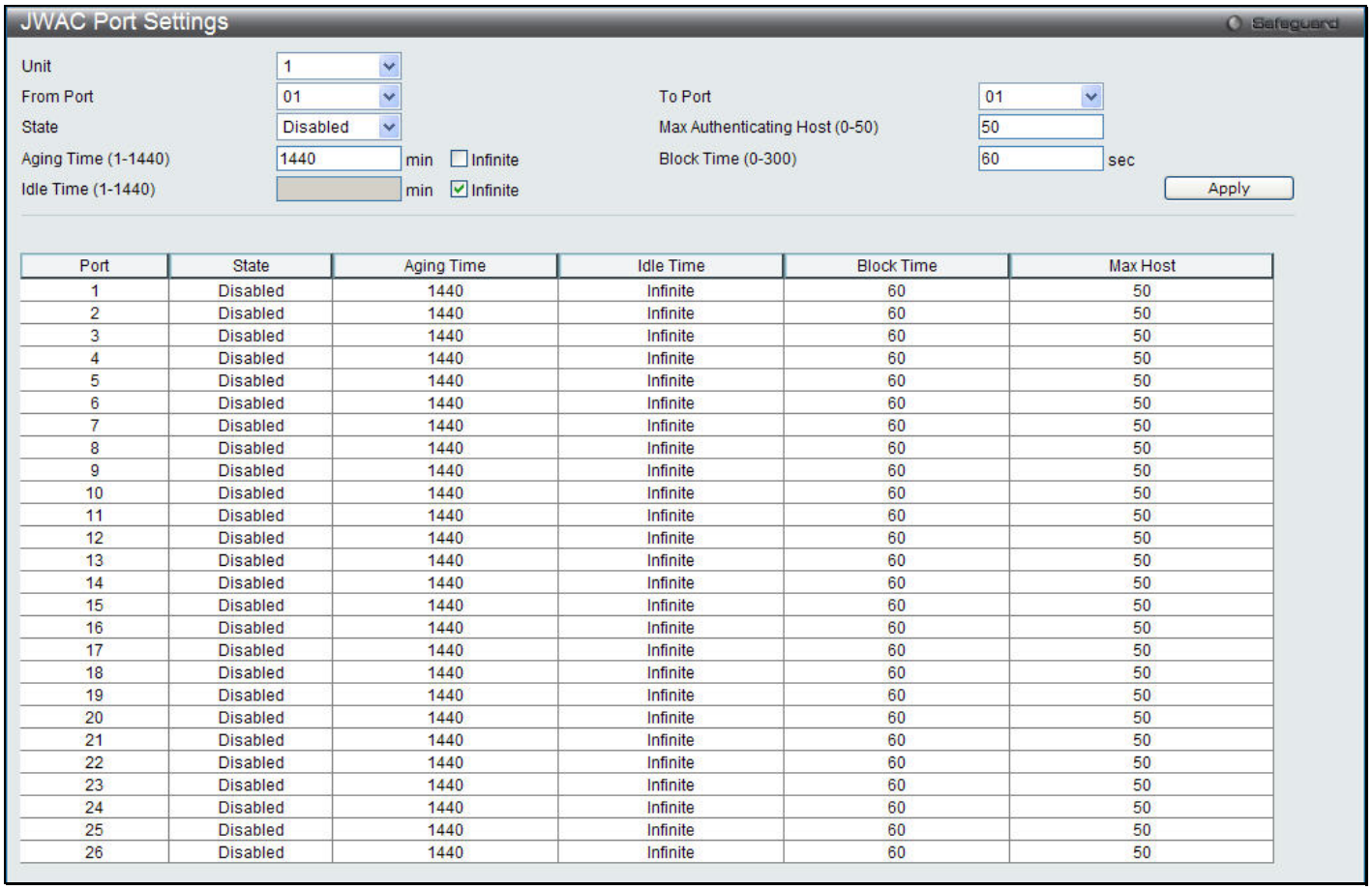


Figure 8-42 JWAC Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menus to select a port or range of ports to configure.
State	Specify the state of the configured ports.
Max Authenticating Host (0-50)	Specify the maximum number of host process authentication attempts allowed on each port at the same time.
Aging Time (1-1440)	Specify the period of time that a host will keep in authenticated state after it successes to authenticate. Enter a value between *1* and *1440* minutes. The default setting is *1440* minutes. To maintain a constant Port Configuration, tick the Infinite check box.
Block Time (0-300)	Specify the period of time that a host will keep in a blocked state after it fails to authenticate. Enter a value between *0* and *300* seconds. The default setting is 6*0* seconds.
Idle Time (1-1440)	Specify the period of time during which there is no traffic for an authenticated host and the host will be moved back to the unauthenticated state. Enter a value between *1* and *1440* minutes. Tick the Infinite check box so that the Idle state of the authenticated host on the port will never be checked. The default setting is *Infinite*.

Click **Apply** to implement changes made.

JWAC User Settings

To view this window, click **Security > JWAC > JWAC User Settings**, as shown below:

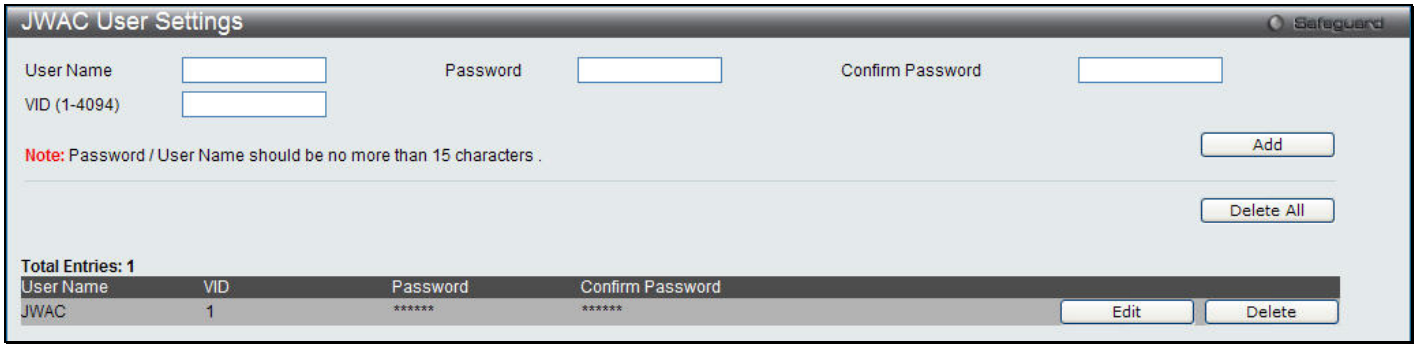


Figure 8-43 JWAC User Settings window

The fields that can be configured are described below:

Parameter	Description
User Name	Enter a username of up to 15 alphanumeric characters.
Password	Enter the password of the user. This field is case-sensitive and must be a complete alphanumeric string.
Confirm Password	Retype the password entered in the previous field.
VID (1-4094)	Enter a VLAN ID up to 4094.

Click the **Add** button to create a new entry.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

JWAC Authentication State

Users can view and delete the hosts for JWAC authentication.

To view this window, click **Security > Japanese Web-based Access Control (JWAC) > JWAC Authentication State**, as shown below:

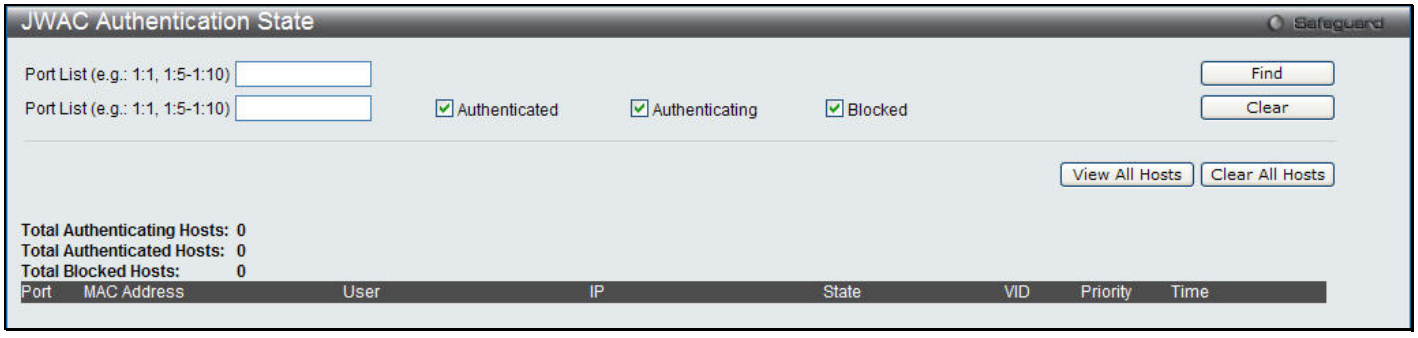


Figure 8-44 WAC Authentication State window

The fields that can be configured are described below:

Parameter	Description
Port List (e.g.: 1:1,	Use the drop-down menus to select the desired range of ports and tick the appropriate

1:5-1:10)	check box(s), Authenticated, Authenticating, and Blocked.
Authenticated	Tick this check box to clear all authenticated users for a port.
Authenticating	Tick this check box to clear all authenticating users for a port.
Blocked	Tick this check box to clear all blocked users for a port.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear** button to remove entry based on the port list entered.

Click the **View All Hosts** button to display all the existing entries.

Click the **Clear All Hosts** button to remove all the entries listed.

JWAC Customize Page Language

This window allows you to select the language of the JWAC Customize Page window. The available languages are *English* and *Japanese*.

To view this window, click **Security > JWAC > JWAC Customize Page Language**, as shown below:

Figure 8-45 JWAC Customize Page Language window

The fields that can be configured are described below:

Parameter	Description
Customize Page Language	Toggle between English and Japanese to choose the language setting of the JWAC Customize Page window.

Click the **Apply** button to accept the changes made.

JWAC Customize Page

To view this window, click **Security > JWAC > JWAC Customize page**, as shown below:

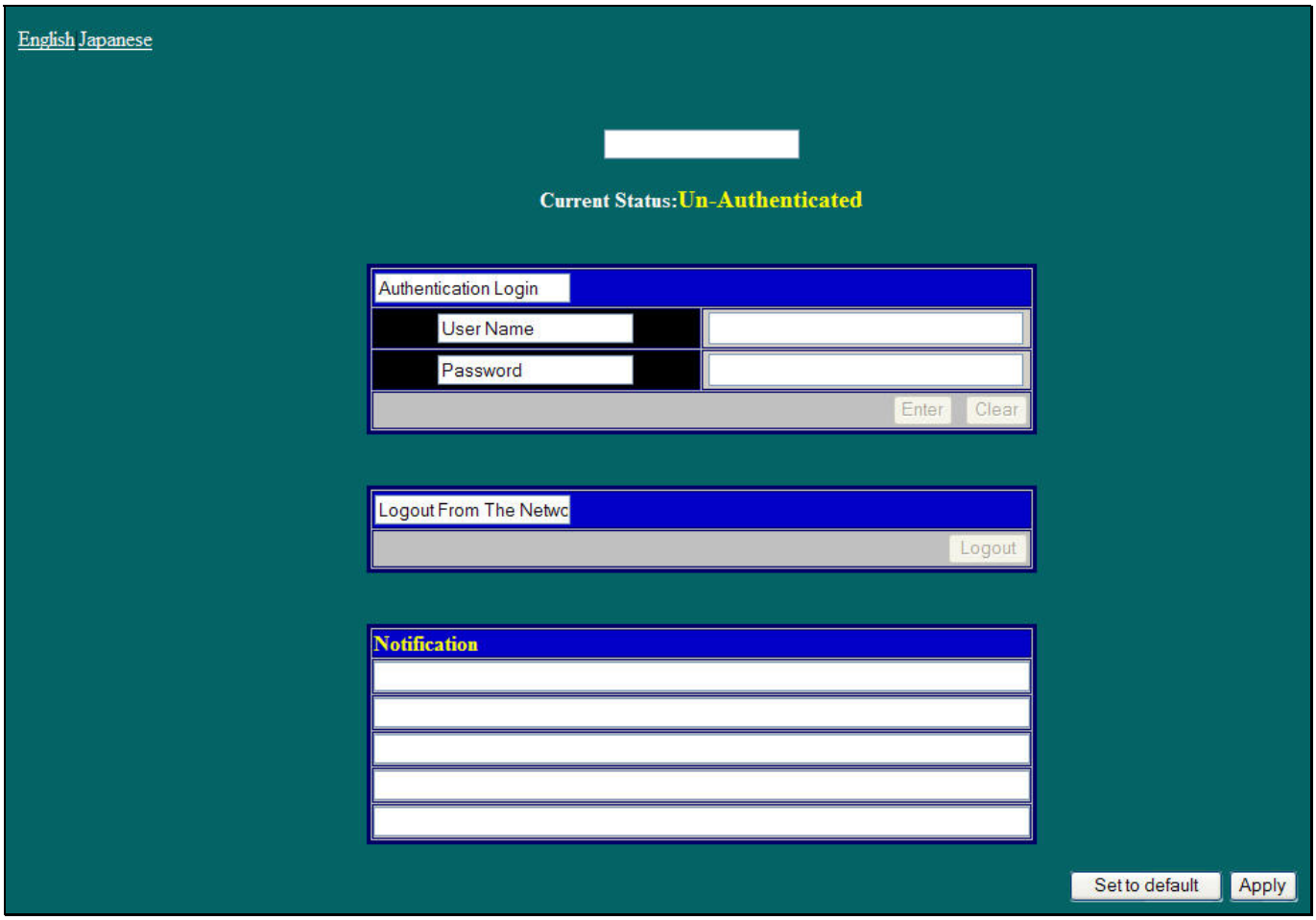


Figure 8-46 JWAC Customize Page window

The fields that can be configured are described below:

Parameter	Description
English/Japanese	Click the link to toggle between English and Japanese.
User Name	Enter the user name title of the authenticate page.
Password	Enter the password title of the authenticate page.
Logout From The Network	Enter the logout window title mapping of the authenticate page.
Notification	Enter the notification information by line in authentication Web pages.

Click the **Apply** button to implement the changes made.

Click the **Set to default** button to change back to the original default description of the fields.

Compound Authentication

Compound Authentication settings allows for multiple authentication to be supported on the Switch.

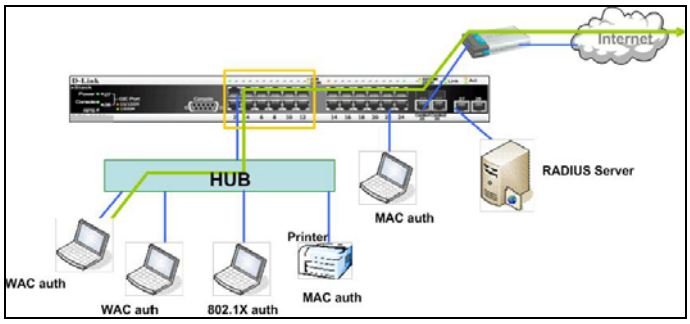
Compound Authentication

Modern networks employ many authentication methods. The Compound Authentication methods supported by this Switch include 802.1X, MAC-based access control (MAC), Web-based Access Control (WAC), Japan Web-based Access Control (JWAC), and IP-MAC-Port Binding (IMPB). The Compound Authentication feature allows clients running different authentication methods to connect to the network using the same switch port.

The Compound Authentication feature can be implemented using one of the following modes:

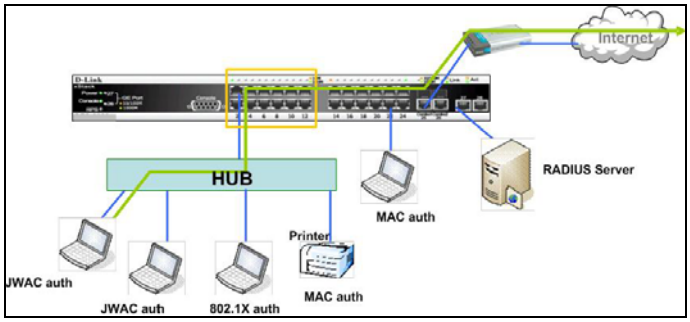
Any (MAC, 802.1X or WAC) Mode

In the diagram above the Switch port has been configured to allow clients to authenticate using 802.1X, MAC, or WAC. When a client tries to connect to the network, the Switch will try to authenticate the client using one of these methods and if the client passes they will be granted access to the network.



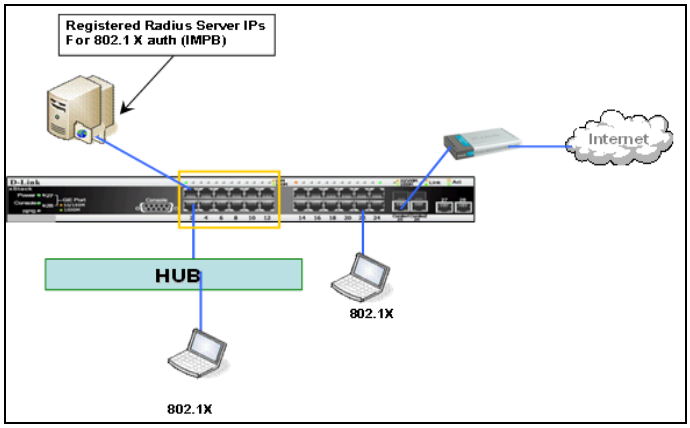
Any (MAC, 802.1X or JWAC) Mode

In the diagram above the Switch port has been configured to allow clients to authenticate using 802.1X, MAC, or JWAC. When a client tries to connect to the network, the Switch will try to authenticate the client using one of these methods and if the client passes they will be granted access to the network.



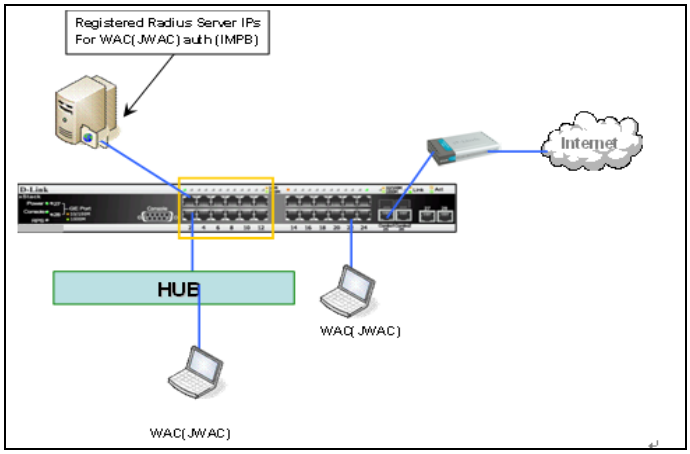
802.1X + IMPB Mode

This mode adds an extra layer of security by checking the IP MAC-Binding Port Binding (IMPB) table before trying one of the supported authentication methods. The IMPB Table is used to create a 'white list' that checks if the IP streams being sent by authorized hosts have been granted or not. In the above diagram the Switch port has been configured to allow clients to authenticate using 802.1X. If the client is in the IMPB table and tries to connect to the network using this authentication method and the client is listed in the white list for legal IP/MAC/port checking, access will be granted. If a client fails one of the authentication methods, access will be denied.



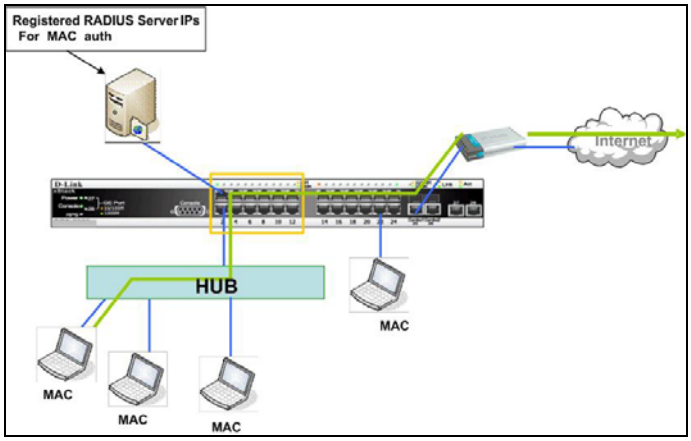
IMPB + WAC/JWAC Mode

This mode adds an extra layer of security by checking the IP MAC-Binding Port Binding (IMPB) table before trying one of the supported authentication methods. The IMPB Table is used to create a 'white-list' that checks if the IP streams being sent by authorized hosts have been granted or not. In the above diagram, the Switch port has been configured to allow clients to authenticate using either WAC or JWAC. If the client is in the IMPB table and tries to connect to the network using either of these supported authentication methods and the client is listed in the white list for legal IP/MAC/port checking, access will be granted. If a client fails one of the authentication methods, access will be denied.



MAC+ IMPB Mode

This mode adds an extra layer of security by checking the IP MAC-Binding Port Binding (IMPB) table before trying one of the supported authentication methods. The IMPB Table is used to create a 'white-list' that checks if the IP streams being sent by authorized hosts have been granted or not. In the above diagram, the Switch port has been configured to allow clients to authenticate by using MAC. If the client is in the IMPB table and tries to connect to the network by using MAC and the client is listed in the white list for legal IP/MAC/port checking, access will be granted. If a client fails one of the authentication methods, access will be denied.



Compound Authentication Settings

Users can configure Authorization Network State Settings and compound authentication methods for a port or ports on the Switch.

To view this window, click **Security > Compound Authentication > Compound Authentication Settings**, as shown below:

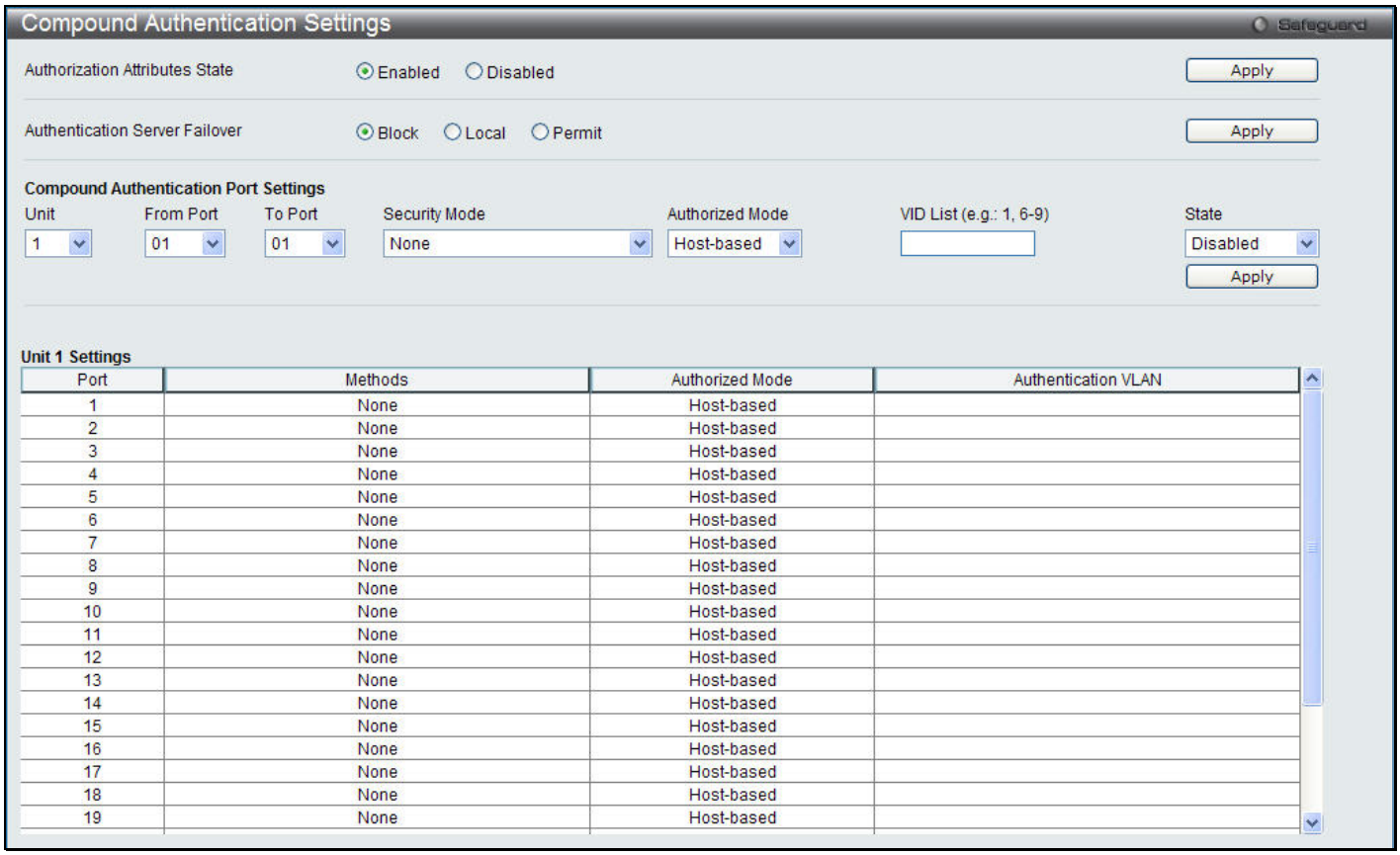


Figure 8-47 Compound Authentication Settings window

The fields that can be configured are described below:

Parameter	Description
Authorization Network State	Click the radio buttons to enable of disable the Authorization Network State.
Authentication Server Failover	Click the radio buttons to configure the authentication server failover function. *Block* (default setting) - The client is always regarded as un-authenticated. *Local* - The Switch will resort to using the local database to authenticate the client if RADIUS server cannot be reached. If the client fails on local authentication, the client is regarded as un-authenticated, otherwise, it authenticated. *Permit* - The client is always regarded as authenticated. If guest VLAN is enabled, clients will stay on the guest VLAN, otherwise, they will stay on the original VLAN.
Unit	Select the unit to configure.
From Port	Use this drop-down menu to select the beginning port of a range of ports to be enabled as compound authentication ports.
To Port	Use this drop-down menu to select the ending port of a range of ports to be enabled as compound authentication ports.
Security Mode	The compound authentication method options include: None, Any (MAC, 802.1X or WAC/JWAC), 802.1X+IMPB, IMPB+JWAC, IMPB+WAC, and MBA+IMPB. *None* - all compound authentication methods are disabled. *Any (MAC, 802.1X or WAC)* - if any of the authentication methods pass, then access will be granted. In this mode, MAC, 802.1X and WAC/JWAC can be enabled on a port at the same time. In Any (MAC, 802.1X or WAC/JWAC) mode,

	whether an individual security module is active on a port depends on its system state. As system states of WAC and JWAC are mutually exclusive, only one of them will be active on a port at the same time. *802.1X+IMPB* - 802.1X will be verified first, and then IMPB will be verified. Both authentication methods need to be passed. *IMPB+JWAC* - IMPB will be verified first, and then JWAC will be verified. Both authentication methods need to be passed. *IMPB+WAC* - IMPB will be verified first, and then WAC will be verified. Both authentication methods need to be passed. *MAC+IMPB* - MAC will be verified first, and then IMPB will be verified. Both authentication methods need to be passed.
Authorized Mode	Toggle between *Host-based* and *Port-based*. When *Port-based* is selected, if one of the attached hosts passes the authentication, all hosts on the same port will be granted access to the network. If the user fails the authorization, this port will keep trying the next authentication method. When *Host-based* is selected, users are authenticated individually.
VID List (e.g.: 1, 6-9)	Enter a list of VLAN ID.
State	Use the drop-down menu to assign or remove the specified VID list as authentication VLAN(s).

Click the **Apply** button to accept the changes made for each individual section.

Compound Authentication Guest VLAN Settings

Users can assign ports to or remove ports from a guest VLAN.

To view this window, click **Security > Compound Authentication > Compound Authentication Guest VLAN Settings**, as shown below:

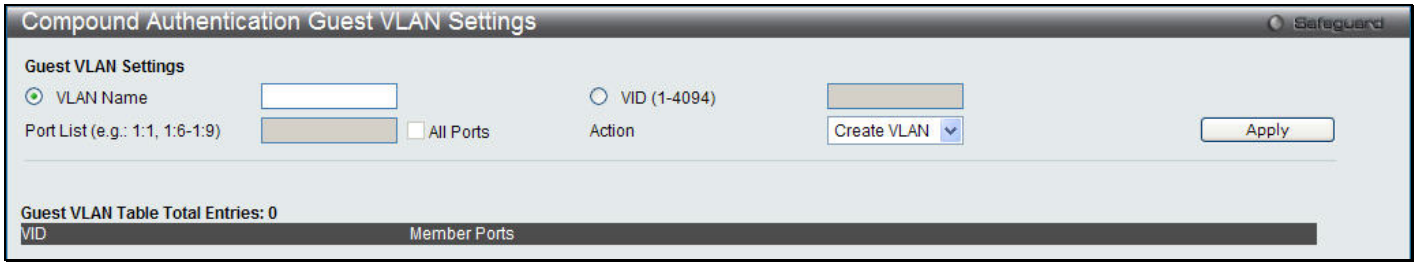


Figure 8-48 Compound Authentication Guest VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the button and assign a VLAN as a Guest VLAN. The VLAN must be an existing static VLAN.
VID (1-4094)	Click the button and assign a VLAN ID for a Guest VLAN. The VLAN must be an existing static VLAN before this VID can be configured.
Port List (e.g.: 1:1, 1:6-1:9)	The list of ports to be configured. Alternatively, tick the All Ports check box to set every port at once.
Action	Use the drop-down menu to choose the desired operation: *Create VLAN*, *Add Ports*, or *Delete Ports*.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

Once properly configured, the Guest VLAN and associated ports will be listed in the lower part of the window.

Port Security

Port Security Settings

A given port's (or a range of ports') dynamic MAC address learning can be locked such that the current source MAC addresses entered into the MAC address forwarding table cannot be changed once the port lock is enabled. The port can be locked by changing the Admin State pull-down menu to *Enabled* and clicking **Apply**.

Port Security is a security feature that prevents unauthorized computers (with source MAC addresses) unknown to the Switch prior to locking the port (or ports) from connecting to the Switch's locked ports and gaining access to the network.

To view this window, click **Security > Port Security > Port Security Settings**, as shown below:

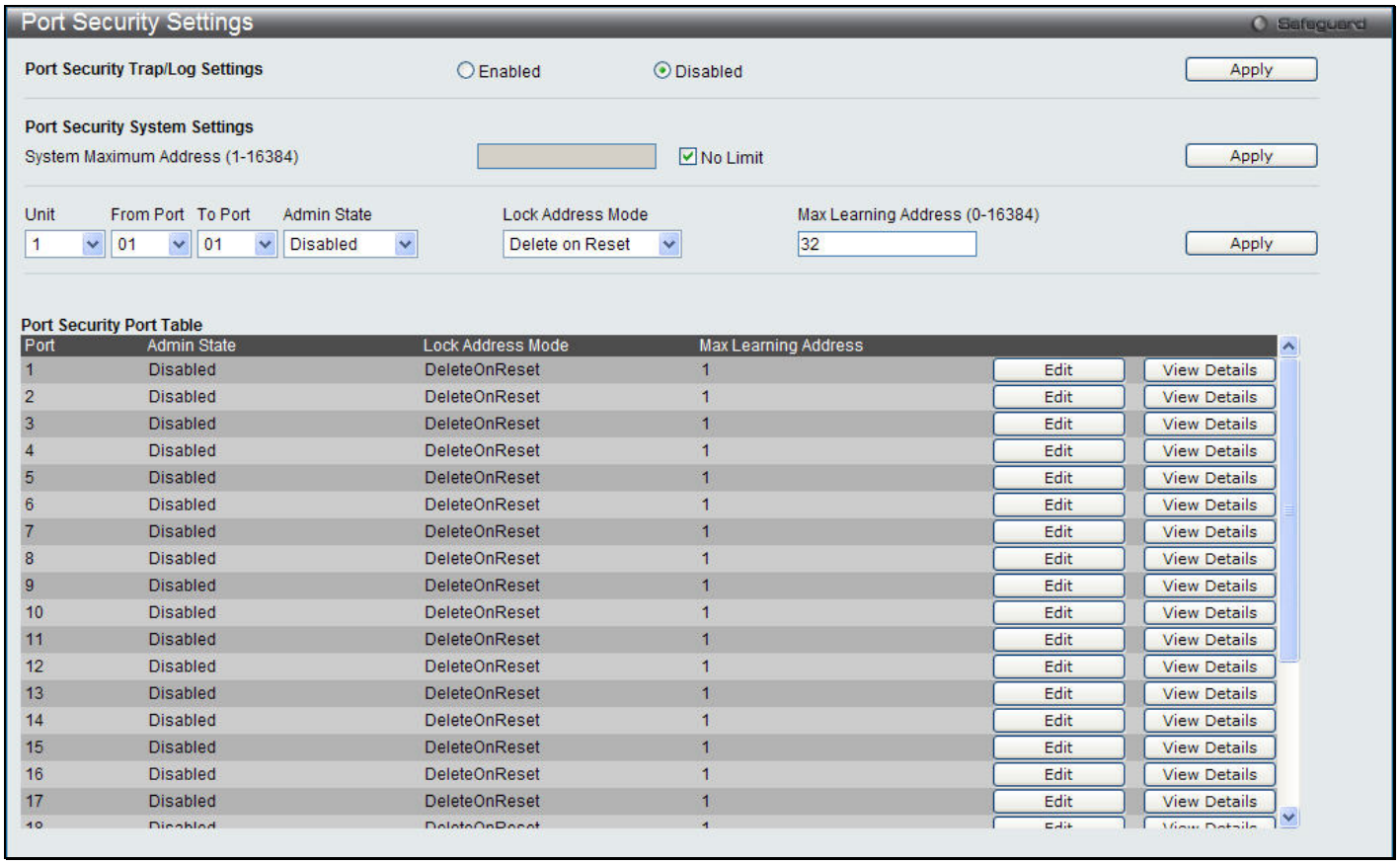


Figure 8-49 Port Security Settings window

The fields that can be configured are described below:

Parameter	Description
Port Security Trap/Log Settings	Use the radio button to enable or disable Port Security Traps and Logs on the Switch. The default is *Disabled*.
System Maximum Address	Enter the system maximum address of the switch. Tick the No Limit check box to have unlimited address.
Unit	Select the unit in the stack to configure.

From Port	The beginning port of a consecutive group of ports to be configured.
To Port	The ending port of a consecutive group of ports to be configured.
Admin State	Use the pull-down menu to enable or disable Port Security (locked MAC address table for the selected ports).
Lock Address Mode	This pull-down menu allows the option of how the MAC address table locking will be implemented on the Switch, for the selected group of ports. The options are: *Permanent* – The locked addresses will only age out after the Switch has been reset. *DeleteOnTimeout* – The locked addresses will age out after the aging timer expires. *DeleteOnReset* – The locked addresses will not age out until the Switch has been reset or rebooted.
Max Learning Address	Specify the maximum value of port security entries that can be learned on this port.

Click the **Apply** button to accept the changes made for each individual section.
Click the **Edit** button to re-configure the specific entry.
Click the **View Details** button to display the information of the specific entry.

After clicking the **View Details** button, the following page will appear:

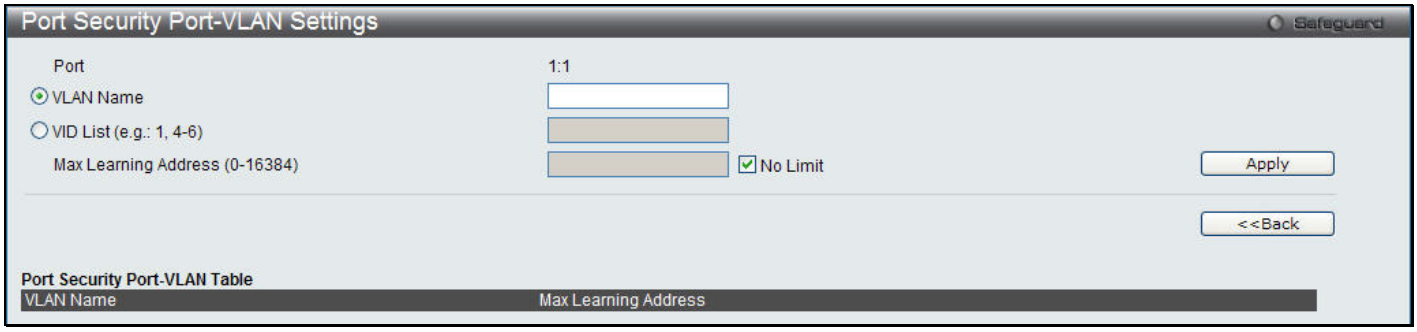


Figure 8-50 Port Security Port-VLAN Settings window

See the next section for parameter descriptions.

Click the **Apply** button to accept the changes made.
Click the **<<Back** button to discard the changes made and return to the previous page.

Port Security VLAN Settings

Users can configure the maximum number of port-security entries that can be learned on a specific VLAN.
To view this window, click **Security > Port Security > Port Security VLAN Settings**, as shown below:

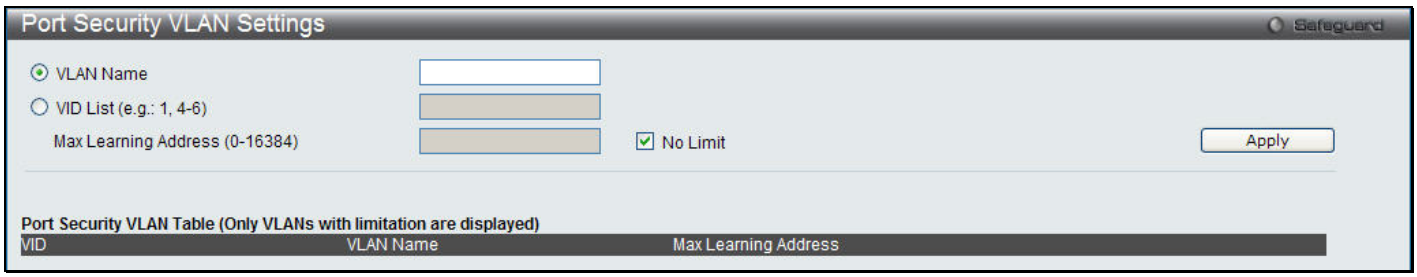


Figure 8-51 Port Security VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Enter the VLAN Name.
VID List	Specify a list of the VLAN be VLAN ID.
Max Learning Address	Specify the maximum number of port-security entries that can be learned by this VLAN.

Click the **Apply** button to accept the changes made.

Port Security Entries

Users can remove an entry from the port security entries learned by the Switch and entered into the forwarding database.

To view this window, click **Security > Port Security > Port Security Entries**, as shown below:

Figure 8-52 Port Security Entries window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	The VLAN Name of the entry in the forwarding database table that has been permanently learned by the Switch.
VID List	The VLAN ID of the entry in the forwarding database table that has been permanently learned by the Switch.
Port List	Enter the port number or list here to be used for the port security entry search. When All is selected, all the ports configured will be displayed.
MAC Address	The MAC address of the entry in the forwarding database table that has been permanently learned by the Switch.
Lock Mode	The type of MAC address in the forwarding database table.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear** button to clear all the entries based on the information entered.

Click the **Show All** button to display all the existing entries.

Click the **Clear All** button to remove all the entries listed.

Click the **Delete** button to remove the specific entry.

ARP Spoofing Prevention Settings

The user can configure the spoofing prevention entry to prevent spoofing of MAC for the protected gateway. When an entry is created, those ARP packets whose sender IP matches the gateway IP of an entry, but either its sender MAC field or source MAC field does not match the gateway MAC of the entry will be dropped by the system.

To view this window, click **Security > ARP Spoofing Prevention Settings**, as shown below:

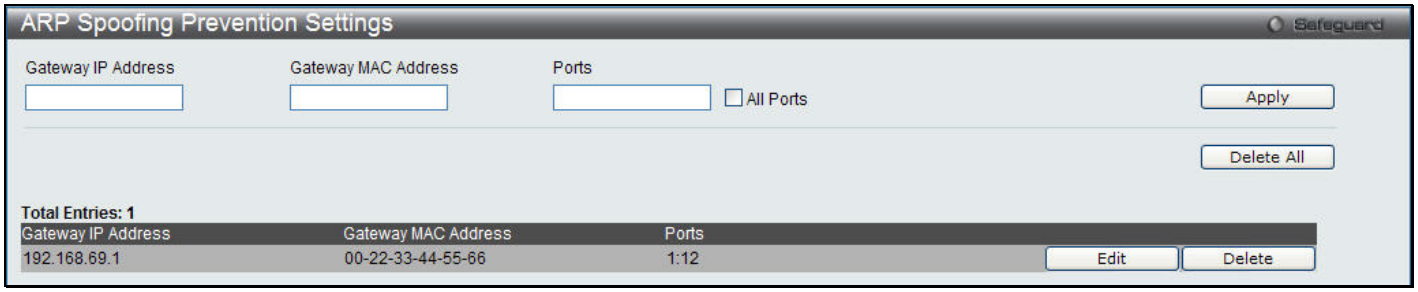


Figure 8-53 ARP Spoofing Prevention Settings window

The fields that can be configured are described below:

Parameter	Description
Gateway IP Address	Enter the gateway IP address to help prevent ARP Spoofing.
Gateway MAC Address	Enter the gateway MAC address to help prevent ARP Spoofing.
Ports	Enter the port numbers that this feature applies to. Alternatively, the user can tick All Ports to apply this feature to all the ports of the Switch.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

BPDU Attack Protection

This page is used to configure the BPDU protection function for the ports on the Switch. In generally, there are two states in BPDU protection function. One is normal state, and another is under attack state. The under attack state have three modes: drop, block, and shutdown. A BPDU protection enabled port will enter an under attack state when it receives one STP BPDU packet. And it will take action based on the configuration. Thus, BPDU protection can only be enabled on the STP-disabled port.

BPDU protection has a higher priority than the FBPDU setting configured by configure STP command in the determination of BPDU handling. That is, when FBPDU is configured to forward STP BPDU but BPDU protection is enabled, then the port will not forward STP BPDU.

BPDU protection also has a higher priority than the BPDU tunnel port setting in determination of BPDU handling. That is, when a port is configured as BPDU tunnel port for STP, it will forward STP BPDU. But if the port is BPDU protection enabled. Then the port will not forward STP BPDU.

To view this window, click **Security > BPDU Attack Protection**, as shown below:

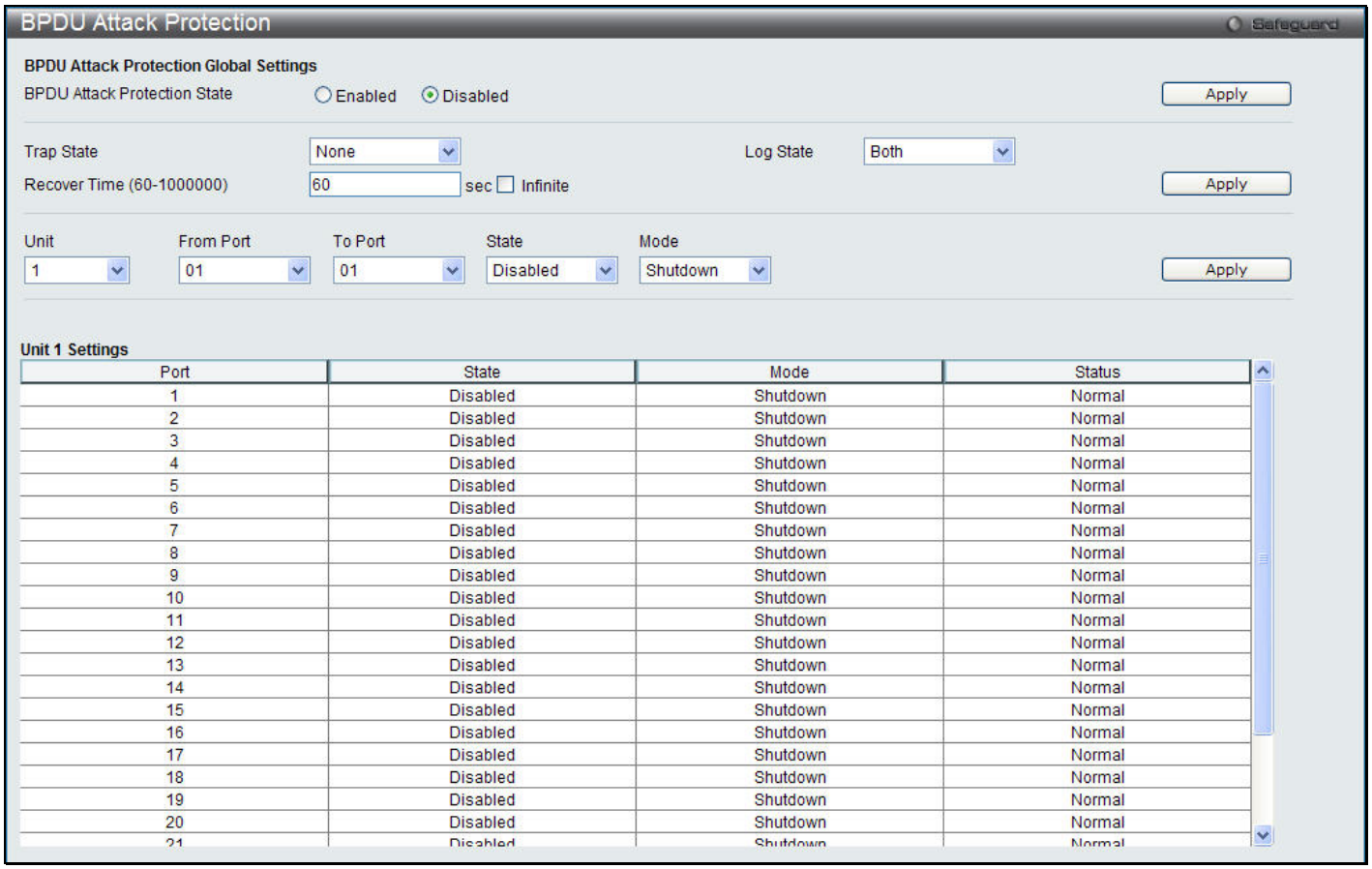


Figure 8-54 BPDU Attack Protection window

The fields that can be configured are described below:

Parameter	Description
BPDU Attack Protection State	Click the radio buttons to enable or disable the BPDU attack protection state.
Trap State	Specify when a trap will be sent. Options to choose from are *None*, *Attack Detected*, *Attack Cleared* or *Both*.
Log State	Specify when a log entry will be sent. Options to choose from are *None*, *Attack Detected*, *Attack Cleared* or *Both*.
Recover Time	Specify the BPDU protection Auto-Recovery timer. The default value of the recovery timer is *60*.
Unit	Select the unit to configure.
From Port / To Port	Select a range of ports to use for this configuration.
State	Use the drop-down menu to enable or disable the protection mode for a specific port.
Mode	Specify the BPDU protection mode. The default mode is shutdown. *Drop* – Drop all received BPDU packets when the port enters under attack state. *Block* – Drop all packets (include BPDU and normal packets) when the port enters under attack state. *Shutdown* – Shut down the port when the port enters under attack state.

Click the **Apply** button to accept the changes made for each individual section.

Loopback Detection Settings

The Loopback Detection (LBD) function is used to detect the loop created by a specific port. This feature is used to temporarily shut down a port on the Switch when a CTP (Configuration Testing Protocol) packet has been looped back to the Switch. When the Switch detects CTP packets received from a port or a VLAN, this signifies a loop on the network. The Switch will automatically block the port or the VLAN and send an alert to the administrator. The Loopback Detection port will restart (change to discarding state) when the Loopback Detection Recover Time times out. The Loopback Detection function can be implemented on a range of ports at a time. The user may enable or disable this function using the pull-down menu.

To view this window, click **Security > Loopback Detection Settings**, as shown below:

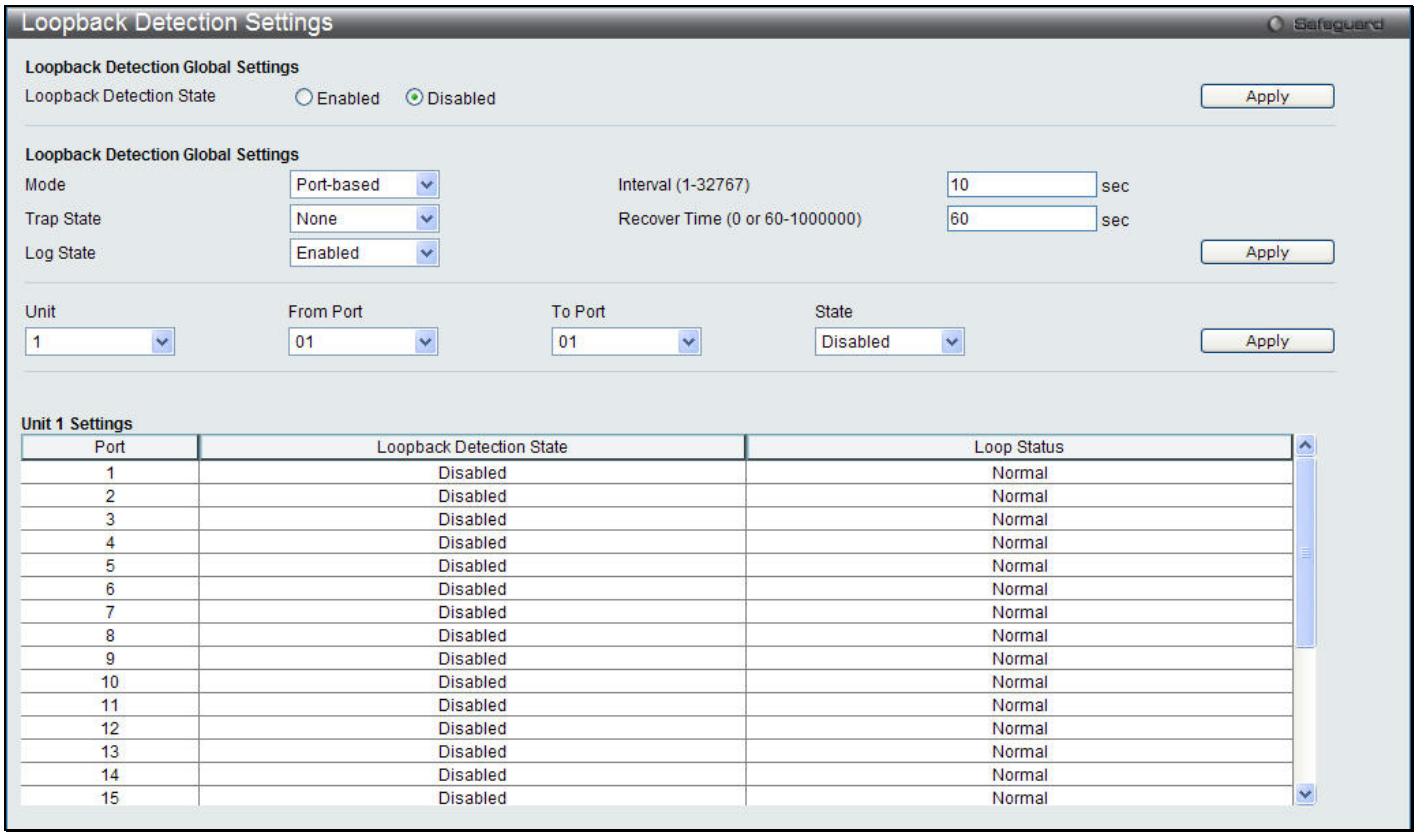


Figure 8-55 Loopback Detection Settings window

The fields that can be configured are described below:

Parameter	Description
Loopback Detection State	Use the radio button to enable or disable loopback detection. The default is Disabled.
Mode	Use the drop-down menu to toggle between *Port-based* and *VLAN-based*.
Interval (1-32767)	The time interval (in seconds) that the device will transmit all the CTP (Configuration Test Protocol) packets to detect a loop-back event. The valid range is from *1* to *32767* seconds. The default setting is *10* seconds.
Trap Status	Set the desired trap status: *None*, *Loop Detected*, *Loop Cleared*, or *Both*.
Recover Time (0 or 60-1000000)	Time allowed (in seconds) for recovery when a Loopback is not detected. The Loop-detect Recover Time can be set at *0* seconds, or *60* to *1000000* seconds. Entering *0* will disable the Loop-detect Recover Time. The default is *60* seconds.
Log State	Use the drop-down menu to enable or disable the log state.

