

Web UI Reference Guide

Product Model: DWS-3160 Series

Gigabit Ethernet Unified Switch

Release 1.00



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Table of Contents

Intended Readers.....	1
Typographical Conventions.....	1
Notes, Notices and Cautions.....	1
Section 1 Web-based Switch Configuration.....	2
Chapter 1 Introduction	2
Chapter 2 Login to the Web Manager	2
Chapter 3 Web-based User Interface.....	3
Areas of the User Interface.....	3
Chapter 4 Web Pages	4
Section 2 LAN.....	6
Chapter 1 System Configuration.....	6
Device Information.....	6
System Information Settings	7
Port Configuration.....	7
PoE	11
Serial Port Settings.....	14
Warning Temperature Settings.....	14
System Log Configuration	15
Time Range Settings	18
Port Group Settings	19
Time Settings.....	19
User Accounts Settings	20
Command Logging Settings	21
Chapter 2 Management.....	22
ARP	22
Gratuitous ARP.....	23
IPv6 Neighbor Settings.....	25
IP Interface	26
Management Settings.....	30
Session Table.....	31
Single IP Management	32
SNMP Settings	41
Telnet Settings.....	50
Web Settings	50
Chapter 3 L2 Features	51
VLAN	51
QinQ	69
Spanning Tree	72
Link Aggregation.....	79
FDB.....	82
L2 Multicast Control.....	86
Multicast Filtering.....	108
ERPS Settings.....	113
LLDP.....	116
NLB FDB Settings	125
Chapter 4 L3 Features.....	126

IPv4 Static/Default Route Settings	126
IPv4 Route Table	127
IPv6 Static/Default Route Settings	127
IP Forwarding Table	128
VRRP	128
Chapter 5 QoS	133
802.1p Settings	134
Bandwidth Control	136
Traffic Control Settings	138
DSCP	140
HOL Blocking Prevention	142
Scheduling Settings	142
Chapter 6 ACL	145
ACL Configuration Wizard	145
Access Profile List	146
CPU Access Profile List	162
ACL Finder	176
ACL Flow Meter	176
Egress Access Profile List	179
Egress ACL Flow Meter	191
Chapter 7 Security	194
802.1X	194
RADIUS	206
IP-MAC-Port Binding (IMPB)	210
MAC-based Access Control (MAC)	215
Compound Authentication	218
Port Security	221
ARP Spoofing Prevention Settings	223
BPDU Attack Protection	224
Loopback Detection Settings	225
Traffic Segmentation Settings	226
NetBIOS Filtering Settings	227
DHCP Server Screening	228
Access Authentication Control	230
SSL Settings	238
SSH	240
Trusted Host Settings	244
Safeguard Engine Settings	244
Captive Portal (CP)	246
Chapter 8 Network Application	266
DHCP	266
SNTP	272
Flash File System Settings	274
Chapter 9 OAM	276
CFM	276
Ethernet OAM	286
Cable Diagnostics	290
Chapter 10 Monitoring	292
Utilization	292
Statistics	293

Mirror	303
sFlow	305
Ping Test.....	308
Trace Route.....	309
Peripheral	310
Chapter 11 Save and Tools	311
Section 3 WLAN	312
Chapter 1 Security	312
Captive Portal (CP).....	312
Chapter 2 Monitoring	331
Global	331
Peer Switch	339
Access Point.....	342
Client.....	363
QoS.....	382
Chapter 3 Administration	390
Basic Setup	390
AP Management.....	402
Advanced Configuration	411
Chapter 4 QoS.....	438
Access Control Lists	438
Differentiated Services	451
Chapter 5 Network Visualization.....	457
Download Image.....	457
Launch.....	457
Section 4 Save and Tools.....	460
Chapter 1 Save	460
Save Configuration / Log	460
Chapter 2 Tools	461
License Management	461
Download Firmware.....	461
Upload Firmware	462
Download Configuration	462
Upload Configuration.....	463
Upload Log File	464
Reset	465
Reboot System	466
Appendices	468
Appendix A Mitigating ARP Spoofing Attacks Using Packet Content ACL.....	468
How Address Resolution Protocol works	468
How ARP Spoofing Attacks a Network.....	470
Prevent ARP Spoofing via Packet Content ACL	471
Configuration	471
Appendix B Password Recovery Procedure	474
Appendix C System Log Entries.....	475
Appendix D Trap Log Entries	486
Appendix E RADIUS Attributes Assignment	490
Appendix F Wireless Switch Specific.....	497