Unit	Select the unit to configure.
From Port	Use the drop-down menu to select a beginning port number.
To Port	Use the drop-down menu to select an ending port number.
State	Use the drop-down menu to toggle between *Enabled* and *Disabled*.

Click the **Apply** button to accept the changes made for each individual section.

Traffic Segmentation Settings

Traffic segmentation is used to limit traffic flow from a single or group of ports, to a group of ports. This method of segmenting the flow of traffic is similar to using VLANs to limit traffic, but is more restrictive. It provides a method of directing traffic that does not increase the overhead of the master switch CPU.

To view this window, click **Security > Traffic Segmentation Settings**, as shown below:

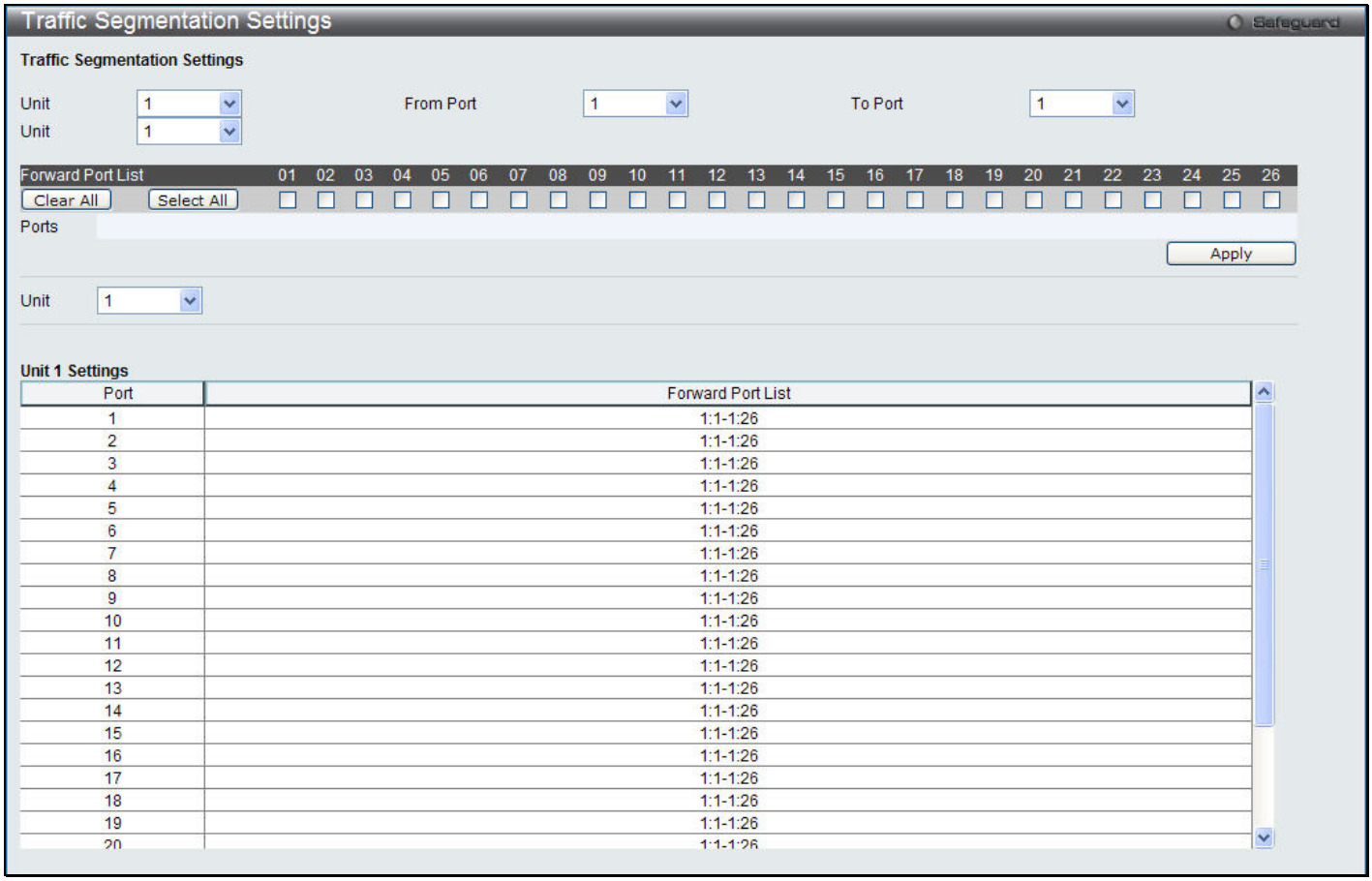


Figure 8-56 Traffic Segmentation Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select the ports to be included in the traffic segmentation setup.
Forward Port List	Select the ports to be included in the traffic segmentation setup by simply ticking the corresponding port's tick box. Click the **Clear All** button to un-select all the ports for the configuration. Click the **Select All** button to select all the ports for the configuration.

Ports	Ports that have been selected to be included in the traffic segmentation setup will be displayed.

Click the **Clear All** button to deselect the ports.

Click the **Select All** button to choose all ports.

Click the **Apply** button to accept the changes made.

NetBIOS Filtering Settings

NetBIOS is an application programming interface, providing a set of functions that applications use to communicate across networks. NetBEUI, the NetBIOS Enhanced User Interface, was created as a data-link-layer frame structure for NetBIOS. A simple mechanism to carry NetBIOS traffic, NetBEUI has been the protocol of choice for small MS-DOS- and Windows-based workgroups. NetBIOS no longer lives strictly inside of the NetBEUI protocol. Microsoft worked to create the international standards described in RFC 1001 and RFC 1002, NetBIOS over TCP/IP (NBT).

If the network administrator wants to block the network communication on more than two computers which use NETBUEI protocol, it can use NETBIOS filtering to filter these kinds of packets.

If the user enables the NETBIOS filter, the Switch will create one access profile and three access rules automatically. If the user enables the extensive NETBIOS filter, the Switch will create one more access profile and one more access rule.

To view this window, click **Security > NetBIOS Filtering Settings**, as shown below:

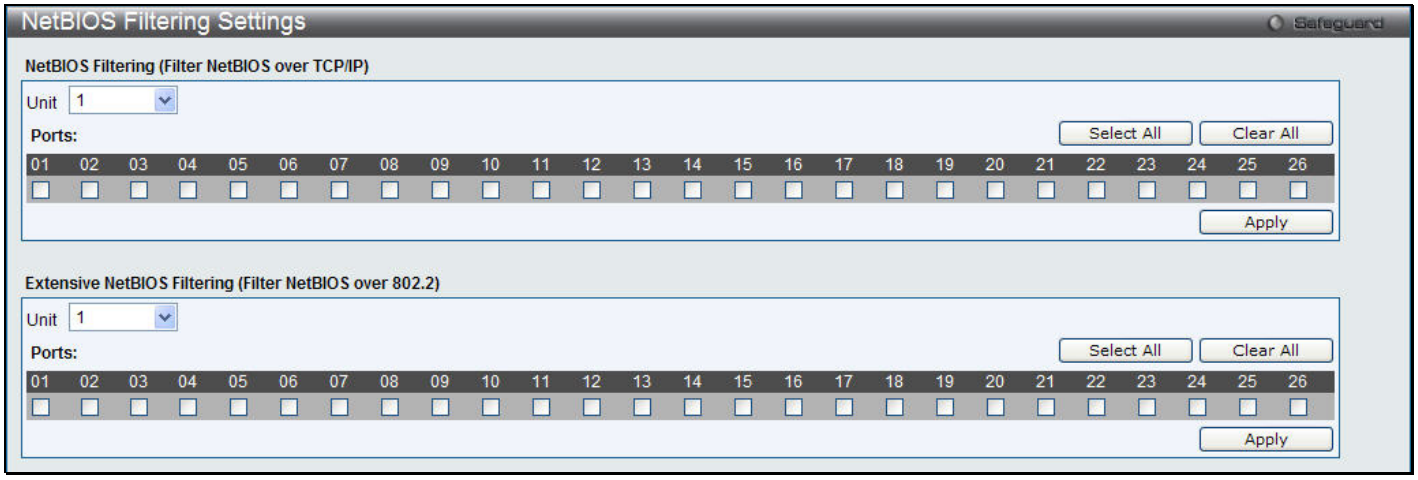


Figure 8-57 NetBIOS Filtering Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select to unit to be configured.
Ports	Tick the appropriate ports that will be included in the NetBIOS or Extensive NetBIOS filtering configuration.

Click the **Select All** button to choose all ports.

Click the **Clear All** button to deselect the ports.

Click the **Apply** button to accept the changes made for each individual section.

DHCP Server Screening

This function allows the user to not only to restrict all DHCP Server packets but also to receive any specified DHCP server packet by any specified DHCP client, it is useful when one or more DHCP servers are present on the network and both provide DHCP services to different distinct groups of clients.

The first time the DHCP filter is enabled it will create both an access profile entry and an access rule per port entry, it will also create other access rules. These rules are used to block all DHCP server packets. In addition to a permit DHCP entry it will also create one access profile and one access rule entry the first time the DHCP client MAC address is used as the client MAC address. The Source IP address is the same as the DHCP server's IP address (UDP port number 67). These rules are used to permit the DHCP server packets with specific fields, which the user has configured.

When DHCP Server filter function is enabled all DHCP Server packets will be filtered from a specific port.

DHCP Server Screening Port Settings

The Switch supports DHCP Server Screening, a feature that denies access to rogue DHCP servers. When the DHCP server filter function is enabled, all DHCP server packets will be filtered from a specific port.

To view this window, click **Security > DHCP Server Screening > DHCP Server Screening Port Settings**, as shown below:

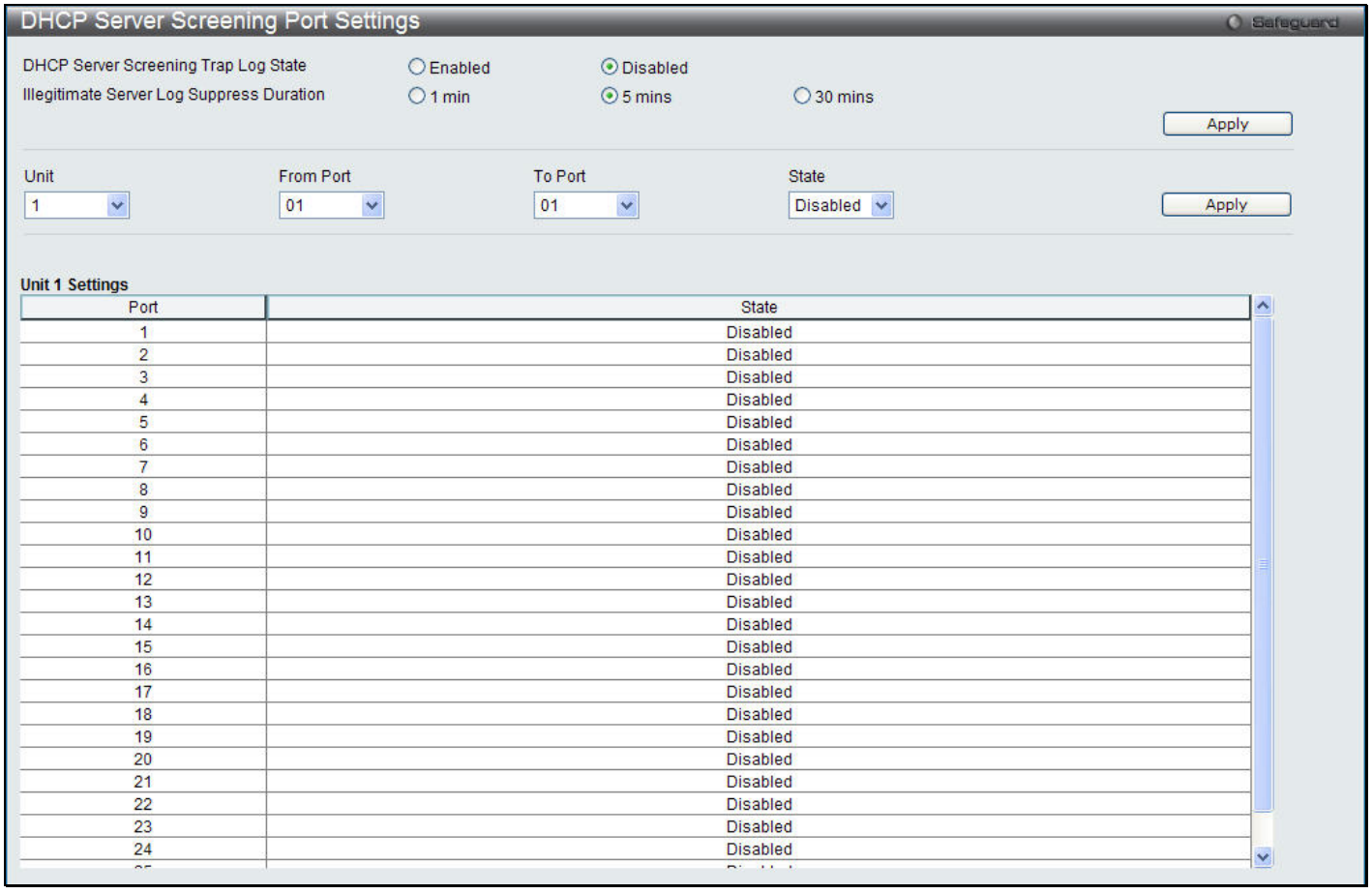


Figure 8-58 DHCP Server Screening Port Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Server Screening Trap Log State	Enable or disable this feature.
Illegitimate Server Log Suppress Duration	Choose an illegal server log suppress duration of 1 minute, 5 minutes, or 30 minutes.
Unit	Select the unit to configure.
From Port/To Port	A consecutive group of ports may be configured starting with the selected port.
State	Choose *Enabled* to enable the DHCP server screening or *Disabled* to disable it. The default is *Disabled*.

Click the **Apply** button to accept the changes made for each individual section.

DHCP Offer Permit Entry Settings

Users can add or delete permit entries on this page.

To view this window, click **Security > DHCP Server Screening > DHCP Offer Permit Entry Settings**, as shown below:

Figure 8-59 DHCP Offer Permit Entry Settings window

The fields that can be configured are described below:

Parameter	Description
Server IP Address	The IP address of the DHCP server to be permitted.
Client's MAC Address	The MAC address of the DHCP client.
Ports	The port numbers of the filter DHCP server. Tick the All Ports check box to include all the ports on this switch for this configuration.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry based on the information entered.

Access Authentication Control

The TACACS / XTACACS / TACACS+ / RADIUS commands allow users to secure access to the Switch using the TACACS / XTACACS / TACACS+ / RADIUS protocols. When a user logs in to the Switch or tries to access the administrator level privilege, he or she is prompted for a password. If TACACS / XTACACS / TACACS+ / RADIUS authentication is enabled on the Switch, it will contact a TACACS / XTACACS / TACACS+ / RADIUS server to verify the user. If the user is verified, he or she is granted access to the Switch.

There are currently three versions of the TACACS security protocol, each a separate entity. The Switch's software supports the following versions of TACACS:

- TACACS (Terminal Access Controller Access Control System) - Provides password checking and authentication, and notification of user actions for security purposes utilizing via one or more centralized TACACS servers, utilizing the UDP protocol for packet transmission.
- Extended TACACS (XTACACS) - An extension of the TACACS protocol with the ability to provide more types of authentication requests and more types of response codes than TACACS. This protocol also uses UDP to transmit packets.
- TACACS+ (Terminal Access Controller Access Control System plus) - Provides detailed access control for authentication for network devices. TACACS+ is facilitated through Authentication commands via one or more centralized servers. The TACACS+ protocol encrypts all traffic between the Switch and the TACACS+ daemon, using the TCP protocol to ensure reliable delivery

In order for the TACACS / XTACACS / TACACS+ / RADIUS security function to work properly, a TACACS / XTACACS / TACACS+ / RADIUS server must be configured on a device other than the Switch, called an Authentication Server Host and it must include usernames and passwords for authentication. When the user is prompted by the Switch to enter usernames and passwords for authentication, the Switch contacts the TACACS / XTACACS / TACACS+ / RADIUS server to verify, and the server will respond with one of three messages:

The server verifies the username and password, and the user is granted normal user privileges on the Switch.

The server will not accept the username and password and the user is denied access to the Switch.

The server doesn't respond to the verification query. At this point, the Switch receives the timeout from the server and then moves to the next method of verification configured in the method list.

The Switch has four built-in Authentication Server Groups, one for each of the TACACS, XTACACS, TACACS+ and RADIUS protocols. These built-in Authentication Server Groups are used to authenticate users trying to access the Switch. The users will set Authentication Server Hosts in a preferable order in the built-in Authentication Server Groups and when a user tries to gain access to the Switch, the Switch will ask the first Authentication Server Hosts for authentication. If no authentication is made, the second server host in the list will be queried, and so on. The built-in Authentication Server Groups can only have hosts that are running the specified protocol. For example, the TACACS Authentication Server Groups can only have TACACS Authentication Server Hosts.

The administrator for the Switch may set up six different authentication techniques per user-defined method list (TACACS / XTACACS / TACACS+ / RADIUS / local / none) for authentication. These techniques will be listed in an order preferable, and defined by the user for normal user authentication on the Switch, and may contain up to eight authentication techniques. When a user attempts to access the Switch, the Switch will select the first technique listed for authentication. If the first technique goes through its Authentication Server Hosts and no authentication is returned, the Switch will then go to the next technique listed in the server group for authentication, until the authentication has been verified or denied, or the list is exhausted.

Users granted access to the Switch will be granted normal user privileges on the Switch. To gain access to administrator level privileges, the user must access the **Enable Admin** window and then enter a password, which was previously configured by the administrator of the Switch.

NOTE: TACACS, XTACACS and TACACS+ are separate entities and are not compatible. The Switch and the server must be configured exactly the same, using the same protocol. (For example, if the Switch is set up for TACACS authentication, so must be the host server.)

Enable Admin

Users who have logged on to the Switch on the normal user level and wish to be promoted to the administrator level can use this window. After logging on to the Switch, users will have only user level privileges. To gain access to administrator level privileges, the user will open this window and will have to enter an authentication password.

Possible authentication methods for this function include TACACS/XTACACS/TACACS+/RADIUS, user defined server groups, local enable (local account on the Switch), or no authentication (none). Because XTACACS and TACACS do not support the enable function, the user must create a special account on the server host, which has the username "enable", and a password configured by the administrator that will support the "enable" function. This function becomes inoperable when the authentication policy is disabled.

To view this window, click **Security > Access Authentication Control > Enable Admin**, as shown below:

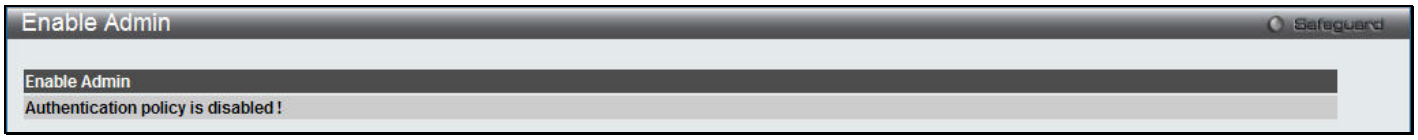


Figure 8-60 Enable Admin window

When this window appears, click the **Enable Admin** button revealing a window for the user to enter authentication (password, username), as seen below. A successful entry will promote the user to Administrator level privileges on the Switch.

Authentication Policy Settings

Users can enable an administrator-defined authentication policy for users trying to access the Switch. When enabled, the device will check the Login Method List and choose a technique for user authentication upon login.

To view this window, click **Security > Access Authentication Control > Authentication Policy Settings**, as shown below:

Figure 8-61 Authentication Policy Settings window

The fields that can be configured are described below:

Parameter	Description
Authentication Policy	Use the pull-down menu to enable or disable the Authentication Policy on the Switch.
Response Timeout (0-255)	This field will set the time the Switch will wait for a response of authentication from the user. The user may set a time between *0* and *255* seconds. The default setting is *30* seconds.
User Attempts (1-255)	This command will configure the maximum number of times the Switch will accept authentication attempts. Users failing to be authenticated after the set amount of attempts will be denied access to the Switch and will be locked out of further authentication attempts. Command line interface users will have to wait 60 seconds before another authentication attempt. Telnet and Web users will be disconnected from the Switch. The user may set the number of attempts from *1* to *255*. The default setting is *3*.

Click the **Apply** button to accept the changes made.

Application Authentication Settings

Users can configure Switch configuration applications (Console, Telnet, SSH, HTTP) for login at the user level and at the administration level (Enable Admin**)** utilizing a previously configured method list.

To view this window, click **Security > Access Authentication Control > Application Authentication Settings**, as shown below:

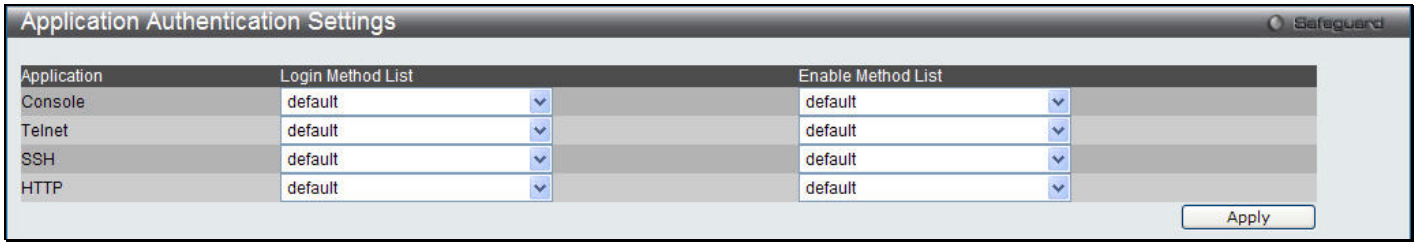


Figure 8-62 Application Authentication Settings window

The fields that can be configured are described below:

Parameter	Description
Application	Lists the configuration applications on the Switch. The user may configure the Login Method List and Enable Method List for authentication for users utilizing the Console (Command Line Interface) application, the Telnet application, SSH application, and the HTTP application.
Login Method List	Using the pull-down menu, configure an application for normal login on the user level, utilizing a previously configured method list. The user may use the default Method List or other Method List configured by the user. See the **Login Method Lists** window, in this section, for more information.
Enable Method List	Using the pull-down menu, configure an application to promote user level to admin-level users utilizing a previously configured method list. The user may use the default Method List or other Method List configured by the user. See the **Enable Method Lists** window, in this section, for more information

Click the **Apply** button to accept the changes made.

Authentication Server Group Settings

Users can set up Authentication Server Groups on the Switch. A server group is a technique used to group TACACS/XTACACS/TACACS+/RADIUS server hosts into user-defined categories for authentication using method lists. The user may define the type of server group by protocol or by previously defined server group. The Switch has four built-in Authentication Server Groups that cannot be removed but can be modified. Up to eight authentication server hosts may be added to any particular group.

To view this window, click **Security > Access Authentication Control > Authentication Server Group Settings**, as shown below:

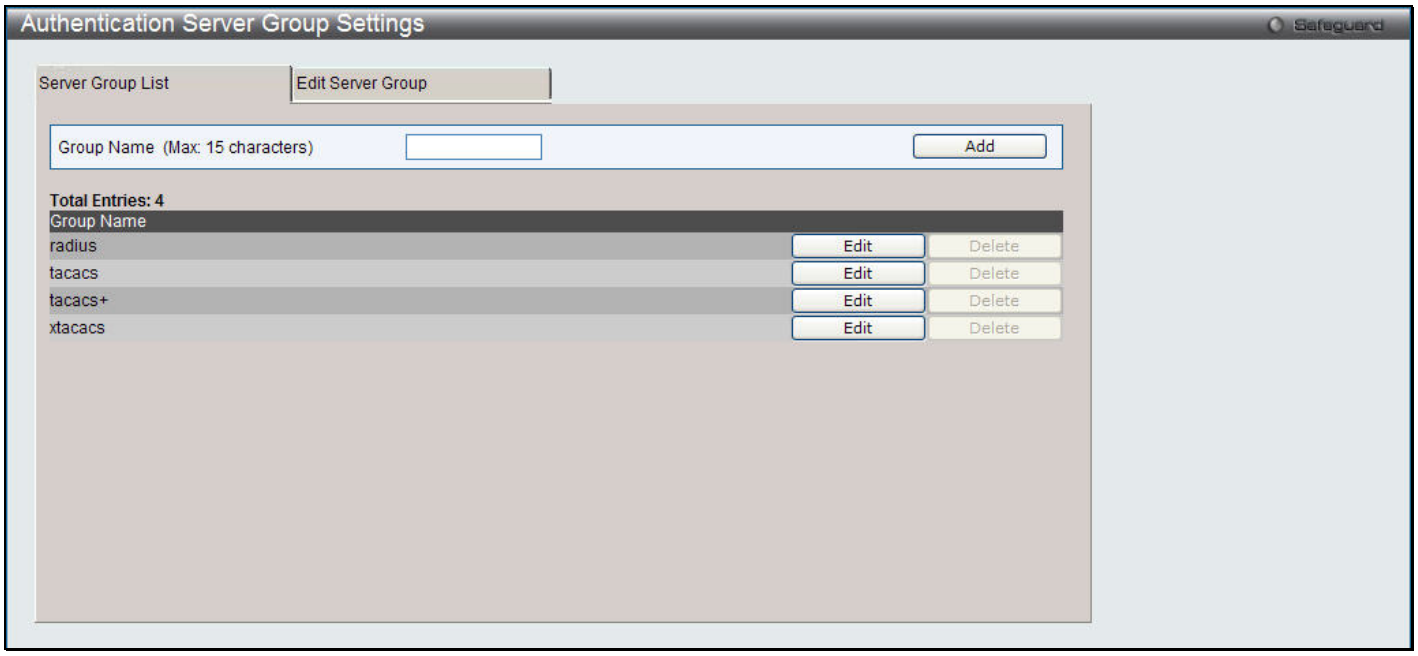


Figure 8-63 Authentication Server Group Settings – Server Group List window

This window displays the Authentication Server Groups on the Switch. The Switch has four built-in Authentication Server Groups that cannot be removed but can be modified. To add a new Server Group, enter a name in the Group Name field and then click the **Add** button. To modify a particular group, click the **Edit** button (or the **Edit Server Group** tab), which will then display the following **Edit Server Group** tab:

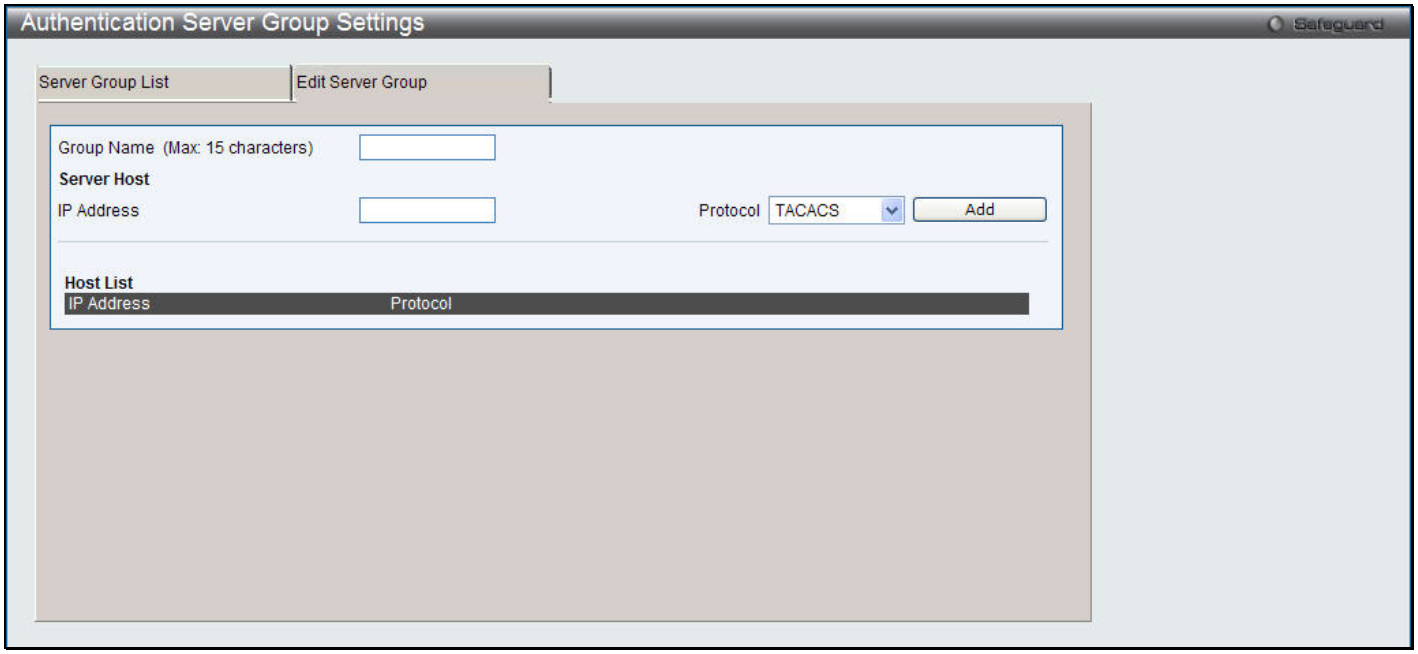


Figure 8-64 Authentication Server Group Settings – Edit Server Group window

To add an Authentication Server Host to the list, enter its name in the Group Name field, IP address in the IP Address field, use the drop-down menu to choose the Protocol associated with the IP address of the Authentication Server Host, and then click **Add** to add this Authentication Server Host to the group. The entry should appear in the Host List at the bottom of this tab.

NOTE: The user must configure Authentication Server Hosts using the Authentication Server Hosts window before adding hosts to the list. Authentication Server Hosts must be configured for their specific protocol on a remote centralized server before this function can work properly.

NOTE: The three built-in server groups can only have server hosts running the same TACACS daemon. TACACS/XTACACS/TACACS+ protocols are separate entities and are not compatible with each other.

Authentication Server Settings

User-defined Authentication Server Hosts for the TACACS / XTACACS / TACACS+ / RADIUS security protocols can be set on the Switch. When a user attempts to access the Switch with Authentication Policy enabled, the Switch will send authentication packets to a remote TACACS / XTACACS / TACACS+ / RADIUS server host on a remote host. The TACACS / XTACACS / TACACS+ / RADIUS server host will then verify or deny the request and return the appropriate message to the Switch. More than one authentication protocol can be run on the same physical server host but, remember that TACACS / XTACACS / TACACS+ / RADIUS are separate entities and are not compatible with each other. The maximum supported number of server hosts is 16.

To view this window, click **Security > Access Authentication Control > Authentication Server Settings**, as shown below:

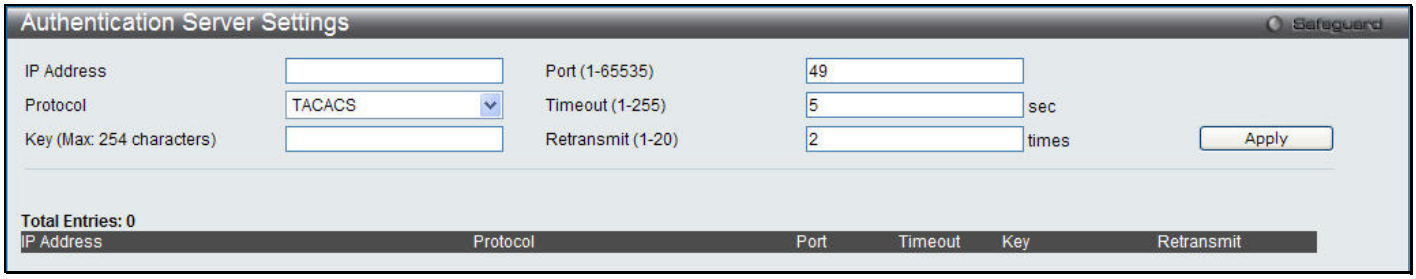


Figure 8-65 Authentication Server Settings window

The fields that can be configured are described below:

Parameter	Description
IP Address	The IP address of the remote server host to add.
Protocol	The protocol used by the server host. The user may choose one of the following: *TACACS* - Enter this parameter if the server host utilizes the TACACS protocol. *XTACACS* - Enter this parameter if the server host utilizes the XTACACS protocol. *TACACS+* - Enter this parameter if the server host utilizes the TACACS+ protocol. *RADIUS* - Enter this parameter if the server host utilizes the RADIUS protocol.
Key (Max: 254 characters)	Authentication key to be shared with a configured TACACS+ or RADIUS servers only. Specify an alphanumeric string up to 254 characters.
Port (1-65535)	Enter a number between *1* and *65535* to define the virtual port number of the authentication protocol on a server host. The default port number is *49* for TACACS/XTACACS/TACACS+ servers and *1813* for RADIUS servers but the user may set a unique port number for higher security.
Timeout (1-255)	Enter the time in seconds the Switch will wait for the server host to reply to an authentication request. The default value is *5* seconds.
Retransmit (1-20)	Enter the value in the retransmit field to change how many times the device will resend an authentication request when the TACACS server does not respond.

Click the **Apply** button to accept the changes made.

NOTE: More than one authentication protocol can be run on the same physical server host but, remember that TACACS/XTACACS/TACACS+ are separate entities and are not compatible with each other.

Login Method Lists Settings

User-defined or default Login Method List of authentication techniques can be configured for users logging on to the Switch. The sequence of techniques implemented in this command will affect the authentication result. For example, if a user enters a sequence of techniques, for example TACACS - XTACACS- local, the Switch will send an authentication request to the first TACACS host in the server group. If no response comes from the server host, the Switch will send an authentication request to the second TACACS host in the server group and so on, until the list is exhausted. At that point, the Switch will restart the same sequence with the following protocol listed, XTACACS. If no authentication takes place using the XTACACS list, the local account database set in the Switch is used to authenticate the user. When the local method is used, the privilege level will be dependent on the local account privilege configured on the Switch.

Successful login using any of these techniques will give the user a "User" privilege only. If the user wishes to upgrade his or her status to the administrator level, the user must use the **Enable Admin** window, in which the user must enter a previously configured password, set by the administrator.

To view this window, click **Security > Access Authentication Control > Login Method Lists Settings**, as shown below:

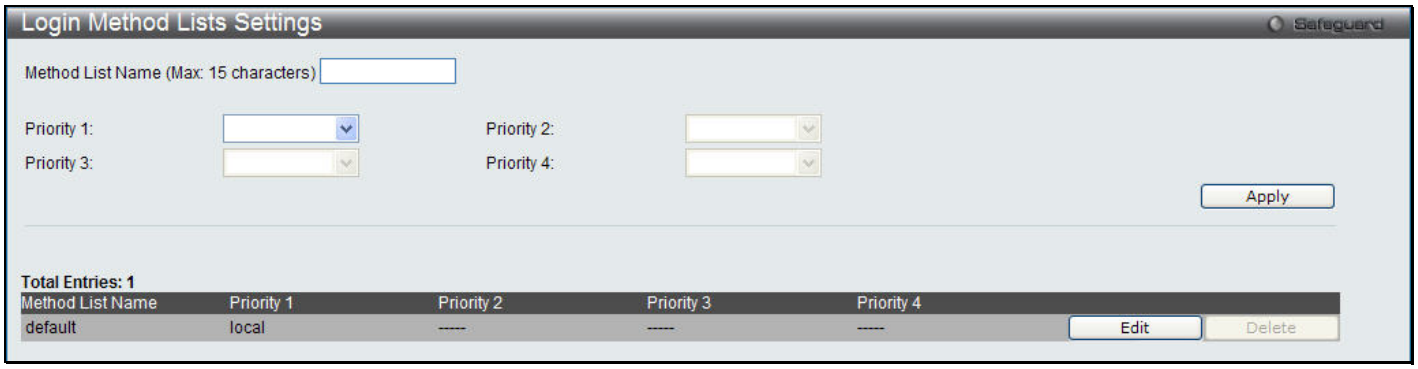


Figure 8-66 Login Method Lists Settings window

The Switch contains one Method List that is set and cannot be removed, yet can be modified. To delete a Login Method List defined by the user, click the **Delete** button corresponding to the entry desired to be deleted. To modify a Login Method List, click on its corresponding **Edit** button.

The fields that can be configured are described below:

Parameter	Description
Method List Name	Enter a method list name defined by the user of up to 15 characters.
Priority 1, 2, 3, 4	The user may add one, or a combination of up to four of the following authentication methods to this method list: *none* - Adding this parameter will require no authentication needed to access the Switch. *local* - Adding this parameter will require the user to be authenticated using the local user account database on the Switch. *radius* - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server. *tacacs* - Adding this parameter will require the user to be authenticated using the

	TACACS protocol from a remote TACACS server. *tacacs+* - Adding this parameter will require the user to be authenticated using the TACACS+ protocol from a remote TACACS+ server. *xtacacs* - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.

Click the **Apply** button to accept the changes made.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Enable Method Lists Settings

Users can set up Method Lists to promote users with user level privileges to Administrator (Admin) level privileges using authentication methods on the Switch. Once a user acquires normal user level privileges on the Switch, he or she must be authenticated by a method on the Switch to gain administrator privileges on the Switch, which is defined by the Administrator. A maximum of eight Enable Method Lists can be implemented on the Switch, one of which is a default Enable Method List. This default Enable Method List cannot be deleted but can be configured.

The sequence of methods implemented in this command will affect the authentication result. For example, if a user enters a sequence of methods like TACACS - XTACACS - Local Enable, the Switch will send an authentication request to the first TACACS host in the server group. If no verification is found, the Switch will send an authentication request to the second TACACS host in the server group and so on, until the list is exhausted. At that point, the Switch will restart the same sequence with the following protocol listed, XTACACS. If no authentication takes place using the XTACACS list, the Local Enable password set in the Switch is used to authenticate the user.

Successful authentication using any of these methods will give the user an "Admin" privilege.

NOTE: To set the Local Enable Password, see the next section, entitled Local Enable Password.

To view this window, click **Security > Access Authentication Control > Enable method Lists Settings**, as shown below:

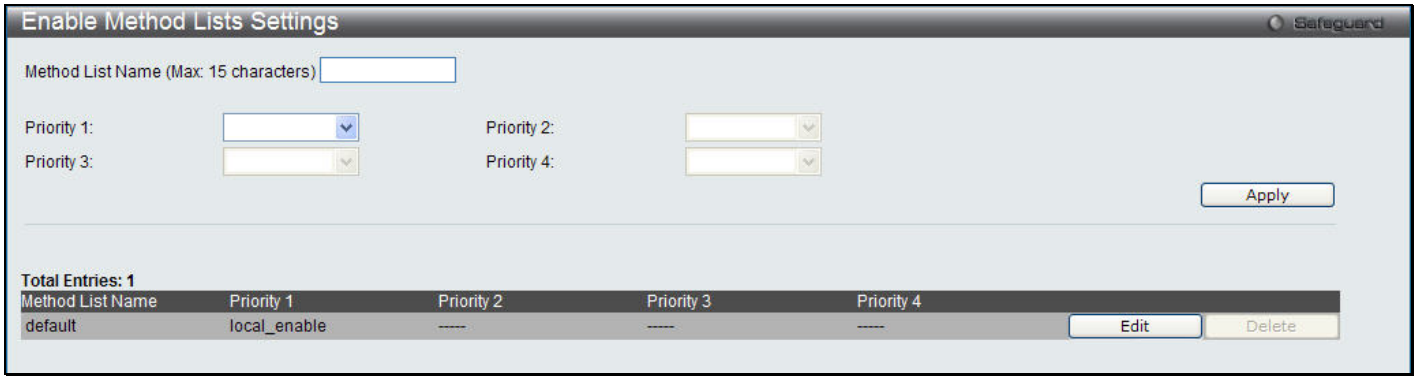


Figure 8-67 Enable method Lists Settings window

To delete an Enable Method List defined by the user, click the **Delete** button corresponding to the entry desired to be deleted. To modify an Enable Method List, click on its corresponding **Edit** button.

The fields that can be configured are described below:

Parameter	Description
Method List Name	Enter a method list name defined by the user of up to 15 characters.
Priority 1, 2, 3, 4	The user may add one, or a combination of up to four of the following authentication methods to this method list: *none* - Adding this parameter will require no authentication needed to access the Switch. *local_enable* - Adding this parameter will require the user to be authenticated using the local enable password database on the Switch. The local enable password must be set by the user in the next section entitled Local Enable Password. *radius* - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server. *tacacs* - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server. *tacacs+* - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server. *xtacacs* - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.

Click the **Apply** button to accept the changes made.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Local Enable Password Settings

Users can configure the locally enabled password for Enable Admin. When a user chooses the "local_enable" method to promote user level privileges to administrator privileges, he or she will be prompted to enter the password configured here that is locally set on the Switch.

To view this window, click **Security > Access Authentication Control > Local Enable Password Settings**, as shown below:

Figure 8-68 Local Enable Password Settings window

The fields that can be configured are described below:

Parameter	Description
Old Local Enable Password	If a password was previously configured for this entry, enter it here in order to change it to a new password
New Local Enable Password	Enter the new password that you wish to set on the Switch to authenticate users attempting to access Administrator Level privileges on the Switch. The user may set a password of up to 15 characters.
Confirm Local Enable Password	Confirm the new password entered above. Entering a different password here from the one set in the New Local Enabled field will result in a fail message.

Click the **Apply** button to accept the changes made.

SSL Settings

Secure Sockets Layer, or SSL, is a security feature that will provide a secure communication path between a host and client through the use of authentication, digital signatures and encryption. These security functions are implemented through the use of a cipher suite, which is a security string that determines the exact cryptographic parameters, specific encryption algorithms and key sizes to be used for an authentication session and consists of three levels:

1. **Key Exchange:** The first part of the Ciphersuite string specifies the public key algorithm to be used. This switch utilizes the Rivest Shamir Adleman (RSA) public key algorithm and the Digital Signature Algorithm (DSA), specified here as the DHE DSS Diffie-Hellman (DHE) public key algorithm. This is the first authentication process between client and host as they "exchange keys" in looking for a match and therefore authentication to be accepted to negotiate encryptions on the following level.
2. **Encryption:** The second part of the cipher suite that includes the encryption used for encrypting the messages sent between client and host. The Switch supports two types of cryptology algorithms:

   Stream Ciphers – There are two types of stream ciphers on the Switch, *RC4 with 40-bit keys* and *RC4 with 128-bit keys*. These keys are used to encrypt messages and need to be consistent between client and host for optimal use.

   CBC Block Ciphers – CBC refers to Cipher Block Chaining, which means that a portion of the previously encrypted block of encrypted text is used in the encryption of the current block. The Switch supports the *3DES EDE* encryption code defined by the Data Encryption Standard (DES) to create the encrypted text.
3. **Hash Algorithm:** This part of the cipher suite allows the user to choose a message digest function which will determine a Message Authentication Code. This Message Authentication Code will be encrypted with a sent message to provide integrity and prevent against replay attacks. The Switch supports two hash algorithms, MD5 (Message Digest 5) and SHA (Secure Hash Algorithm).

These three parameters are uniquely assembled in four choices on the Switch to create a three-layered encryption code for secure communication between the server and the host. The user may implement any one or combination of the cipher suites available, yet different cipher suites will affect the security level and the performance of the secured connection. The information included in the cipher suites is not included with the Switch and requires downloading from a third source in a file form called a *certificate*. This function of the Switch cannot be executed without the presence and implementation of the certificate file and can be downloaded to the Switch by utilizing a TFTP server. The Switch supports SSLv3. Other versions of SSL may not be compatible with this Switch and may cause problems upon authentication and transfer of messages from client to host.

The SSL Settings window located on the next page will allow the user to enable SSL on the Switch and implement any one or combination of listed cipher suites on the Switch. A cipher suite is a security string that determines the exact cryptographic parameters, specific encryption algorithms and key sizes to be used for an authentication session. The Switch possesses four possible cipher suites for the SSL function, which are all enabled by default. To utilize a particular cipher suite, disable the unwanted cipher suites, leaving the desired one for authentication.

When the SSL function has been enabled, the web will become disabled. To manage the Switch through the web based management while utilizing the SSL function, the web browser must support SSL encryption and the header of the URL must begin with https://. (Ex. https://xx.xx.xx.xx) Any other method will result in an error and no access can be authorized for the web-based management.

Users can download a certificate file for the SSL function on the Switch from a TFTP server. The certificate file is a data record used for authenticating devices on the network. It contains information on the owner, keys for authentication and digital signatures. Both the server and the client must have consistent certificate files for optimal use of the SSL function. The Switch only supports certificate files with .der file extensions. Currently, the Switch comes with a certificate pre-loaded though the user may need to download more, depending on user circumstances.

To view this window, click **Security > SSL Settings**, as shown below:

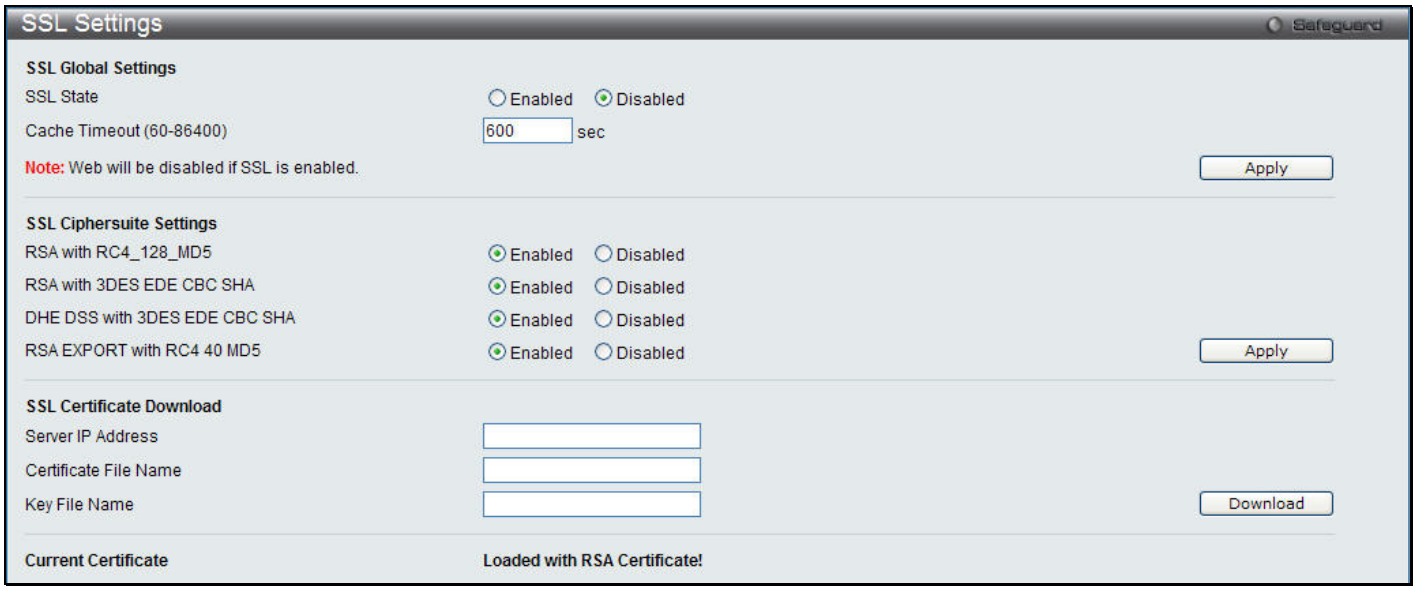


Figure 8-69 SSL Settings window

To set up the SSL function on the Switch, configure the parameters in the SSL Settings section described.

The fields that can be configured are described below:

Parameter	Description
SSL State	Use the radio buttons to enable or disable the SSL status on the Switch. The default is Disabled.
Cache Timeout (60-86400)	This field will set the time between a new key exchange between a client and a host using the SSL function. A new SSL session is established every time the client and host go through a key exchange. Specifying a longer timeout will allow the SSL session to reuse the master key on future connections with that particular host, therefore speeding up the negotiation process. The default setting is *600* seconds.

Click the **Apply** button to accept the changes made.

To set up the **SSL cipher suite function** on the Switch, configure the parameters in the SSL Cipher suite Settings section described below:

Parameter	Description
RSA with RC4_128_MD5	This cipher suite combines the RSA key exchange, stream cipher RC4 encryption with 128-bit keys and the MD5 Hash Algorithm. Use the radio buttons to enable or disable this cipher suite. This field is Enabled by default.
RSA with 3DES EDE CBC SHA	This cipher suite combines the RSA key exchange, CBC Block Cipher 3DES_EDE encryption and the SHA Hash Algorithm. Use the radio buttons to enable or disable this cipher suite. This field is Enabled by default.
DHS DSS with 3DES EDE CBC SHA	This cipher suite combines the DSA Diffie Hellman key exchange, CBC Block Cipher 3DES_EDE encryption and SHA Hash Algorithm. Use the radio buttons to enable or disable this cipher suite. This field is Enabled by default.
RSA EXPORT with RC4 40 MD5	This cipher suite combines the RSA Export key exchange and stream cipher RC4 encryption with 40-bit keys. Use the radio buttons to enable or disable this cipher suite. This field is Enabled by default.

Click the **Apply** button to accept the changes made.

To download SSL certificates, configure the parameters in the SSL Certificate Download section described below.

Parameter	Description
Server IP Address	Enter the IPv4 address of the TFTP server where the certificate files are located.
Certificate File Name	Enter the path and the filename of the certificate file to download. This file must have a .der extension. (Ex. c:/cert.der)
Key File Name	Enter the path and the filename of the key file to download. This file must have a .der extension (Ex. c:/pkey.der)

Click the **Download** button to download the SSL certificate based on the information entered.

NOTE: Certain implementations concerning the function and configuration of SSL are not available on the web-based management of this Switch and need to be configured using the command line interface.

NOTE: Enabling the SSL command will disable the web-based switch management. To log on to the Switch again, the header of the URL must begin with https://. Entering anything else into the address field of the web browser will result in an error and no authentication will be granted.

SSH

SSH is an abbreviation of Secure Shell, which is a program allowing secure remote login and secure network services over an insecure network. It allows a secure login to remote host computers, a safe method of executing commands on a remote end node, and will provide secure encrypted and authenticated communication between two non-trusted hosts. SSH, with its array of unmatched security features is an essential tool in today's networking environment. It is a powerful guardian against numerous existing security hazards that now threaten network communications.

The steps required to use the SSH protocol for secure communication between a remote PC (the SSH client) and the Switch (the SSH server) are as follows:

1. Create a user account with admin-level access using the **User Accounts** window. This is identical to creating any other admin-level User Account on the Switch, including specifying a password. This password is used to logon to the Switch, once a secure communication path has been established using the SSH protocol.
2. Configure the User Account to use a specified authorization method to identify users that are allowed to establish SSH connections with the Switch using the **SSH User Authentication Mode** window. There are three choices as to the method SSH will use to authorize the user, which are Host Based, Password, and Public Key.
3. Configure the encryption algorithm that SSH will use to encrypt and decrypt messages sent between the SSH client and the SSH server, using the **SSH Authentication Method and Algorithm Setting**s window.
4. Finally, enable SSH on the Switch using the **SSH Configuration** window.

After completing the preceding steps, a SSH Client on a remote PC can be configured to manage the Switch using a secure, in band connection.

SSH Settings

Users can configure and view settings for the SSH server.

To view this window, click **Security > SSH > SSH Settings**, as shown below:

Figure 8-70 SSH Settings window

The fields that can be configured are described below:

Parameter	Description
SSH Server State	Use the radio buttons to enable or disable SSH on the Switch. The default is Disabled.
Max Session (1-8)	Enter a value between *1* and *8* to set the number of users that may simultaneously access the Switch. The default setting is *8*.
Connection Timeout (120-600)	Allows the user to set the connection timeout. The user may set a time between *120* and *600* seconds. The default setting is *120* seconds.
Authfail Attempts (2-20)	Allows the Administrator to set the maximum number of attempts that a user may try to log on to the SSH Server utilizing the SSH authentication. After the maximum number of attempts has been exceeded, the Switch will be disconnected and the user must reconnect to the Switch to attempt another login. The number of maximum attempts may be set between *2* and *20*. The default setting is *2*.
Rekey Timeout	This field is used to set the time period that the Switch will change the security shell encryptions by using the pull-down menu. The available options are *Never*, *10 min*, *30 min*, and *60 min*. The default setting is *Never*.
TCP Port Number (1-65535)	Here the user can enter the TCP Port Number used for SSH. The default value is *22*.

Click the **Apply** button to accept the changes made for each individual section.

SSH Authentication Method and Algorithm Settings

Users can configure the desired types of SSH algorithms used for authentication encryption. There are three categories of algorithms listed and specific algorithms of each may be enabled or disabled by ticking their corresponding check boxes. All algorithms are enabled by default.

To view this window, click **Security > SSH > SSH Authentication method and Algorithm Settings**, as shown below:

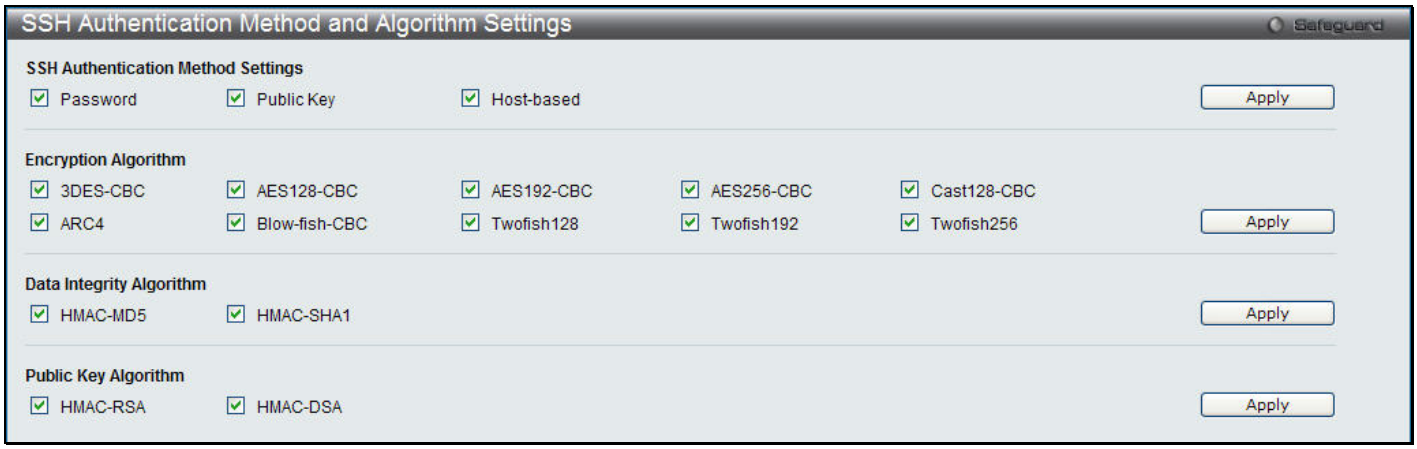


Figure 8-71 SSH Authentication Method and Algorithm Settings window

The fields that can be configured for **SSH Authentication Mode** are described below:

Parameter	Description
Password	This may be enabled or disabled to choose if the administrator wishes to use a locally configured password for authentication on the Switch. This parameter is enabled by default.
Public Key	This may be enabled or disabled to choose if the administrator wishes to use a public key configuration set on a SSH server, for authentication. This parameter is enabled by default.
Host-based	This may be enabled or disabled to choose if the administrator wishes to use a host computer for authentication. This parameter is intended for Linux users requiring SSH authentication techniques and the host computer is running the Linux operating system with a SSH program previously installed. This parameter is enabled by default.

Click the **Apply** button to accept the changes made.

The fields that can be configured for the **Encryption Algorithm** are described below:

Parameter	Description
3DES-CBC	Use the check box to enable or disable the Triple Data Encryption Standard encryption algorithm with Cipher Block Chaining. The default is enabled.
Blow-fish CBC	Use the check box to enable or disable the Blowfish encryption algorithm with Cipher Block Chaining. The default is enabled.
AES128-CBC	Use the check box to enable or disable the Advanced Encryption Standard AES128 encryption algorithm with Cipher Block Chaining. The default is enabled.
AES192-CBC	Use the check box to enable or disable the Advanced Encryption Standard AES192 encryption algorithm with Cipher Block Chaining. The default is enabled.
AES256-CBC	Use the check box to enable or disable the Advanced Encryption Standard AES-256 encryption algorithm with Cipher Block Chaining. The default is enabled.
ARC4	Use the check box to enable or disable the Arcfour encryption algorithm with Cipher Block Chaining. The default is enabled.
Cast128-CBC	Use the check box to enable or disable the Cast128 encryption algorithm with Cipher Block Chaining. The default is enabled.
Twofish128	Use the check box to enable or disable the twofish128 encryption algorithm. The default is enabled.
Twofish192	Use the check box to enable or disable the twofish192 encryption algorithm. The

	default is enabled.
Twofish256	Use the check box to enable or disable the twofish256 encryption algorithm. The default is enabled.

Click the **Apply** button to accept the changes made.

The fields that can be configured for the **Data Integrity Algorithm** are described below:

Parameter	Description
HMAC-SHA1	Use the check box to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the Secure Hash algorithm. The default is enabled.
HMAC-MD5	Use the check box to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the MD5 Message Digest encryption algorithm. The default is enabled.

Click the **Apply** button to accept the changes made.

The fields that can be configured for the **Public Key Algorithm** are described below:

Parameter	Description
HMAC-RSA	Use the check box to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the RSA encryption algorithm. The default is enabled.
HMAC-DSA	Use the check box to enable or disable the HMAC (Hash for Message Authentication Code) mechanism utilizing the Digital Signature Algorithm (DSA) encryption. The default is enabled.

Click the **Apply** button to accept the changes made.

SSH User Authentication List

Users can configure parameters for users attempting to access the Switch through SSH. In the window above, the User Account “username” has been previously set using the **User Accounts** window in the **Configuration** folder. A User Account MUST be set in order to set the parameters for the SSH user.

To view this window, click **Security > SSH > SSH User Authentication List**, as shown below:

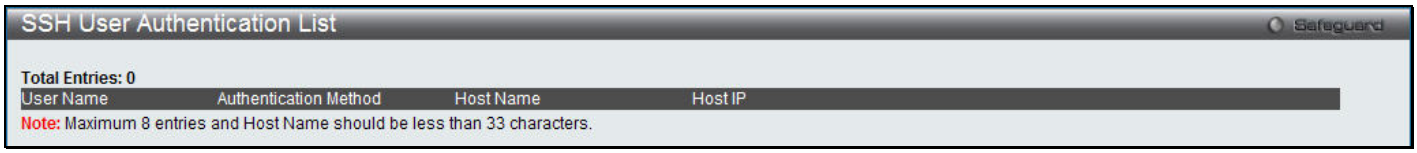


Figure 8-72 SSH User Authentication List window

The fields that can be configured are described below:

Parameter	Description
User Name	A name of no more than 15 characters to identify the SSH user. This User Name must be a previously configured user account on the Switch.
Authentication Method	The administrator may choose one of the following to set the authorization for users attempting to access the Switch. *Host Based* – This parameter should be chosen if the administrator wishes to use a remote SSH server for authentication purposes. Choosing this parameter requires the user to input the following information to identify the SSH user. *Password* – This parameter should be chosen if the administrator wishes to use an

	administrator-defined password for authentication. Upon entry of this parameter, the Switch will prompt the administrator for a password, and then to re-type the password for confirmation. *Public Key* – This parameter should be chosen if the administrator wishes to use the public key on a SSH server for authentication.
Host Name	Enter an alphanumeric string of no more than 32 characters to identify the remote SSH user. This parameter is only used in conjunction with the *Host Based* choice in the Auth. Mode field.
Host IP	Enter the corresponding IP address of the SSH user. This parameter is only used in conjunction with the *Host Based* choice in the Auth. Mode field.

Click the **Edit** button to re-configure the specific entry.

Click the **Apply** button to accept the changes made.

NOTE: To set the SSH User Authentication Mode parameters on the Switch, a User Account must be previously configured.

Trusted Host Settings

Up to thirty trusted host secure IP addresses or ranges may be configured and used for remote Switch management. It should be noted that if one or more trusted hosts are enabled, the Switch will immediately accept remote instructions from only the specified IP address or addresses. If you enable this feature, be sure to first enter the IP address of the station you are currently using.

To view this window, click **Security > Trusted Host Settings**, as shown below:

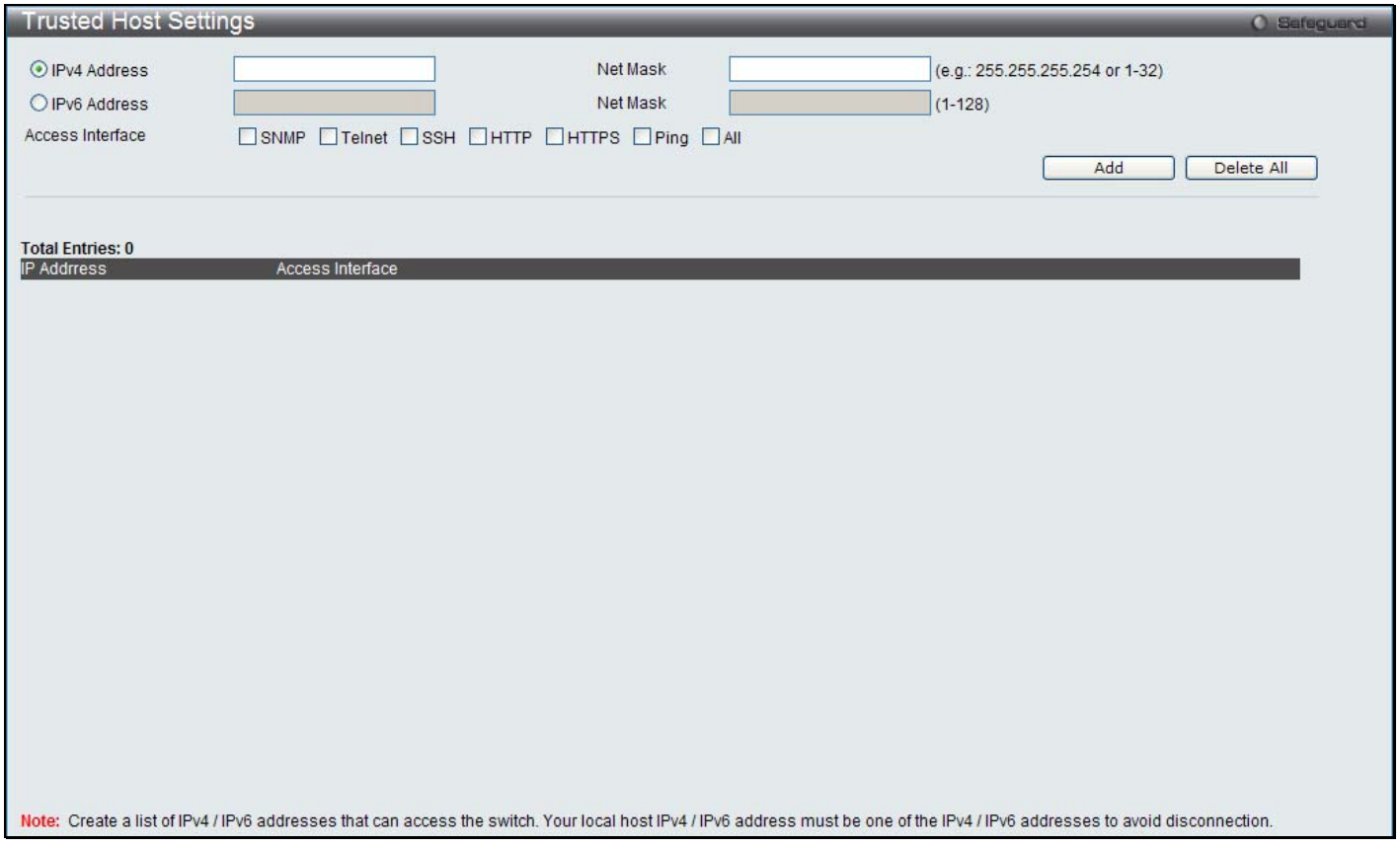


Figure 8-73 Trusted Host window

When the user clicks the **Edit** button, one will be able to edit the service allowed to the selected host.
The fields that can be configured are described below:

Parameter	Description
IPv4 Address	Enter an IPv4 address to add to the trusted host list.
IPv6 Address	Enter an IPv6 address to add to the trusted host list.
Net Mask	Enter a Net Mask address to add to the trusted host list.
Access Interface	Tick the check boxes to select services that will be allowed to the trusted host.

Click the **Add** button to add a new entry based on the information entered.
Click the **Delete All** button to remove all the entries listed.

Safeguard Engine Settings

Periodically, malicious hosts on the network will attack the switch by utilizing packet flooding (ARP Storm) or other methods. These attacks may increase the switch load beyond its capability. To alleviate this problem, the Safeguard Engine function was added to the Switch's software.

The Safeguard Engine can help the overall operability of the Switch by minimizing the workload of the Switch while the attack is ongoing, thus making it capable to forward essential packets over its network in a limited bandwidth. The Safeguard Engine has two operating modes that can be configured by the user, *Strict* and *Fuzzy*. In *Strict* mode, when the Switch either (a) receives too many packets to process or (b) exerts too much memory, it will enter the Exhausted mode. When in this mode, the Switch will drop all ARP and IP broadcast packets and packets from un-trusted IP addresses for a calculated time interval. Every five seconds, the Safeguard Engine will check to see if there are too many packets flooding the Switch. If the threshold has been crossed, the Switch will initially stop all ingress ARP and IP broadcast packets and packets from un-trusted IP addresses for five seconds. After another five-second checking interval arrives, the Switch will again check the ingress flow of packets. If the flooding has stopped, the Switch will again begin accepting all packets. Yet, if the checking shows that there continues to be too many packets flooding the Switch, it will stop accepting all ARP and IP broadcast packets and packets from un-trusted IP addresses for double the time of the previous stop period. This doubling of time for stopping these packets will continue until the maximum time has been reached, which is 320 seconds and every stop from this point until a return to normal ingress flow would be 320 seconds. For a better understanding, please examine the following example of the Safeguard Engine.

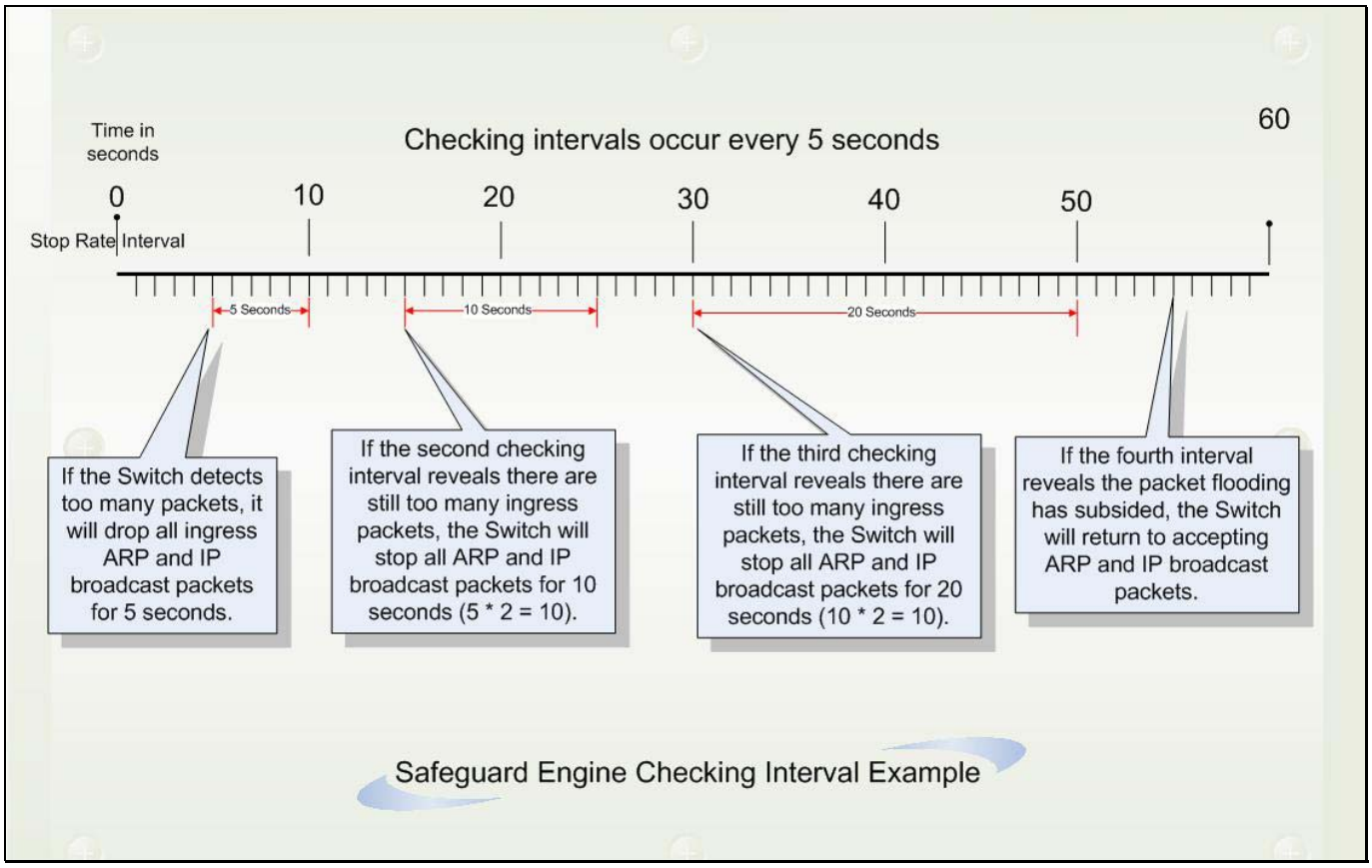


Figure 8-74 Mapping QoS on the Switch

For every consecutive checking interval that reveals a packet flooding issue, the Switch will double the time it will discard ingress ARP and IP broadcast packets and packets from the illegal IP addresses. In the example above, the Switch doubled the time for dropping ARP and IP broadcast packets when consecutive flooding issues were detected at 5-second intervals. (First stop = 5 seconds, second stop = 10 seconds, third stop = 20 seconds) Once the flooding is no longer detected, the wait period for dropping ARP and IP broadcast packets will return to 5 seconds and the process will resume.

In Fuzzy mode, once the Safeguard Engine has entered the Exhausted mode, the Safeguard Engine will decrease the packet flow by half. After returning to Normal mode, the packet flow will be increased by 25%. The Switch will then return to its interval checking and dynamically adjust the packet flow to avoid overload of the Switch.

NOTICE: When Safeguard Engine is enabled, the Switch will allot bandwidth to various traffic flows (ARP, IP) using the FFP (Fast Filter Processor) metering table to control the CPU utilization and limit traffic. This may limit the speed of routing traffic over the network.

Users can enable the Safeguard Engine or configure advanced Safeguard Engine settings for the Switch.

To view this window, click **Security > Safeguard Engine Settings**, as shown below:

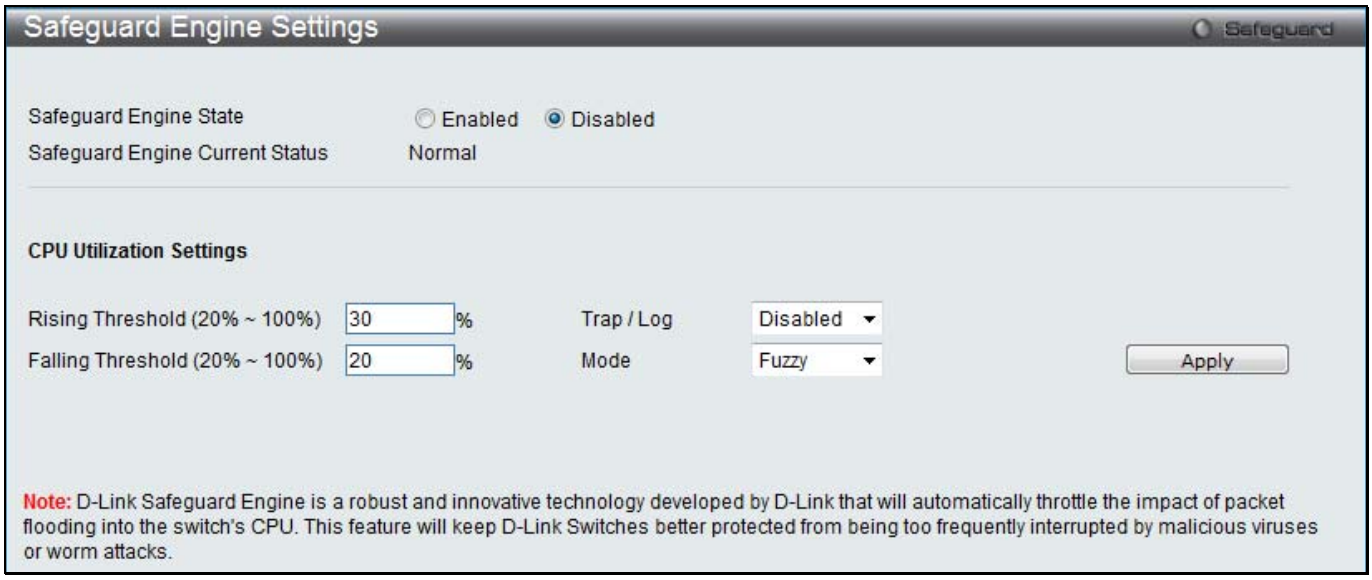


Figure 8-75 Safeguard Engine Settings window

The fields that can be configured are described below:

Parameter	Description
Safeguard Engine State	Use the radio button to globally enable or disable Safeguard Engine settings for the Switch.
Rising Threshold (20% - 100%)	Used to configure the acceptable level of CPU utilization before the Safeguard Engine mechanism is enabled. Once the CPU utilization reaches this percentage level, the Switch will move into Exhausted mode, based on the parameters provided in this window. The default is *30*.
Falling Threshold (20% - 100%)	Used to configure the acceptable level of CPU utilization as a percentage, where the Switch leaves the Safeguard Engine state and returns to normal mode. The default is *20*.
Trap / Log	Use the pull-down menu to enable or disable the sending of messages to the device's SNMP agent and switch log once the Safeguard Engine has been activated by a high CPU utilization rate.
Mode	Used to select the type of Safeguard Engine to be activated by the Switch when the CPU utilization reaches a high rate. The user may select: *Fuzzy* – If selected, this function will instruct the Switch to minimize the IP and ARP traffic flow to the CPU by dynamically allotting an even bandwidth to all traffic flows. *Strict* – If selected, this function will stop accepting all ARP packets not intended for the Switch, and will stop receiving all unnecessary broadcast IP packets, until the storm has subsided. The default setting is *Fuzzy* mode.

Click the **Apply** button to accept the changes made.

Chapter 9 Network Application

DHCP
DNS
PPPoE Circuit ID Insertion Settings
SNTP

DHCP

DHCP Relay

DHCP Relay Global Settings

Users can enable and configure DHCP Relay Global Settings. The relay hops count limit allows the maximum number of hops (routers) that the DHCP messages can be relayed through to be set. If a packet's hop count is more than the hop count limit, the packet is dropped. The range is between *1* and *16* hops, with a default value of *4*. The relay time threshold sets the minimum time (in seconds) that the Switch will wait before forwarding a BOOTREQUEST packet. If the value in the seconds' field of the packet is less than the relay time threshold, the packet will be dropped. The range is between *0* and *65,535* seconds, with a default value of *0* seconds.

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay Global Settings**, as shown below:

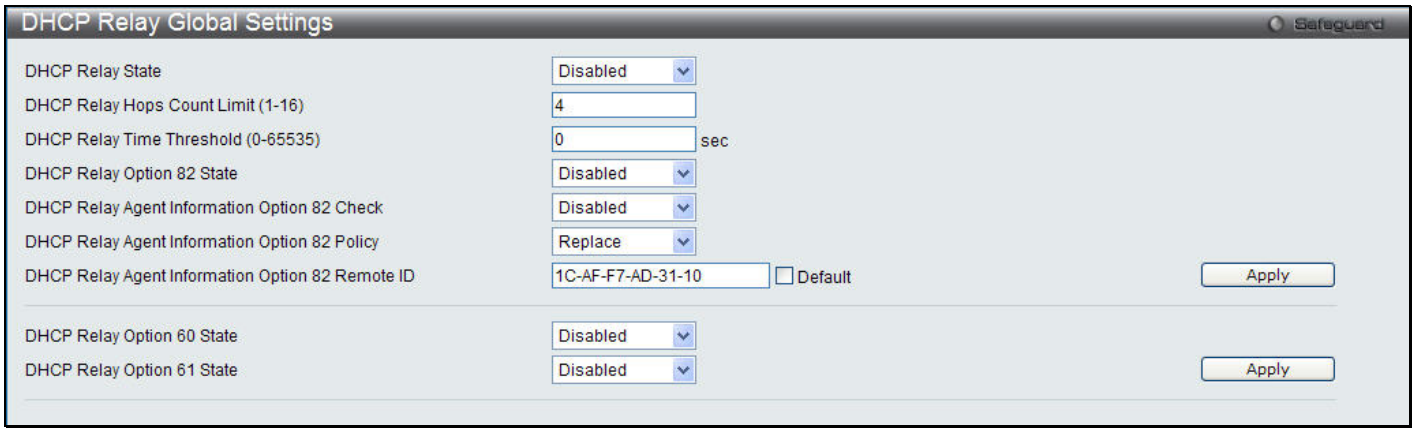


Figure 9-1 DHCP Relay Global Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Relay State	This field can be toggled between *Enabled* and *Disabled* using the pull-down menu. It is used to enable or disable the DHCP Relay service on the Switch. The default is *Disabled.*
DHCP Relay Hops Count Limit (1-16)	This field allows an entry between *1* and *16* to define the maximum number of router hops DHCP messages can be forwarded. The default hop count is *4*.
DHCP Relay Time Threshold (0-65535)	Allows an entry between *0* and *65535* seconds, and defines the maximum time limit for routing a DHCP packet. If a value of *0* is entered, the Switch will not process the value in the seconds' field of the DHCP packet. If a non-zero value is entered, the Switch will use that value, along with the hop count to determine whether to forward a

	given DHCP packet.
DHCP Relay Option 82 State	This field can be toggled between *Enabled* and *Disabled* using the pull-down menu. It is used to enable or disable the DHCP Relay Agent Information Option 82 on the Switch. The default is *Disabled.* *Enabled* –When this field is toggled to *Enabled*, the relay agent will insert and remove DHCP relay information (option 82 field) in messages between DHCP servers and clients. When the relay agent receives the DHCP request, it adds the option 82 information, and the IP address of the relay agent (if the relay agent is configured), to the packet. Once the option 82 information has been added to the packet it is sent on to the DHCP server. When the DHCP server receives the packet, if the server is capable of option 82, it can implement policies like restricting the number of IP addresses that can be assigned to a single remote ID or circuit ID. Then the DHCP server echoes the option 82 field in the DHCP reply. The DHCP server unicasts the reply back to the relay agent if the request was relayed to the server by the relay agent. The Switch verifies that it originally inserted the option 82 data. Finally, the relay agent removes the option 82 field and forwards the packet to the Switch port that connects to the DHCP client that sent the DHCP request. *Disabled*- When the field is toggled to *Disabled*, the relay agent will not insert and remove DHCP relay information (option 82 field) in messages between DHCP servers and clients, and the check and policy settings will have no effect.
DHCP Relay Agent Information Option 82 Check	This field can be toggled between *Enabled* and *Disabled* using the pull-down menu. It is used to enable or disable the Switch's ability to check the validity of the packet's option 82 field. The default is *Disabled*. *Enabled* – When the field is toggled to *Enabled*, the relay agent will check the validity of the packet's option 82 field. If the Switch receives a packet that contains the option 82 field from a DHCP client, the Switch drops the packet because it is invalid. In packets received from DHCP servers, the relay agent will drop invalid messages. *Disabled* – When the field is toggled to *Disabled*, the relay agent will not check the validity of the packet's option 82 field.
DHCP Relay Agent Information Option 82 Policy	This field can be toggled between *Replace, Drop,* and *Keep* by using the pull-down menu. It is used to set the Switch's policy for handling packets when the DHCP Relay Agent Information Option 82 Check is set to *Disabled*. The default is *Replace.* *Replace* – The option 82 field will be replaced if the option 82 field already exists in the packet received from the DHCP client. *Drop* – The packet will be dropped if the option 82 field already exists in the packet received from the DHCP client. *Keep* – The option 82 field will be retained if the option 82 field already exists in the packet received from the DHCP client.
DHCP Relay Agent Information Option 82 Remote ID	Enter the DHCP Relay Agent Information Option 82 Remote ID. Tick the **Default** check box to use MAC address as the Remote ID.
DHCP Relay Option 60 State	Use the drop-down menu to enable or disable the use of the DHCP Relay Option 60 State feature.
DHCP Relay Option 61 State	Use the drop-down menu to enable or disable the use of the DHCP Relay Option 61 State feature.

Click the **Apply** button to accept the changes made for each individual section.

NOTE: If the Switch receives a packet that contains the option 82 field from a DHCP client and the information-checking feature is enabled, the Switch drops the packet because it is invalid. However, in some instances, users may configure a client with the option 82 field. In this situation, disable the information check feature so that the Switch does not remove the option 82 field from the packet. Users may configure the action that the Switch takes when it receives a packet with existing option 82 information by configuring the DHCP Agent Information Option 82 Policy.

The Implementation of DHCP Relay Agent Information Option 82

The **DHCP Relay Option 82** command configures the DHCP relay agent information option 82 setting of the Switch. The formats for the circuit ID sub-option and the remote ID sub-option are as follows:

NOTE: For the circuit ID sub-option of a standalone switch, the module field is always zero.

Circuit ID sub-option format:

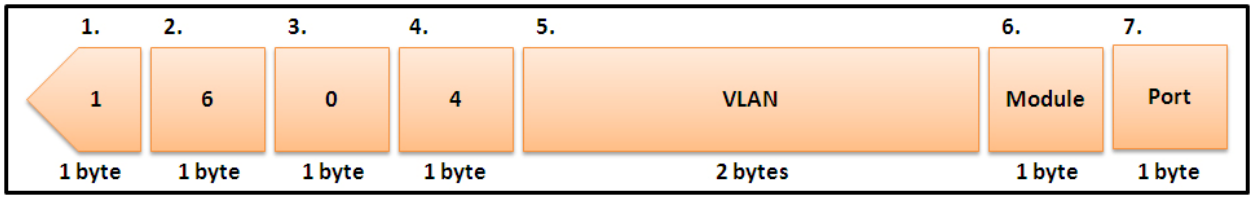


Figure 9-2 Circuit ID Sub-option Format

1 Sub-option type
2 Length
3 Circuit ID type
4 Length
5 VLAN: The incoming VLAN ID of DHCP client packet.
6 Module: For a standalone switch, the Module is always 0; for a stackable switch, the Module is the Unit ID.
7 Port: The incoming port number of the DHCP client packet, the port number starts from 1.

Remote ID sub-option format:

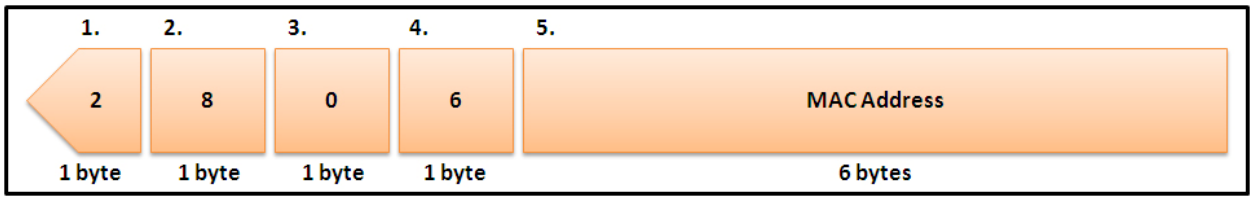


Figure 9-3 Remote ID Sub-option Format

1 Sub-option type
2 Length
3 Remote ID type
4 Length
5 MAC address: The Switch's system MAC address.

DHCP Relay Interface Settings

Users can set up a server, by IP address, for relaying DHCP information to the Switch. The user may enter a previously configured IP interface on the Switch that will be connected directly to the DHCP server using this window. Properly configured settings will be displayed in the DHCP Relay Interface Table at the bottom of the window, once the user clicks the **Apply** button. The user may add up to four server IPs per IP interface on the Switch. Entries may be deleted by clicking the corresponding **Delete** button.

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay Interface Settings**, as shown below:

Figure 9-4 DHCP Relay Interface Settings window

The fields that can be configured are described below:

Parameter	Description
Interface Name	The IP interface on the Switch that will be connected directly to the server.
Server IP	Enter the IP address of the DHCP server. Up to four server IPs can be configured per IP interface.

Click the **Apply** button to accept the changes made.

DHCP Relay VLAN Settings

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay VLAN Settings**, as shown below:

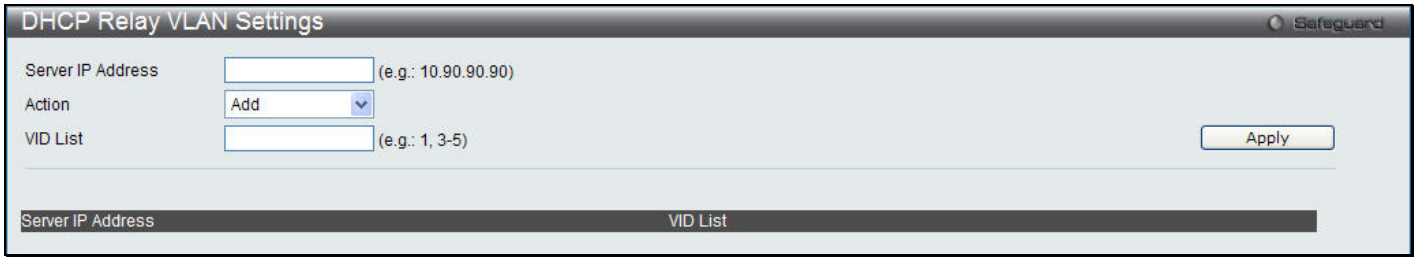


Figure 9-5 DHCP Relay VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
Server IP	Enter the IP address of the DHCP server. Up to four server IPs can be configured per VLAN.
Action	Use the drop-down menu to add or delete the VLAN.
VID List	Enter a list of VLANs.

Click the **Apply** button to implement the changes made.

DHCP Relay Option 60 Server Settings

On this page the user can configure the DHCP relay option 60 server parameters.

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay Option 60 Server Settings**, as shown below:

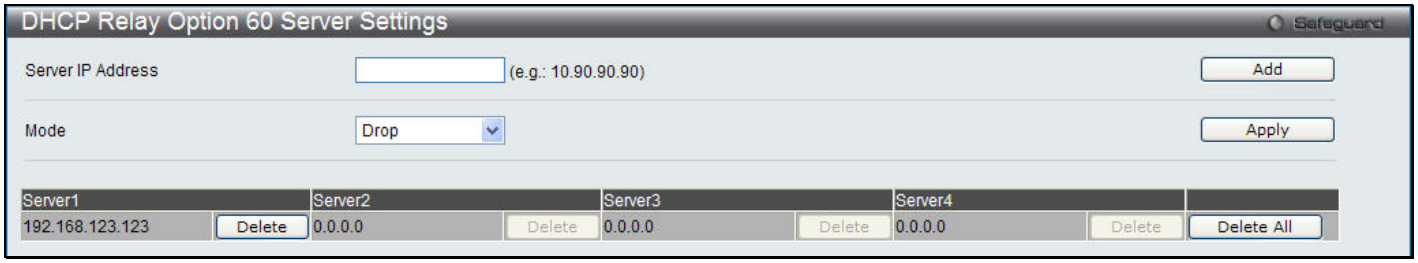


Figure 9-6 DHCP Relay Option 60 Server Settings window

The fields that can be configured are described below:

Parameter	Description
Server IP Address	Enter the DHCP Relay Option 60 Server Relay IP address.
Mode	Use the drop-down menu to select the DHCP Relay Option 60 Server mode.

Click the **Add** button to add a new entry based on the information entered.

Click the **Apply** button to accept the changes made.

Click the **Delete** button to remove the specific entry.

Click the **Delete All** button to remove all the entries listed.

NOTE: When there is no matching server found for the packet based on option 60, the relay servers will be determined by the default relay server setting.

DHCP Relay Option 60 Settings

This option decides whether the DHCP Relay will process the DHCP option 60 or not

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay Option 60 Settings**, as shown below:

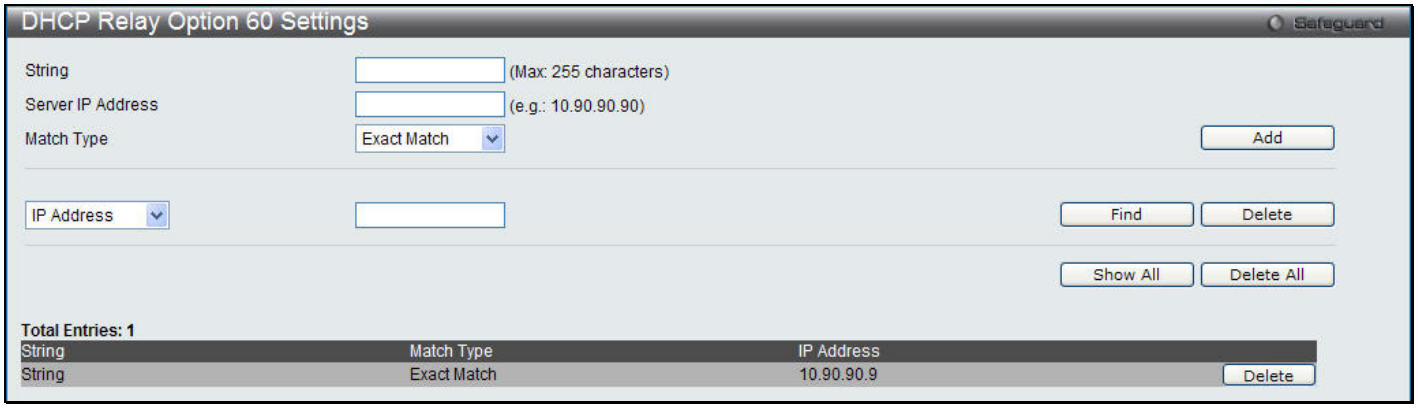


Figure 9-7 DHCP Relay Option 60 Settings window

The fields that can be configured are described below:

Parameter	Description
String	Enter the DHCP Relay Option 60 String value. Different strings can be specified for the same relay server, and the same string can be specified with multiple relay servers. The

	system will relay the packet to all the matching servers.
Server IP Address	Enter the DHCP Relay Option 60 Server IP address.
Match Type	Enter the DHCP Relay Option 60 Match Type value. *Exact Match* – The option 60 string in the packet must full match with the specified string. *Partial Match* – The option 60 string in the packet only need partial match with the specified string.
IP Address	Enter the DHCP Relay Option 60 IP address.
String	Enter the DHCP Relay Option 60 String value.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete** button to remove the specific entry based on the information entered.

Click the **Show All** button to display all the existing entries.

Click the **Delete All** button to remove all the entries listed.

Click the **Delete** button to remove the specific entry.

DHCP Relay Option 61 Settings

On this page the user can configure, add and delete DHCP relay option 61 parameters.

To view this window, click **Network Application > DHCP > DHCP Relay > DHCP Relay Option 61 Settings**, as shown below:

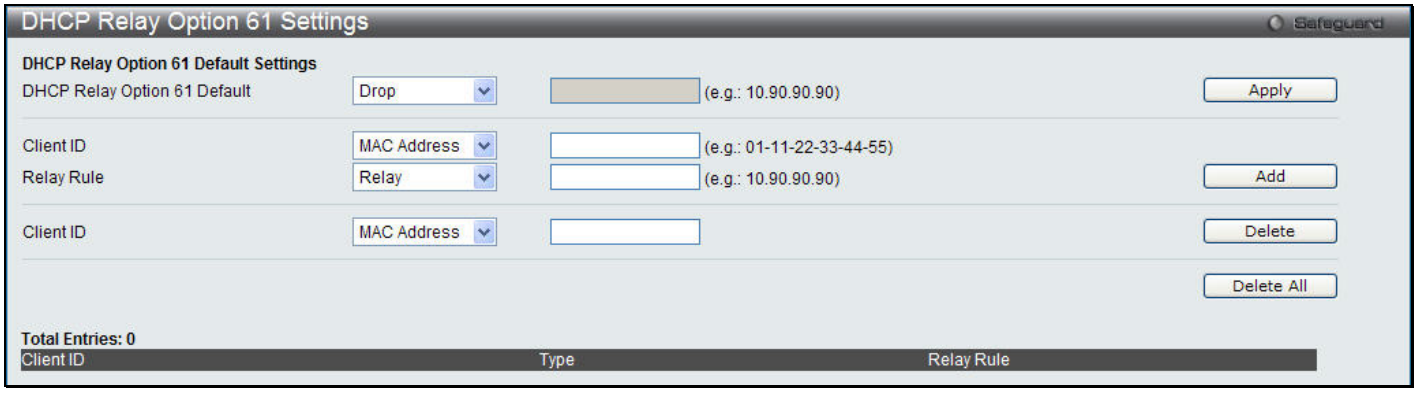


Figure 9-8 DHCP Relay Option 61 Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Relay Option 61 Default	Select the DHCP Relay Option 61 default action. *Drop* – Specify to drop the packet. *Relay* – Specify to relay the packet to an IP address. Enter the IP Address of the default relay server. When there is no matching server found for the packet based on option 61, the relay servers will be determined by this default relay server setting.
Client ID	*MAC Address* – The client's client ID, which is the hardware address of client. *String* – The client's client ID, which is specified by the administrator.
Relay Rule	*Relay* – Specify to relay the packet to an IP address. *Drop* – Specify to drop the packet.

Click the **Apply** button to accept the changes made.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specific entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

DHCP Server

For this release, the Switch now has the capability to act as a DHCP server to devices within its locally attached network. DHCP, or Dynamic Host Configuration Protocol, allows the Switch to delegate IP addresses, subnet masks, default gateways and other IP parameters to devices that request this information. This occurs when a DHCP enabled device is booted on or attached to the locally attached network. This device is known as the DHCP client and when enabled, it will emit query messages on the network before any IP parameters are set. When the DHCP server receives this request, it returns a response to the client, containing the previously mentioned IP information that the DHCP client then utilizes and sets on its local configurations.

The user can configure many DHCP related parameters that it will utilize on its locally attached network, to control and limit the IP settings of clients desiring an automatic IP configuration, such as the lease time of the allotted IP address, the range of IP addresses that will be allowed in its DHCP pool, the ability to exclude various IP addresses within the pool so as not to make identical entries on its network, or to assign the IP address of an important device (such as a DNS server or the IP address of the default route) to another device on the network.

Users also have the ability to bind IP addresses within the DHCP pool to specific MAC addresses in order to keep consistent the IP addresses of devices that may be important to the upkeep of the network that require a static IP address.

To begin configuring the Switch as a DHCP Server, open the **L3 Features** folder, then the **DHCP Server** folder, which will display five links to aid the user in configuring the DHCP server.

DHCP Server Global Settings

The following window will allow users to globally enable the Switch as a DHCP server and set the DHCP Ping Settings to test connectivity between the DHCP Server and Client.

To view this window, click **Network Application > DHCP > DHCP Server > DHCP Server Global Settings**, as shown below:

Figure 9-9 DHCP Server Global Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Server State	Click the radio buttons to enable or disable the Switch as a DHCP server.
Ping Packets (0-10)	Enter a number between *0* and *10* to denote the number of ping packets that the Switch will send out on the network containing the IP address to be allotted. If the ping request is not returned, the IP address is considered unique to the local network and then allotted to the requesting client. The default setting is *2* packets.
Ping Timeout (10-2000)	The user may set a time between *10* and *2000* milliseconds that the Switch will wait before timing out a ping packet. The default setting is *100* milliseconds.

Click the **Apply** button to accept the changes made for each individual section.

DHCP Server Exclude Address Settings

The following window will allow the user to set an IP address, or a range of IP addresses that are NOT to be included in the range of IP addresses that the Switch will allot to clients requesting DHCP service.

To view this window, click **Network Application > DHCP > DHCP Server > DHCP Server Exclude Address Settings**, as shown below:

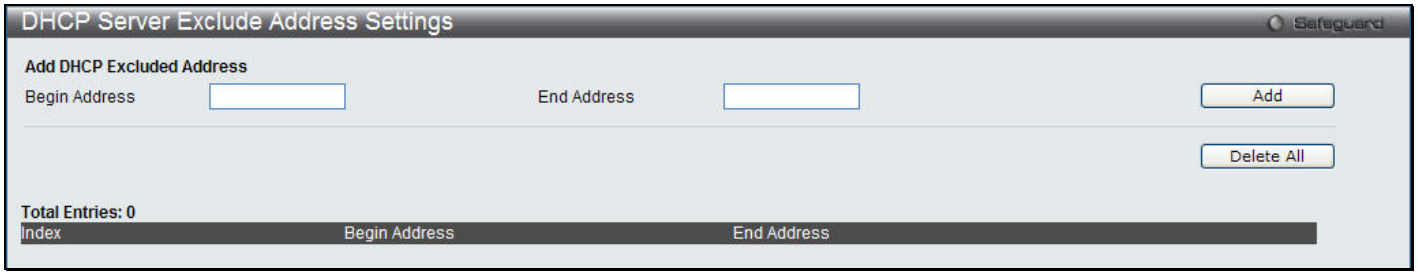


Figure 9-10 DHCP Server Exclude Address Settings window

The fields that can be configured are described below:

Parameter	Description
Begin Address	Enter the start IP address of the range.
End Address	Enter the end address of the range.