Intended Readers

Typographical Conventions
Notes, Notices and Cautions
Safety Instructions
General Precautions for Rack-Mountable Products
Protecting Against Electrostatic Discharge

The **DWS-3160 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.

Section 1 Web-based Switch Configuration

Introduction

Login to the Web Manager

Web-based User Interface

Web Pages

Chapter 1 Introduction

All software functions of the DWS-3160 Series switches can be managed, configured and monitored via the embedded web-based (HTML) interface. Manage the Switch from remote stations anywhere on the network through a standard browser. 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.

Chapter 2 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 2-1 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.

Chapter 3 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.

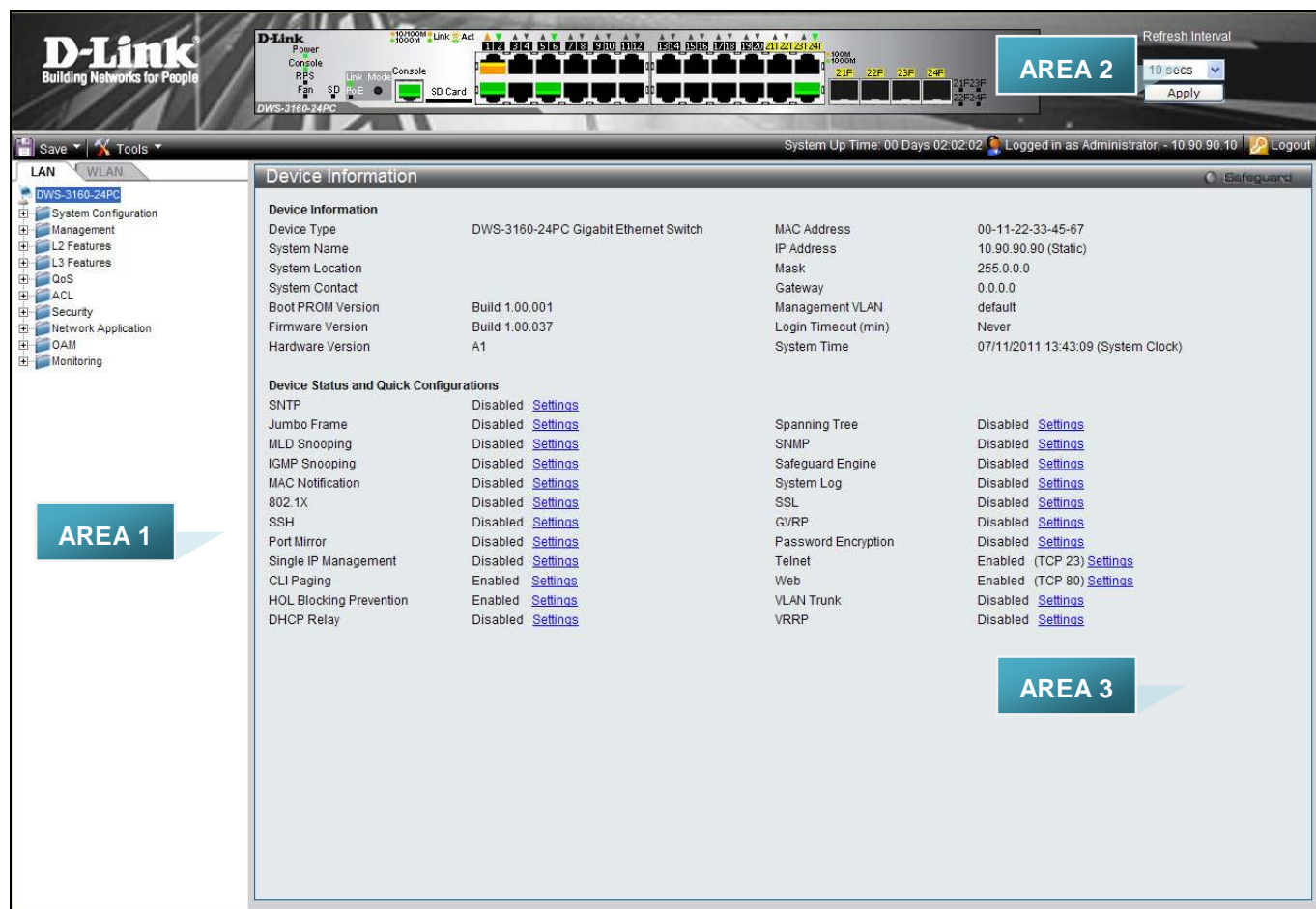


Figure 3-1 Main Web-Manager page

Area Number	Function
Area 1	This navigation window presents LAN and WLAN tabs. Click the tabs to display the features, settings and functions. Select the menu or window to display. Open folders and click the hyperlinked menu buttons and subfolders contained within them to display menus.
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. Click the D-Link logo to go to the D-Link website. 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.

Chapter 4 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:

LAN Tab

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 operations, administration and maintenance (OAM).

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

WLAN Tab

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

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

Administration - In this section the user will be able to configure features regarding the Switch's wireless functionalities, including basic setup, AP management, and some more advanced configurations such as AP Profiles and Peer Switch settings.

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