Click the **Apply** button to add a new entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

Click the **Delete** button to remove the specific entry.

DHCP Server Pool Settings

The following windows will allow users to create and then set the parameters for the DHCP Pool of the Switch's DHCP server.

To view the following window, click **Network Application > DHCP > DHCP Server > DHCP Server Pool Settings**, as shown below:

Figure 9-11 DHCP Server Pool Settings window

The fields that can be configured are described below:

Parameter	Description
Pool Name	Enter a name of the DHCP pool up to 12 alphanumeric characters.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to configure the DHCP Server Pool Settings.

Click the **Delete** button to remove the specific entry.

After clicking the **Edit** button, the following page will appear:

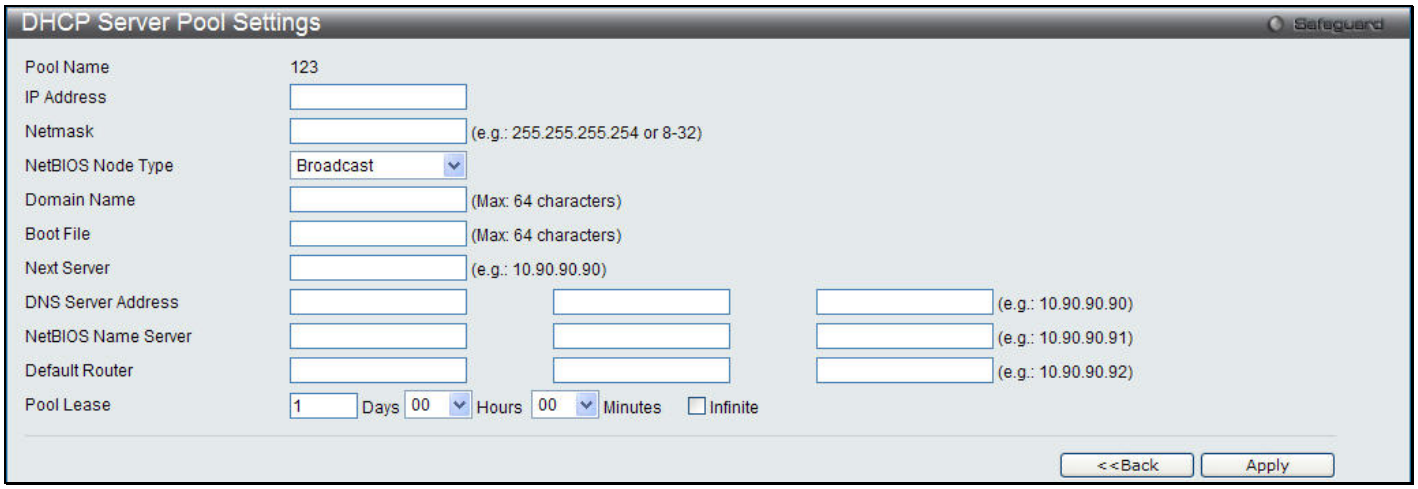


Figure 9-12 DHCP Server Pool Settings - Edit window

The fields that can be configured are described below:

Parameter	Description
IP Address	Enter the IP address to be assigned to requesting DHCP Clients. The IP address is a network address working with its net mask. (ex. If this entry is given the IP address 10.10.10.2 and the net mask is 255.255.255.0, the assigned addresses to DHCP Clients will resemble 10.10.10.x, where x is a number between 1 and 255.)
Netmask	Enter the corresponding net mask of the IP address assigned above.
NetBIOS Node Type	This field will allow users to set the type of node server for the previously configured Net BIOS Name server. Using the pull-down menu, the user has four node type choices: *Broadcast*, *Peer to Peer*, *Mixed*, and *Hybrid*.
Domain Name	Enter the domain name for the DHCP client. This domain name represents a general group of networks that collectively make up the domain. The Domain Name may be an alphanumeric string of up to 64 characters.
Boot File	This field is used to specify the boot file that will be used as the boot image of the DHCP client. This image is usually the operating system that the client uses to load its IP parameters.
Next Server	This field is used to identify the IP address of the device that has the previously stated boot file.
DNS Server Address	Enter the IP address of a DNS server that is available to the DHCP client. The DNS Server correlates IP addresses to host names when queried. Users may add up to three DNS Server addresses.
NetBIOS Name Server	Enter the IP address of a Net BIOS Name Server that will be available to a Microsoft DHCP Client. This Net BIOS Name Server is actually a WINS (Windows Internet Naming Service) Server that allows Microsoft DHCP clients to correlate host names to IP addresses within a general grouping of networks. The user may establish up to three Net BIOS Name Servers.
Default Router	Enter the IP address of the default router for a DHCP Client. Users must configure at least one address here, yet up to three IP addresses can be configured for this field. The IP address of the default router must be on the same subnet as the DHCP client.
Pool Lease	Using this field, the user can specify the lease time for the DHCP client. This time represents the amount of time that the allotted address is valid on the local network. Users may set the time by entering the days into the open field and then use the pull-down

	menus to precisely set the time by hours and minutes. Users may also use the Infinite check box to set the allotted IP address to never be timed out of its lease. The default setting is *1* day.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

DHCP Server Manual Binding

The following windows will allow users to view and set manual DHCP entries. Manual DHCP entries will bind an IP address with the MAC address of a device within a DHCP pool. These entries are necessary for special devices on the local network that will always require a static IP address that cannot be changed.

To view this window, click **Network Application > DHCP > DHCP Server > DHCP Server Manual Binding**, as shown below:

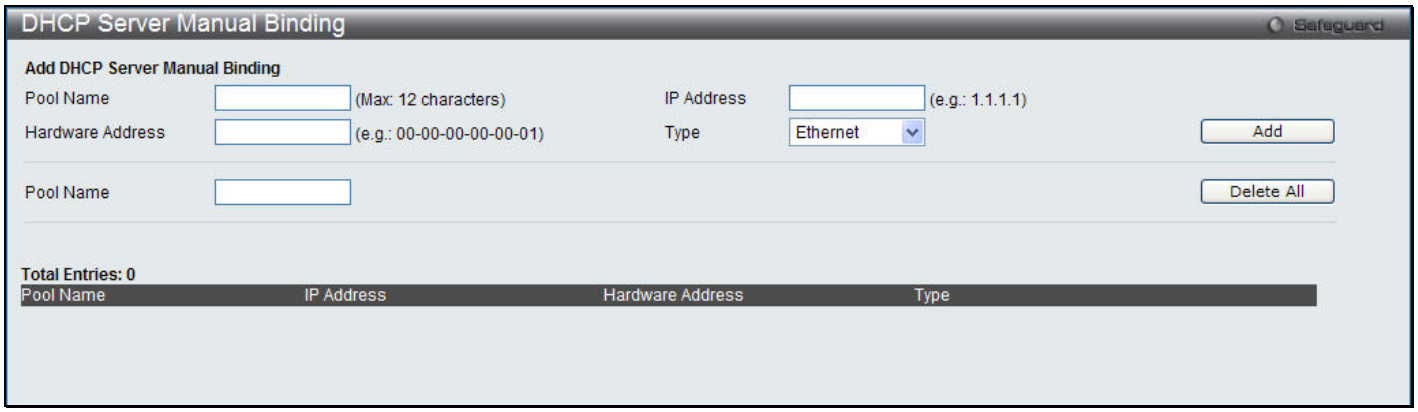


Figure 9-13 DHCP Server Manual Binding window

The fields that can be configured are described below:

Parameter	Description
Pool Name	Enter the name of the DHCP pool within which will be created a manual DHCP binding entry.
IP Address	Enter the IP address to be statically bound to a device within the local network that will be specified by entering the Hardware Address in the following field.
Hardware Address	Enter the MAC address of the device to be statically bound to the IP address entered in the previous field.
Type	This field is used to specify the type of connection for which this manually bound entry will be set. *Ethernet* will denote that the manually bound device is connected directly to the Switch, while the *IEEE802* denotes that the manually bound device is outside the local network of the Switch.

Click the **Add** button to add a new entry based on the information entered.

Click the **Delete All** button to remove all the entries based on the information entered.

Click the **Delete** button to remove the specific entry.

DHCP Server Dynamic Binding

To view this window, click **Network Application > DHCP > DHCP Server > DHCP Server Dynamic Binding**, as shown below:

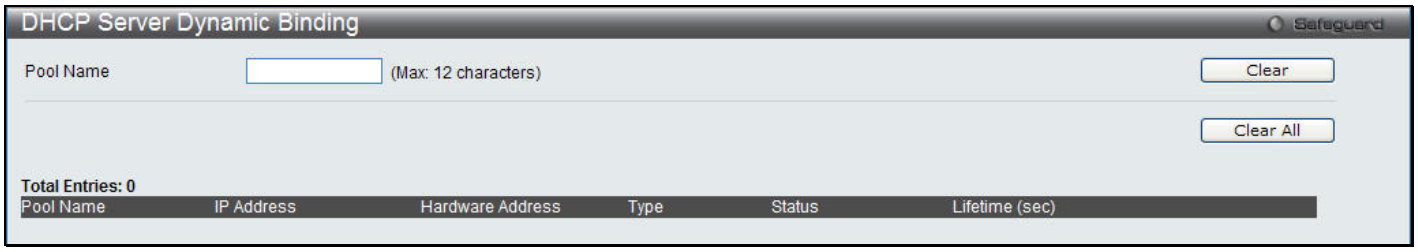


Figure 9-14 DHCP Server Dynamic Binding window

The fields that can be configured are described below:

Parameter	Description
Pool Name	Enter the name of the DHCP pool.

Click the **Clear** button to remove the specific entry based on the information entered.

Click the **Clear All** button to remove all the entries.

DHCP Conflict IP

To view this window, click **Network Application > DHCP > DHCP Server > DHCP Conflict IP**, as shown below:

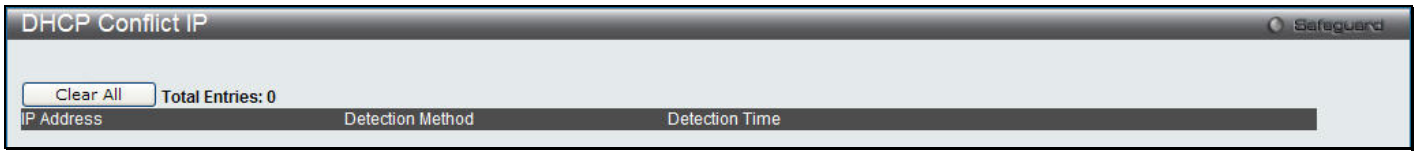


Figure 9-15 DHCP Conflict IP window

Click the **Clear All** button to remove all the entries.

DHCPv6 Relay

DHCPv6 Relay Global Settings

This window is used to configure DHCPv6 relay global settings.

To view this window, click **Network Application > DHCP > DHCPv6 Relay > DHCPv6 Relay Global Settings**, as shown below:

Figure 9-16 DHCPv6 Relay Global Settings window

The fields that can be configured are described below:

Parameter	Description
DHCPv6 Relay State	Click the radio buttons to enable or disable the DHCPv6 Relay service on the Switch. The default is *Disabled.*
DHCPv6 Relay Hops Count Limit (1-32)	This field allows an entry between *1* and *32* to define the maximum number of router hops DHCPv6 messages can be forwarded. The default hop count is *4*.

Click the **Apply** button to accept the changes made for each individual section.

DHCPv6 Relay Settings

This window is used to configure DHCPv6 relay settings.

To view this window, click **Network Application > DHCP > DHCPv6 Relay > DHCPv6 Relay Settings**, as shown below:

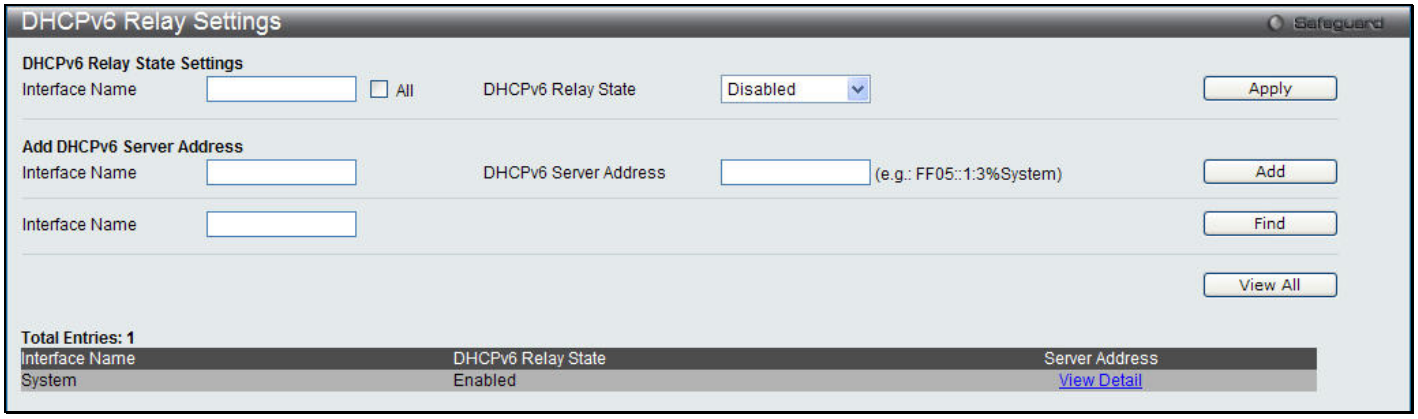


Figure 9-17 DHCPv6 Relay Settings

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter a name of the interface. Tick the All check box to apply to all the interfaces.
DHCPv6 Relay State	Use the drop-down menu to enable or disable the DHCPv6 relay.
DHCPv6 Server Address	Enter the DHCPv6 Server address.

Click the **Apply** button to implement the changes made.

Click the **Add** button to add a new entry based on the information entered.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the existing entries.

Click the View Detail link to view the detailed information about the specific interface.

Click the View Detail link to see the following window:

Figure 9-18 DHCPv6 Relay Settings - View Detail window

Click the **<<Back** button to return to the previous page.

Click the **Delete** button to remove the specific entry.

DHCP Local Relay Settings

The DHCP local relay settings allows the user to add option 82 into DHCP request packets when the DHCP client gets an IP address from the same VLAN. If the DHCP local relay settings are not configured, the Switch will flood the packets to the VLAN. In order to add option 82 into the DHCP request packets, the DHCP local relay settings and the state of the Global VLAN need to be enabled.

To view this window, click **Network Application > DHCP > DHCP Local Relay Settings**, as shown below:

Figure 9-19 DHCP Local Relay Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Local Relay Global State	Enable or disable the DHCP Local Relay Global State. The default is Disabled.
VLAN Name	This is the VLAN Name that identifies the VLAN the user wishes to apply the DHCP Local Relay operation.
State	Enable or disable the configure DHCP Local Relay for VLAN state.

Click the **Apply** button to accept the changes made for each individual section.

DNS

DNS Relay

Computer users usually prefer to use text names for computers for which they may want to open a connection. Computers themselves, require 32 bit IP addresses. Somewhere, a database of network devices' text names and their corresponding IP addresses must be maintained.

The Domain Name System (DNS) is used to map names to IP addresses throughout the Internet and has been adapted for use within intranets.

For two DNS servers to communicate across different subnets, the DNS Relay of the Switch must be used. The DNS servers are identified by IP addresses.

Mapping Domain Names to Addresses

Name-to-address translation is performed by a program called a Name server. The client program is called a Name resolver. A Name resolver may need to contact several Name servers to translate a name to an address.

The Domain Name System (DNS) servers are organized in a somewhat hierarchical fashion. A single server often holds names for a single network, which is connected to a root DNS server - usually maintained by an ISP.

Domain Name Resolution

The domain name system can be used by contacting the name servers one at a time, or by asking the domain name system to do the complete name translation. The client makes a query containing the name, the type of answer required, and a code specifying whether the domain name system should do the entire name translation, or simply return the address of the next DNS server if the server receiving the query cannot resolve the name.

When a DNS server receives a query, it checks to see if the name is in its sub domain. If it is, the server translates the name and appends the answer to the query, and sends it back to the client. If the DNS server cannot translate the name, it determines what type of name resolution the client requested. A complete translation is called recursive resolution and requires the server to contact other DNS servers until the name is resolved. Iterative resolution specifies that if the DNS server cannot supply an answer, it returns the address of the next DNS server the client should contact.

Each client must be able to contact at least one DNS server, and each DNS server must be able to contact at least one root server.

The address of the machine that supplies domain name service is often supplied by a DHCP or BOOTP server, or can be entered manually and configured into the operating system at startup.

DNS Relay Global Settings

To configure the DNS function on the Switch, click **Network Application > DNS > DNS Relay > DNS Relay Global Settings**, as shown below:

Figure 9-20 DNS Relay Global Settings window

The fields that can be configured are described below:

Parameter	Description
DNS Relay Status	This field can be toggled between *Disabled* and *Enabled* using the pull-down menu, and is used to enable or disable the DNS Relay service on the Switch.
Primary Name Server	Allows the entry of the IP address of a primary domain name server (DNS).
Secondary Name Server	Allows the entry of the IP address of a secondary domain name server (DNS).
DNS Relay Cache Status	This can be toggled between *Disabled* and *Enabled.* This determines if a DNS cache will be enabled on the Switch.
DNS Relay Static Table State	This field can be toggled using the pull-down menu between *Disabled* and *Enabled.* This determines if the static DNS table will be used or not.

Click **Apply** to implement changes made.

DNS Relay Static Settings

To view this window, click **Network Application > DNS > DNS Relay > DNS Relay Static Settings**, as shown below:

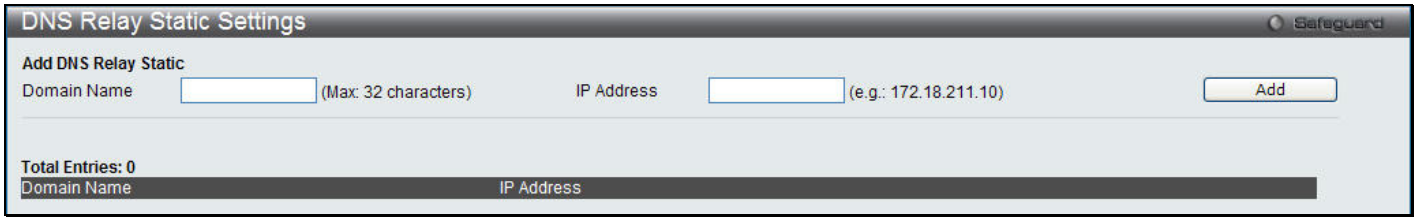


Figure 9-21 DNS Relay Static Settings window

The fields that can be configured are described below:

Parameter	Description
Domain Name	Enter a domain name.
IP Address	Enter the IP address associated with the domain name.

Click **Apply** to implement changes made.

Click the **Delete** button to remove the specific entry.

PPPoE Circuit ID Insertion Settings

This window allows to enable or disable PPPoE Circuit ID Insertion.

To view this window, click **Network Application > PPPoE Circuit ID Insertion Settings**, as shown below:

Figure 9-22 PPPoE Circuit ID Insertion Settings window

The fields that can be configured are described below:

Parameter	Description
PPPoE Circuit ID Insertion	Click the radio buttons to enable of disable the PPPoE circuit ID insertion. When enabled, the system will insert the circuit ID tag to the received PPPoE discover request and the request packet if the tag is absent. It will remove the circuit ID tag from the received PPPoE offer and session confirmation packet.

Click the **Apply** button to accept the changes made.

SNTP

The Simple Network Time Protocol (SNTP) is a protocol for synchronizing computer clocks through the Internet. It provides comprehensive mechanisms to access national time and frequency dissemination services, organize the SNTP subnet of servers and clients, and adjust the system clock in each participant.

SNTP Settings

Users can configure the time settings for the Switch.

To view this window, click **Network Application > SNTP > SNTP Settings**, as shown below:

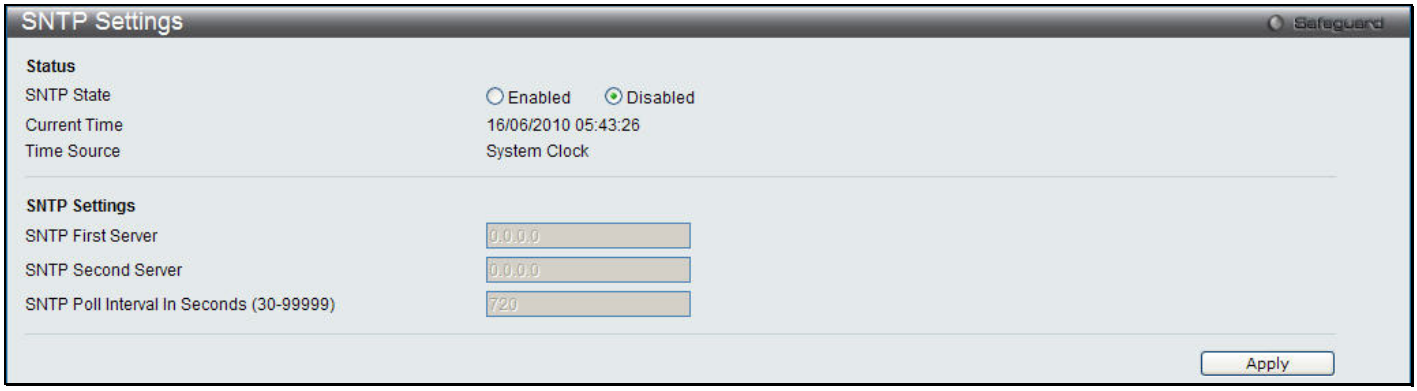


Figure 9-23 SNTP Settings window

The fields that can be configured are described below:

Parameter	Description
SNTP State	Use this radio button to enable or disable SNTP.
Current Time	Displays the current time.
Time Source	Displays the time source for the system.
SNTP First Server	The IP address of the primary server from which the SNTP information will be taken.
SNTP Second Server	The IP address of the secondary server from which the SNTP information will be taken.
SNTP Poll Interval In Seconds (30-99999)	The interval, in seconds, between requests for updated SNTP information.

Click the **Apply** button to accept the changes made.

Time Zone Settings

Users can configure time zones and Daylight Savings Time settings for SNTP.

To view this window, click **Network Application > SNTP > Time Zone Settings**, as shown below:

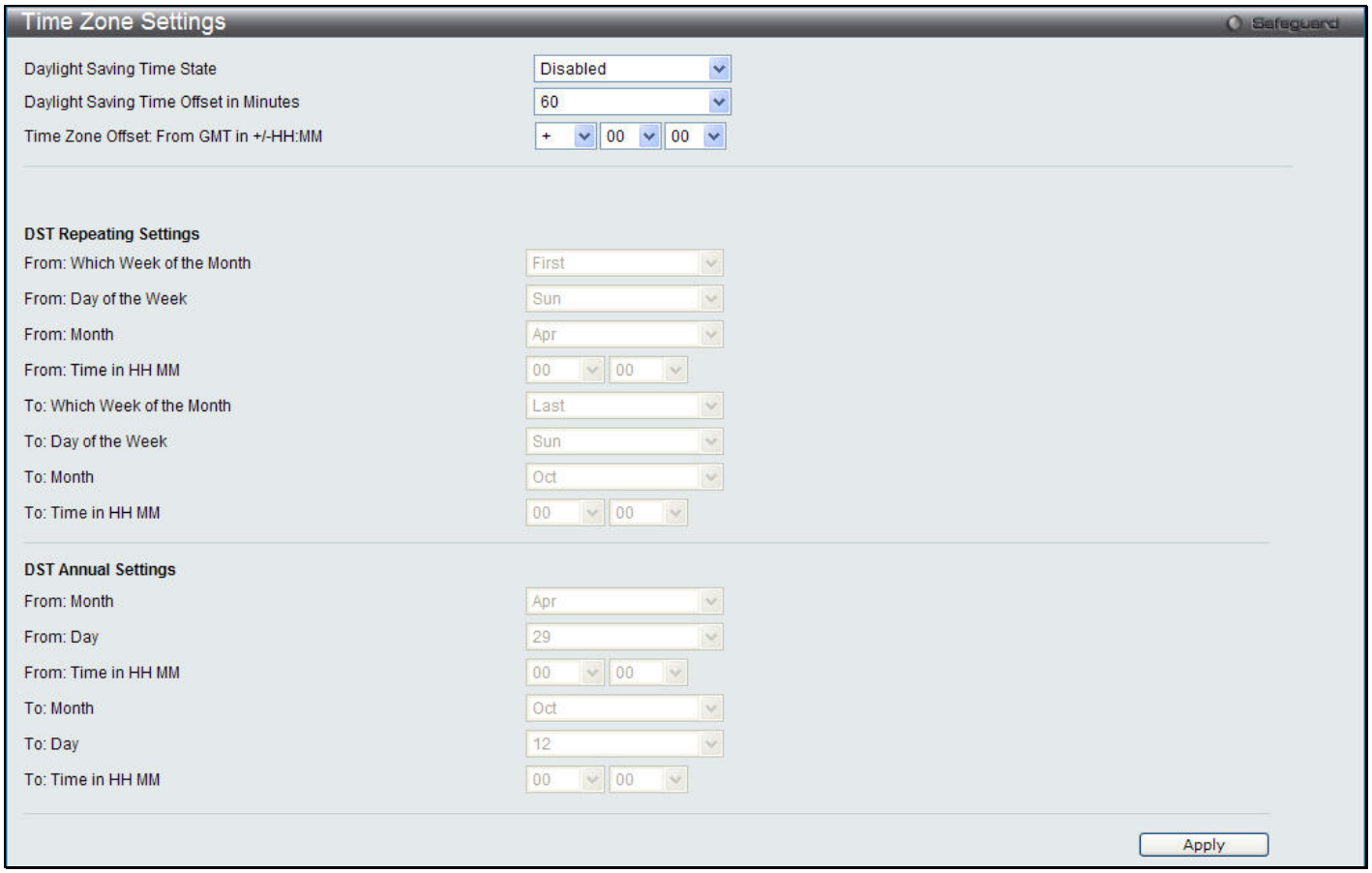


Figure 9-24 Time Zone Settings window

The fields that can be configured are described below:

Parameter	Description
Daylight Saving Time State	Use this pull-down menu to enable or disable the DST Settings.
Daylight Saving Time Offset In Minutes	Use this pull-down menu to specify the amount of time that will constitute your local DST offset – *30*, *60*, *90*, or *120* minutes.
Time Zone Offset From GMT In +/- HH:MM	Use these pull-down menus to specify your local time zone's offset from Greenwich Mean Time (GMT.)

Parameter	Description
DST Repeating Settings	Using repeating mode will enable DST seasonal time adjustment. Repeating mode requires that the DST beginning and ending date be specified using a formula. For example, specify to begin DST on Saturday during the second week of April and end DST on Sunday during the last week of October.
From: Which Week Of The Month	Enter the week of the month that DST will start.

From: Day Of Week	Enter the day of the week that DST will start on.
From: Month	Enter the month DST will start on.
From: Time In HH:MM	Enter the time of day that DST will start on.
To: Which Week Of The Month	Enter the week of the month the DST will end.
To: Day Of Week	Enter the day of the week that DST will end.
To: Month	Enter the month that DST will end.
To: Time In HH:MM	Enter the time DST will end.

Parameter	Description
DST Annual Settings	Using annual mode will enable DST seasonal time adjustment. Annual mode requires that the DST beginning and ending date be specified concisely. For example, specify to begin DST on April 3 and end DST on October 14.
From: Month	Enter the month DST will start on, each year.
From: Day	Enter the day of the month DST will start on, each year.
From: Time In HH:MM	Enter the time of day DST will start on, each year.
To: Month	Enter the month DST will end on, each year.
To: Day	Enter the day of the month DST will end on, each year.
To: Time In HH:MM	Enter the time of day that DST will end on, each year.

Click the **Apply** button to accept the changes made.

Chapter 10 OAM

CFM
Ethernet OAM
DULD Settings
Cable Diagnostics

CFM

Connectivity Fault Management (CFM) is defined by IEEE 802.1ag, which is a standard for detecting, isolating and reporting connectivity faults in a network. CFM is an end-to-end per-service-instance Ethernet layer operation, administration, and management (OAM) function. CFM functions include path discovery, fault detection, fault verification and isolation, and fault notification as defined by 802.1ag.

Ethernet CFM frames have a special Ether Type (0x8902). All CFM messages are confined to a maintenance domain per VLAN basis. There are different message types which are identified by unique Opcode of the CFM frame payload.

CFM message types that are supported include; Continuity Check Message (CCM), Loopback Message and Response (LBM, LBR) and Linktrace Message and Response (LTM and LTR).

CFM Settings

This window is used to configure the CFM settings on the Switch.

To view this window, click **OAM > CFM > CFM Settings**, as shown below:

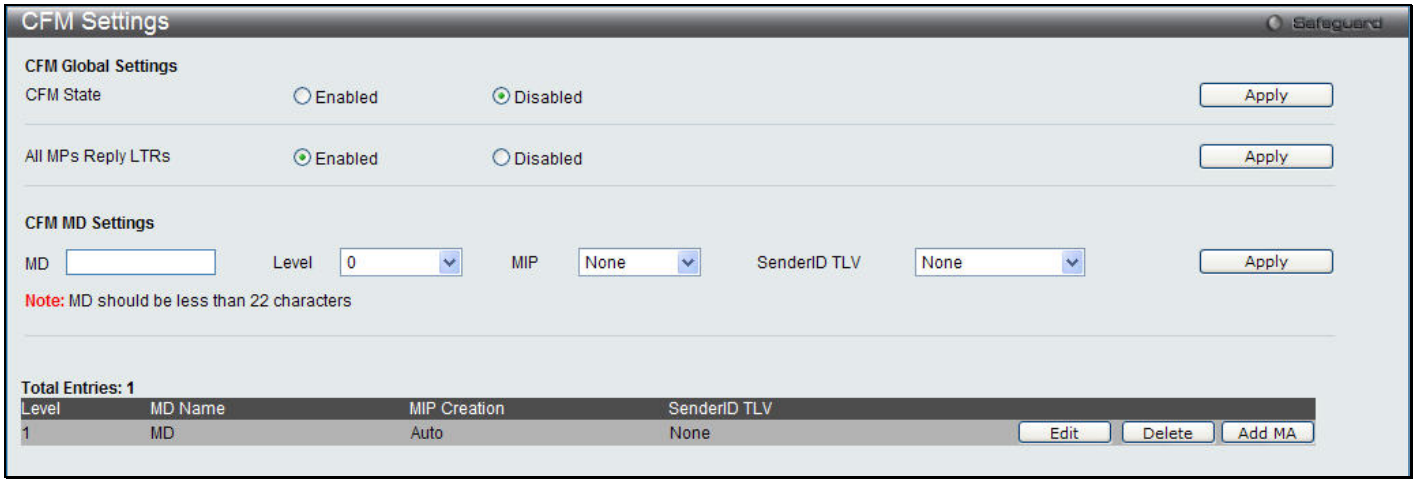


Figure 10-1 CFM Settings window

The fields that can be configured are described below:

Parameter	Description
CFM State	Used to enable or disable the CFM State.
All MPs Reply LTRs	Used to enable or disable the CFM maintenance point reply Linktrace Response on the Switch.
MD	Enter the maintenance domain (MD) name you wish to create.
Level	Use the drop-down menu to select the maintenance domain level.
MIP	This setting controls the creation of MIPs.

	None – No MIPs will be created. This is the default value. *Auto* – MIPs are created when the next lower active MD-level on the port is reached or there are no lower active MD levels. *Explicit* – MIPs are created when the next lower active MD-level on the port is reached.
SenderID TLV	Used to define the TLV data types of the maintenance domain. The user can choose between *None*, *Chassis*, *Manage* or *Chassis Manage*.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Edit** button to configure the MIP Creation and SenderID TLV of the specific entry.

Click the **Apply** button in the table to apply the changes to the specific entry.

Click the **Delete** button to remove the specific entry.

Click the **Add MA** button to configure the CFM MA settings.

Click the **Add MA** button to see the following window.

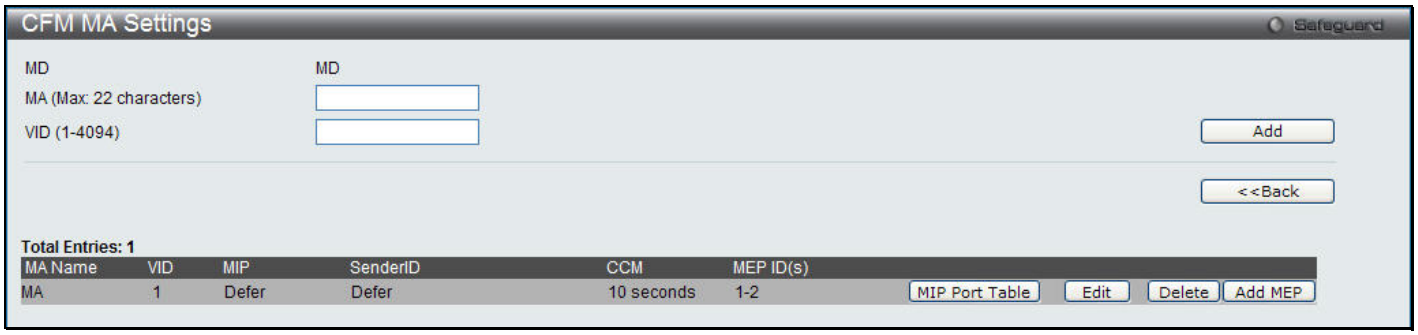


Figure 10-2 CFM MA Settings window

The fields that can be configured are described below:

Parameter	Description
MA (Max: 22 characters)	Enter the CFM maintenance association (MA) name.
VID (1-4094)	Enter a VLAN ID for CFM MA.
MIP	Use the drop-down menu to select the control creation of MIP. *None* - Do not create MIPs. *Defer* - Inherit the setting configured for the maintenance domain that this MA is associated with. This is the default value. *Auto* - MIPs can always be created on any port in this MA, if that port is not configured with an MEP of that MA. *Explicit* - MIP can be created on ports which has an existing lower level MEP configured on it, and that port is not configured with an MEP of this MA.
SenderID	Use the drop-down menu to select the control transmission of the sender ID TLV. *None* - Do not transmit the sender ID TLV. *Chassis* - Transmit the sender ID TLV with the chassis ID information. *Manage* - Transmit the sender ID TLV with the manage address information. *Chassis Manage* - Transmit the sender ID TLV with the chassis ID information and the manage address information. *Defer* - Inherit the setting configured for the maintenance domain that this MA is associated with. This is the default value.
CCM	Use the drop-down menu to select CCM interval. The available choices are 10ms, 100ms, 1sec, 10sec, 1min and 10min.

MEP ID(s)	Enter the MEP ID(s) contained in the maintenance association. The range of the MEPID is from 1 to 8191.

Click the **Add** button to create a new entry based on the entered information.
Click the **<<Back** button to go back to the CFM Settings window.
Click the **MIP Port Table** button to see the MIP port information.
Click the **Edit** button to configure the MIP, SenderID, CCM and MEP ID(s) of the specific entry.
Click the **Apply** button in the table to apply the changes to the specific entry.
Click the **Delete** button to remove the specific entry.
Click the **Add MEP** button to configure the CFM MEP settings.

Click the **MIP Port Table** button to see the following window.

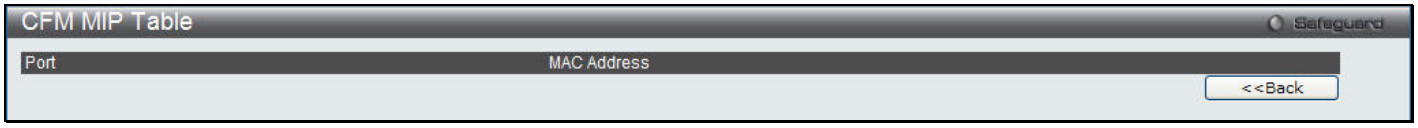


Figure 10-3 CFM MIP Table window

Click the **<<Back** button to go back to the CFM MA Settings window.

Click the **Add MEP** button to see the following window.

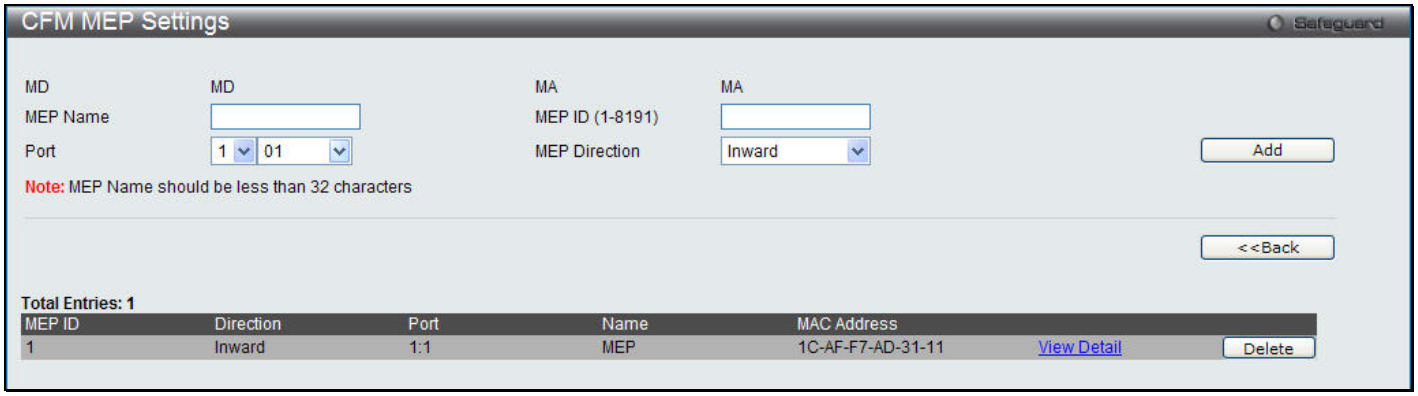


Figure 10-4 CFM MEP Settings window

The fields that can be configured are described below:

Parameter	Description
MEP Name	Enter a name of MEP.
MEP ID (1-8191)	Enter the ID for the MEP
Port	Use the drop-down menu to select a port on a unit.
MEP Direction	Use the drop-down menu to select the MEP direction between Inward and Outward.

Click the **Add** button to create a new entry based on the entered information.
Click the **<<Back** button to go back to the CFM MA Settings window.
Click the View Detail link to view the detailed information about the specific interface.
Click the **Delete** button to remove the specific entry.

Click the View Detail link to see the following window:

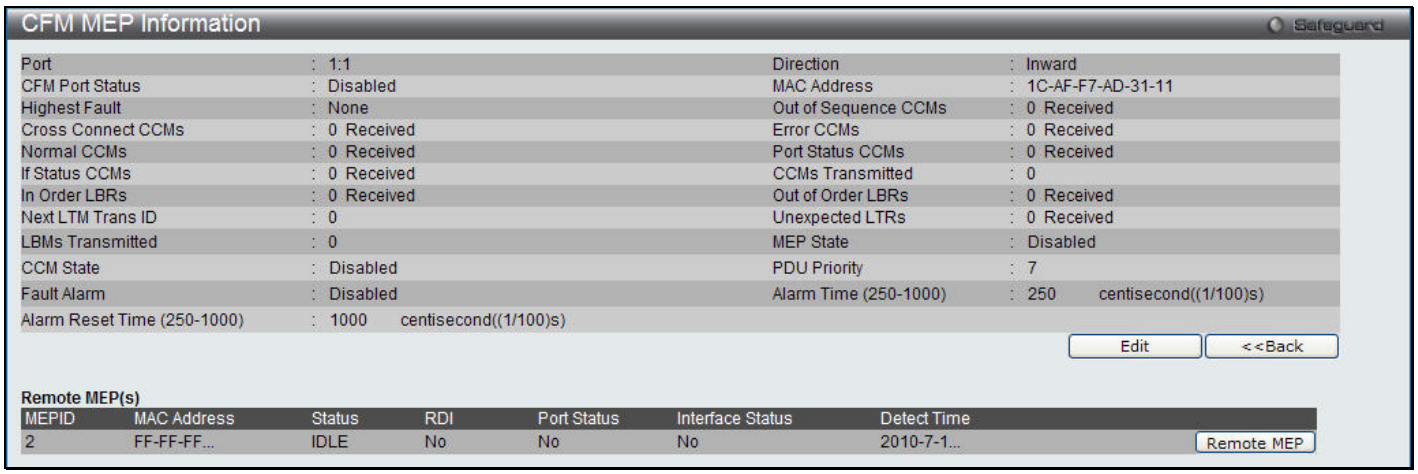


Figure 10-5 CFM MEP Information window

Click the **Edit** button to see the following window.

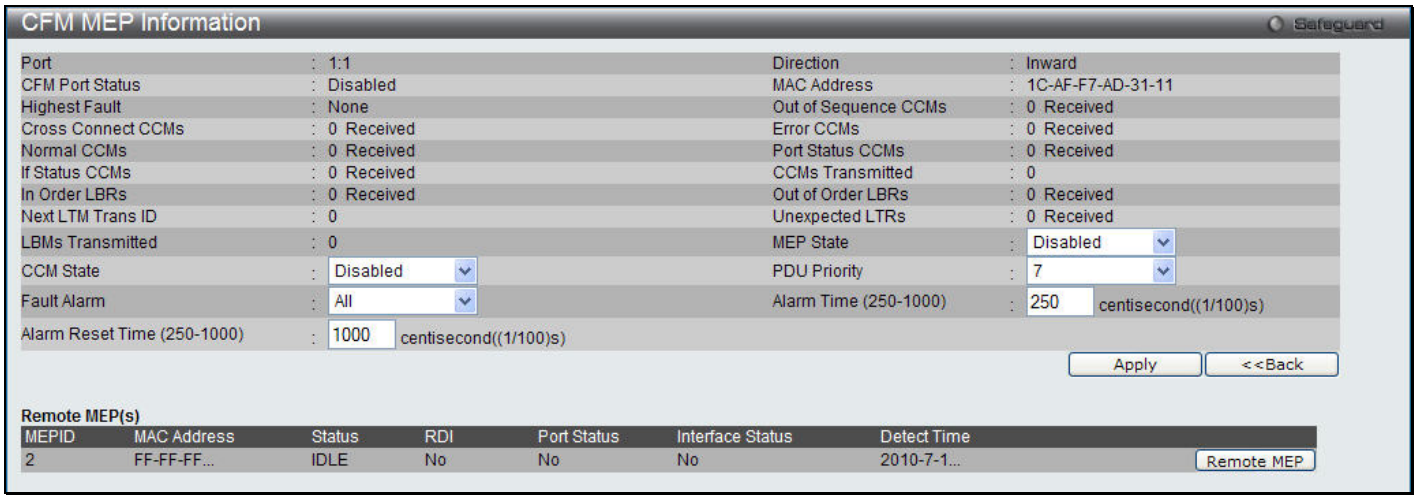


Figure 10-6 CFM MEP Information - Edit window

The fields that can be configured are described below:

Parameter	Description
MEP State	Use the drop-down menu to select the MEP administrative state to *Disabled* or *Enabled*.
CCM State	Use the drop-down menu to select the CCM transmission state to *Disabled* or *Enabled*.
PDU Priority	Use the drop-down menu to set the 802.1p priority in the CCMs and the LTMs messages transmitted by the MEP. The default value is *7*.
Fault Alarm	Use the drop-down menu to select the control types of the fault alarms sent by the MEP. *All* - All types of fault alarms will be sent. *MAC Status* - Only the fault alarms whose priority is equal to or higher than “Some Remote MEP MAC Status Errors” will be sent. *Remote CCM* - Only the fault alarms whose priority is equal to or higher than “Some Remote MEPs Down” will be sent. *Error CCM* - Only the fault alarms whose priority is equal to or higher than “Error CCM Received” will be sent.

	Xcon CCM - Only the fault alarms whose priority is equal to or higher than "Cross-connect CCM Received" will be sent. *None* - No fault alarm will be sent. This is the default value.
Alarm Time (250-1000)	Enter the time period in centisecond to control the fault alarm to be sent if a defect is reported continuously. The default value is 250.
Alarm Reset Time (250-1000)	Enter the time period in centisecond to reset the fault alarm if a defect hasn't been reported since the last defect report. The default value is 1000.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to go back to the CFM MEP Settings window.

Click the **Remote MEP** button to detail information about remote MEP.

Click the **Remote MEP** button to see the following window.

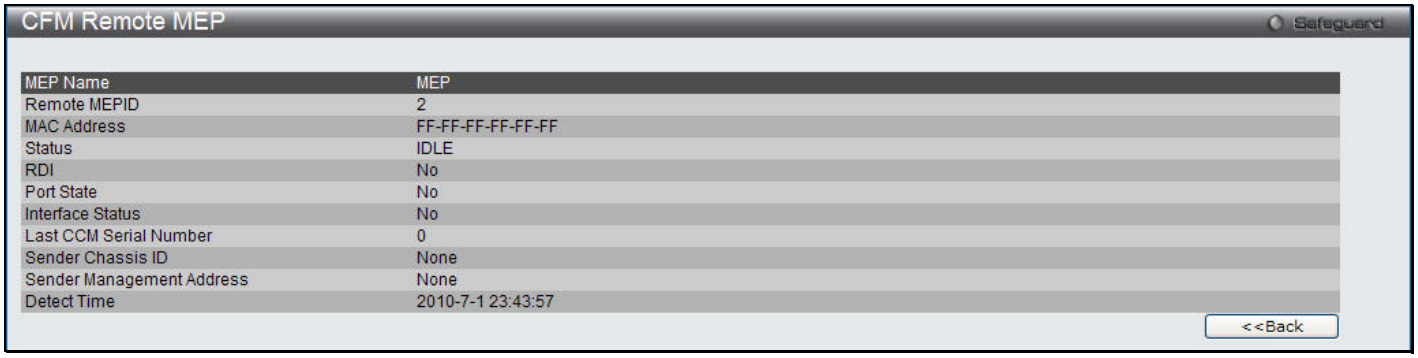


Figure 10-7 CFM Remote MEP window

CFM Port Settings

This table is used to enable or disable the connectivity fault management function on a per port basis. CFM is disabled on all ports by default.

To view this window, click **OAM > CFM > CFM Port Settings**, as shown below:

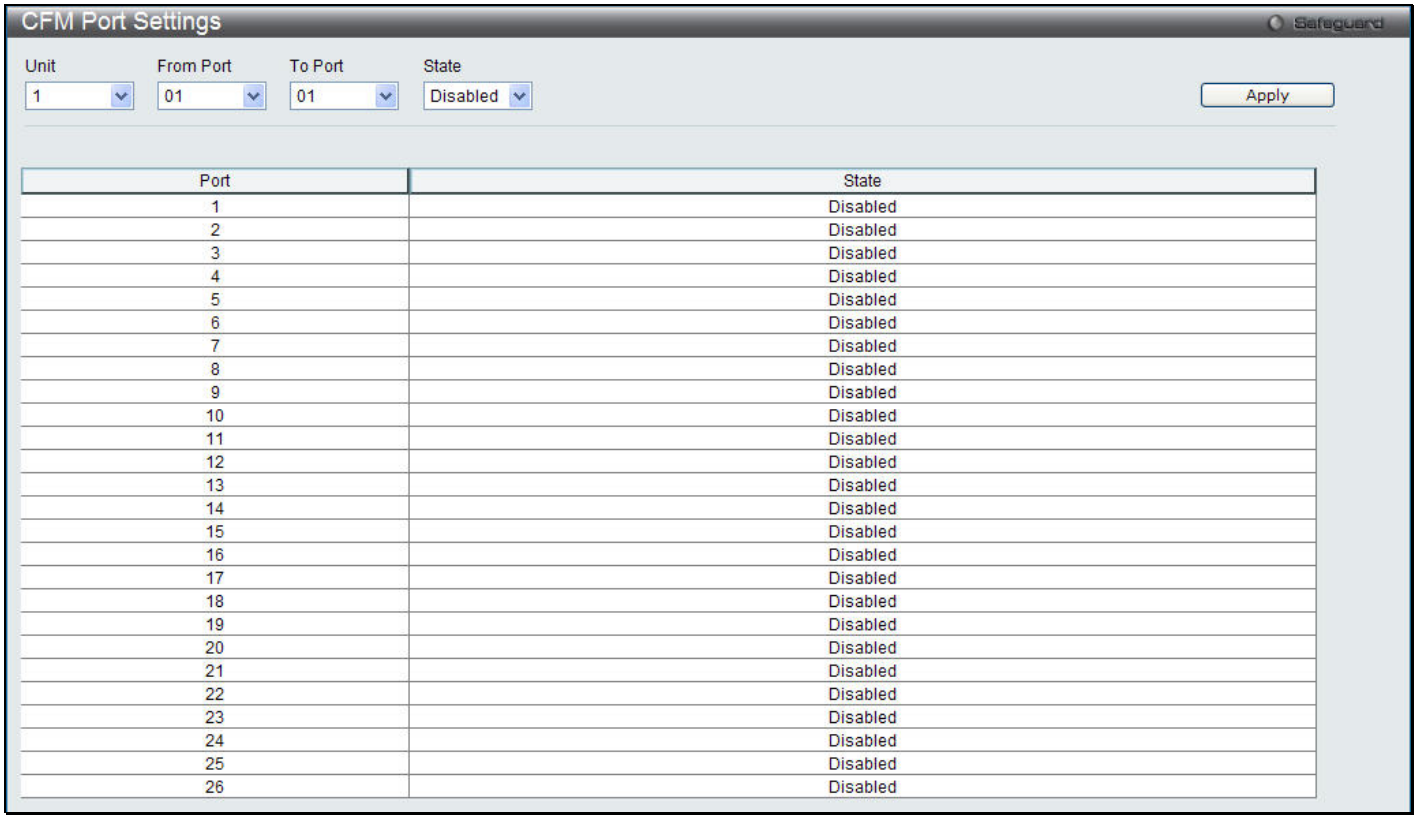


Figure 10-8 CFM Port Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Use the drop-down menus to select a port or range of ports to configure.
State	Use the drop-down menu to enable or disable the function.

Click the **Apply** button to implement the changes made.

CFM Loopback Settings

This window is used to configure the CFM Loopback settings on the Switch.

To view this window, click **OAM > CFM > CFM Loopback Settings**, as shown below:

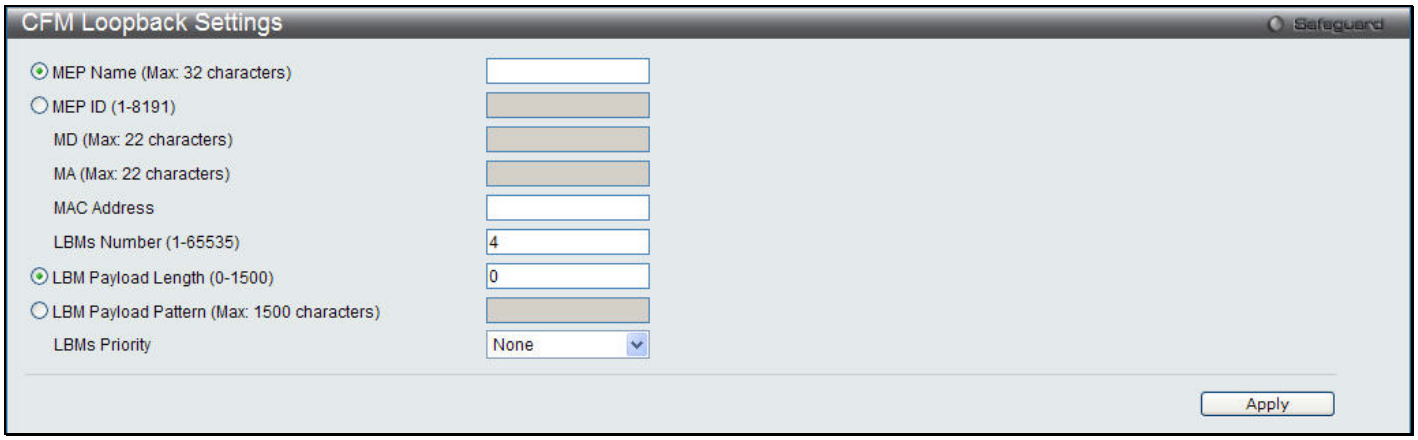


Figure 10-9 CFM Loopback Settings window

The fields that can be configured are described below:

Parameter	Description
MEP Name (Max:32 characters)	The name of the Maintenance End Point.
MEP ID (1-8191)	The ID for the Maintenance End Point between *1* and *8191*.
MD (Max: 22 characters)	The Maintenance Domain Name.
MA (Max: 22 characters)	The Maintenance Association Name.
MAC Address	The destination MAC address.
LBMs Number (1-65535)	The number of LBMs to be sent the default value is *4*.
LBM Payload Length (0-1500)	The payload length of the LBM to be sent, the default value is *0*.
LBM Payload Pattern (Max: 1500 characters)	The arbitrary amount of data to be included in a Data TLV, along with the indication of whether the Data TLV is to be included.
LBMs Priority	The 802.1p priority to be set in the transmitted LBMs. If not specified it uses the same priority as CCMs and LTMs sent by the MEP.

Click the **Apply** button to implement the changes made.

CFM Linktrace Settings

This window is used to configure the CFM linktrace settings on the Switch.

To view this window, click **OAM > CFM > CFM Linktrace Settings**, as shown below:

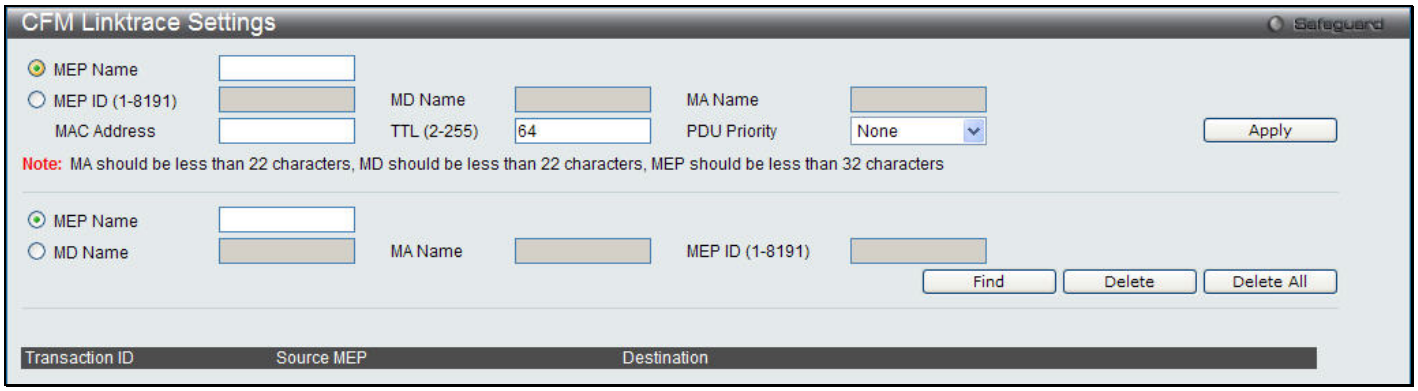


Figure 10-10 CFM Linktrace Settings window

The fields that can be configured are described below:

Parameter	Description
MEP Name	The name of the Maintenance End Point.
MEP ID (1-8191)	The ID for the Maintenance End Point between *1* and *8191*.
MD Name	The Maintenance Domain Name.
MA Name	The Maintenance Association Name.
MAC Address	The destination MAC address.
TTL (2-255)	The linktrace message TTL value. The default value is *64*.
PDU Priority	The 802.1p priority to be set in the transmitted LTM. If the PDU Priority is not specified, it uses the same priority as CCMs sent by the MA.

Click **Apply** to implement changes made.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Delete** button to remove the specific entry.

Click the **Delete All** button to remove all the entries.

CFM Packet Counter

This window is used to show the CFM Packet Counter List on the Switch.

To view this window, click **OAM > CFM > CFM Packet Counter**, as shown below:

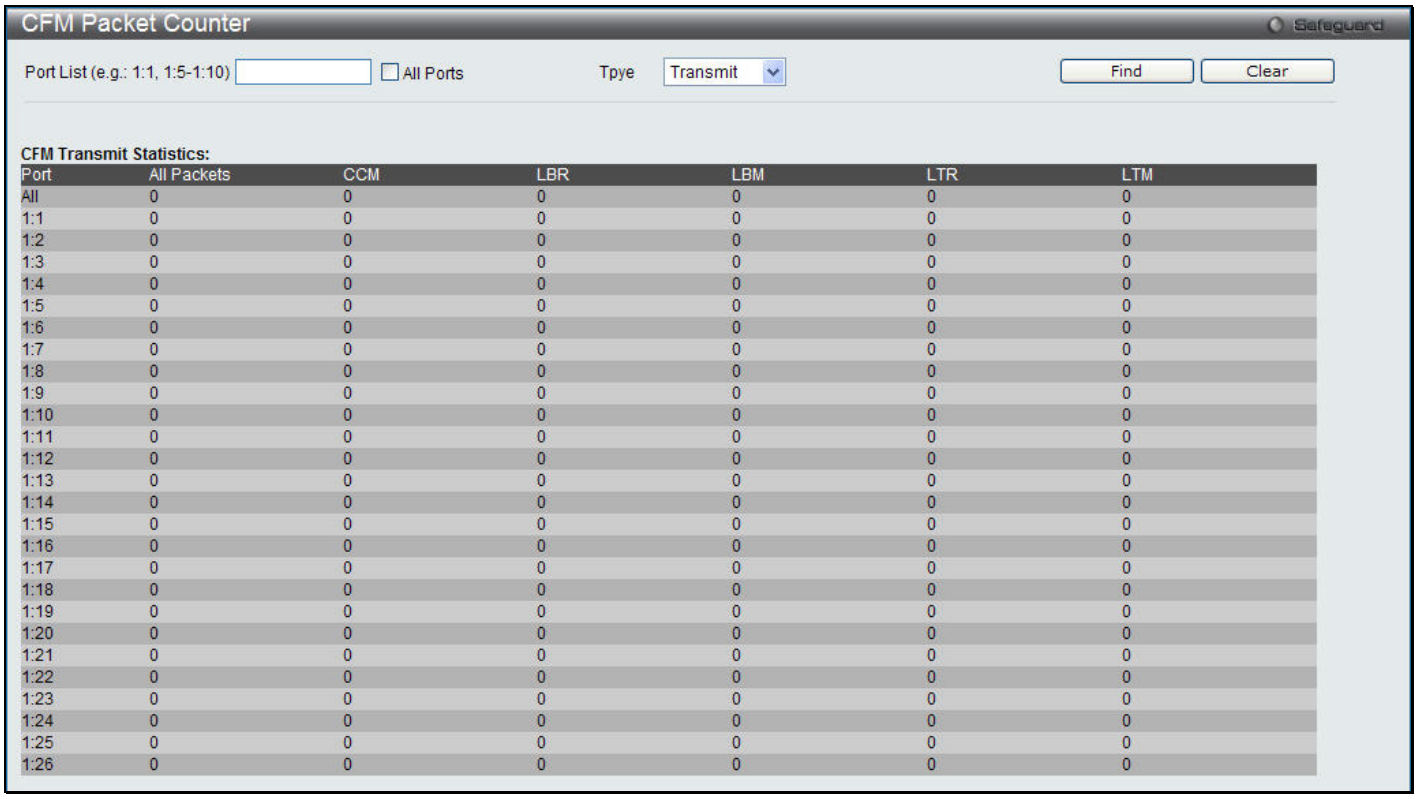


Figure 10-11 CFM Packet Counter List window

The fields that can be configured are described below:

Parameter	Description
Port List	Specify which ports' counter to show. Tick All Ports to view all ports.
Type	This drop-down menu allows you to select among *Transmit*, *Receive* and *CCM*.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear** button to clear all the information entered in the fields.

CFM Fault Table

This window is used to display the CFM Fault table on the Switch.

To view this window, click **OAM > CFM > CFM Fault Table**, as shown below:

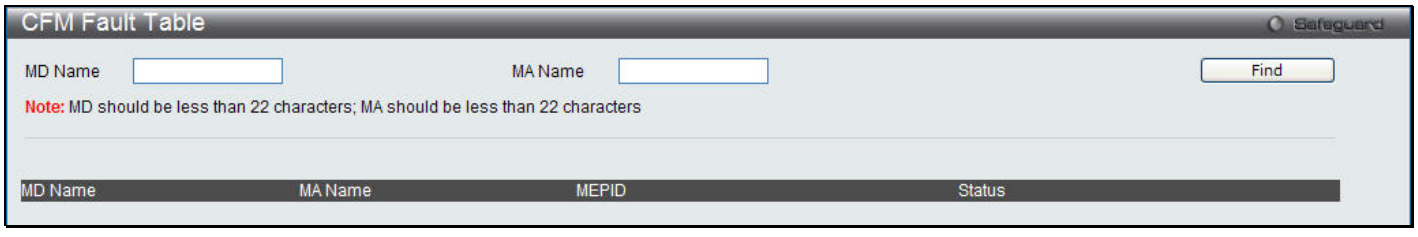


Figure 10-12 CFM Fault Table window

The fields that can be configured are described below:

Parameter	Description
MD Name	The Maintenance Domain Name.

MA Name	The Maintenance Association Name.

Click the **Find** button to show the information at the lower half of the window.

CFM MP Table

This window is used to display the CFM MP table on the Switch.

To view this window, click **OAM > CFM > CFM MP Table**, as shown below:

Figure 10-13 CFM MP Table window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to specify the port number.
Level (0-7)	Specifies the MD Level. If not specified, all levels are shown.
Direction	Use the drop-down menu to select *Any*, *Inward* or *Outward* facing MEP.
VID (1-4094)	The VLAN ID of the VLAN.

Click the **Find** button to show the information at the lower half of the window.

Ethernet OAM

Ethernet OAM (Operations, Administration, and Maintenance), specified in IEEE 802.3ah-2004 clause 57, is a data link layer protocol which provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions on point-to-point and emulated point-to-point Ethernet link.

OAMPDUs (OAM Protocol Data Units) contain the control and status information used to monitor, and also test and troubleshoot OAM-enabled links. OAMPDUs traverse a single link being passed between peer OAM entities, and as a result, are not forwarded by switches. OAM is a slow protocol, i.e. OAMPDU frame transmission rate is limited to a maximum of 10 frames per second.

The major features of Ethernet OAM are: OAM discovery, link monitoring, remote fault indication and remote loopbacks.

Ethernet OAM Settings

This window is used to configure the ports Ethernet OAM mode. In Active mode the ports can initiate OAM discovery and start or stop remote loopback. When a port in OAM enabled, any change to the OAM mode will cause the OAM discovery to be restarted.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Settings**, as shown below:

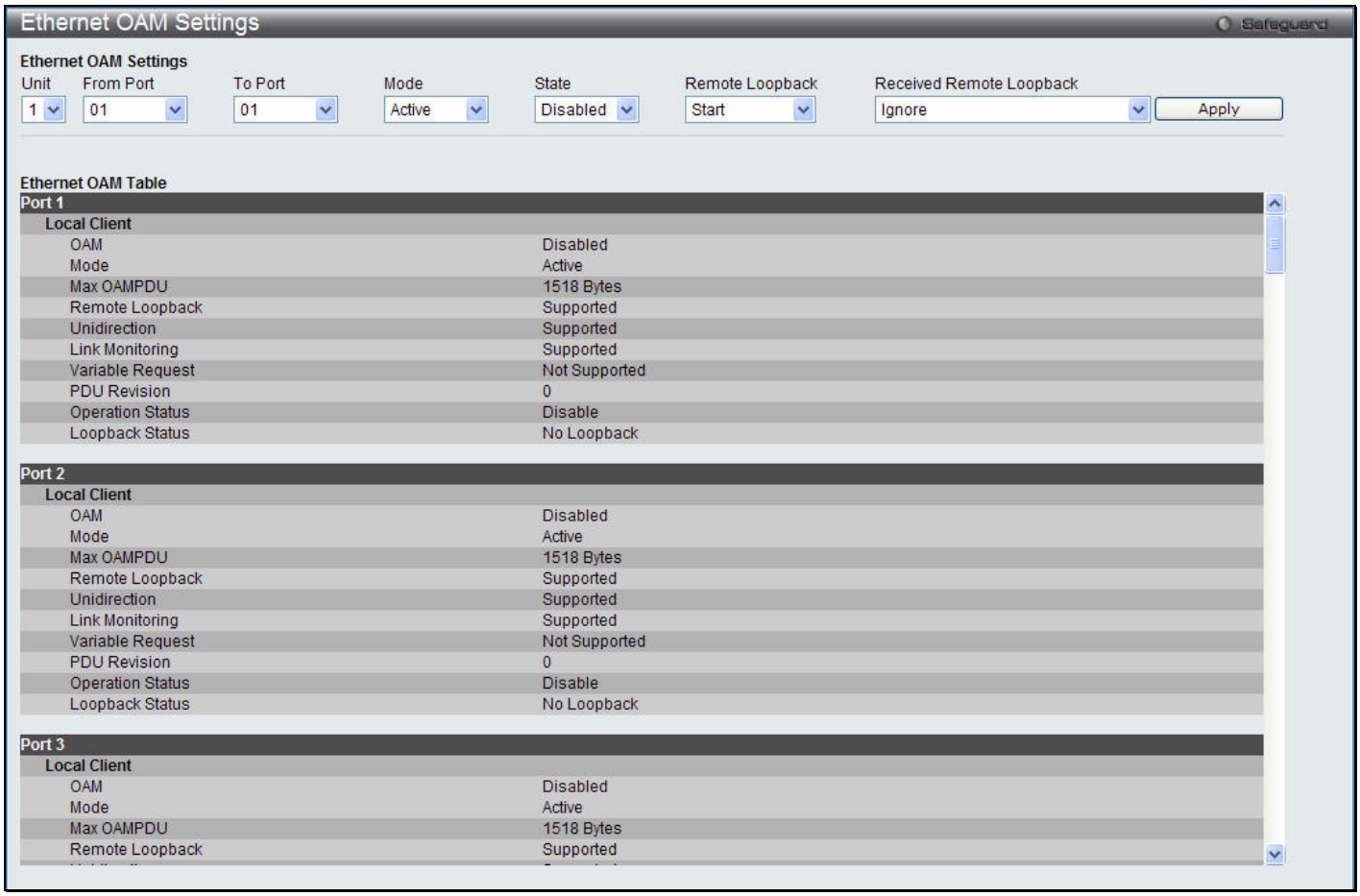


Figure 10-14 Ethernet OAM Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select a range of ports to be configured.
Mode	Specify to operate in either *Active* mode or *Passive* mode The default mode is *Active*.
State	Specify that the OAM function state is *Enabled* or *Disabled*. The default state is *Disabled*.
Remote Loopback	Specify to *Start* or *Stop* the OAM remote loopback function.
Received Remote Loopback	Specify whether to *Process* or *Ignore* the received Ethernet OAM remote loopback function. The default method is *Ignore*.

Click the **Apply** button to implement changes made.

Ethernet OAM Configuration Settings

This window is used to configure and display the primary controls and status information for Ethernet OAM on the Switch.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Configuration Settings**, as shown below:

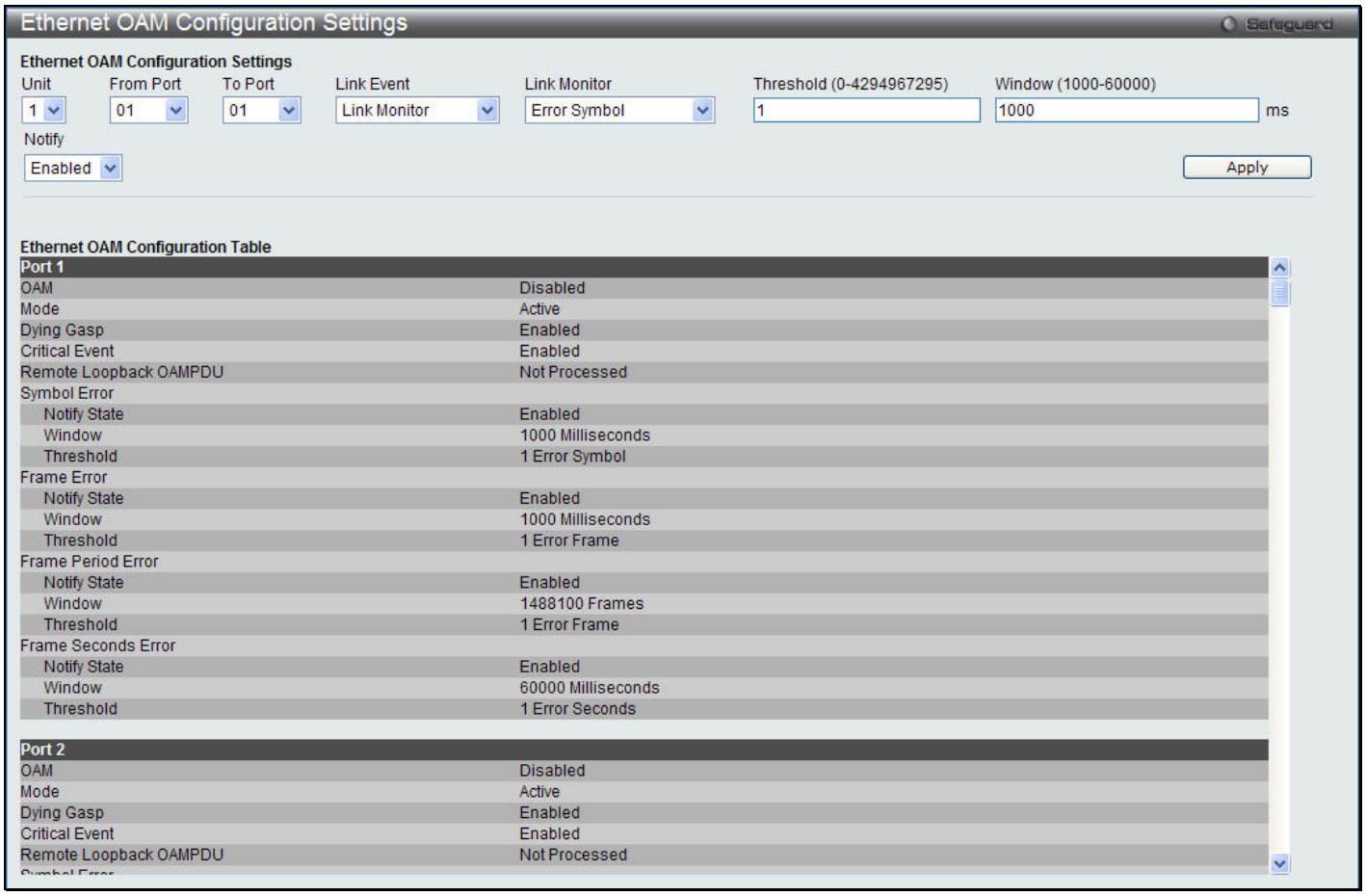


Figure 10-15 Ethernet OAM Configuration Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select a range of ports to be configured.
Link Event	Configure the Ethernet OAM link event. Specify *Link Monitor* or *Critical Link Event*. *Link Monitor* - Indicate that the OAM entity can send and receive Event Notification OAMPDUs. *Critical Link Event* - Configure the Ethernet OAM critical link event.
Link Monitor	Use the drop-down menu to select various types of link monitoring.
Critical Link Event	Use the drop-down menu to select the critical link event between *Dying Gasp* and *Critical Event*.
Threshold (0-4294967295)	Specify the number of error frame per second in the period that is required to be equal to or greater than the value of the special threshold in order for the event to be generated. The default value of threshold is 1 error frame per second.
Window (1000-60000)	Specify the period of error frame summary events. The range is from 1000ms to 60000ms and the default value is *1000* ms.
Notify	Specify to *Enable* or *Disable* the event notification. The default state is *Enabled*.

Click the **Apply** button to implement changes made.

Ethernet OAM Event Log

The window is used to display the Ethernet OAM event log information. The Switch can record up to 1000 event logs. This event log has more detailed information than system log. Each OAM event is recorded in both OAM event log and system log.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Event Log**, as shown below:

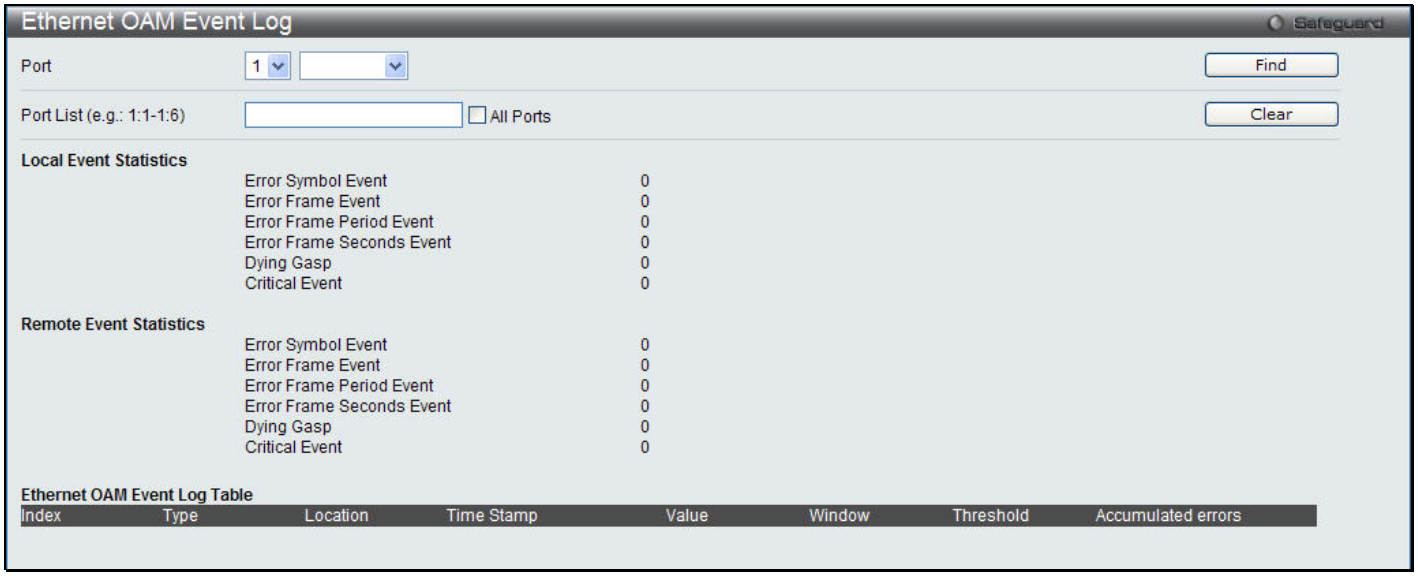


Figure 10-16 Ethernet OAM Event Log window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to specify the port number.
Port List	Specify which ports' counter to show. Tick All Ports to view all ports.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **Clear** button to clear all the information entered in the fields.

Ethernet OAM Statistics

The window is used to display Ethernet OAM statistics information.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Statistics**, as shown below:

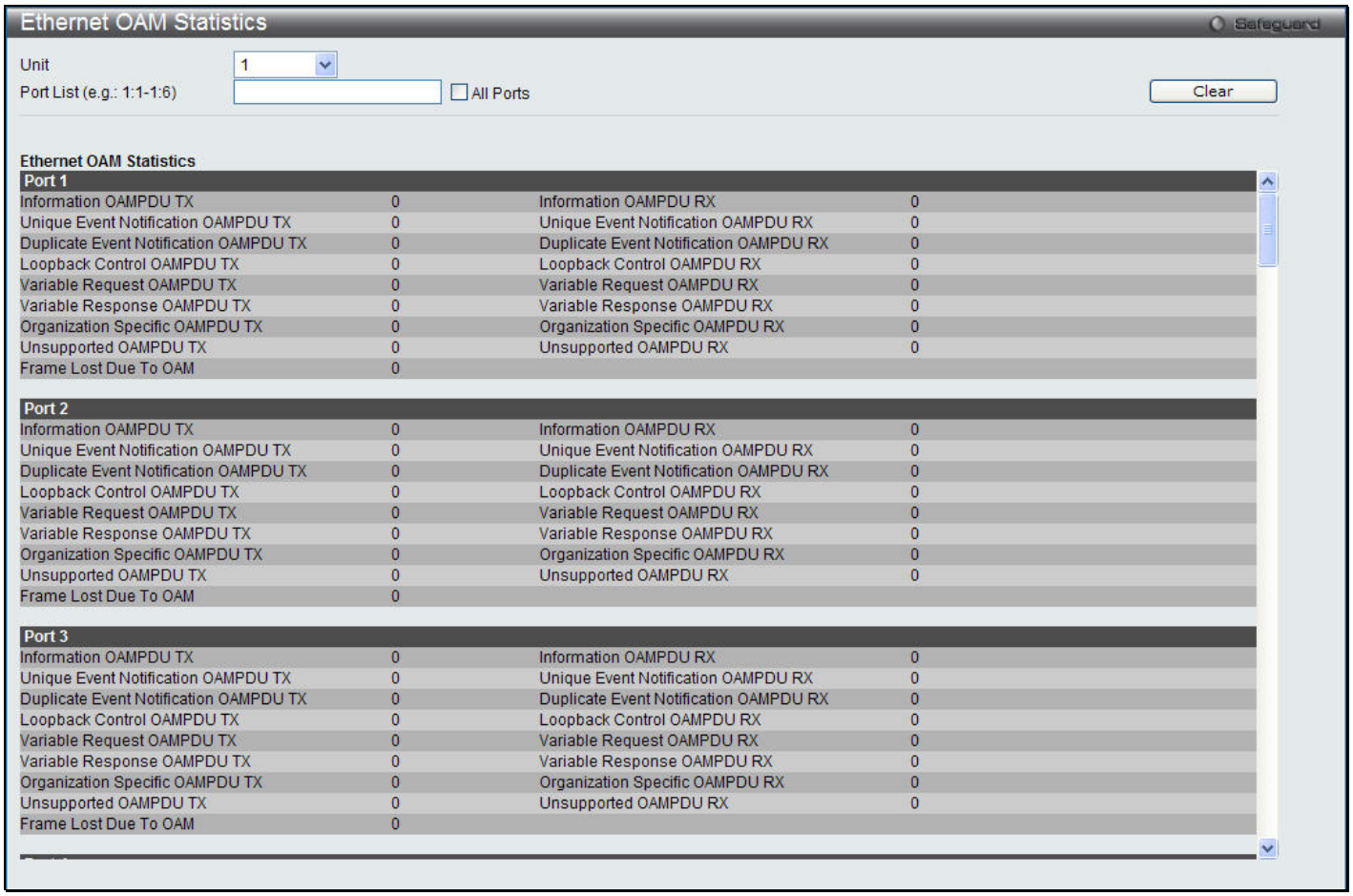


Figure 10-17 Ethernet OAM Statistics window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to specify the port number.
Port List	Specify which ports' counter to show. Tick All Ports to view all ports.

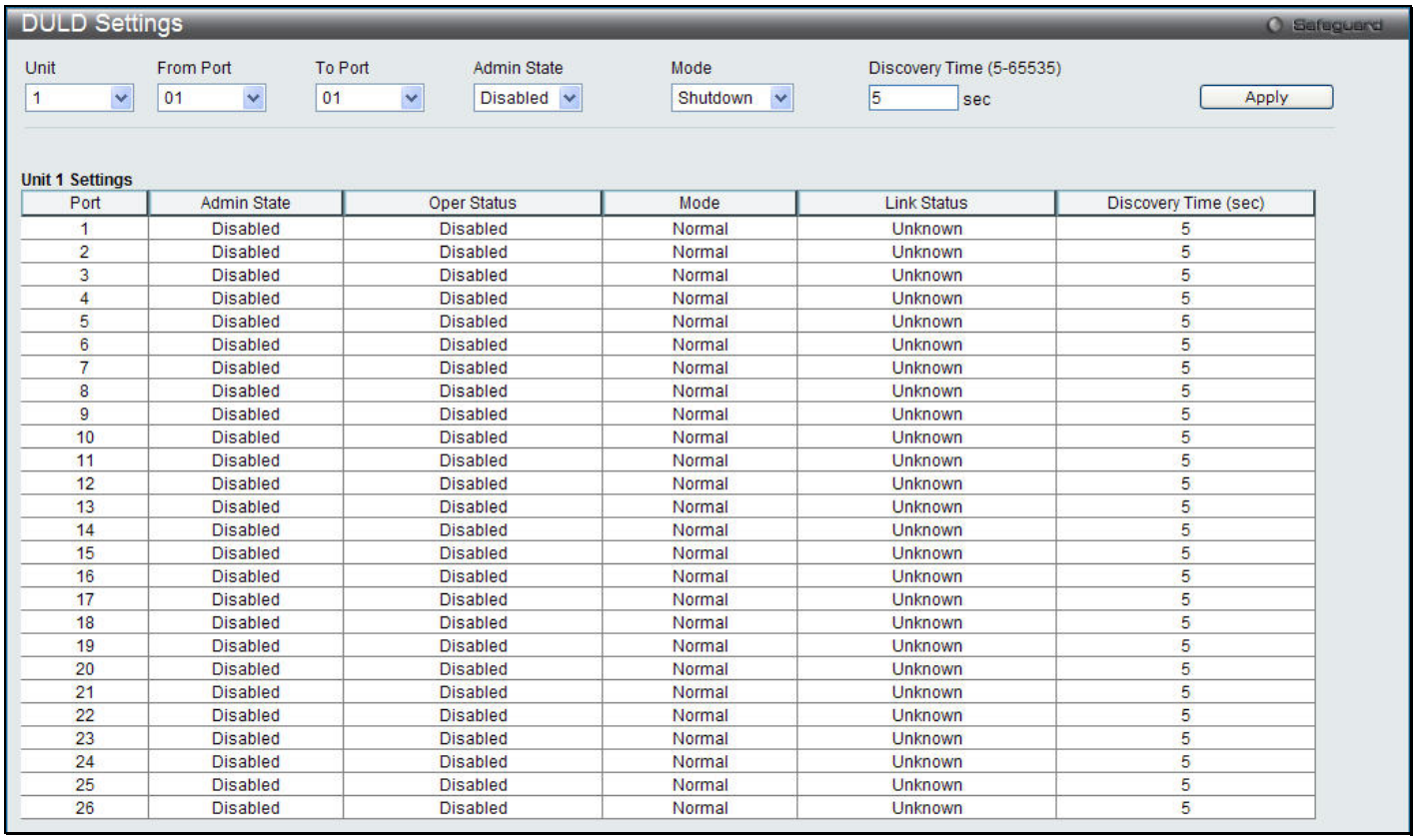
Click the **Clear** button to clear all the information entered in the fields.

DULD Settings

The window is used to configure unidirectional link detection on ports.

Unidirectional link detection provides discovery mechanism based on 802.3ah to find its neighbor. If the discovery can complete in the configured discovery time, it concludes the bi-directional link. Otherwise, it starts to detect the link status.

To view this window, click **OAM > DULD Settings**, as shown below:



Port	Admin State	Oper Status	Mode	Link Status	Discovery Time (sec)
1	Disabled	Disabled	Normal	Unknown	5
2	Disabled	Disabled	Normal	Unknown	5
3	Disabled	Disabled	Normal	Unknown	5
4	Disabled	Disabled	Normal	Unknown	5
5	Disabled	Disabled	Normal	Unknown	5
6	Disabled	Disabled	Normal	Unknown	5
7	Disabled	Disabled	Normal	Unknown	5
8	Disabled	Disabled	Normal	Unknown	5
9	Disabled	Disabled	Normal	Unknown	5
10	Disabled	Disabled	Normal	Unknown	5
11	Disabled	Disabled	Normal	Unknown	5
12	Disabled	Disabled	Normal	Unknown	5
13	Disabled	Disabled	Normal	Unknown	5
14	Disabled	Disabled	Normal	Unknown	5
15	Disabled	Disabled	Normal	Unknown	5
16	Disabled	Disabled	Normal	Unknown	5
17	Disabled	Disabled	Normal	Unknown	5
18	Disabled	Disabled	Normal	Unknown	5
19	Disabled	Disabled	Normal	Unknown	5
20	Disabled	Disabled	Normal	Unknown	5
21	Disabled	Disabled	Normal	Unknown	5
22	Disabled	Disabled	Normal	Unknown	5
23	Disabled	Disabled	Normal	Unknown	5
24	Disabled	Disabled	Normal	Unknown	5
25	Disabled	Disabled	Normal	Unknown	5
26	Disabled	Disabled	Normal	Unknown	5

Figure 10-18 DULD Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
From Port / To Port	Select a range of ports to be configured.
Admin State	Use the drop-down menu to enable or disable the unidirectional link detection status of the ports.
Mode	Specify the unidirectional OAM operation mode of the ports. *Shutdown* - If unidirectional link is detected, disable the port and log the event. *Normal* - Only log unidirectional link event when unidirectional link is detected.
Discovery Time	Enter the neighbor discovery time of the ports. If the discovery time ends, the unidirectional link detection starts. The default discovery time is *5* seconds.

Click the **Apply** button to implement changes made.

Cable Diagnostics

The cable diagnostics feature is designed primarily for administrators or customer service representatives to verify and test copper cables; it can rapidly determine the quality of the cables and the types of error.

To view this window, click **OAM > Cable Diagnostics**, as shown below:

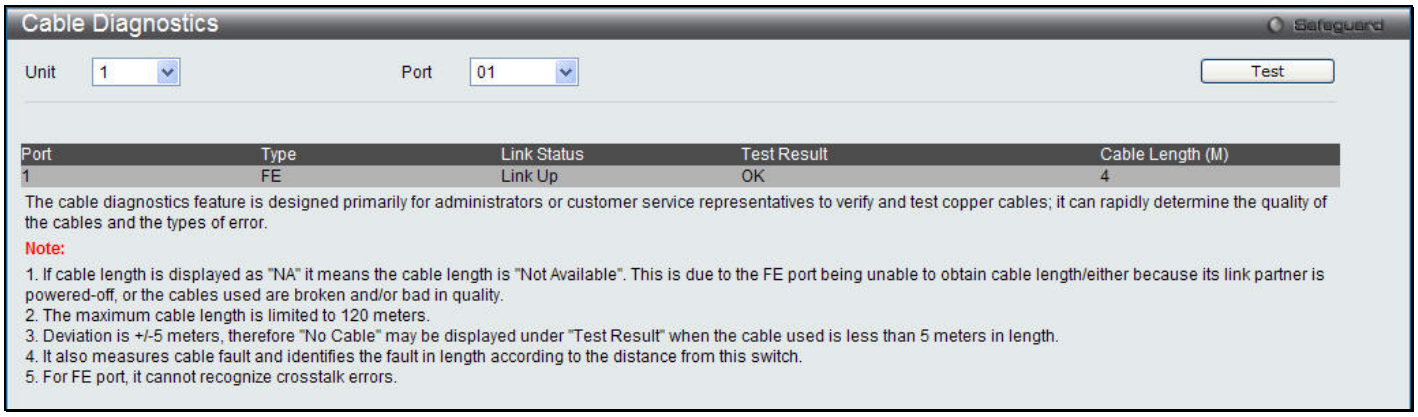


Figure 10-19 Cable Diagnostics window

To view the cable diagnostics for a particular port, use the drop-down menu to choose the port and click **Test** The information will be displayed in this window.

NOTE: Cable diagnostics function limitation: Cross-talk errors detection is not supported on FE ports.

NOTE: The available cable diagnosis length is from 5 to 120 meters.

NOTE: The deviation of cable length detection is +/- 5M.

Fault messages:

- *Open* - This pair is left open.
- *Short* - Two lines of this pair is shorted.
- *CrossTalk* - Lines of this pair is short with lines in other pairs.
- *Unknown* - The diagnosis does not obtain the cable status, please try again.
- *NA* - No cable was found, maybe it's because cable is out of diagnosis specification or the quality is too bad.

Chapter 11 Monitoring

Utilization
Statistics
Mirror
sFlow
Ping Test
Trace Route
Peripheral

Utilization

CPU Utilization

Users can display the percentage of the CPU being used, expressed as an integer percentage and calculated as a simple average by time interval.

To view this window, click **Monitoring > Utilization > CPU Utilization**, as shown below:

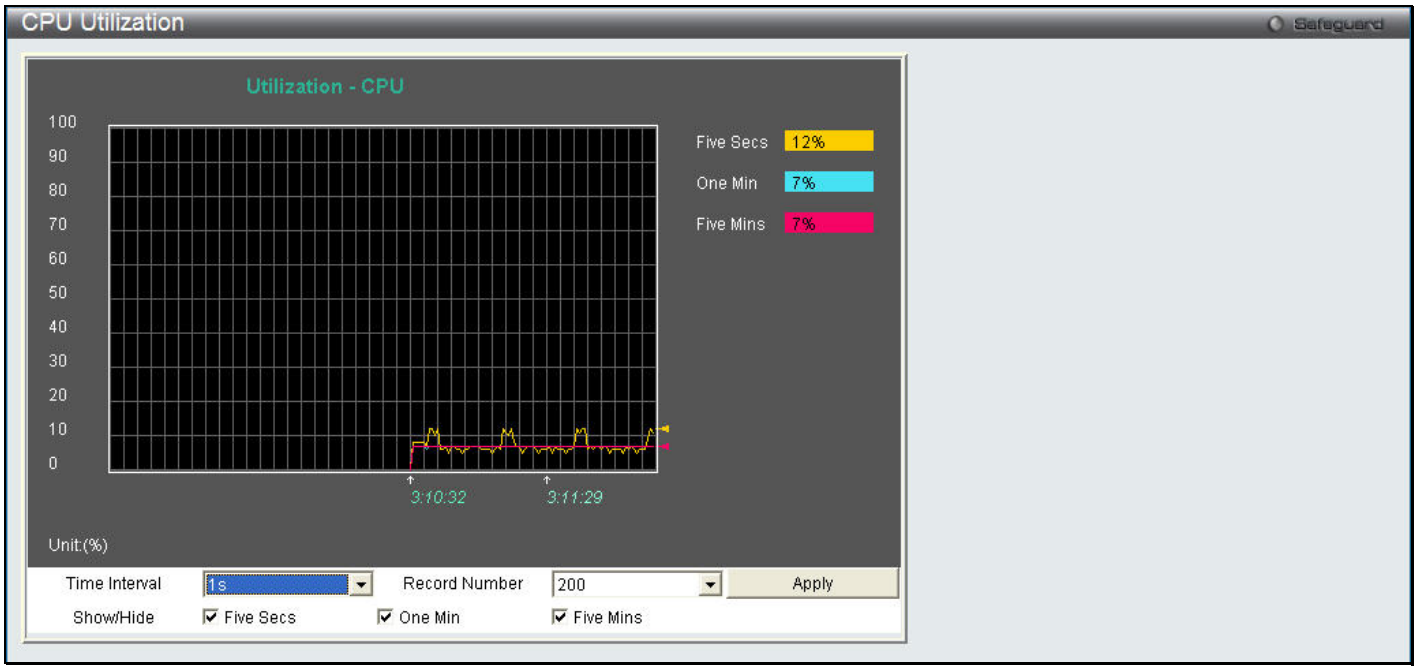


Figure 11-1 CPU Utilization window

The fields that can be configured are described below:

Parameter	Description
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
Show/Hide	Check whether or not to display Five Seconds, One Minute, and Five Minutes.

Click the **Apply** button to accept the changes made.

DRAM & Flash Utilization

On this page the user can view information regarding the DRAM and Flash utilization.

To view this window, click **Monitoring > Utilization > DRAM & Flash Utilization**, as shown below:

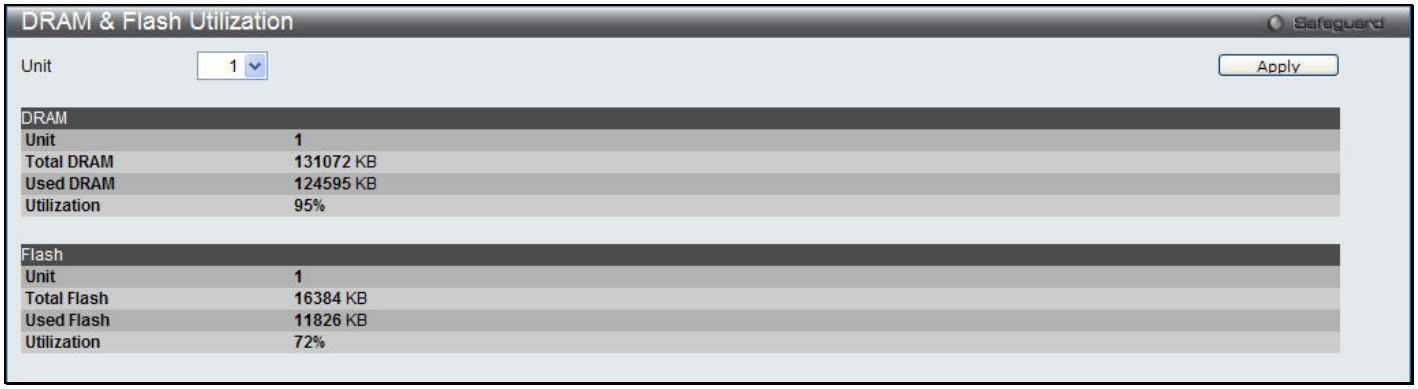


Figure 11-2 DRAM & Flash Utilization window

Port Utilization

Users can display the percentage of the total available bandwidth being used on the port.

To view this window, click **Monitoring > Utilization > Port Utilization**, as shown below:

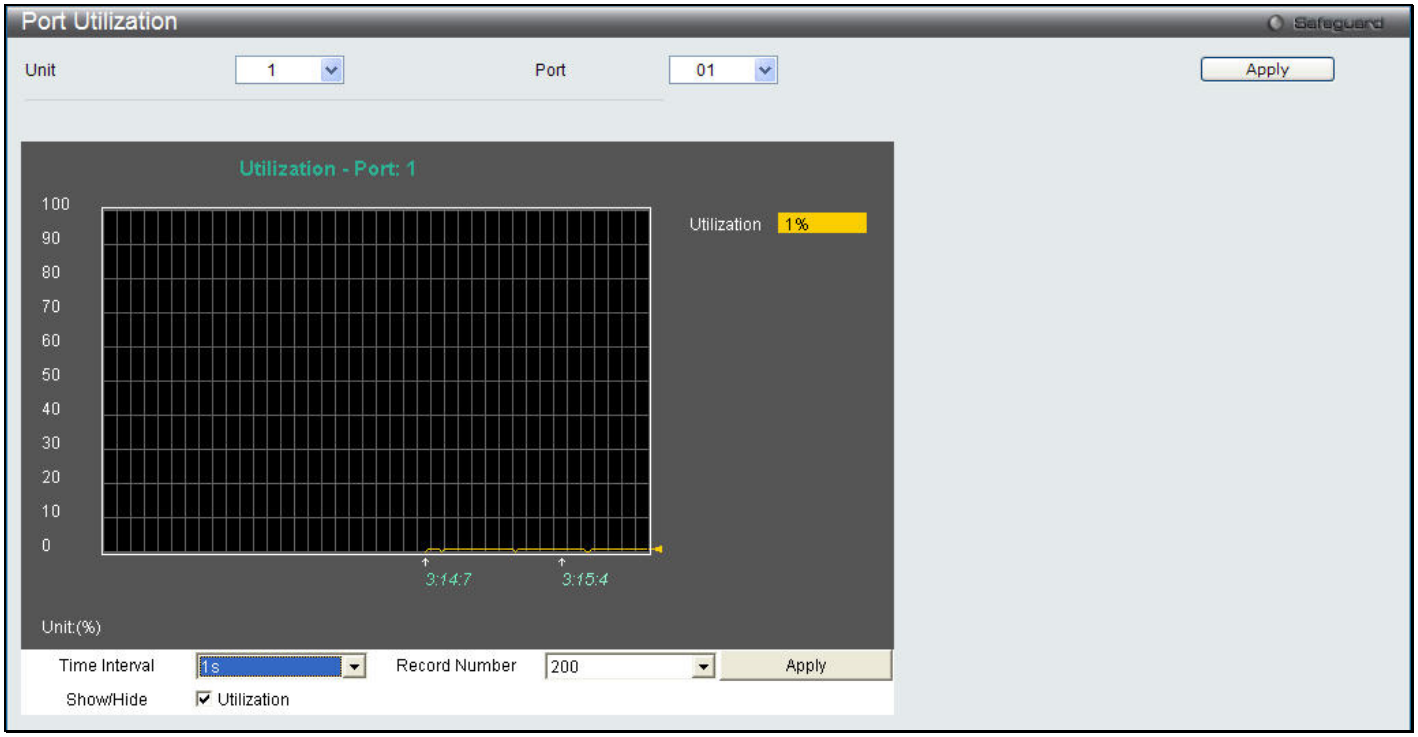


Figure 11-3 Port Utilization window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
Show/Hide	Check whether or not to display Port Util.

Click the **Apply** button to accept the changes made for each individual section.

Statistics

Port Statistics

Packets

The Web manager allows various packet statistics to be viewed as either a line graph or a table. Six windows are offered.

Received (RX)

To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Port Statistics > Packets > Received (RX)**, as shown below:

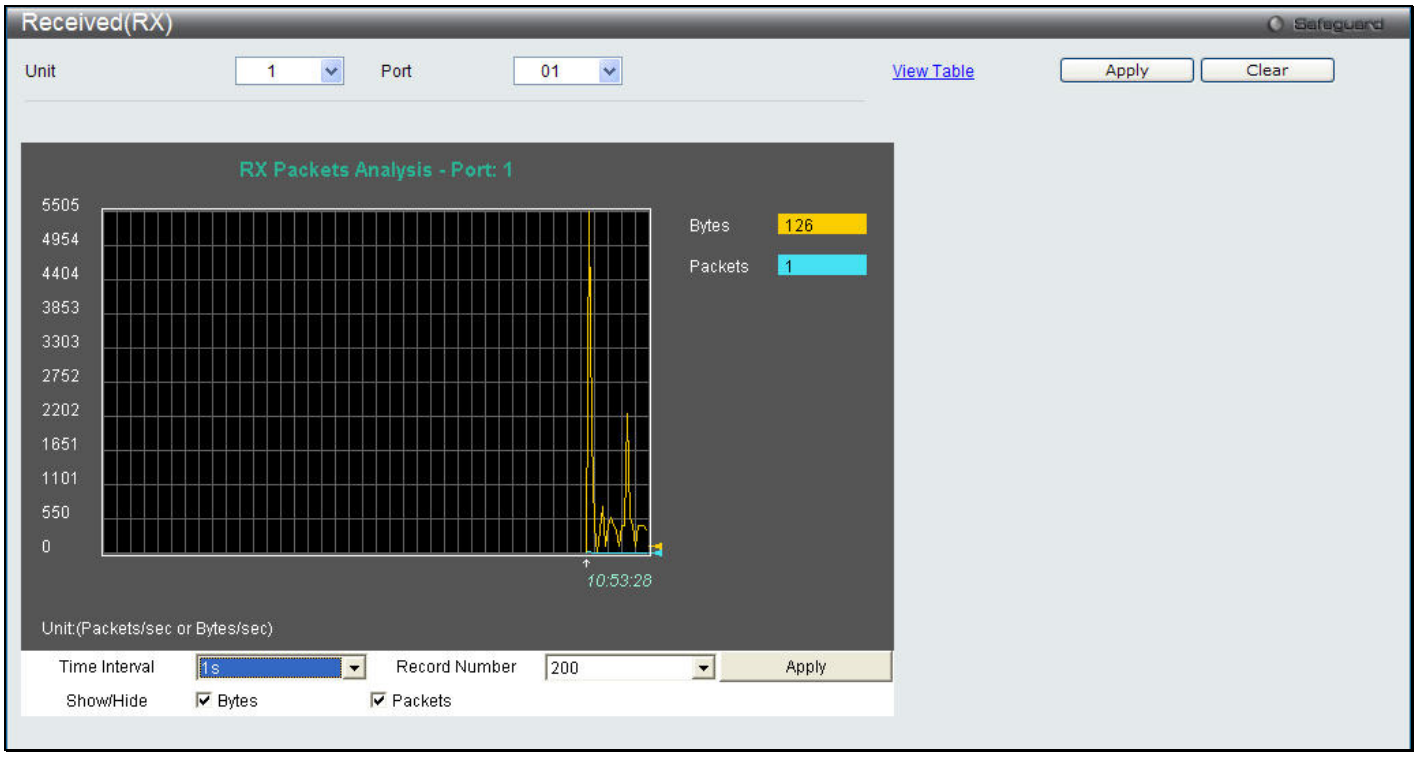


Figure 11-4 Received (RX) window (for Bytes and Packets)

Click the View Table link to display the information in a table rather than a line graph.