Network Visualization - In this section, the user will be able to input a map and visualize the wireless network graphically.



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

Section 2 LAN

This section describes all the available configurations in the LAN tab.

Chapter 1 System Configuration

Device Information

System Information Settings

Port Configuration

PoE

Serial Port Settings

Warning Temperature Settings

System Log configuration

Time Range Settings

Port Group Settings

Time Settings

User Accounts Settings

Command Logging Settings

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 **DWS-3160 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.

Device Information			
Device Information			
Device Type	DWS-3160-24PC Gigabit Ethernet Switch	MAC Address	00-11-22-33-45-67
System Name		IP Address	10.90.90.90 (Static)
System Location		Mask	255.0.0.0
System Contact		Gateway	0.0.0.0
Boot PROM Version	Build 1.00.001	Management VLAN	default
Firmware Version	Build 1.00.037	Login Timeout (min)	Never
Hardware Version	A1	System Time	07/11/2011 13:43:09 (System Clock)
Device Status and Quick Configurations			
SNTP	Disabled	Settings	
Jumbo Frame	Disabled	Settings	
MLD Snooping	Disabled	Settings	
IGMP Snooping	Disabled	Settings	
MAC Notification	Disabled	Settings	
802.1X	Disabled	Settings	
SSH	Disabled	Settings	
Port Mirror	Disabled	Settings	
Single IP Management	Disabled	Settings	
CLI Paging	Enabled	Settings	
HOL Blocking Prevention	Enabled	Settings	
DHCP Relay	Disabled	Settings	
Spanning Tree	Disabled	Settings	
SNMP	Disabled	Settings	
Safeguard Engine	Disabled	Settings	
System Log	Disabled	Settings	
SSL	Disabled	Settings	
GVRP	Disabled	Settings	
Password Encryption	Disabled	Settings	
Telnet	Enabled (TCP 23)	Settings	
Web	Enabled (TCP 80)	Settings	
VLAN Trunk	Disabled	Settings	
VRRP	Disabled	Settings	

Figure 5-1 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. To view the following window, click **System Configuration > System Information Settings**, as show below:

Figure 5-2 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.