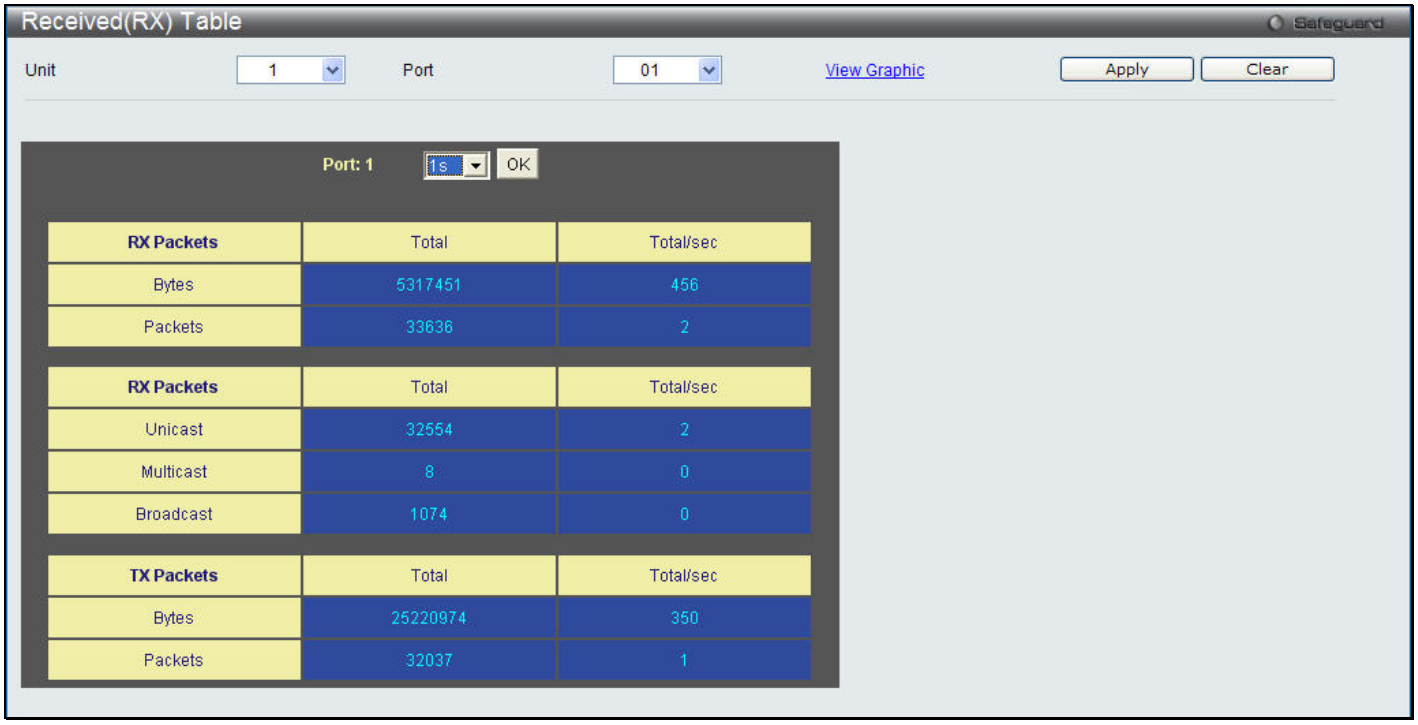


Figure 11-5 Received (RX) Table window (for Bytes and Packets)

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.

Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
Bytes	Counts the number of bytes received on the port.
Packets	Counts the number of packets received on the port.
Unicast	Counts the total number of good packets that were received by a unicast address.
Multicast	Counts the total number of good packets that were received by a multicast address.
Broadcast	Counts the total number of good packets that were received by a broadcast address.
Show/Hide	Check whether to display Bytes and Packets.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

UMB_Cast (RX)

To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Port Statistics > Packets > UMB_Cast (RX)**, as shown below:

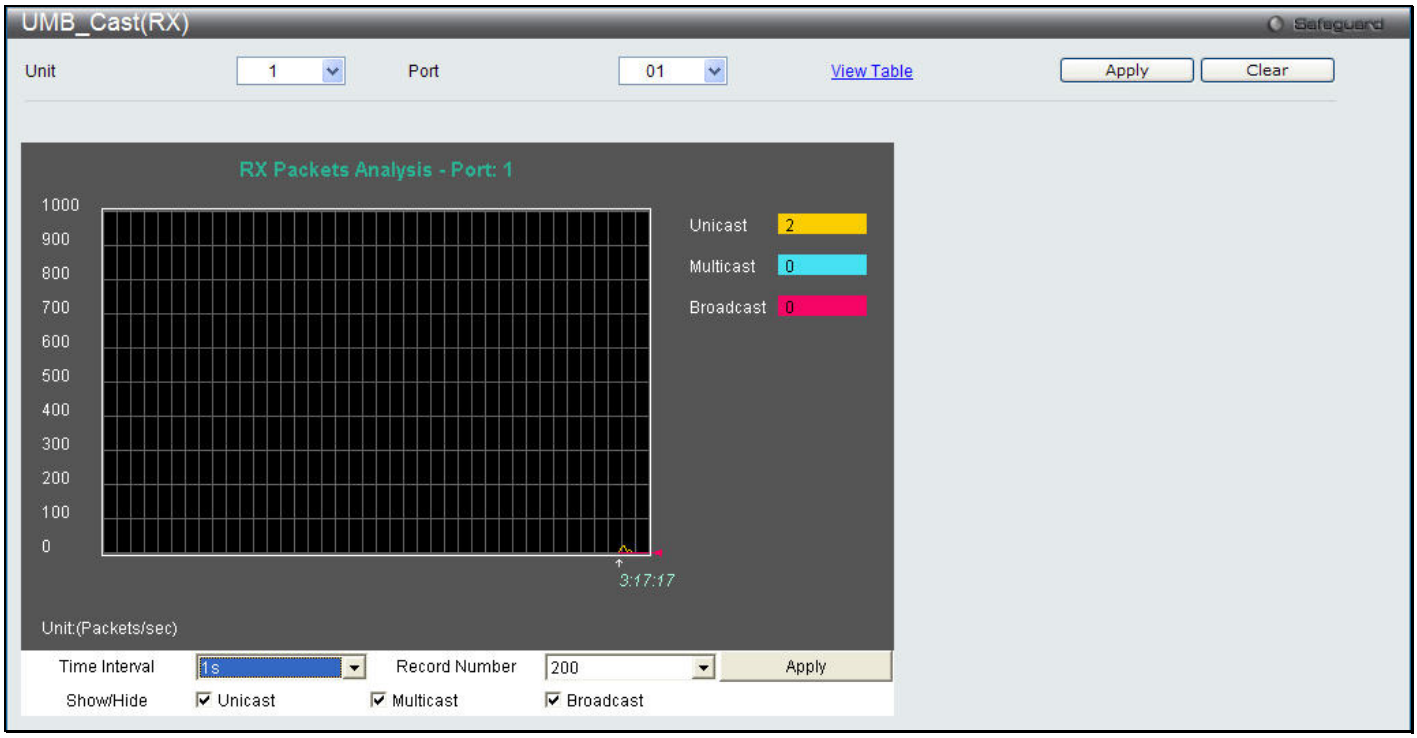


Figure 11-6 UMB_cast (RX) window (for Unicast, Multicast, and Broadcast Packets)

Click the View Table link to display the information in a table rather than a line graph.

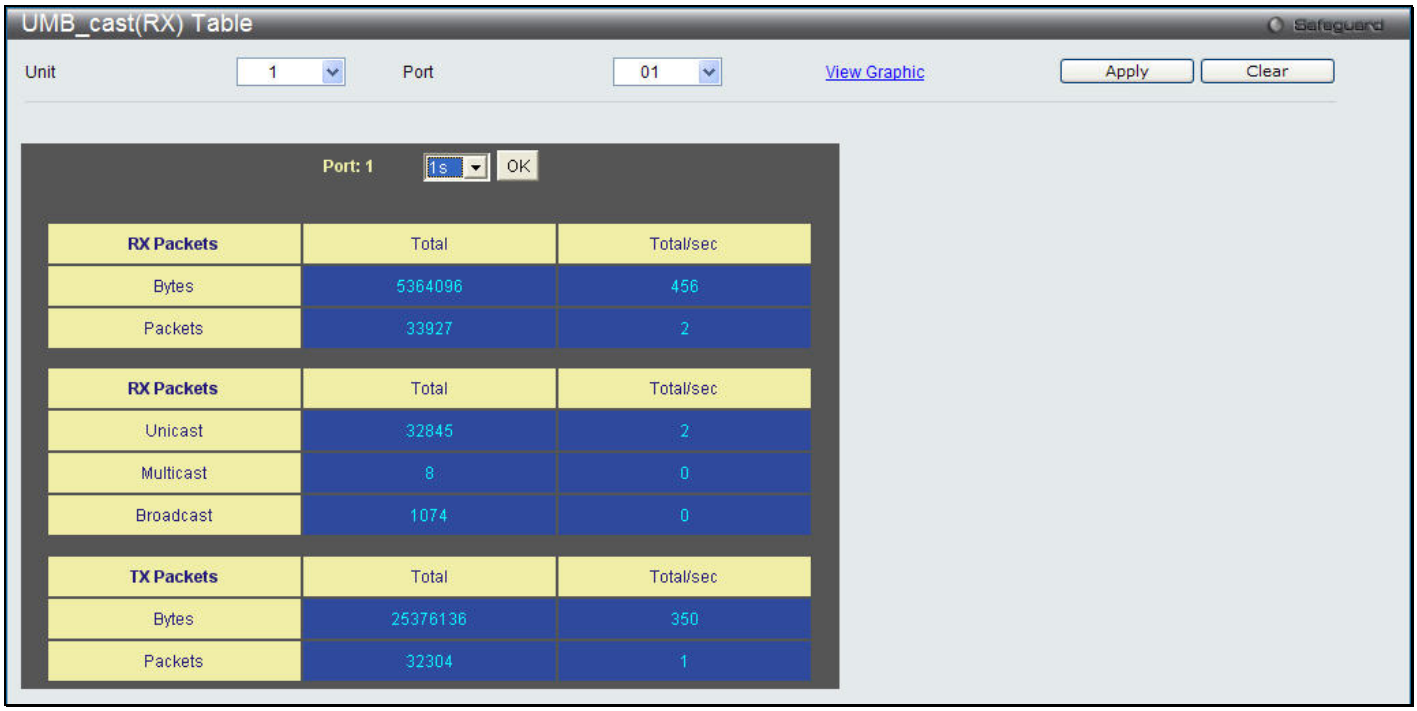


Figure 11-7 RX UMB_cast (RX) Table window (table for Unicast, Multicast, and Broadcast Packets)

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
Unicast	Counts the total number of good packets that were received by a unicast address.
Multicast	Counts the total number of good packets that were received by a multicast address.
Broadcast	Counts the total number of good packets that were received by a broadcast address.
Show/Hide	Check whether or not to display Multicast, Broadcast, and Unicast Packets.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

Transmitted (TX)

To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Port Statistics > Packets > Transmitted (TX)**, as shown below:

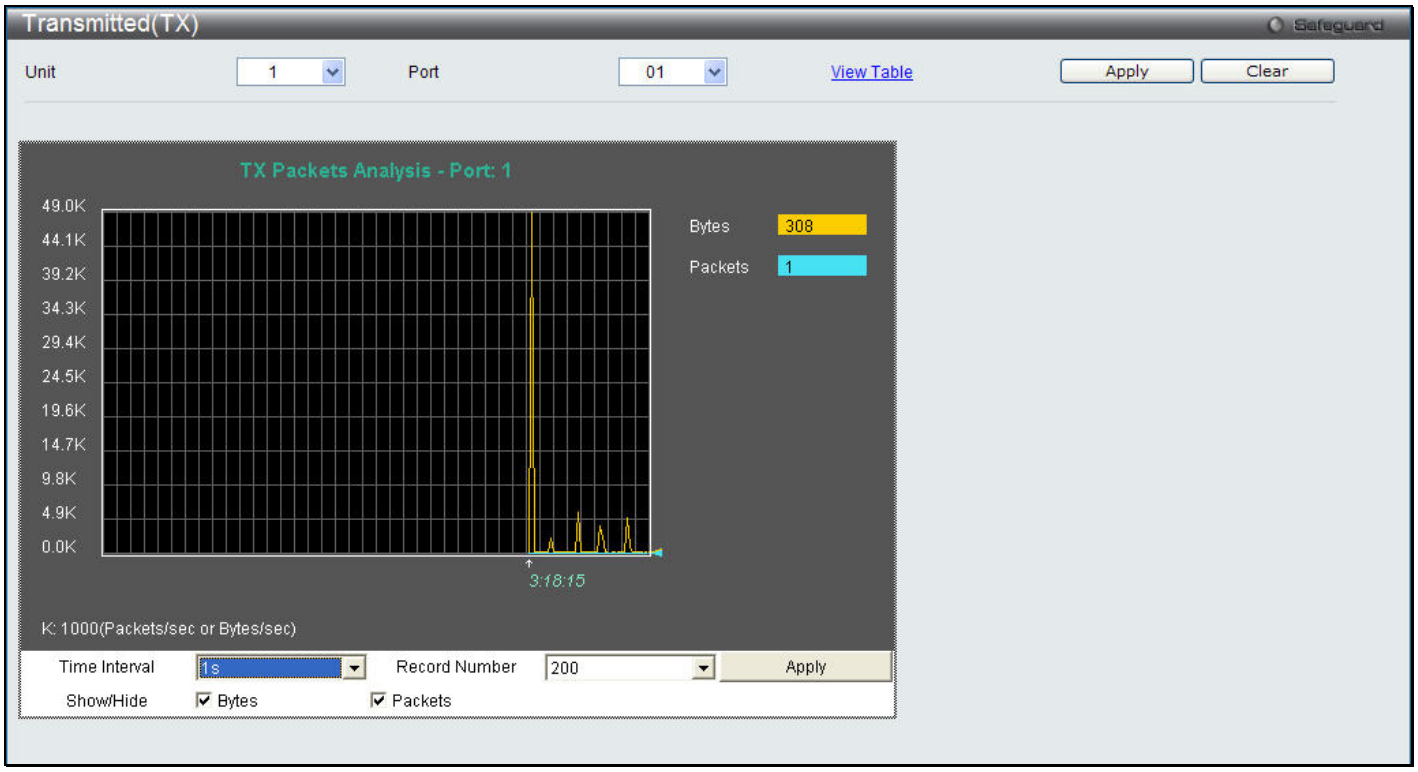


Figure 11-8 Transmitted (TX) window (for Bytes and Packets)

Click the View Table link to display the information in a table rather than a line graph.

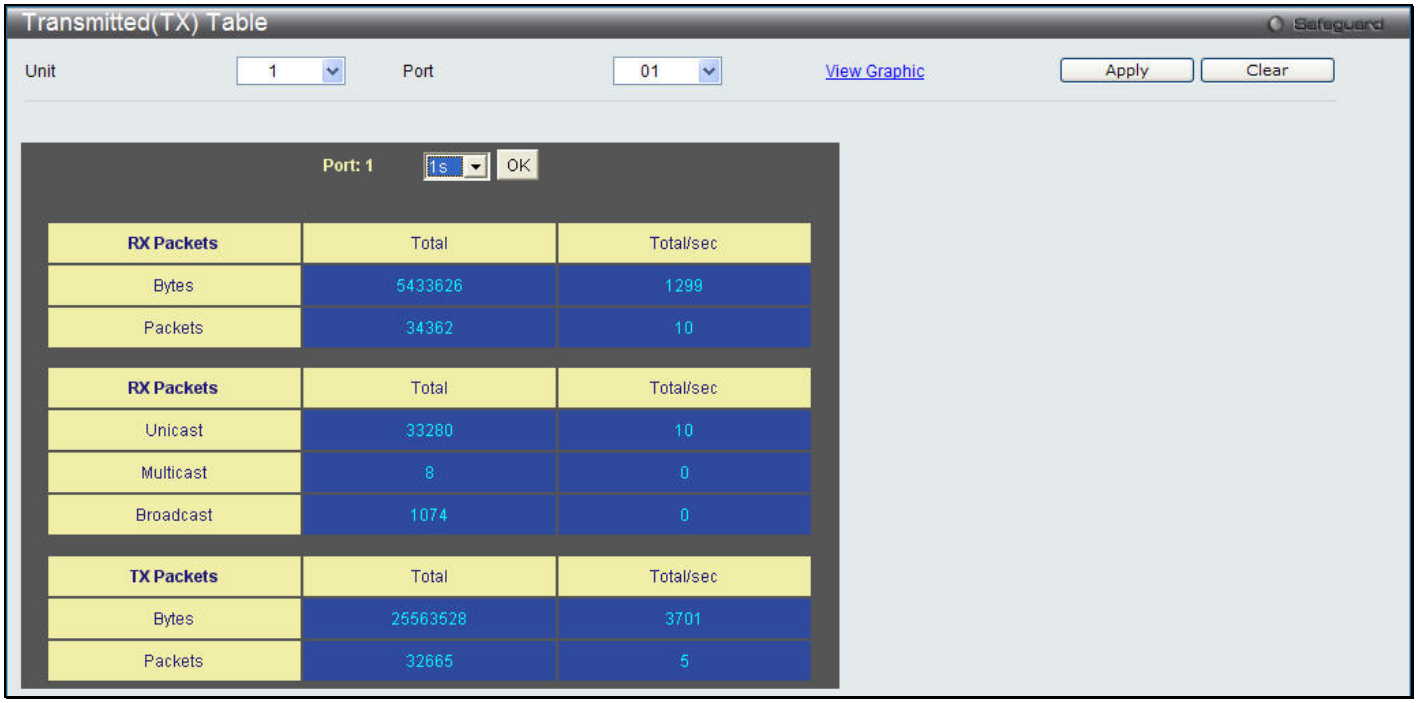


Figure 11-9 Transmitted (TX) Table window (table for Bytes and Packets)

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to choose the port that will display statistics.

Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
Bytes	Counts the number of bytes successfully sent on the port.
Packets	Counts the number of packets successfully sent on the port.
Unicast	Counts the total number of good packets that were transmitted by a unicast address.
Multicast	Counts the total number of good packets that were transmitted by a multicast address.
Broadcast	Counts the total number of good packets that were transmitted by a broadcast address.
Show/Hide	Check whether or not to display Bytes and Packets.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

Errors

The Web manager allows port error statistics compiled by the Switch's management agent to be viewed as either a line graph or a table. Four windows are offered.

Received (RX)

To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the Web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Port Statistics > Errors > Received (RX)**, as shown below:

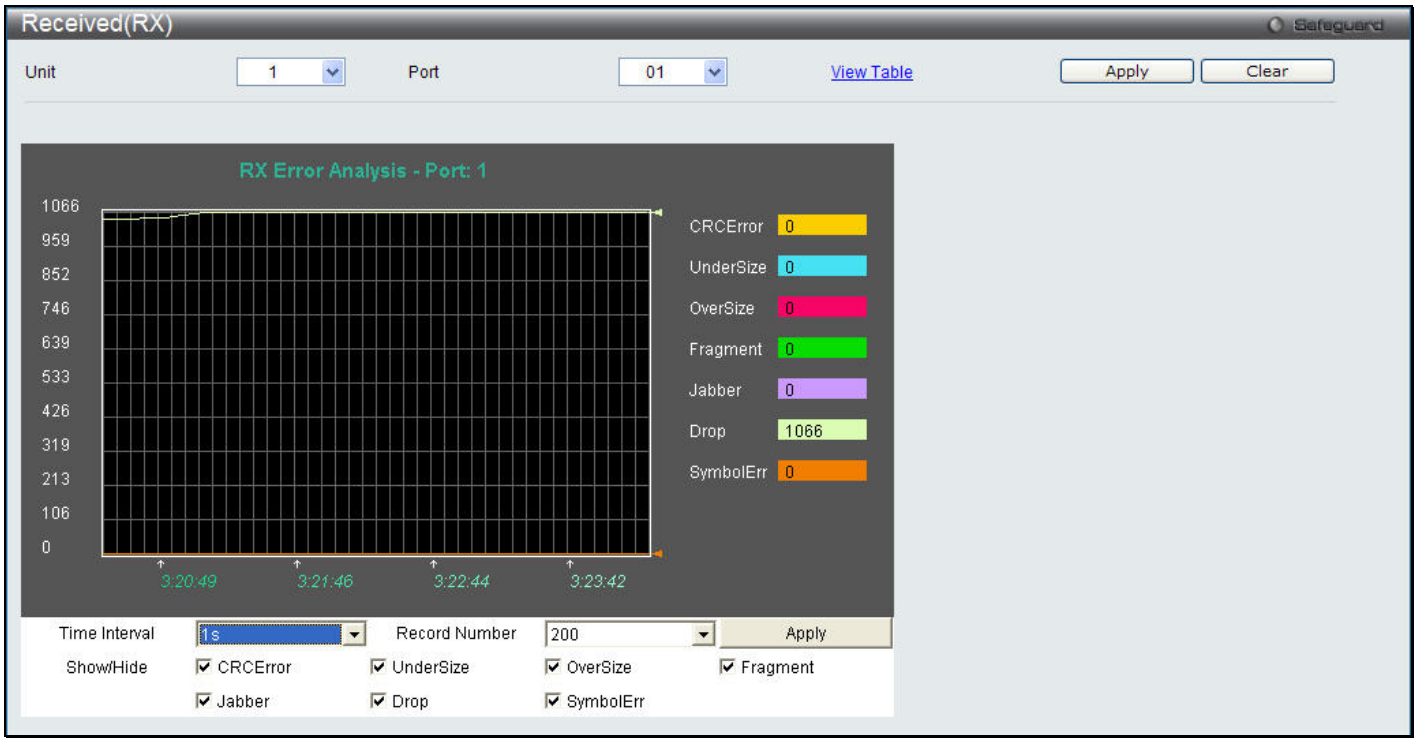


Figure 11-10 Received (RX) window (for errors)

Click the View Table link to display the information in a table rather than a line graph.

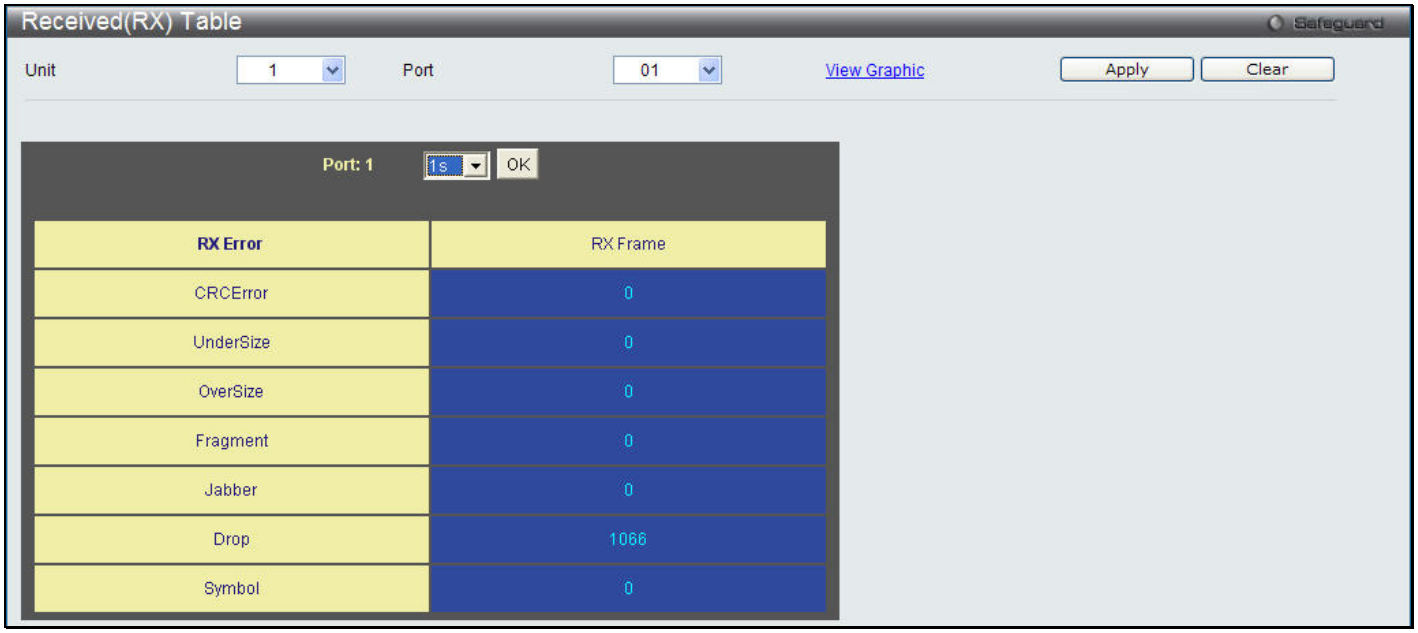


Figure 11-11 Received (RX) Table window (for errors)

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default

	value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is *200*.
CRCError	Counts otherwise valid packets that did not end on a byte (octet) boundary.
UnderSize	The number of packets detected that are less than the minimum permitted packets size of 64 bytes and have a good CRC. Undersize packets usually indicate collision fragments, a normal network occurrence.
OverSize	Counts valid packets received that were longer than 1518 octets and less than the MAX_PKT_LEN. Internally, MAX_PKT_LEN is equal to 1536.
Fragment	The number of packets less than 64 bytes with either bad framing or an invalid CRC. These are normally the result of collisions.
Jabber	Counts invalid packets received that were longer than 1518 octets and less than the MAX_PKT_LEN. Internally, MAX_PKT_LEN is equal to 1536.
Drop	The number of packets that are dropped by this port since the last Switch reboot.
Symbol	Counts the number of packets received that have errors received in the symbol on the physical labor.
Show/Hide	Check whether or not to display CRCError, UnderSize, OverSize, Fragment, Jabber, Drop, and SymbolErr errors.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

Transmitted (TX)

To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Port Statistics > Errors > Transmitted (TX)**, as shown below:

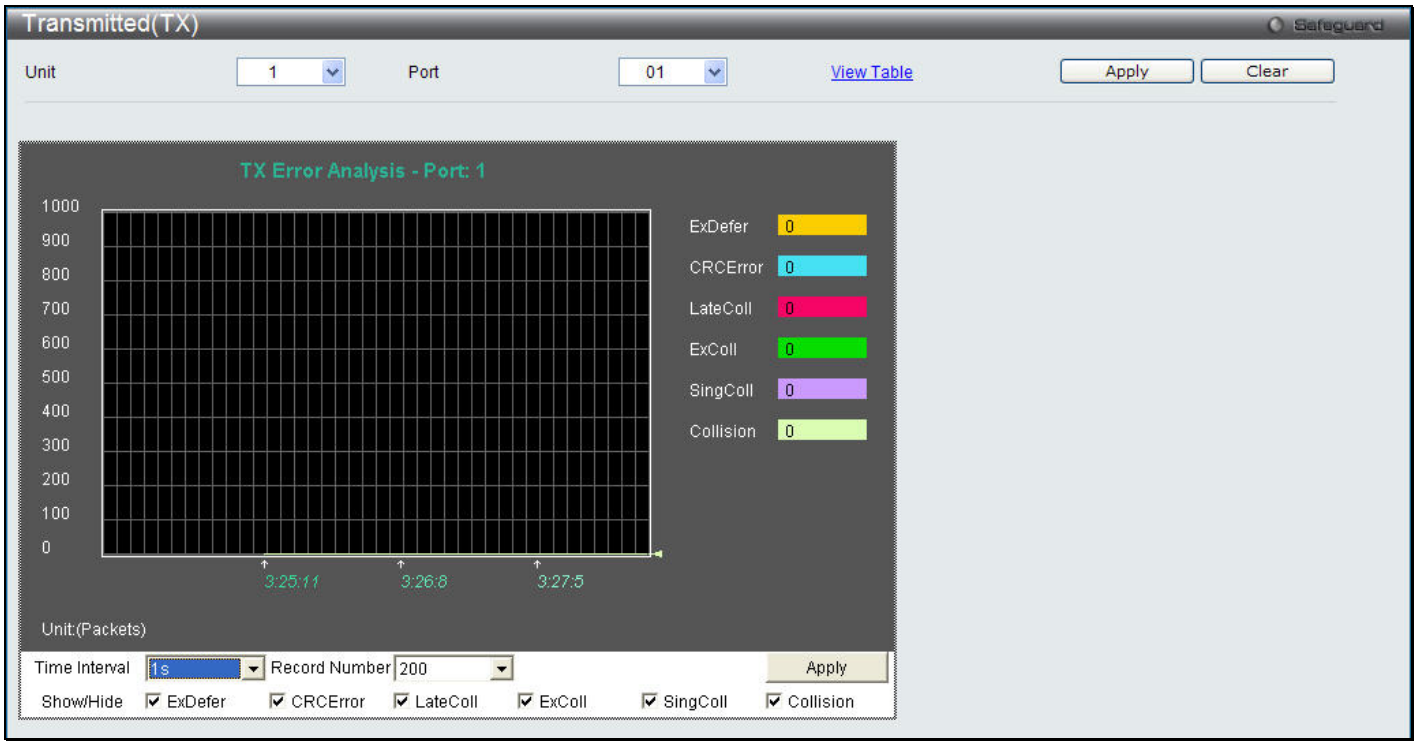


Figure 11-12 Transmitted (TX) window (for errors)

Click the View Table link to display the information in a table rather than a line graph.

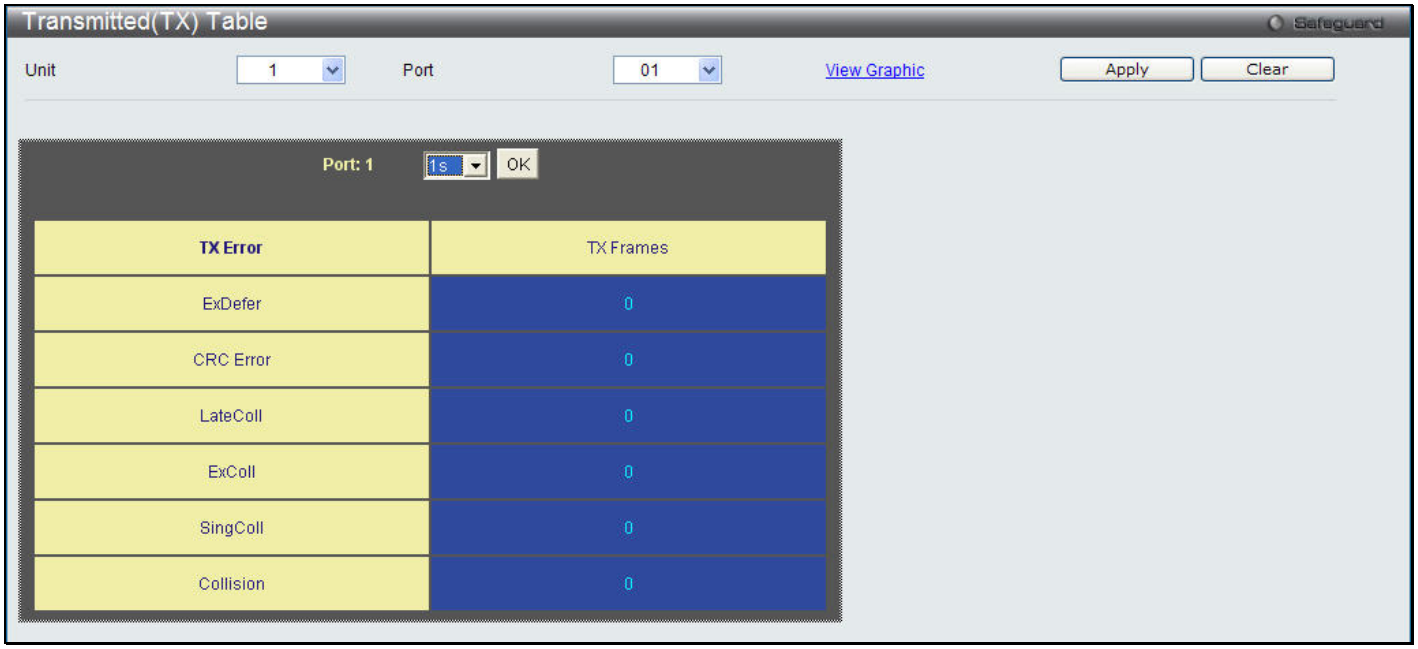


Figure 11-13 Transmitted (TX) Table window (for errors)

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default

	value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is 200.
ExDefer	Counts the number of packets for which the first transmission attempt on a particular interface was delayed because the medium was busy.
CRC Error	Counts otherwise valid packets that did not end on a byte (octet) boundary.
LateColl	Counts the number of times that a collision is detected later than 512 bit-times into the transmission of a packet.
ExColl	Excessive Collisions. The number of packets for which transmission failed due to excessive collisions.
SingColl	Single Collision Frames. The number of successfully transmitted packets for which transmission is inhibited by more than one collision.
Collision	An estimate of the total number of collisions on this network segment.
Show/Hide	Check whether or not to display ExDefer, CRCError, LateColl, ExColl, SingColl, and Collision errors.

Click the **Apply** button to accept the changes made for each individual section.

Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

Packet Size

Users can display packets received by the Switch, arranged in six groups and classed by size, as either a line graph or a table. Two windows are offered. To select a port to view these statistics for, select the port by using the Port pull-down menu. The user may also use the real-time graphic of the Switch at the top of the web page by simply clicking on a port.

To view this window, click **Monitoring > Statistics > Packet Size**, as shown below:

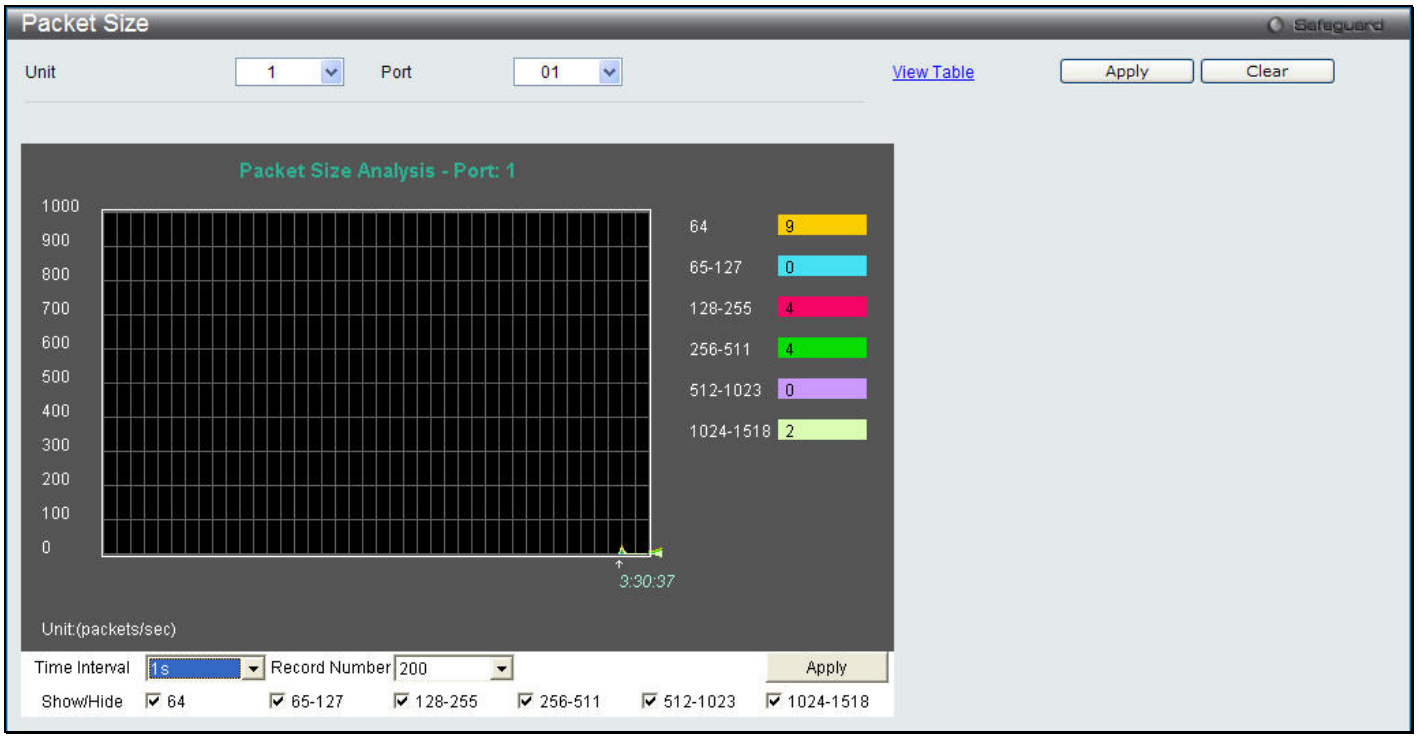


Figure 11-14 Packet Size window

Click the View Table link to display the information in a table rather than a line graph.

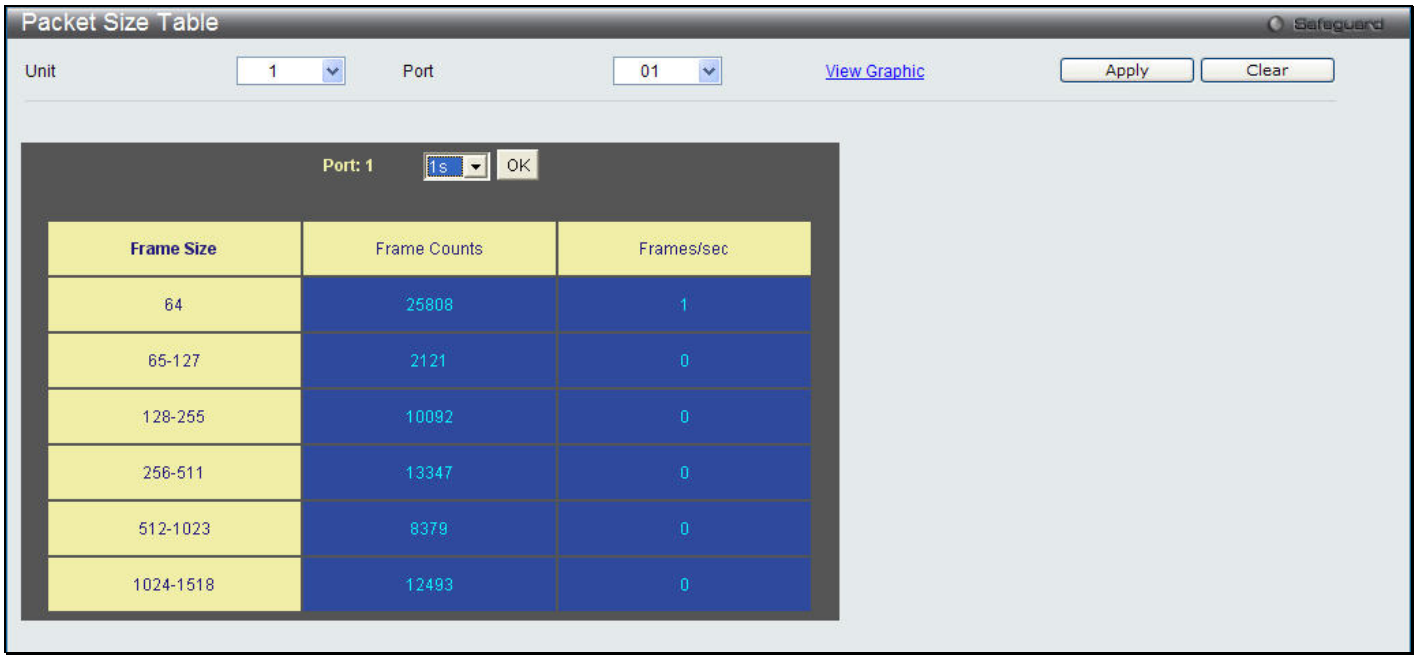


Figure 11-15 RX Size Analysis window (table)

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit to configure.
Port	Use the drop-down menu to choose the port that will display statistics.
Time Interval	Select the desired setting between *1s* and *60s*, where "s" stands for seconds. The default

	value is one second.
Record Number	Select number of times the Switch will be polled between *20* and *200*. The default value is 200.
64	The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
65-127	The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
128-255	The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
256-511	The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
512-1023	The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
1024-1518	The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
Show/Hide	Check whether or not to display 64, 65-127, 128-255, 256-511, 512-1023, and 1024-1518 packets received.

Click the **Apply** button to accept the changes made for each individual section.

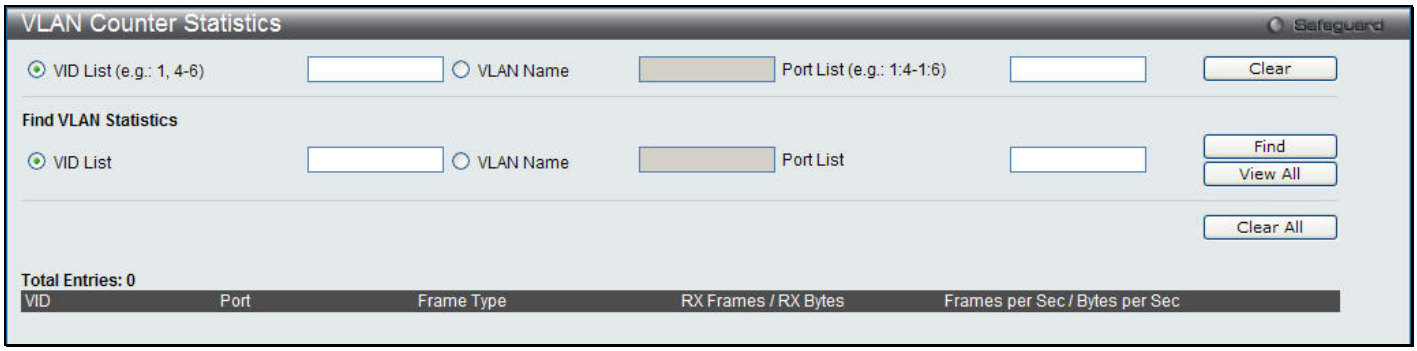
Click the **Clear** button to clear all statistics counters on this window.

Click the View Table link to display the information in a table rather than a line graph.

Click the View Graphic link to display the information in a line graph rather than a table.

VLAN Counter Statistics

To view this window, click **Monitoring > Statistics > VLAN Counter Statistics**, as shown below:



The fields that can be configured are described below:

Parameter	Description
VID List	Click the radio button and enter a list of VLAN ID.
VLAN name	Click the radio button and enter a VLAN name.
Port List	Enter a list of ports

Click the **Clear** button to clear all the information entered in the fields.

Click the **Find** button to locate a specific entry based on the information entered.

Click the **View All** button to display all the VLAN counter statistics.

Click the **Clear All** button to remove all the entries listed in the table.

Mirror

The Switch allows you to copy frames transmitted and received on a port and redirect the copies to another port. You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets passing through the first port. This is useful for network monitoring and troubleshooting purposes.

Port Mirror Settings

To view this window, click **Monitoring > Mirror > Port Mirror Settings**, as shown below:

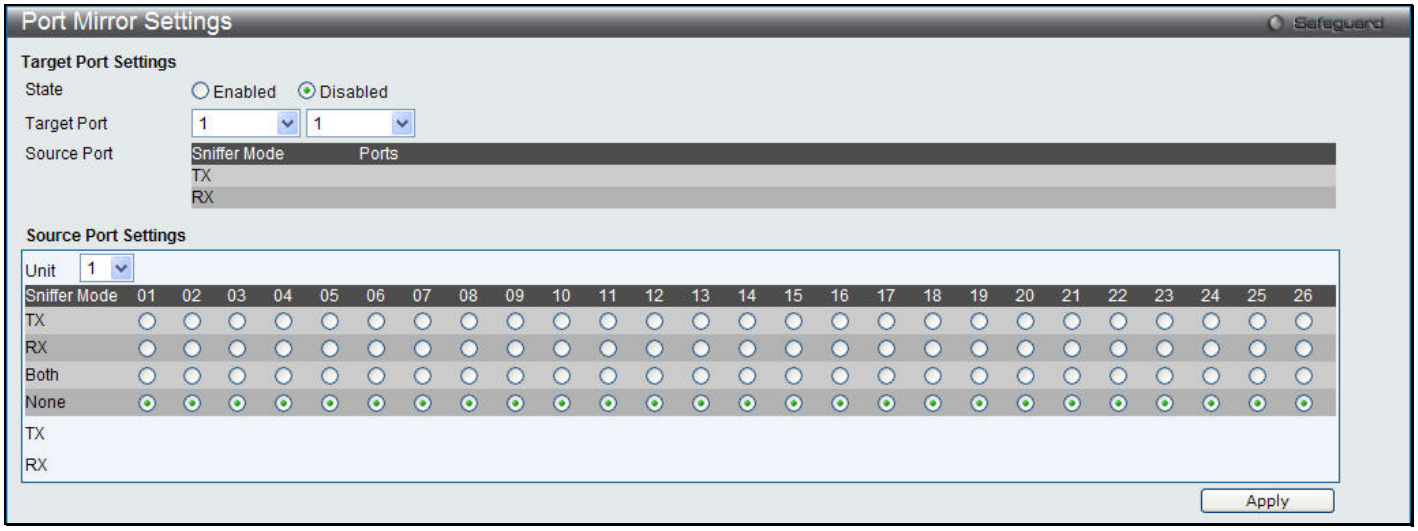


Figure 11-16 Port Mirror Settings window

The fields that can be configured are described below:

Parameter	Description
State	Click the radio buttons to enable or disable the Port Mirroring feature.
Target Port	Use the drop-down menu to select the Target Port used for Port Mirroring.
Unit	Select the unit to configure.
TX (Egress)	Click the radio buttons to select whether the port should include outgoing traffic.
RX (Ingress)	Click the radio buttons to select whether the port should include incoming traffic.
Both	Click the radio buttons to select whether the port should include both incoming and outgoing traffic.
None	Click the radio buttons to select whether the port should not include any traffic.

Click the **Apply** button to accept the changes made.

NOTE: You cannot mirror a fast port onto a slower port. For example, if you try to mirror the traffic from a 100 Mbps port onto a 10 Mbps port, this can cause throughput problems. The port you are copying frames from should always support an equal or lower speed than the port to which you are sending the copies. Please note a target port and a source port cannot be the same port.

RSPAN Settings

This page controls the RSPAN function. The purpose of the RSPAN function is to mirror packets to a remote switch. A packet travels from the switch where the monitored packet is received, passing through the intermediate switch, and then to the switch where the sniffer is attached. The first switch is also named the source switch.

To make the RSPAN function work, the RSPAN VLAN source setting must be configured on the source switch. For the intermediate and the last switch, the RSPAN VLAN redirect setting must be configured.

NOTE: RSPAN VLAN mirroring will only work when RSPAN is enabled (when one RSPAN VLAN has been configured with a source port). The RSPAN redirect function will work when RSPAN is enabled and at least one RSPAN VLAN has been configured with redirect ports.

To view this window, click **Monitoring > Mirror > RSPAN Settings**, as shown below:

Figure 11-17 RSPAN Settings window

The fields that can be configured are described below:

Parameter	Description
RSPAN State	Click the radio buttons to enable or disable the RSPAN feature.
VLAN Name	Create the RSPAN VLAN by VLAN name.
VID	Create the RSPAN VLAN by VLAN ID.

Click the **Apply** button to accept the changes made.

Click the **Add** button to add a new entry based on the information entered.

Click the **Modify** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

After clicking the **Modify** button, the following page will appear:

Figure 11-18 RSPAN Settings – Modify window

The fields that can be configured are described below:

Parameter	Description
VID	Displays the RSPAN VLAN by VLAN ID.
VLAN Name	Displays the RSPAN VLAN by VLAN name.
Source Ports	If the ports are not specified by option, the source of RSPAN will come from the source specified by the mirror command or the flow-based source specified by an ACL. If no parameter is specified for Source, it deletes the configured source parameters. Select *RX*, *TX* or *Both* to specify in which direction the packets will be monitored. Tick Add or Delete to add or delete source ports.
Redirect Port List	Specify the output port list for the RSPAN VLAN packets. If the redirect port is a Link Aggregation port, the Link Aggregation behavior will apply to the RSPAN packets. Tick Add or Delete to add or delete redirect ports.

Click the **Apply** button to accept the changes made.

Click the **<<Back** button to discard the changes made and return to the previous page.

sFlow

sFlow (RFC3176) is a technology for monitoring traffic in data networks containing switches and routers. The sFlow monitoring system consists of an sFlow Agent (embedded in a switch or router or in a standalone probe) and a central sFlow Collector. The architecture and sampling techniques used in the sFlow monitoring system were designed for providing continuous site-wide (and enterprise-wide) traffic monitoring of high speed switched and routed networks.

sFlow Global Settings

This window is used to enable or disable the sFlow feature.

To view this window, click **Monitoring > sFlow > sFlow Global Settings**, as shown below:

Figure 11-19 sFlow Global Settings window

The fields that can be configured are described below:

Parameter	Description
sFlow State	Click the radio buttons to enable or disable the sFlow feature.

Click the **Apply** button to accept the changes made.

sFlow Analyzer Server Settings

The Switch can support four different Analyzer Servers at the same time and each sampler or poller can select a collector to send the samples. The Switch can send different samples from different samplers or pollers to different collectors.

To view this window, click **Monitoring > sFlow > sFlow Analyzer Server Settings**, as shown below:

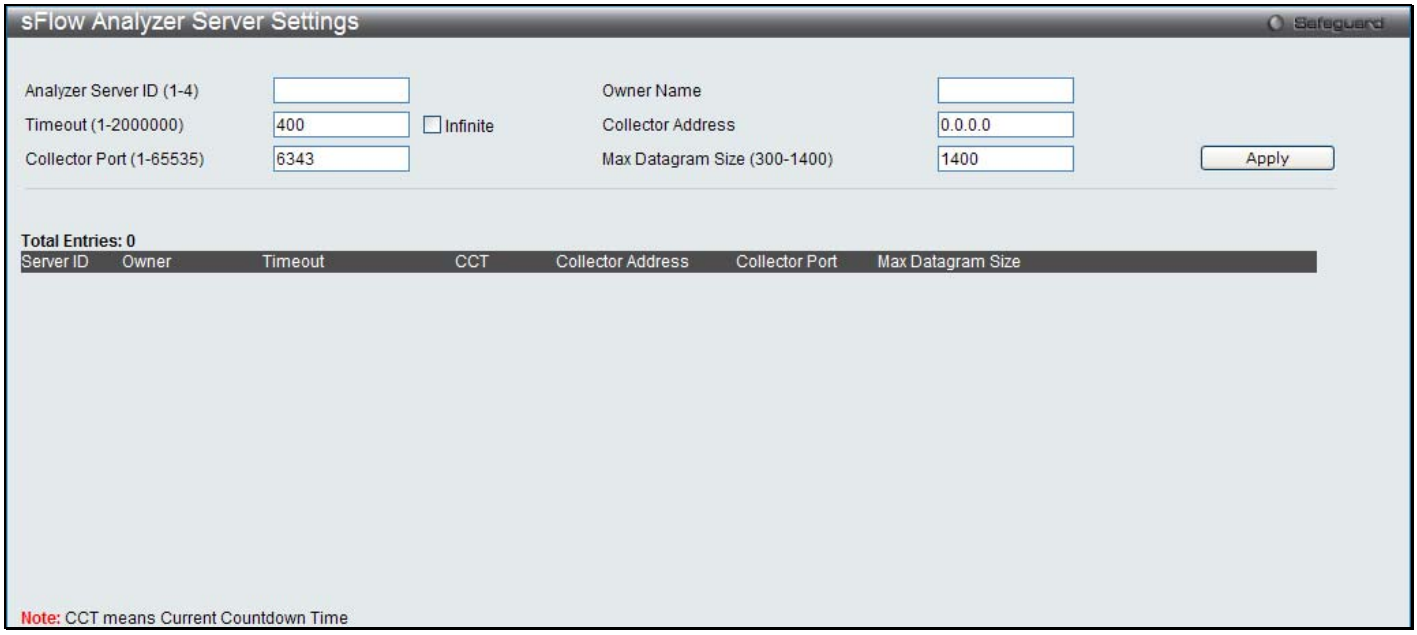


Figure 11-20 sFlow Analyzer Server Settings window

The fields that can be configured are described below:

Parameter	Description
Analyzer Server ID (1-4)	The analyzer server ID specifies the ID of a server analyzer where the packet will be forwarded.
Owner Name	The entity making use of this sFlow analyzer server.
Timeout (1-2000000)	The length of time before the server times out. When the analyzer server times out, all of the flow samplers and counter pollers associated with this analyzer server will be deleted. If not specified, its default value is *400*.
Collector Address	The IP address of the analyzer server. If not specified or set a 0 address, the entry will be inactive.
Collector Port (1-65535)	The destination UDP port for sending the sFlow datagrams. If not specified, the default value is *6343.*
Max Datagram Size (300-1400)	The maximum number of data bytes that can be packed in a single sample datagram. If not specified, the default value is *1400*.

Click the **Apply** button to accept the changes made.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

sFlow Flow Sampler Settings

This window is used to configure the sFlow flow sampler parameters. By configuring the sampling function for a port, a sample packet received by this port will be encapsulated and forwarded to the analyzer server at the specified interval.

NOTE: If the user wants the change the analyze server ID, he needs to delete the flow sampler and creates a new one.

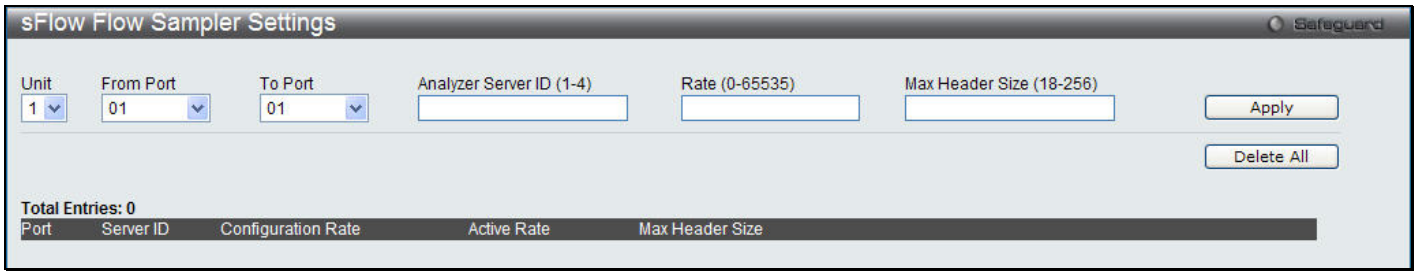


Figure 11-21 sFlow Flow Sampler Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menus to specify the list of ports to be configured.
Analyzer Server ID (1-4)	The analyzer server ID specifies the ID of a server analyzer where the packet will be forwarded.
Rate (0-65535)	The sampling rate for packet RX sampling. The configured rate value multiplied by 256 is the actual rate. For example, if the rate is 20, the actual rate 5120. One packet will be sampled from every 5120 packets. If set to 0, the sampler is disabled. If the rate is not specified, its default value is 0.
Max Header Size (18-256)	The maximum number of leading bytes in the packet which has been sampled that will be encapsulated and forwarded to the server. If not specified, the default value is 128.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

sFlow Counter Poller Settings

This window is used to configure the sFlow counter poller parameters. If the user wants the change the analyzer server ID, he needs to delete the counter poller and create a new one.

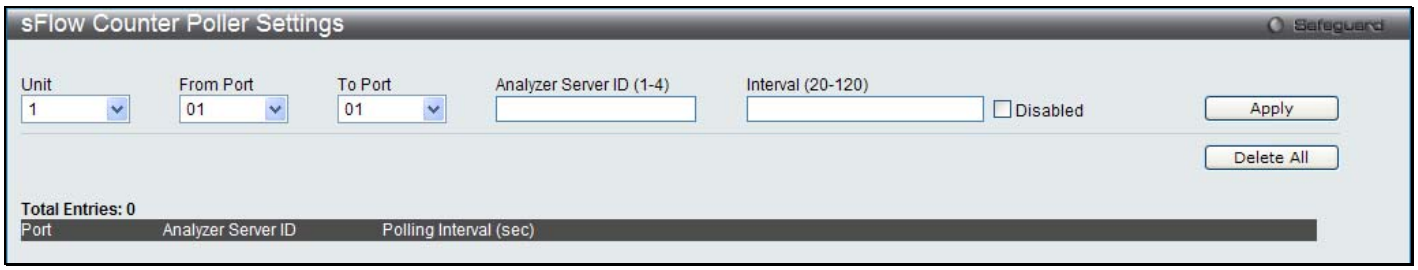


Figure 11-22 sFlow Counter Poller Settings window

The fields that can be configured are described below:

Parameter	Description
Unit	Select a unit to configure.
From Port / To Port	Use the drop-down menus to specify the list of ports to be configured.
Analyzer Server ID (1-4)	The analyzer server ID specifies the ID of a server analyzer where the packet will be forwarded.
Interval (20-120)	The maximum number of seconds between successive samples of the counters. Tick the **Disabled** check box to disable the function.

Click the **Apply** button to accept the changes made.

Click the **Delete All** button to remove all the entries listed.

Click the **Edit** button to re-configure the specific entry.

Click the **Delete** button to remove the specific entry.

Ping Test

Ping is a small program that sends ICMP Echo packets to the IP address you specify. The destination node then responds to or “echoes” the packets sent from the Switch. This is very useful to verify connectivity between the Switch and other nodes on the network.

To view this window, click **Monitoring > Ping Test**, as shown below:

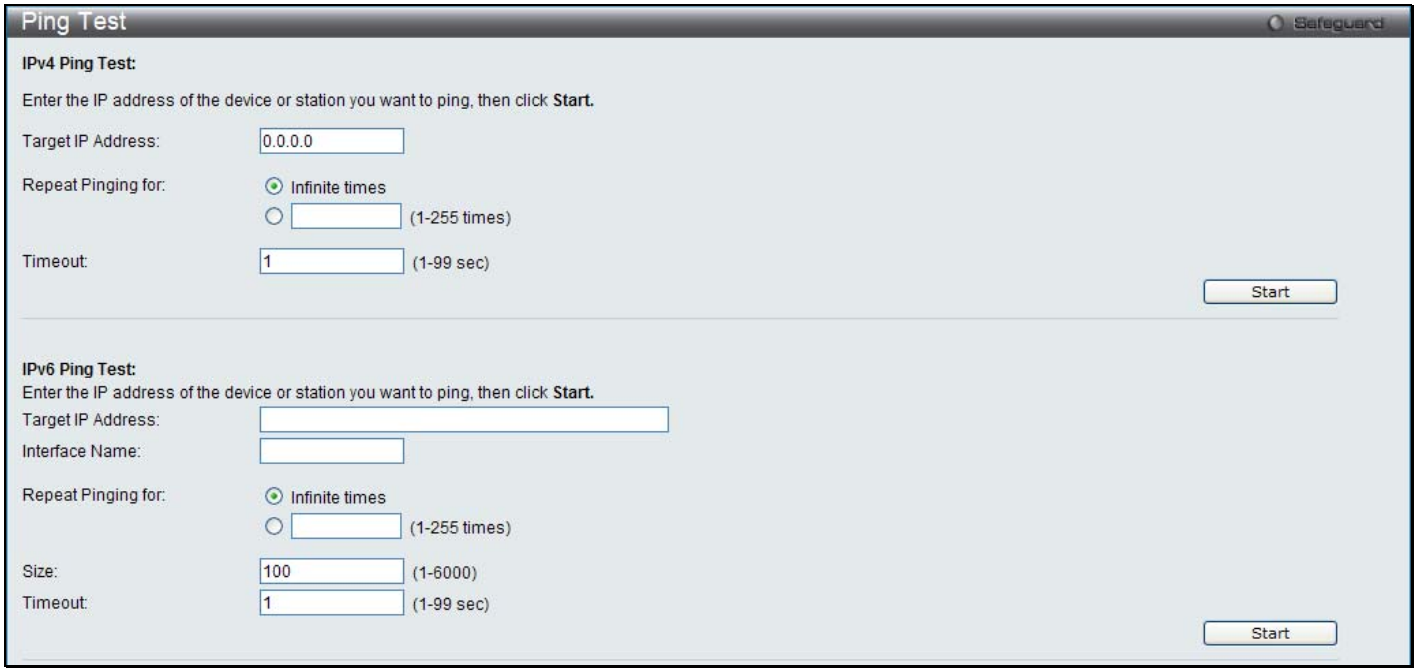


Figure 11-23 Ping Test window

The user may click the Infinite times radio button, in the Repeat Pinging for field, which will tell the ping program to keep sending ICMP Echo packets to the specified IP address until the program is stopped. The user may opt to choose a specific number of times to ping the Target IP Address by clicking its radio button and entering a number between *1* and *255*.

The fields that can be configured are described below:

Parameter	Description

Target IP Address	Enter an IP address to be pinged.
Repeat Pinging for	Enter the number of times desired to attempt to Ping either the IPv4 address or the IPv6 address configured in this window. Users may enter a number of times between *1* and *255*.
Size	For IPv6 only, enter a value between *1* and *6000*. The default is *100*.
Timeout	Select a timeout period between *1* and *99* seconds for this Ping message to reach its destination. If the packet fails to find the IP address in this specified time, the Ping packet will be dropped.

Click the **Start** button to initiate the Ping Test.

After clicking the **Start** button, the following page will appear:

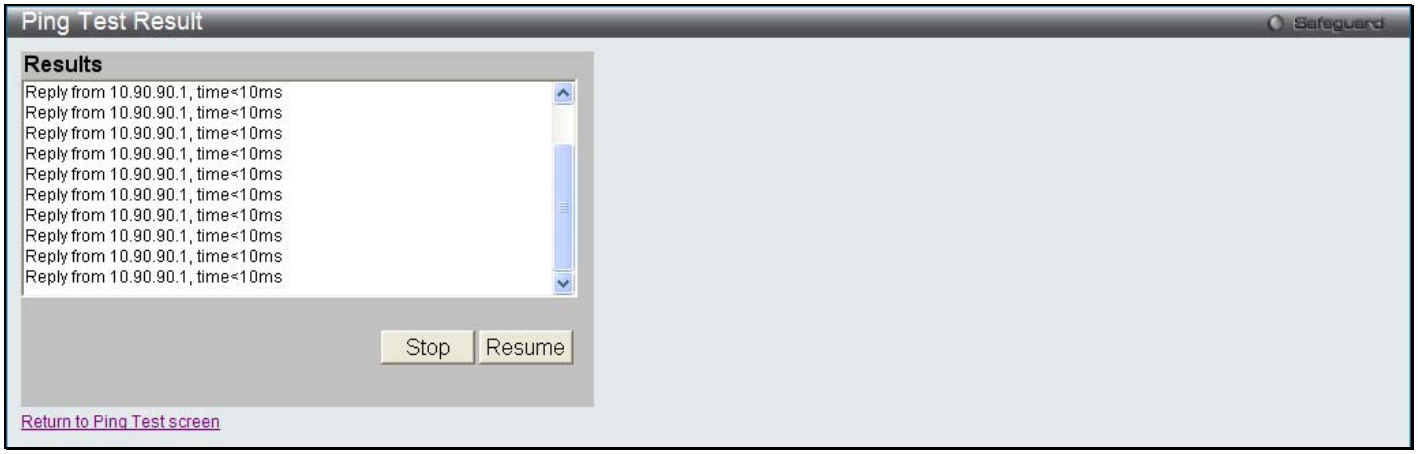


Figure 11-24 Ping Test Result window

Click the **Stop** button to halt the Ping Test.
Click the **Resume** button to resume the Ping Test.

Trace Route

The trace route page allows the user to trace a route between the Switch and a given host on the network.
To view this window, click **Monitoring > Trace Route**, as shown below:

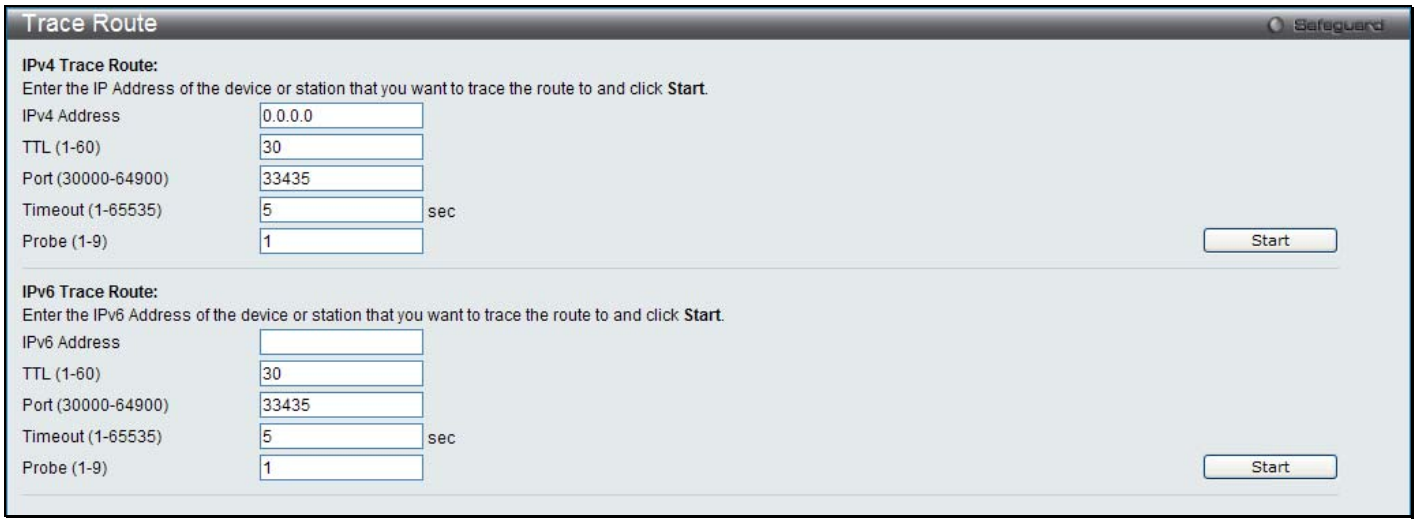


Figure 11-25 Trace Route window

The fields that can be configured are described below:

Parameter	Description
IPv4 Address / IPv6 Address	The IP address of the destination station.
TTL (1-60)	The time to live value of the trace route request. This is the maximum number of routers that a trace route packet can pass. The trace route option will cross while seeking the network path between two devices. The range for the TTL is *1* to *60* hops.
Port (30000-64900)	The port number. The value range is from *30000* to *64900*.
Timeout (1-65535)	Defines the timeout period while waiting for a response from the remote device. A value of *1* to *65535* seconds can be specified. The default is *5* seconds.
Probe (1-9)	The number of probing. The range is from *1* to *9*. If unspecified, the default value is *1*.

Click the **Start** button to initiate the Trace Route.

After clicking the **Start** button, the following page will appear:

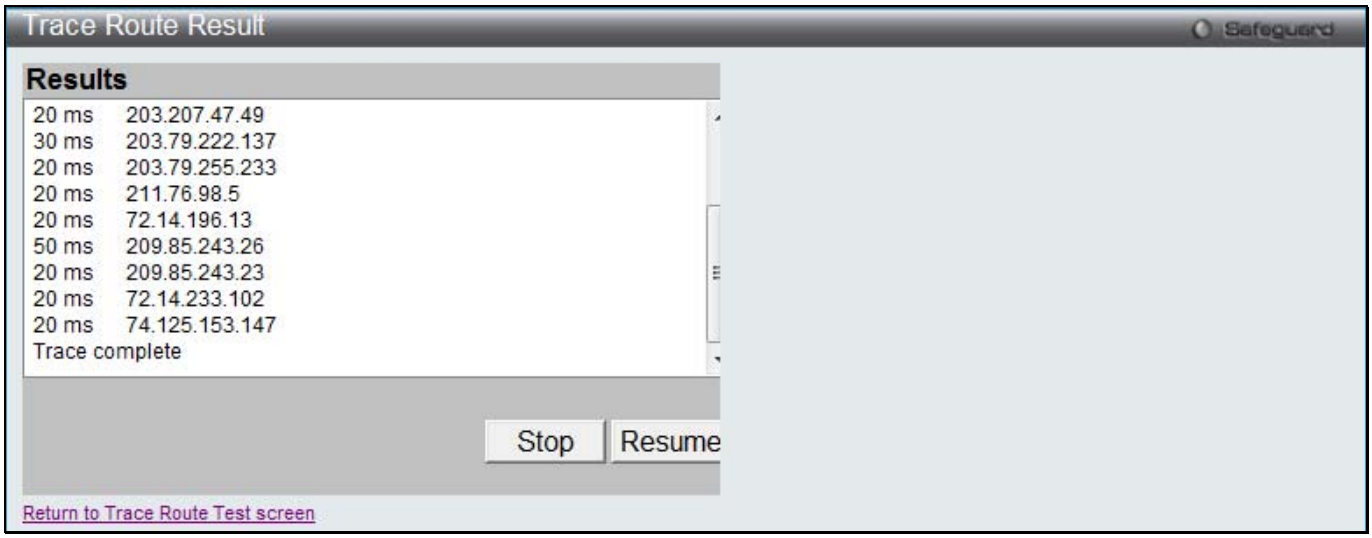


Figure 11-26 Trace Route Result window

Click the **Stop** button to halt the Trace Route.

Click the **Resume** button to resume the Trace Route.

Peripheral

Device Status

This window displays power and fan status of the Switch.

To view this window, click **Monitoring > Peripheral > Device Status**, as shown below:

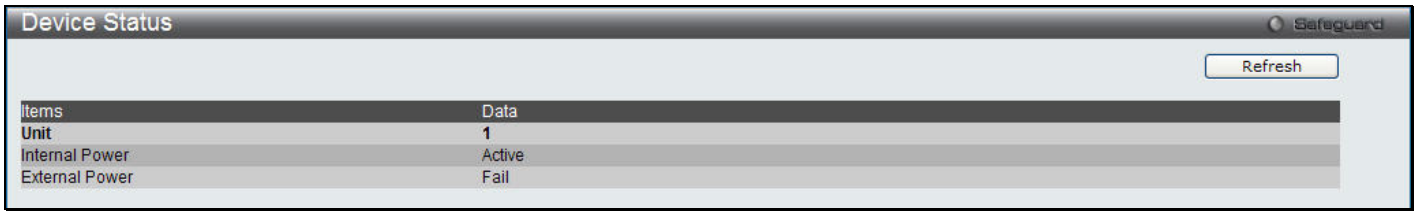


Figure 11-27 Device Status window

Click the **Refresh** button to refresh the display table.

Chapter 12 Save and Tools

Save Configuration ID 1
Save Configuration ID 2
Save Log
Save All
Stacking Information
Download Firmware
Download Configuration File
Upload Configuration File
Upload Log File
Reset
Reboot System

Save Configuration ID 1

Open the **Save** drop-down menu at the top of the Web manager and click **Save Configuration ID 1** to see the following window:

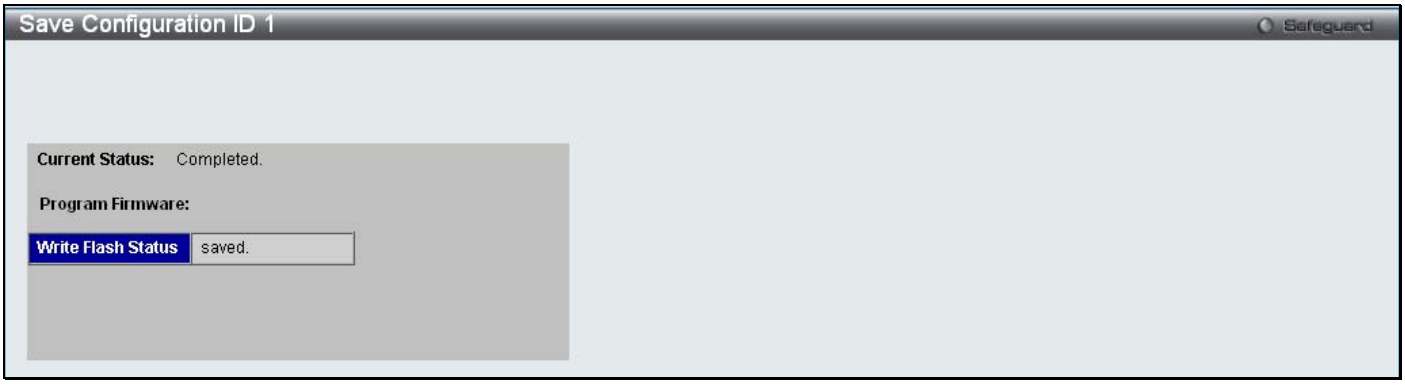


Figure 12-1 Save Configuration ID 1 window

Save Configuration ID 2

Open the **Save** drop-down menu at the top of the Web manager and click **Save Configuration ID 2** to see the following window:

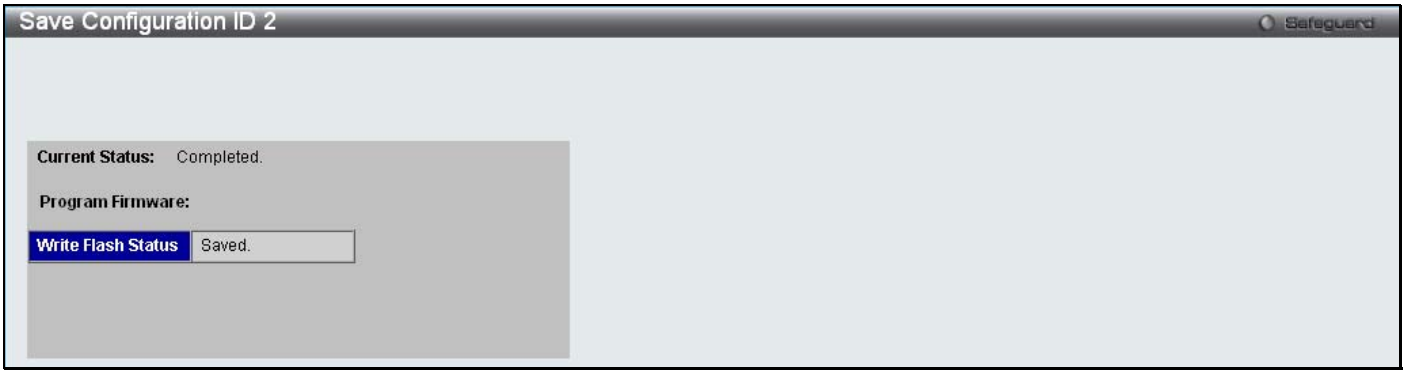


Figure 12-2 Save Configuration ID 2 window

Save Log

Open the **Save** drop-down menu at the top of the Web manager and click **Save Log** to see the following window:

Figure 12-3 Save Log window

Save All

Open the **Save** drop-down menu at the top of the Web manager and click **Save All** to see the following window:

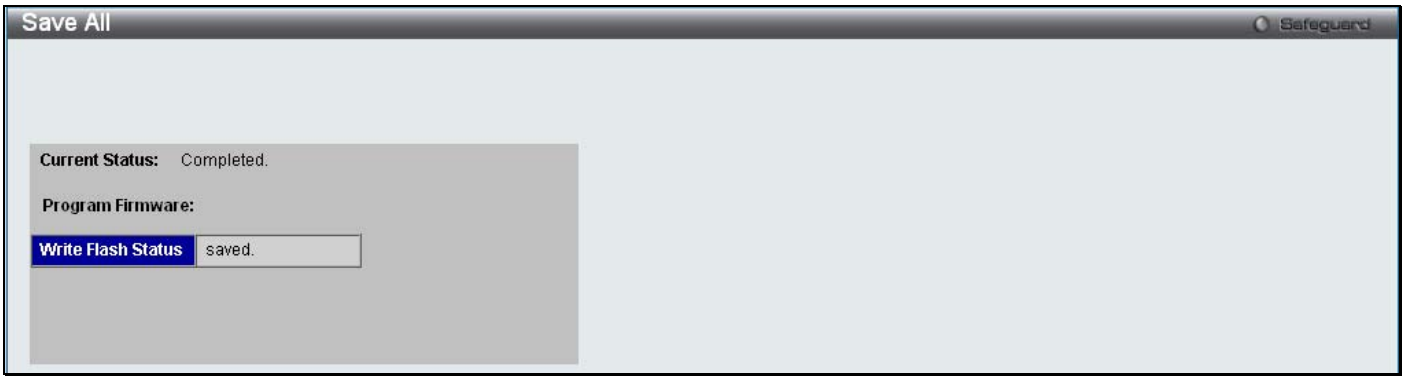


Figure 12-4 Save All window

Stacking Information

To change a switch's default stacking configuration (for example, the order in the stack), see **System Configuration > Stacking > Stacking Mode Settings** window.

The number of switches in the switch stack (up to 8 total) are displayed next to the Tools drop-down menu. The icons are in the same order as their respective Unit numbers, with the Unit 1 switch corresponding to the icon in the upper left-most corner of the icon group.

When the switches are properly interconnected through their optional Stacking Modules, information about the resulting switch stack is displayed under the **Stacking Information** link.

Open the **Tools** drop-down menu at the top of the Web manager and click **Stacking Information** to see the following window:

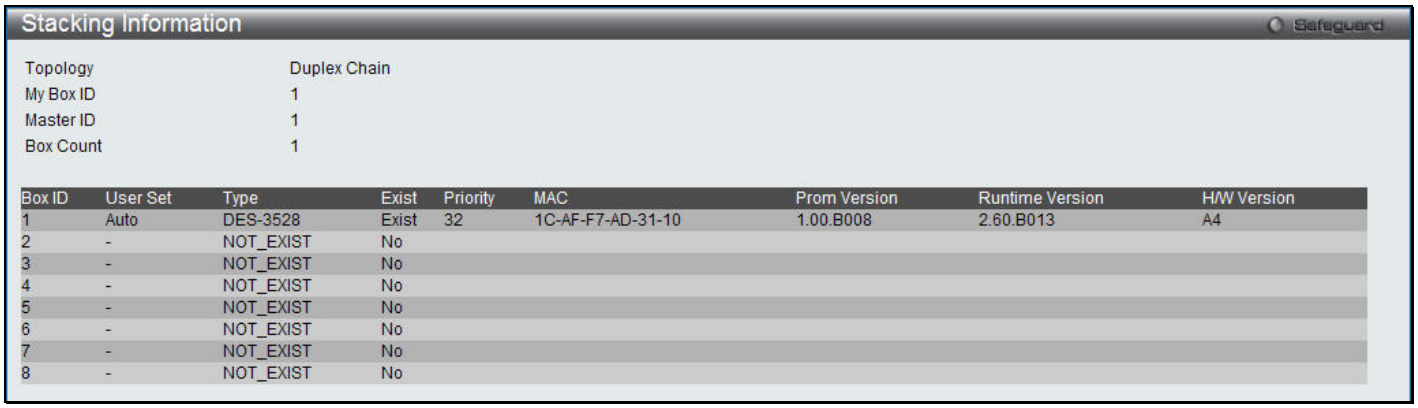


Figure 12-5 Stacking Information window

The Stacking Information window displays the following information:

Parameter	Description
Topology	Show the current topology employed using this Switch.
My Box ID	Display the Box ID of the Switch currently in use.
Master ID	Display the Unit ID number of the Primary Master of the Switch stack.
Backup Master	Display the Unit ID of the Backup Master of the switch stack.
Box Count	Display the number of switches in the switch stack.
Box ID	Display the Switch's order in the stack.
User Set	Box ID can be assigned automatically (Auto), or can be assigned statically. The default is Auto.
Type	Display the model name of the corresponding switch in a stack.
Exist	Denote whether a switch does or does not exist in a stack.
Priority	Display the priority ID of the Switch. The lower the number, the higher the priority. The box (switch) with the lowest priority number in the stack denotes the Primary Master switch.
MAC	Display the MAC address of the corresponding switch in the switch stack.
Prom Version	Show the PROM in use for the Switch. This may be different from the values shown in the illustration.
Runtime Version	Show the firmware version in use for the Switch. This may be different from the values shown in the illustrations.
H/W Version	Show the hardware version in use for the Switch. This may be different from the values shown in the illustration.

Download Firmware

This window allows the user to download firmware from a TFTP Server to the Switch and updates the switch.

Open the **Tools** drop-down menu at the top of the Web manager and click **Download Firmware** to see the following window:

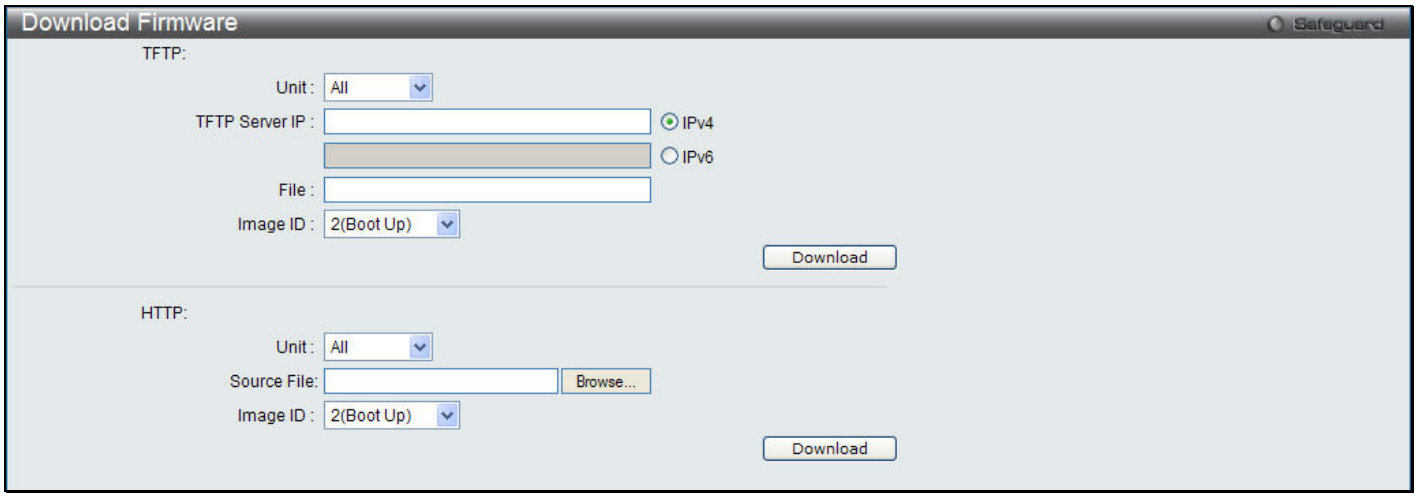


Figure 12-6 Download Firmware – TFTP window

The fields that can be configured are described below:

Parameter	Description
Unit	Use the drop-down menu to select a unit for receiving the firmware. Select *All* for all units.
TFTP Server IP	Click the IPv4 or IPv6 radio button to enter the TFTP Server IP Address.
File	Enter the location and name of the Source File.
Source File	Enter the location of the Source File or click the **Browse** button to navigate to the firmware file for the download.
Image ID	Select an image ID.

Click **Download** to initiate the download.

Download Configuration File

This page allows the user to download the configuration file from a TFTP Server to the Switch and updates the switch.

Open the **Tools** drop-down menu at the top of the Web manager and click **Download Configuration File** to see the following window:

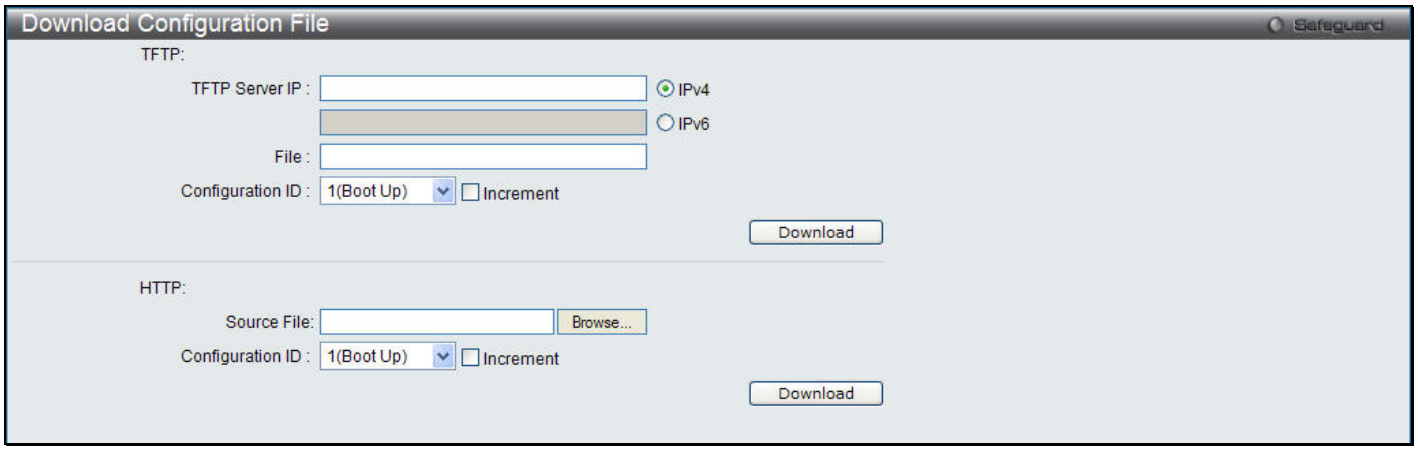


Figure 12-7 Download Configuration – TFTP window

The fields that can be configured are described below:

Parameter	Description
TFTP Server IP	Click the IPv4 or IPv6 radio button to enter the TFTP Server IP address.
File	Enter the location and name of the file.
Source File	Enter the location and name of the source file, or click the **Browse** button to navigate to the configuration file for the download.
Configuration ID	Select a configuration ID.

Click **Download** to initiate the download.

Upload Configuration File

This page allows the user to upload the configuration file from the Switch to a TFTP Server.

Open the **Tools** drop-down menu at the top of the Web manager and click **Upload Configuration File** to see the following window:

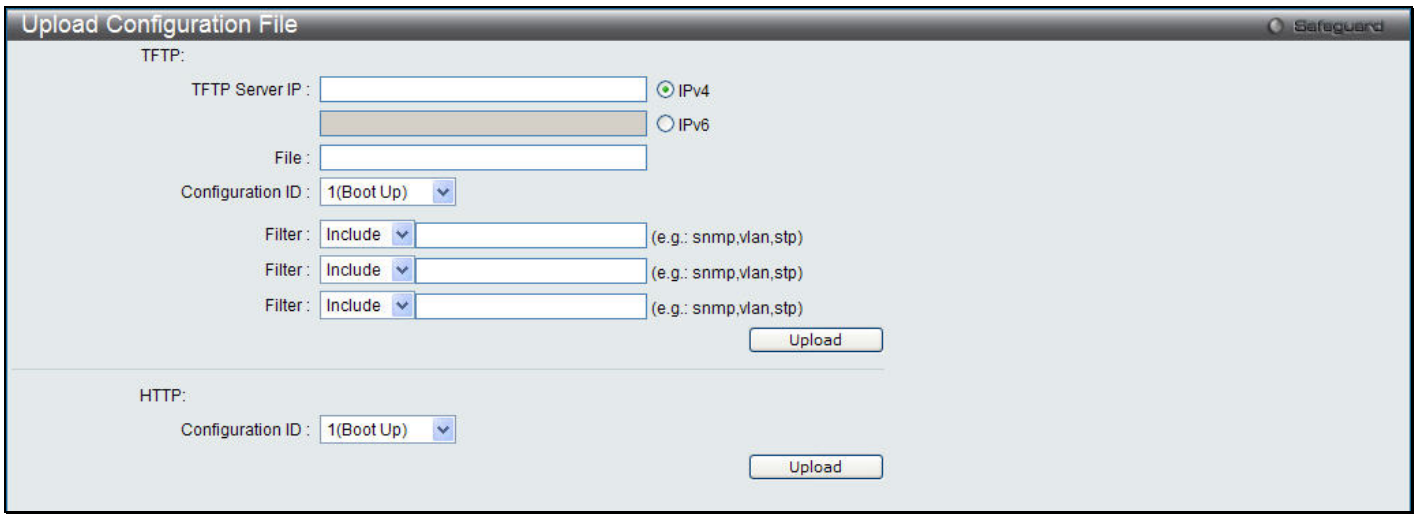


Figure 12-8 Upload Configuration – TFTP window

The fields that can be configured are described below:

Parameter	Description
TFTP Server IP	Click the IPv4 or IPv6 radio button to enter the TFTP Server IP address.
File	Enter the location and name of the file.
Configuration ID	Select a configuration ID.
Filter	Use the drop-down menu to *include, begin* or *exclude* a filter like SNMP, VLAN or STP. Select the appropriate Filter action and enter the service name in the space provided.

Click **Upload** to initiate the upload.

Upload Log File

This page allows the user to upload the log file from the Switch to a TFTP Server.

Open the **Tools** drop-down menu at the top of the Web manager and click **Upload Log File** to see the following window:

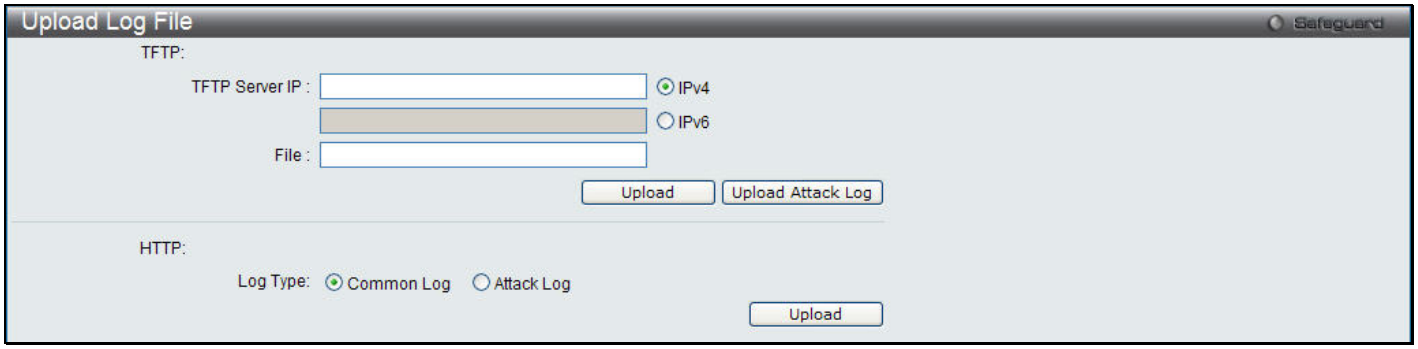


Figure 12-9 Upload Log File window

To upload a history or attack log from the Switch to a TFTP server, enter a Server IP address, and file/path name and then click **Upload** or **Upload Attack Log**.

To upload either a common log or an attack log by HTTP, click the desired Log Type in the bottom half of the window and then click **Upload**.

Reset

The Reset function has several options when resetting the Switch. Some of the current configuration parameters can be retained while resetting all other configuration parameters to their factory defaults.

NOTE: Only the Reset System option will enter the factory default parameters into the Switch's non-volatile RAM, and then restart the Switch. All other options enter the factory defaults into the current configuration, but do not save this configuration. Reset System will return the Switch's configuration to the state it was when it left the factory

NOTE: The serial port's baud rate will not be changed by the reset command. It will not be restored to the factory default setting.

Reset gives the option of retaining the Switch's User Accounts and History Log while resetting all other configuration parameters to their factory defaults. If the Switch is reset using this window, and **Save Changes** is not executed, the Switch will return to the last saved configuration when rebooted.

Open the **Tools** drop-down menu at the top of the Web manager and click **Reset** to see the following window:

Figure 12-10 Reset System window

The fields that can be configured are described below:

Parameter	Description
Reset	Selecting this option will factory reset the Switch but not the IP Address, User Accounts and the Banner.
Reset Config	Selecting this option will factory reset the Switch but not perform a Reboot.
Reset System	Selecting this option will factory reset the Switch and perform a Reboot.

Click the **Apply** button to initiate the Reset action.

Reboot System

The window is used to restart the Switch.

Open the **Tools** drop-down menu at the top of the Web manager and click **Reboot System** to see the following window:

Figure 12-11 Reboot System window

Click the Yes radio button will instruct the Switch to save the current configuration to non-volatile RAM before restarting the Switch.

Click the No radio button instructs the Switch not to save the current configuration before restarting the Switch. All of the configuration information entered from the last time Save Changes was executed will be lost.

Click the **Reboot** button to restart the Switch.

Appendix A Mitigating ARP Spoofing Attacks Using Packet Content ACL

Address Resolution Protocol (ARP) is the standard method for finding a host's hardware address (MAC address) when only its IP address is known. However, this protocol is vulnerable because crackers can spoof the IP and MAC information in the ARP packets to attack a LAN (known as ARP spoofing). This document is intended to introduce the ARP protocol, ARP spoofing attacks, and the countermeasures brought by D-Link's switches to thwart ARP spoofing attacks.

How Address Resolution Protocol Works

In the process of ARP, PC A will first issue an ARP request to query PC B's MAC address. The network structure is shown in Figure 1.

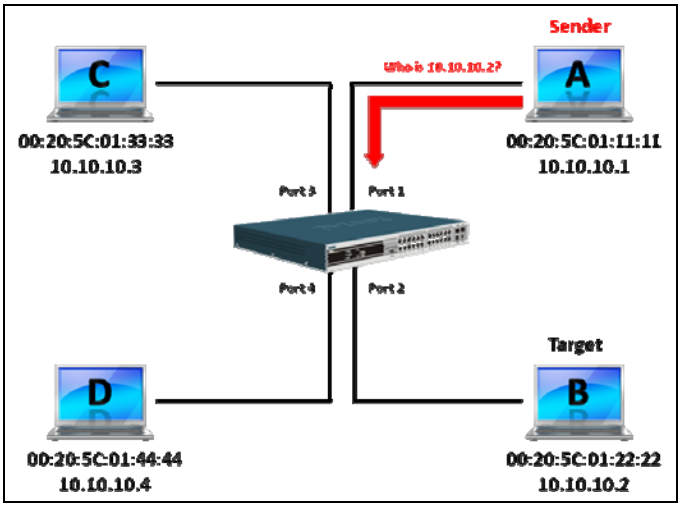


Figure 1

In the meantime, PC A's MAC address will be written into the "Sender H/W Address" and its IP address will be written into the "Sender Protocol Address" in the ARP payload. As PC B's MAC address is unknown, the "Target H/W Address" will be "00-00-00-00-00-00," while PC B's IP address will be written into the "Target Protocol Address," shown in Table1.

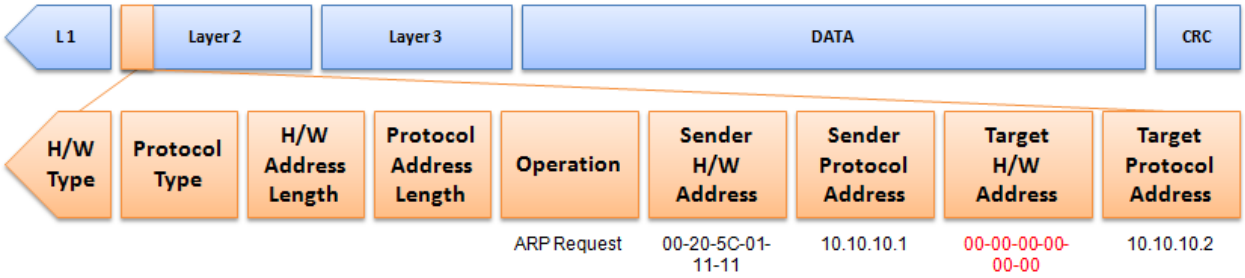


Table 1 ARP Payload

The ARP request will be encapsulated into an Ethernet frame and sent out. As can be seen in Table 2, the "Source Address" in the Ethernet frame will be PC A's MAC address. Since an ARP request is sent via broadcast, the "Destination address" is in a format of Ethernet broadcast (FF-FF-FF-FF-FF-FF).

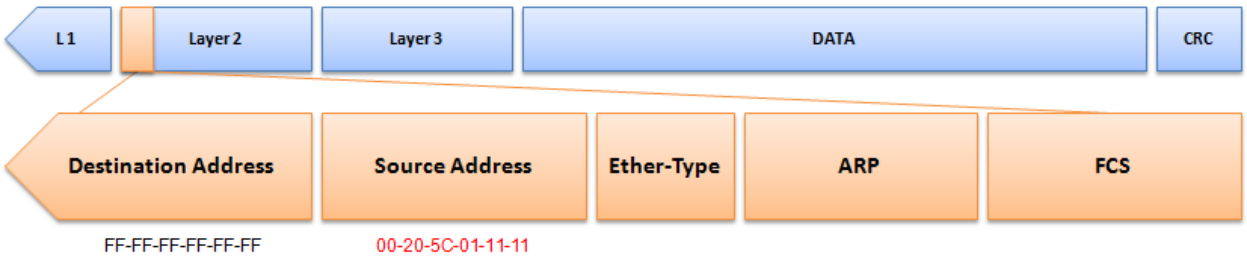


Table 2 Ethernet Frame Format

When the switch receives the frame, it will check the “Source Address” in the Ethernet frame’s header. If the address is not in its Forwarding Table, the switch will learn PC A’s MAC and the associated port into its Forwarding Table.

In addition, when the switch receives the broadcasted ARP request, it will flood the frame to all ports except the source port, port 1 (see Figure 2).

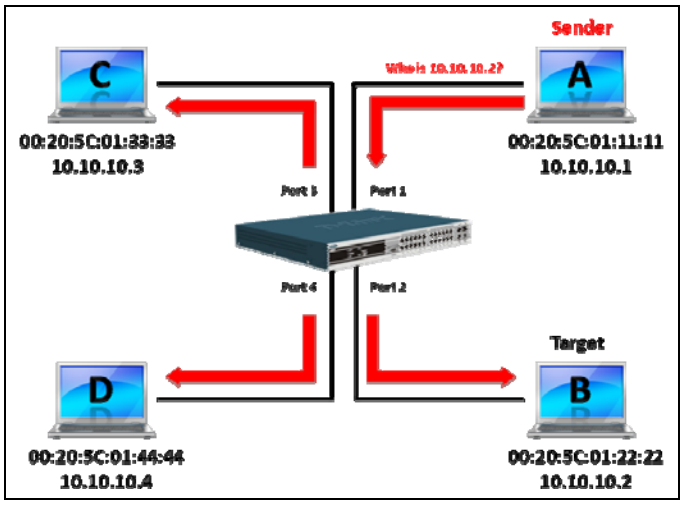


Figure 2

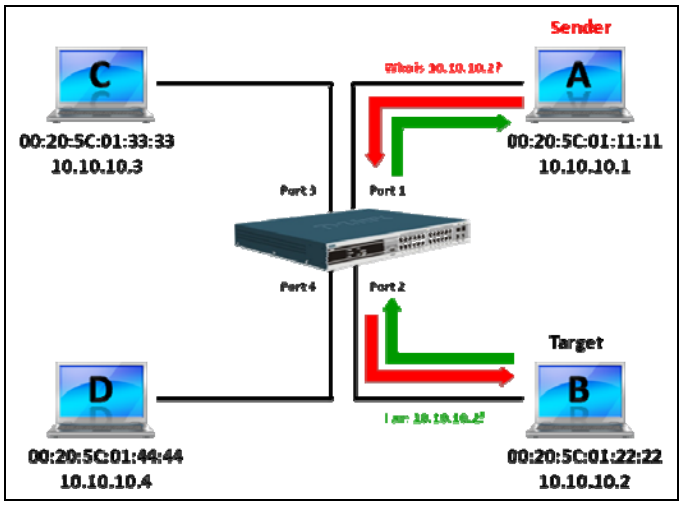


Figure 3

When PC B replies to the ARP request, its MAC address will be written into “Target H/W Address” in the ARP payload shown in Table 3. The ARP reply will be then encapsulated into an Ethernet frame again and sent back to the sender. The ARP reply is in a form of Unicast communication.

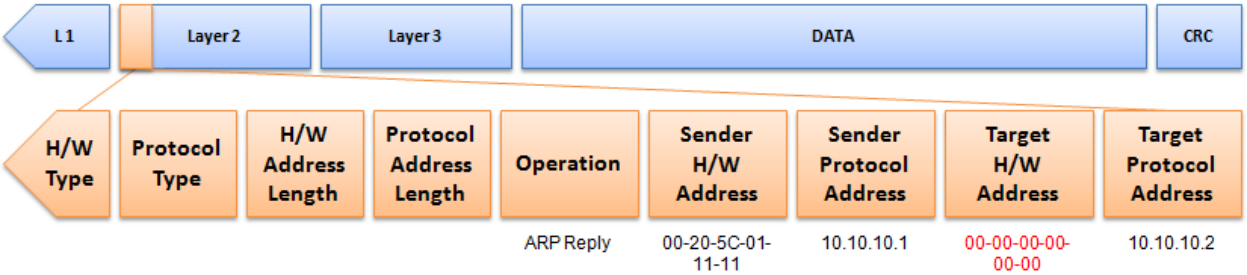


Table 3 ARP Payload

When PC B replies to the query, the “Destination Address” in the Ethernet frame will be changed to PC A’s MAC address. The “Source Address” will be changed to PC B’s MAC address (see Table 4).

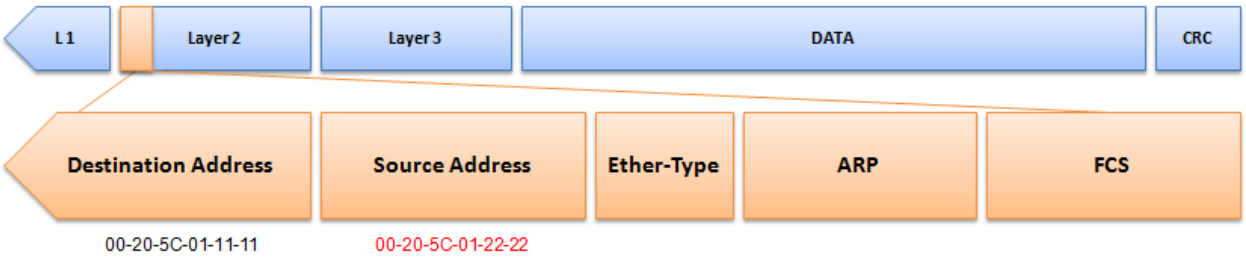
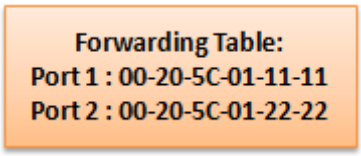


Table 4 Ethernet Frame Format

The switch will also examine the “Source Address” of the Ethernet frame and find that the address is not in the Forwarding Table. The switch will learn PC B’s MAC and update its Forwarding Table.



How ARP Spoofing Attacks a Network

ARP spoofing, also known as ARP poisoning, is a method to attack an Ethernet network which may allow an attacker to sniff data frames on a LAN, modify the traffic, or stop the traffic altogether (known as a Denial of Service – DoS attack). The principle of ARP spoofing is to send the fake, or spoofed ARP messages to an Ethernet network. Generally, the aim is to associate the attacker's or random MAC address with the IP address of another node (such as the default gateway). Any traffic meant for that IP address would be mistakenly re-directed to the node specified by the attacker.

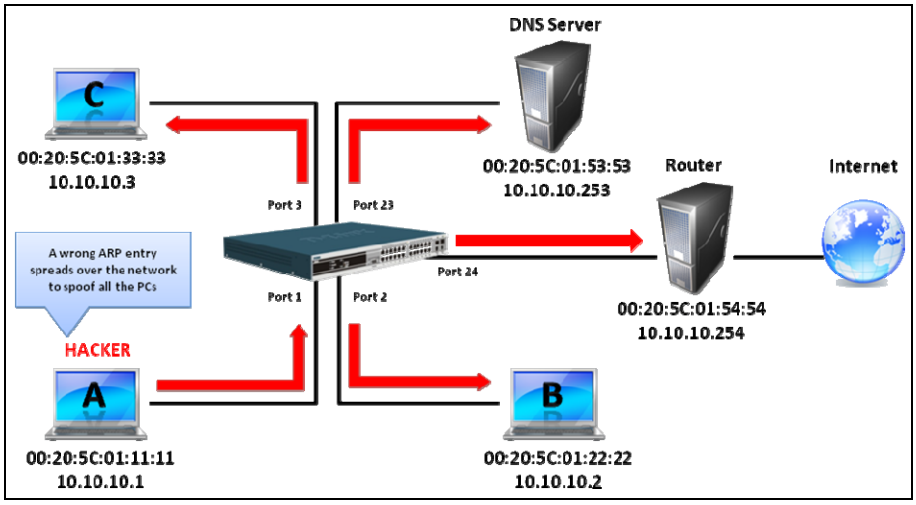
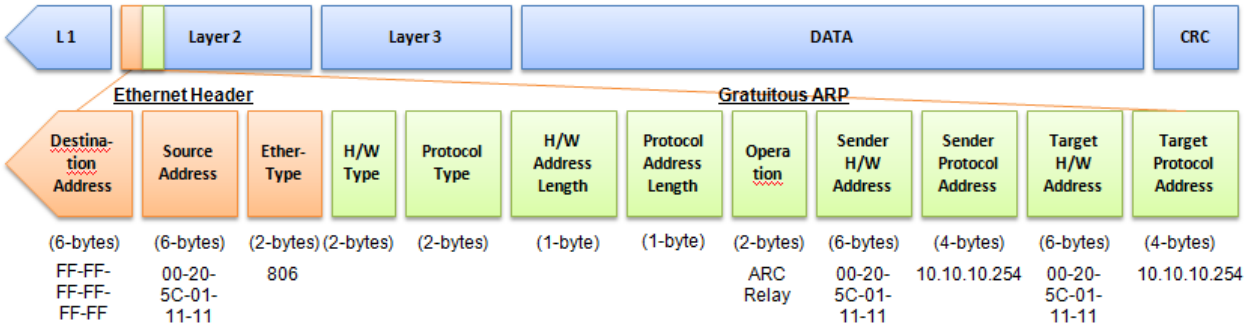


Figure 4

IP spoofing attack is caused by Gratuitous ARP that occurs when a host sends an ARP request to resolve its own IP address. Figure-4 shows a hacker within a LAN to initiate ARP spoofing attack.

In the Gratuitous ARP packet, the “Sender protocol address” and “Target protocol address” are filled with the same source IP address itself. The “Sender H/W Address” and “Target H/W address” are filled with the same source MAC address itself. The destination MAC address is the Ethernet broadcast address (FF-FF-FF-FF-FF-FF). All nodes within the network will immediately update their own ARP table in accordance with the sender’s MAC and IP address. The format of Gratuitous ARP is shown in the following table.



A common DoS attack today can be done by associating a nonexistent or any specified MAC address to the IP address of the network's default gateway. The malicious attacker only needs to broadcast one Gratuitous ARP to the network claiming it is the gateway so that the whole network operation will be turned down as all packets to the Internet will be directed to the wrong node.

Likewise, the attacker can either choose to forward the traffic to the actual default gateway (passive sniffing) or modify the data before forwarding it (man-in-the-middle attack).

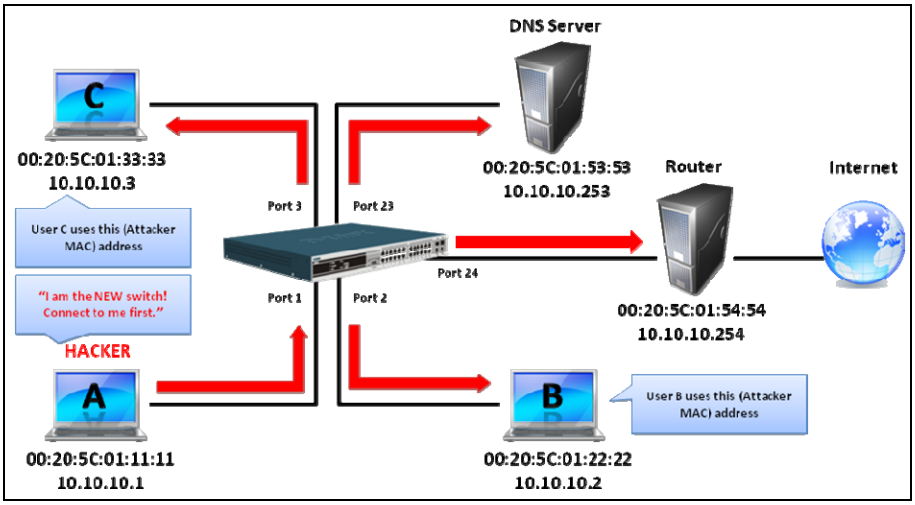


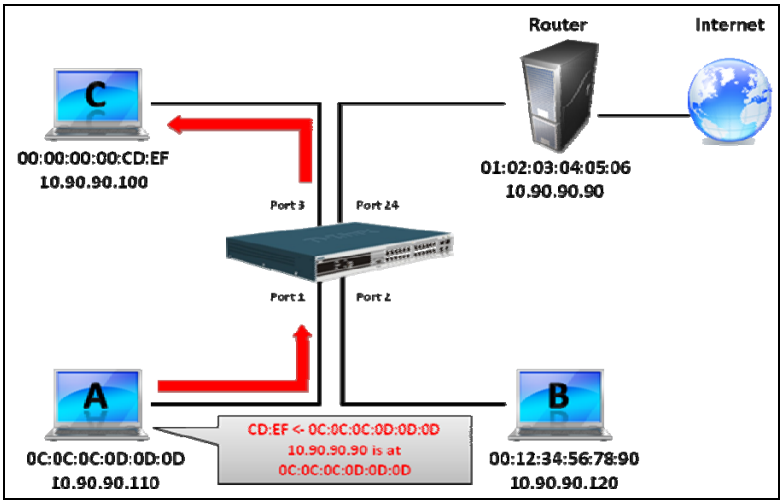
Figure 5

The hacker cheats the victim PC that it is a router and cheats the router that it is the victim. As can be seen in Figure 5 all traffic will be then sniffed by the hacker but the users will not discover.

Prevent ARP Spoofing via Packet Content ACL

D-Link managed switches can effectively mitigate common DoS attacks caused by ARP spoofing via a unique Package Content ACL.

For the reason that basic ACL can only filter ARP packets based on packet type, VLAN ID, Source, and Destination MAC information, there is a need for further inspections of ARP packets. To prevent ARP spoofing attack, we will demonstrate here via using Packet Content ACL on the Switch to block the invalid ARP packets which contain faked gateway's MAC and IP binding.



Configuration

The configuration logic is as follows:

1. Only if the ARP matches Source MAC address in Ethernet, Sender MAC address and Sender IP address in ARP protocol can pass through the switch. (In this example, it is the gateway's ARP.)

2. The switch will deny all other ARP packets which claim they are from the gateway's IP.

The design of Packet Content ACL on the Switch enables users to inspect any offset chunk. An offset chunk is a 4-byte block in a HEX format, which is utilized to match the individual field in an Ethernet frame. Each profile is allowed to contain up to a maximum of four offset chunks. Furthermore, only one single profile of Packet Content ACL can be supported per switch. In other words, up to 16 bytes of total offset chunks can be applied to each profile and a switch. Therefore, a careful consideration is needed for planning and configuration of the valuable offset chunks.

In Table 6, you will notice that the Offset_Chunk0 starts from the 127th byte and ends at the 128th byte. It also can be found that the offset chunk is scratched from 1 but not zero.

Offset Chunk	Offset Chunk0	Offset Chunk1	Offset Chunk2	Offset Chunk3	Offset Chunk4	Offset Chunk5	Offset Chunk6	Offset Chunk7	Offset Chunk8	Offset Chunk9	Offset Chunk10	Offset Chunk11	Offset Chunk12	Offset Chunk13	Offset Chunk14	Offset Chunk15
Byte	127	3	7	11	15	19	23	27	31	35	39	43	47	51	55	59
Byte	128	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
Byte	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61
Byte	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62

Offset Chunk	Offset Chunk16	Offset Chunk17	Offset Chunk18	Offset Chunk19	Offset Chunk20	Offset Chunk21	Offset Chunk22	Offset Chunk23	Offset Chunk24	Offset Chunk25	Offset Chunk26	Offset Chunk27	Offset Chunk28	Offset Chunk29	Offset Chunk30	Offset Chunk31
Byte	63	67	71	75	79	83	87	91	95	99	103	107	111	115	119	123
Byte	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124
Byte	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125
Byte	66	70	74	78	82	86	90	94	98	102	106	110	114	118	122	126

Table 6. Chunk and Packet Offset

The following table indicates a completed ARP packet contained in Ethernet frame which is the pattern for the calculation of packet offset.

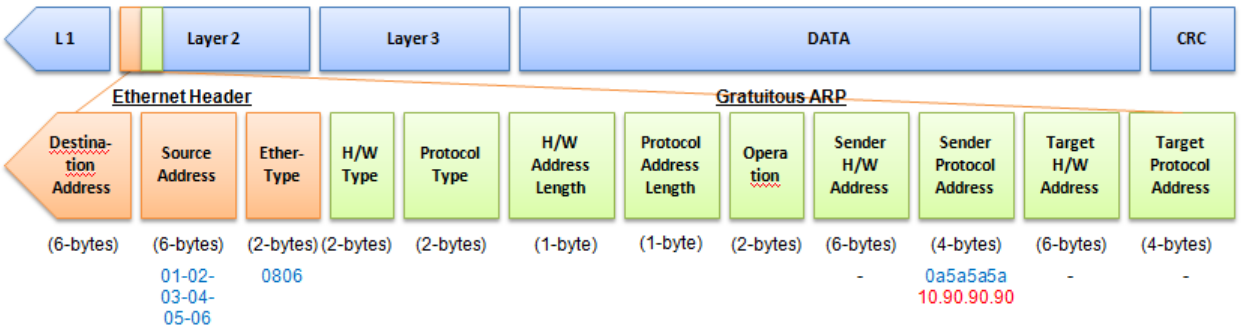


Table 5 A Completed ARP Packet Contained in an Ethernet Frame

	Command	Description
Step 1:	**create access_profile profile_id 1 profile_name 1 ethernet source_mac FF-FF-FF-FF-FF-FF ethernet_type**	Create access profile 1 to match Ethernet Type and Source MAC address.
Step 2:	**config access_profile profile_id 1 add access_id 1 ethernet source_mac 01-02-03-04-05-06 ethernet_type**	Configure access profile 1 Only if the gateway's ARP packet that contains the

	0x806 port 1-12 permit	correct Source MAC in the Ethernet frame can pass through the switch.
Step 3:	**create access_profile profile_id 2 profile_name 2 packet_content_mask offset_chunk_1 3 0xFFFF offset_chunk_2 7 0xFFFF offset_chunk_3 8 0xFFFF0000**	Create access profile 2 The first chunk starts from Chunk 3 mask for Ethernet Type. (Blue in Table 6, 13th and 14th bytes) The second chunk starts from Chunk 7 mask for Sender IP in ARP packet. (Green in Table 6, 29th and 30th bytes) The third chunk starts from Chunk 8 mask for Sender IP in ARP packet. (Brown in Table 6, 31st and 32nd bytes)
Step 4:	**config access_profile profile_id 2 add access_id 1 packet_content offset_chunk_1 0x00000806 offset_chunk_2 0x00000A5A offset_chunk_3 0x5A5A0000 port 1-12 deny**	Configure access profile 2. The rest of the ARP packets whose Sender IP claim they are the gateway's IP will be dropped.
Step 5:	**save**	Save configuration.

Appendix B System Log and Trap List

System Log Entries

The following table lists all possible entries and their corresponding meanings that will appear in the System Log of this Switch.

Category	Event Description	Log Information	Severity
system	System warm start	[Unit <unitID>,] System warm start	Critical
	System cold start	[Unit <unitID>,] System cold start	Critical
	Configuration saved to flash	[Unit <unitID>,] Configuration saved to flash (Username: <username>)	Informational
	System log saved to flash	[Unit <unitID>,] System log saved to flash (Username: <username>)	Informational
	Configuration and log saved to flash	[Unit <unitID>,] Configuration and log saved to flash(Username: <username>)	Informational
	Internal Power failed	[Unit <unitID>,] Internal Power failed	Critical
	Internal Power is recovered	[Unit <unitID>,] Internal Power is recovered	Critical
	Redundant Power failed	[Unit <unitID>,] Redundant Power failed	Critical
	Redundant Power is working	[Unit <unitID>,] Redundant Power is working	Critical
	Access flash failed	[Unit <unitID>,] Access flash failed (operation: <operation>, physical address: <address>)	Warning
	Temperature sensor alarms	[Unit <unitID>,] Temperature sensor <sensorID> enters alarm state(threshold: <temperature>)	Warning
	Temperature sensor recoveries	[Unit <unitID>,] Temperature sensor <sensorID> enters normal state(threshold: <temperature>)	Informational
up/down-load	Firmware upgraded successfully	[Unit <unitID>,] Firmware upgraded by console successfully (Username: <username>)	Informational
	Firmware upgrade was unsuccessful	[Unit <unitID>,] Firmware upgrade by console was unsuccessful! (Username: <username>)	Warning
	Configuration successfully downloaded	Configuration successfully downloaded by console(Username: <username>)	Informational
	Configuration download was unsuccessful	Configuration download by console was unsuccessful! (Username: <username>)	Warning
	Configuration successfully uploaded	Configuration successfully uploaded by console (Username: <username>)	Informational
	Configuration upload was unsuccessful	Configuration upload by console was unsuccessful! (Username: <username>)	Warning

	Log message successfully uploaded	Log message successfully uploaded by console (Username: <username>)	Informational
	Log message upload was unsuccessful	Log message upload by console was unsuccessful! (Username: <username>)	Warning
Interface	Port link up	Port <unitID:portNum> link up, <link state>	Informational
	Port link down	Port <unitID:portNum> link down	Informational
Console	Successful login through Console	[Unit <unitID>,] Successful login through Console (Username: <username>)	Informational
	Login failed through Console	[Unit <unitID>,] Login failed through Console (Username: <username>)	Warning
	Logout through Console	[Unit <unitID>,] Logout through Console (Username: <username>)	Informational
	Console session timed out	[Unit <unitID>,] Console session timed out (Username: <username>)	Informational
Web	Successful login through Web	Successful login through Web (Username: <username>, IP: <ipaddr>)	Informational
	Login failed through Web	Login failed through Web (Username: <username>, IP: <ipaddr>)	Warning
	Logout through Web	Logout through Web (Username: <username>, IP: <ipaddr>)	Informational
SSL	Successful login through Web(SSL)	Successful login through Web (SSL) (Username: <username>, IP: <ipaddr>)	Informational
	Login failed through Web(SSL)	Login failed through Web (SSL) (Username: <username>, IP: <ipaddr>)	Warning
	Logout through Web(SSL)	Logout through Web (SSL) (Username: <username>, IP: <ipaddr>)	Informational
	Web(SSL) session timed out	Web(SSL) session timed out (Username: <username>, IP: <ipaddr>)	Informational
Telnet	Successful login through Telnet	Successful login through Telnet (Username: <username>, IP: <ipaddr>)	Informational
	Login failed through Telnet	Login failed through Telnet (Username: <username>, IP: <ipaddr>)	Warning
	Logout through Telnet	Logout through Telnet (Username: <username>, IP: <ipaddr>)	Informational
	Telnet session timed out	Telnet session timed out (Username: <username>, IP: <ipaddr>)	Informational
SNMP	SNMP request received with invalid community string	SNMP request received from <ipAddress> with invalid community string!	Informational
STP	Topology changed	Topology changed	Informational
	New Root selected	New Root selected	Informational
	BPDU Loop Back on port	BPDU Loop Back on Port <unitID:portNum>	Warning

	Spanning Tree Protocol is enabled	Spanning Tree Protocol is enabled	Informational
	Spanning Tree Protocol is disabled	Spanning Tree Protocol is disabled	Informational
SSH	Successful login through SSH	Successful login through SSH (Username: <username>, IP: <ipaddr>)	Informational
	Login failed through SSH	Login failed through SSH (Username: <username>, IP: <ipaddr>)	Warning
	Logout through SSH	Logout through SSH (Username: <username>, IP: <ipaddr>)	Informational
	SSH session timed out	SSH session timed out (Username: <username>, IP: <ipaddr>)	Informational
	SSH server is enabled	SSH server is enabled	Informational
	SSH server is disabled	SSH server is disabled	Informational
AAA	Authentication Policy is enabled	Authentication Policy is enabled (Module: AAA)	Informational
	Authentication Policy is disabled	Authentication Policy is disabled (Module: AAA)	Informational
	Successful login through Console authenticated by AAA local method	Successful login through Console authenticated by AAA local method (Username: <username>)	Informational
	Login failed through Console authenticated by AAA local method	Login failed through Console authenticated by AAA local method (Username: <username>)	Warning
	Successful login through Web authenticated by AAA local method	Successful login through Web from <userIP> authenticated by AAA local method (Username: <username>)	Informational
	Login failed through Web authenticated by AAA local method	Login failed failed through Web from <userIP> authenticated by AAA local method (Username: <username>)	Warning
	Successful login through Web(SSL) authenticated by AAA local method	Successful login through Web(SSL) from <userIP> authenticated by AAA local method (Username: <username>)	Informational
	Login failed through Web(SSL) authenticated by AAA local method	Login failed through Web(SSL) from <userIP> authenticated by AAA local method (Username: <username>)	Warning
	Successful login through Telnet authenticated by AAA local method	Successful login through Telnet from <userIP> authenticated by AAA local method (Username: <username>)	Informational
	Login failed through Telnet authenticated by AAA local method	Login failed through Telnet from <userIP> authenticated by AAA local method (Username: <username>)	Warning
	Successful login through SSH authenticated by AAA local method	Successful login through SSH from <userIP> authenticated by AAA local method (Username: <username>)	Informational
	Login failed through SSH authenticated by AAA local	Login failed through SSH from <userIP> authenticated by AAA local method (Username: <username>)	Warning

	method		
	Successful login through Console authenticated by AAA none method	Successful login through Console authenticated by AAA none method (Username: <username>)	Informational
	Successful login through Web authenticated by AAA none method	Successful login through Web from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful login through Web(SSL) authenticated by AAA none method	Successful login through Web(SSL) from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful login through Telnet authenticated by AAA none method	Successful login through Telnet from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful login through SSH authenticated by AAA none method	Successful login through SSH from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful login through Console authenticated by AAA server	Successful login through Console authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Login failed through Console authenticated by AAA server	Login failed through Console authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Successful login through Web authenticated by AAA server	Successful login through Web from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Login failed through Web authenticated by AAA server	Login failed through Web from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Successful login through Web(SSL) authenticated by AAA server	Successful login through Web(SSL) from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Login failed through Web(SSL) authenticated by AAA server	Login failed through Web(SSL) from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Login failed through Web(SSL) due to AAA server timeout or improper configuration	Login failed through Web(SSL) from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Successful login through Telnet authenticated by AAA server	Successful login through Telnet from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Login failed through Telnet authenticated by AAA server	Login failed through Telnet from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Successful login through SSH authenticated by AAA server	Successful login through SSH from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Login failed through SSH authenticated by AAA server	Login failed through SSH from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning

	Successful Enable Admin through Console authenticated by AAA local_enable method	Successful Enable Admin through Console authenticated by AAA local_enable method (Username: <username>)	Informational
	Enable Admin failed through Console authenticated by AAA local_enable method	Enable Admin failed through Console authenticated by AAA local_enable method (Username: <username>)	Warning
	Successful Enable Admin through Web authenticated by AAA local_enable method	Successful Enable Admin through Web from <userIP> authenticated by AAA local_enable method (Username: <username>)	Informational
	Enable Admin failed through Web authenticated by AAA local_enable method	Enable Admin failed through Web from <userIP> authenticated by AAA local_enable method (Username: <username>)	Warning
	Successful Enable Admin through Telnet authenticated by AAA local_enable method	Successful Enable Admin through Telnet from <userIP> authenticated by AAA local_enable method (Username: <username>)	Informational
	Enable Admin failed through Telnet authenticated by AAA local_enable method	Enable Admin failed through Telnet from <userIP> authenticated by AAA local_enable method (Username: <username>)	Warning
	Successful Enable Admin through SSH authenticated by AAA local_enable method	Successful Enable Admin through SSH from <userIP> authenticated by AAA local_enable method (Username: <username>)	Informational
	Enable Admin failed through SSH authenticated by AAA local_enable method	Enable Admin failed through SSH from <userIP> authenticated by AAA local_enable method (Username: <username>)	Warning
	Successful Enable Admin through Console authenticated by AAA none method	Successful Enable Admin through Console authenticated by AAA none method (Username: <username>)	Informational
	Successful Enable Admin through Web authenticated by AAA none method	Successful Enable Admin through Web from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful Enable Admin through Telnet authenticated by AAA none method	Successful Enable Admin through Telnet from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful Enable Admin through SSH authenticated by AAA none method	Successful Enable Admin through SSH from <userIP> authenticated by AAA none method (Username: <username>)	Informational
	Successful Enable Admin through Console authenticated by AAA server	Successful Enable Admin through Console authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Enable Admin failed through Console authenticated by AAA server	Enable Admin failed through Console authenticated by AAA server <serverIP> (Username: <username>)	Warning

	Successful Enable Admin through Web authenticated by AAA server	Successful Enable Admin through Web from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Enable Admin failed through Web authenticated by AAA server	Enable Admin failed through Web from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Successful Enable Admin through Telnet authenticated by AAA server	Successful Enable Admin through Telnet from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Enable Admin failed through Telnet authenticated by AAA server	Enable Admin failed through Telnet from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Successful Enable Admin through SSH authenticated by AAA server	Successful Enable Admin through SSH from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational
	Enable Admin failed through SSH authenticated by AAA server	Enable Admin failed through SSH from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning
	Login failed through Console due to AAA server timeout or improper configuration.	Login failed through Console due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Enable Admin failed through Console due to AAA server timeout or improper configuration.	Enable Admin failed through Console due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Login failed through Web from user due to AAA server timeout or improper configuration.	Login failed through Web from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Enable Admin failed through Web from user due to AAA server timeout or improper configuration.	Enable Admin failed through Web from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Login failed through Web(SSL) from user due to AAA server timeout or improper configuration	Login failed through Web(SSL) from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Enable Admin failed through Web(SSL) from <userIP> due to AAA server timeout or improper configuration.	Enable Admin failed through Web(SSL) from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Login failed through Telnet from user due to AAA server timeout or improper configuration.	Login failed through Telnet from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Enable Admin failed through Telnet from user due to AAA server timeout or improper configuration.	Enable Admin failed through Telnet from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning

	Login failed through SSH from user due to AAA server timeout or improper configuration.	Login failed through SSH from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	Enable Admin failed through SSH from user due to AAA server timeout or improper configuration.	Enable Admin failed through SSH from <userIP> due to AAA server timeout or improper configuration (Username: <username>)	Warning
	AAA server response is wrong	AAA server <serverIP> (Protocol: <protocol>) response is wron	Warning
	AAA doesn't support this functionality	AAA doesn't support this functionality	Informational
Port security	Port security has exceeded its maximum learning size and will not learn any new addresses	Port security violation mac addrss <macaddr> on locking address full port <unitID:portNum>	Warning
Safeguard Engine	Safeguard Engine is in normal mode	Safeguard Engine enters NORMAL mode	Informational
	Safeguard Engine is in filtering packet mode	Safeguard Engine enters EXHAUSTED mode	Warning
Packet Storm	Broadcast strom occurrence	Port <portNum> Broadcast storm is occurring	Warning
	Broadcast storm cleared	Port <portNum> Broadcast storm has cleared	Informational
	Multicast storm occurrence	Port <portNum> Multicast storm is occurring	Warning
	Multicast storm cleared	Port <portNum> Multicast storm has cleared	Informational
	Port shut down due to a packet storm	Port <portNum> is currently shut down due to a packet storm	Warning
IP-MAC-PORT Binding	Unauthenticated ip address and discard by ip mac port binding	Unauthenticated IP-MAC address and discarded by ip mac port binding (IP: <ipaddr>, MAC: <macaddr>, Port <portNum>)	Warning
	Unauthenticated IP address encountered and discarded by ip IP-MAC port binding	Unauthenticated IP-MAC address and discarded by IP-MAC port binding (IP: <ipaddr>, MAC: <macaddr>, Port: <portNum>)	Warning
	Dynamic IMPB entry is conflict with static ARP	Dynamic IMPB entry is conflict with static ARP(IP: <ipaddr>, MAC: <macaddr>, Port: <[unitID:]portNum>)	Informational
	Dynamic IMPB entry conflicts with static IMPB	Dynamic IMPB entry conflicts with static IMPB: IP: <ipaddr>, MAC: <macaddr>, Port: <[unitID:]portNum>	Informational
	Dynamic IMPB entry cannot be created	Creating IMPB entry Failed due to no ACL rule available: IP: <ipaddr>, MAC: <macaddr>, Port: <[unitID:]portNum>	Informational
	Port enter IMPB block state	Port <[unitID:]portNum> enter IMPB block state	Informational
	Port recover from IMPB block state	Port <[unitID:]portNum> recover from IMPB block state	Informational
LBD	LBD loop occurred	Port <portNum> LBD loop occurred. Port blocked	Critical
	LBD port recovered. Loop detection restarted	Port <portNum> LBD port recovered. Loop detection restarted	Informational
	LBD loop occurred. Packet discard begun	Port <portNum> VID <vid> LBD loop occurred. Packet discard begun	Critical
	LBD recovered. Loop	Port <portNum> VID <vid> LBD recovered. Loop detection	Informational

	detection restarted	restarted	
	Loop vlan number overflow,	Loop VLAN number overflow	Informational
DOS	Spoofing attack	Possible spoofing attack from IP <ipaddr> MAC <macaddr> port <[unitID:]portNum>	Critical
JWAC	A user fails to pass the authentication	JWAC unauthenticated user (Username: <string>, IP: <ipaddr>, MAC: <macaddr>, Port: <[unitID:]portNum>)	Warning
	system stop learning	JWAC enters stop learning state.	Warning
	system recover learning	JWAC recovers from stop learning state.	Warning
WAC	A user fails to pass the authentication	WAC unauthenticated user (Username: <string>, IP: <ipaddr>, MAC: <macaddr>, Port: <[unitID:]portNum>)	Warning
	system stop learning	WAC enters stop learning state.	Warning
	system recover learning	WAC recovers from stop learning state.	Warning
MAC	Login OK	MAC-AC login successful (MAC: <macaddr>, Port: <[unitID:]portNum>, VID: <vid>)	Information
	Login fail	MAC-AC login rejected (MAC: <macaddr>, Port: <[unitID:]portNum>, VID: <vid>)	Warning
	Logout normal	MAC-AC host aged out (MAC: <macaddr>, Port: <[unitID:]portNum>, VID: <vid>)	Information
IP and Password Changed	IP Address change activity	Unit <unitID>,Management IP address was changed by (Username: <username>,IP:<ipaddr>)	Informational
	Password change activity	Unit <unitID>,Password was changed by (Username: <username>,IP:<ipaddr>)	Informational
Gratuitous ARP	Conflict IP was detected with this device	Conflict IP was detected with this device (IP: <ipaddr>, MAC: <macaddr>, Port <[unitID:]portNum>, Interface: <ipif_name>)	Informational
CFM	CFM remote detects a defect	CFM remote detects a defect. MD Level:<level>, VLAN:<vid>, Local(Port <portNum>, Direction:<direcrtion>)	Informational
	CFM remote MAC error	CFM remote MAC error. MD Level:<level>, VLAN:<vid>, Local(Port <portNum>, Direction:<direcrtion>)	Warning
	CFM remote down	CFM remote down. MD Level:<level>, VLAN:<vid>, Local(Port %S, Direction:<direcrtion>)	Warning
	CFM error ccm	CFM error ccm. MD Level:<level>, VLAN:<vid>, Local(Port <portNum>, Direction:<direcrtion>) Remote(MEPID:<mepid>,MAC:<macaddr>)	Warning
	CFM cross-connect	CFM cross-connect. VLAN:<vid>, Local(MD Level:<level>, Port <portNum>, Direction:<direcrtion>) Remote(MEPID:<mepid>,MAC:<macaddr>)	Critical
Stacking	Hot insert	Unit <unitID>, MAC:<macaddr> Hot insert	Informational
	Hot remove	Unit <unitID>, MAC:<macaddr> Hot remove	Informational
	Firmware upgraded to SLAVE successfully	Firmware upgraded to SLAVE by console successfully (Username: <username>)	Informational
	Firmware upgraded to SLAVE unsuccessfully	Firmware upgraded to SLAVE by console unsuccessfully! (Username: <username>)	Warning
	Stacking topology change.	Stacking topology is <Stack_TP_TYPE>. Master(Unit <unitID>, MAC:<macaddr>).	Informational
	box id conflict	Unit <unitID> Conflict	Informational
BPDU Attack Protection	Port enter BPDU under attacking state	Port <[unitID:] portNum> enter BPDU under attacking state (mode: <mode>)	Informational

	Port recover from BPDU under attacking state manually	Port <[unitID:] portNum> recover from BPDU under attacking state manually	Informational
	Port recover from BPDU under attacking state automatically	Port <[unitID:] portNum> recover from BPDU under attacking state automatically	Informational
DHCP	Detect untrusted DHCP server IP address	Detected untrusted DHCP server(IP: <ipaddr>, Port: <[unitID:]portNum>)	Informational
Voice VLAN	New voice device detected	New voice device detected :<macaddr>, Trunk:<trunk_ID>	Informational
	Trunk add into voice VLAN	Trunk <trunk_ID> add into voice VLAN <vid>	Informational
	Trunk remove from voice VLAN	Trunk <trunk_ID> remove from voice VLAN <vid>	Informational

DES-3528/DES-3552 Series Trap List

Trap Name/OID	Variable Bind	Format	MIB Name	Severity
coldStart 1.3.6.1.6.3.1.1.5.1	None	V2	RFC1907 (SNMPv2-MIB)	Critical
warmStart 1.3.6.1.6.3.1.1.5.2	None	V2	RFC1907 (SNMPv2-MIB)	Critical
authenticationFailure 1.3.6.1.6.3.1.1.5.5	None	V2	RFC1907 (SNMPv2-MIB)	Informational
linkDown 1.3.6.1.6.3.1.1.5.3	ifIndex, ifAdminStatus, ifOperStatus	V2	RFC2863 (IF-MIB)	Informational
linkup 1.3.6.1.6.3.1.1.5.4	ifIndex, ifAdminStatus, ifOperStatus	V2	RFC2863 (IF-MIB)	Informational
newRoot	None	V2	RFC1493 (BRIDGE-MIB)	Informational
topologyChange	None	V2	RFC1493 (BRIDGE-MIB)	Informational

Proprietary Trap List

Trap Name/OID	Variable Bind	Format	MIB Name	Severity
swL2macNotification 1.3.6.1.4.1.171.11.101.2.2.100.1.2.0.1	swL2macNotifyInfo	V2	L2Mgmt-MIB	Warning
swPowerError 1.3.6.1.4.1.171.12.11.2.2.2.0.2		V2	Equipment-MIB	Warning
swFilterDetectedTrap 1.3.6.1.4.1.171.12.37.100.0.1	swFilterDetectedIP swFilterDetectedport	V2	Filter-MIB	Warning

swIpMacBindingViolationTrap 1.3.6.1.4.1.171.12.23.5.0.1	swIpMacBindingPortIndex swIpMacBindingViolationIP swIpMacBindingViolationMac	V2	IPMacBind-MIB	Warning
SwMacBasedAuthLoggedSuccess 1.3.6.1.4.1.171.12.35.11.1.0.1	swMacBasedAuthInfoMacIndex swMacBasedAuthInfoPortIndex swMacBasedAuthVID	V2	Mac-Based-Authentication-MIB	Warning
swMacBasedAuthLoggedFail 1.3.6.1.4.1.171.12.35.11.1.0.2	swMacBasedAuthInfoMacIndex swMacBasedAuthInfoPortIndex swMacBasedAuthVID	V2	Mac-Based-Authentication-MIB	Warning
SwMacBasedAuthAgesOut 1.3.6.1.4.1.171.12.35.11.1.0.3	swMacBasedAuthInfoMacIndex swMacBasedAuthInfoPortIndex swMacBasedAuthVID	V2	Mac-Based-Authentication-MIB	Warning
agentAccessFlashFailed 1.3.6.1.4.1.171.12.1.7.2.0.8	agentNotifyPrefix	V2	Genmgmt-MIB	Warning
swSafeGuardChgToExhausted 1.3.6.1.4.1.171.12.19.4.1.0.1	swSafeGuardCurrentStatus	V2	SafeGuard.mib	Warning
swSafeGuardChgToNormal 1.3.6.1.4.1.171.12.19.4.1.0.2	swSafeGuardCurrentStatus	V2	SafeGuard.mib	Warning
swPktStormOccurred 1.3.6.1.4.1.171.12.25.5.0.1	swPktStormCtrlPortIndex	V2	PktStormCtrl.mib	Warning
swPktStormCleared 1.3.6.1.4.1.171.12.25.5.0.2	swPktStormCtrlPortIndex	V2	PktStormCtrl.mib	Warning
swPktStormDisablePort 1.3.6.1.4.1.171.12.25.5.0.3	swPktStormCtrlPortIndex	V2	PktStormCtrl.mib	Warning
swL2PortSecurityViolationTrap 1.3.6.1.4.1.171.11.105.1.2.100.1.2.0.2	swPortSecPortIndex swL2PortSecurityViolationMac	V2	DES3528-L2MGMT-MIB	Warning
lldpRemTablesChange 1.0.8802.1.1.2.0.0.1	lldpStatsRemTablesInserts lldpStatsRemTablesDeletes lldpStatsRemTablesDrops lldpStatsRemTablesAgeouts	V2	LLDP-MIB	Warning
dot1agCfmFaultAlarm 1.3.111.2.802.1.1.8.0.1	dot1agCfmMepHighestPrDefect	V2	IEEE8021-CFM-MIB	Warning
swERPSSFDetectedTrap 1.3.6.1.4.1.171.12.78.4.0.1	swERPSNodeId	V2	ERPS-MIB	Notice
swERPSSFClearedTrap 1.3.6.1.4.1.171.12.78.4.0.2	swERPSNodeId	V2	ERPS-MIB	Notice
swERPSRPLOwnerConflictTrap 1.3.6.1.4.1.171.12.78.4.0.3	swERPSNodeId	V2	ERPS-MIB	Warning
swPowerStatusChg	swEquipPowerNotifyPerfix	V2	Equipment-MIB	Warning

1.3.6.1.4.1.171.12.11.2.2.2.0.1				
swPowerFailure 1.3.6.1.4.1.171.12.11.2.2.2.0.2	swEquipPowerNotifyPerfix	V2	Equipment-MIB	Warning
swPowerRecover 1.3.6.1.4.1.171.12.11.2.2.2.0.3	swEquipPowerNotifyPerfix	V2	Equipment-MIB	Warning
swFanFailure 1.3.6.1.4.1.171.12.11.2.2.3.0.1	swEquipFanNotifyPrefix	V2	Equipment-MIB	Warning
swFanRecover 1.3.6.1.4.1.171.12.11.2.2.3.0.2	swEquipFanNotifyPrefix	V2	Equipment-MIB	Warning
agentFirmwareUpgrade 1.3.6.1.4.1.171.12.1.7.2.0.7	agentNotifyPrefix	V2	Genmgmt-MIB	Warning
swPortLoopOccurred 1.3.6.1.4.1.171.12.41.10.0.1	swLoopDetectPortIndex	V2	LBD-MIB	Warning
swPortLoopRestart 1.3.6.1.4.1.171.12.41.10.0.2	swLoopDetectPortIndex	V2	LBD-MIB	Warning
swVlanLoopOccurred 1.3.6.1.4.1.171.12.41.10.0.3	swLoopDetectPortIndex swVlanLoopDetectVID	V2	LBD-MIB	Warning
swVlanLoopRestart 1.3.6.1.4.1.171.12.41.10.0.4	swLoopDetectPortIndex swVlanLoopDetectVID	V2	LBD-MIB	Warning
agentGratuitousARPTrap 1.3.6.1.4.1.171.12.1.7.2.0.5	agentNotifyPrefix	V2	Genmgmt-MIB	Warning
swBpduProtectionUnderAttackingTrap 1.3.6.1.4.1.171.12.76.4.0.1	swBpduProtectionPortIndex, swBpduProtectionPortMode	V2	BPDUProtection-MIB	Warning
swBpduProtectionRecoveryTrap 1.3.6.1.4.1.171.12.76.4.0.2	wBpduProtectionPortIndex, swBpduProtectionRecoveryMethod	V2	BPDUProtection-MIB	Warning

Appendix C Password Recovery Procedure

This document describes the procedure for resetting passwords on D-Link Switches.

Authenticating any user who tries to access networks is necessary and important. The basic authentication method used to accept qualified users is through a local login, utilizing a Username and Password. Sometimes, passwords get forgotten or destroyed, so network administrators need to reset these passwords. This document will explain how the Password Recovery feature can help network administrators reach this goal.

The following steps explain how to use the Password Recovery feature on D-Link devices to easily recover passwords.

Complete these steps to reset the password:

1. For security reasons, the Password Recovery feature requires the user to physically access the device. Therefore this feature is only applicable when there is a direct connection to the console port of the device. It is necessary for the user needs to attach a terminal or PC with terminal emulation to the console port of the switch.
2. Power on the Switch. After the UART init is loaded to 100%, the Switch will allow 2 seconds for the user to press the hotkey [^] (Shift + 6) to enter the “Password Recovery Mode.” Once the Switch enters the “Password Recovery Mode,” all ports on the Switch will be disabled.

```
Boot Procedure                                                    V1.00.B008
-------------------------------------------------------------------------------

  Power On Self Test ....................................  100%

  MAC Address   : 1C-AF-F7-AD-31-10
  H/W Version   : A4

   Please Wait, Loading V2.60..017 Runtime Image .............  100 %
.  UART init .................................................  100 %
```

```
Password Recovery Mode
>
```

3. In the “Password Recovery Mode” only the following commands can be used.

Command	Parameters
reset config	The **reset config** command resets the whole configuration back to the default values.
reboot	The **reboot** command exits the Reset Password Recovery Mode and restarts the switch. A confirmation message will be displayed to allow the user to save the current settings.
reset account	The **reset** account command deletes all the previously created accounts.
reset password {<username>}	The **reset password** command resets the password of the specified user. If a username is not specified, the passwords of all users will be reset.
show account	The **show account** command displays all previously created accounts.

Appendix D Glossary

1000BASE-SX	A short laser wavelength on multimode fiber optic cable for a maximum length of 550 meters
1000BASE-LX	A long wavelength for a "long haul" fiber optic cable for a maximum length of 10 kilometers
100BASE-FX	100Mbps Ethernet implementation over fiber.
100BASE-TX	100Mbps Ethernet implementation over Category 5 and Type 1 Twisted Pair cabling.
10BASE-T	The IEEE 802.3 specification for Ethernet over Unshielded Twisted Pair (UTP) cabling.
ageing	The automatic removal of dynamic entries from the Switch Database which have timed-out and are no longer valid.
ATM	Asynchronous Transfer Mode. A connection oriented transmission protocol based on fixed length cells (packets). ATM is designed to carry a complete range of user traffic, including voice, data and video signals.
auto-negotiation	A feature on a port which allows it to advertise its capabilities for speed, duplex and flow control. When connected to an end station that also supports auto-negotiation, the link can self-detect its optimum operating setup.
backbone port	A port which does not learn device addresses, and which receives all frames with an unknown address. Backbone ports are normally used to connect the Switch to the backbone of your network. Note that backbone ports were formerly known as designated downlink ports.
backbone	The part of a network used as the primary path for transporting traffic between network segments.
bandwidth	Information capacity, measured in bits per second that a channel can transmit. The bandwidth of Ethernet is 10Mbps, the bandwidth of Fast Ethernet is 100Mbps.
baud rate	The switching speed of a line. Also known as line speed between network segments.
BOOTP	The BOOTP protocol allows automatic mapping of an IP address to a given MAC address each time a device is started. In addition, the protocol can assign the subnet mask and default gateway to a device.
bridge	A device that interconnects local or remote networks no matter what higher level protocols are involved. Bridges form a single logical network, centralizing network administration.
broadcast	A message sent to all destination devices on the network.
broadcast storm	Multiple simultaneous broadcasts that typically absorb available network bandwidth and can cause network failure.
console port	The port on the Switch accepting a terminal or modem connector. It changes the parallel arrangement of data within computers to the serial form used on data transmission links. This port is most often used for dedicated local management.
CSMA/CD	Channel access method used by Ethernet and IEEE 802.3 standards in which devices transmit only after finding the data channel clear for some period of time. When two devices transmit simultaneously, a collision occurs and the colliding devices delay their retransmissions for a random amount of time.
data center switching	The point of aggregation within a corporate network where a switch provides high-performance access to server farms, a high-speed backbone connection and a control point for network management and security.
Ethernet	A LAN specification developed jointly by Xerox, Intel and Digital Equipment Corporation. Ethernet networks operate at 10Mbps using CSMA/CD to run over cabling.
Fast Ethernet	100Mbps technology based on the CSMA/CD network access method.
Flow Control	(IEEE 802.3X) A means of holding packets back at the transmit port of the connected end station. Prevents packet loss at a congested switch port.
forwarding	The process of sending a packet toward its destination by an internetworking device.
full duplex	A system that allows packets to be transmitted and received at the same time and, in effect, doubles the potential throughput of a link.
half duplex	A system that allows packets to be transmitted and received, but not at the same time. Contrast with full duplex.
IP address	Internet Protocol address. A unique identifier for a device attached to a network using TCP/IP. The address is written as four octets separated with full-stops (periods), and is made up of a network section, an optional subnet section and a host section.
IPX	Internetwork Packet Exchange. A protocol allowing communication in a NetWare network.
LAN - Local Area Network	A network of connected computing resources (such as PCs, printers, servers) covering a relatively small geographic area (usually not larger than a floor or building). Characterized by high data rates and low error rates.
latency	The delay between the time a device receives a packet and the time the packet is forwarded out of the destination port.
line speed	See baud rate.
main port	The port in a resilient link that carries data traffic in normal operating conditions.
MDI - Medium Dependent Interface:	An Ethernet port connection where the transmitter of one device is connected to the receiver of another device.
MDI-X - Medium Dependent Interface Cross-over	Ethernet port connections, where the internal transmit and receive lines are crossed.
MIB - Management Information Base	Stores a device's management characteristics and parameters. MIBs are used by the Simple Network Management Protocol (SNMP) to contain attributes of their managed systems. The Switch contains its own internal MIB.

multicast	Single packets copied to a specific subset of network addresses. These addresses are specified in the destination-address field of the packet.
protocol	A set of rules for communication between devices on a network. The rules dictate format, timing, sequencing and error control.
resilient link	A pair of ports that can be configured so that one will take over data transmission should the other fail. See also main port and standby port.
RJ-45	Standard 8-wire connectors for IEEE 802.3 10BASE-T networks.
RMON	Remote Monitoring. A subset of SNMP MIB II that allows monitoring and management capabilities by addressing up to ten different groups of information.
RPS - Redundant Power System	A device that provides a backup source of power when connected to the Switch.
server farm	A cluster of servers in a centralized location serving a large user population.
SLIP - Serial Line Internet Protocol	A protocol which allows IP to run over a serial line connection.
SNMP - Simple Network Management Protocol	A protocol originally designed to be used in managing TCP/IP internets. SNMP is presently implemented on a wide range of computers and networking equipment and may be used to manage many aspects of network and end station operation.
Spanning Tree Protocol (STP)	A bridge-based system for providing fault tolerance on networks. STP works by allowing the user to implement parallel paths for network traffic, and ensure that redundant paths are disabled when the main paths are operational and enabled if the main paths fail.
standby port	The port in a resilient link that will take over data transmission if the main port in the link fails.
switch	A device which filters, forwards and floods packets based on the packet's destination address. The switch learns the addresses associated with each switch port and builds tables based on this information to be used for the switching decision.
TCP/IP	A layered set of communications protocols providing Telnet terminal emulation, FTP file transfer, and other services for communication among a wide range of computer equipment.
telnet	A TCP/IP application protocol that provides virtual terminal service, letting a user log in to another computer system and access a host as if the user were connected directly to the host.
TFTP - Trivial File Transfer Protocol	Allows the user to transfer files (such as software upgrades) from a remote device using your switch's local management capabilities.
UDP - User Datagram Protocol	An Internet standard protocol that allows an application program on one device to send a datagram to an application program on another device.
VLAN - Virtual LAN	A group of location and topology-independent devices that communicate as if they are on a common physical LAN.
VLT - Virtual LAN Trunk	A Switch-to-Switch link which carries traffic for all the VLANs on each Switch.
VT100	A type of terminal that uses ASCII characters. VT100 screens have a text-based appearance.