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 show below:

Port Settings Safeguard

From Port: 01 To Port: 01 State: Enabled Speed/Duplex: Auto Flow Control: Disabled Address Learning: Enabled MDIX: Auto Medium Type: Copper Apply Refresh

Port	State	Speed/Duplex	Flow Control	Connection	MDIX	Address Learning
01	Enabled	Auto	Disabled	100M/Full/None	Auto	Enabled
02	Enabled	Auto	Disabled	Link Down	Auto	Enabled
03	Enabled	Auto	Disabled	Link Down	Auto	Enabled
04	Enabled	Auto	Disabled	Link Down	Auto	Enabled
05	Enabled	Auto	Disabled	Link Down	Auto	Enabled
06	Enabled	Auto	Disabled	Link Down	Auto	Enabled
07	Enabled	Auto	Disabled	Link Down	Auto	Enabled
08	Enabled	Auto	Disabled	Link Down	Auto	Enabled
09	Enabled	Auto	Disabled	Link Down	Auto	Enabled
10	Enabled	Auto	Disabled	Link Down	Auto	Enabled
11	Enabled	Auto	Disabled	Link Down	Auto	Enabled
12	Enabled	Auto	Disabled	Link Down	Auto	Enabled
13	Enabled	Auto	Disabled	Link Down	Auto	Enabled
14	Enabled	Auto	Disabled	Link Down	Auto	Enabled
15	Enabled	Auto	Disabled	Link Down	Auto	Enabled
16	Enabled	Auto	Disabled	Link Down	Auto	Enabled
17	Enabled	Auto	Disabled	Link Down	Auto	Enabled
18	Enabled	Auto	Disabled	Link Down	Auto	Enabled
19	Enabled	Auto	Disabled	Link Down	Auto	Enabled
20	Enabled	Auto	Disabled	Link Down	Auto	Enabled
21 (C)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
21 (F)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
22 (C)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
22 (F)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
23 (C)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
23 (F)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
24 (C)	Enabled	Auto	Disabled	Link Down	Auto	Enabled
24 (F)	Enabled	Auto	Disabled	Link Down	Auto	Enabled

Figure 5-3 Port Settings window

To configure switch ports:

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

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menu to select the port range to be configured.
State	Toggle the State field to either enable or disable a given port or group of ports.
Speed/Duplex	<p>Toggle the Speed/Duplex field to select the speed and full-duplex/half-duplex state of the port. <i>Auto</i> denotes auto-negotiation among 10, 100 and 1000 Mbps devices, in full- or half-duplex (except 1000 Mbps which is always full duplex). The <i>Auto</i> 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 <i>10M Half</i>, <i>10M Full</i>, <i>100M Half</i>, <i>100M Full</i>, <i>1000M Full_Master</i>, <i>1000M Full_Slave</i>, and <i>1000M Full</i>. There is no automatic adjustment of port settings with any option other than <i>Auto</i>.</p> <p>The Switch allows the user to configure three types of gigabit connections; <i>1000M Full_Master</i>, <i>1000M Full_Slave</i>, and <i>1000M Full</i>. Gigabit connections only support full duplex connections and take on certain characteristics that are different from the other choices listed.</p> <p>The <i>1000M Full_Master</i> and <i>1000M Full_Slave</i> 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 (<i>1000M Full_Master</i>) 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 (<i>1000M Full_Slave</i>) uses loop timing, where the timing comes</p>

	from a data stream received from the master. If one connection is set for <i>1000M Full_Master</i> , the other side of the connection must be set for <i>1000M Full_Slave</i> . 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 <i>Disabled</i> .
Address Learning	Enable or disable MAC address learning for the selected ports. When <i>Enabled</i> , destination and source MAC addresses are automatically listed in the forwarding table. When address learning is <i>Disabled</i> , 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 <i>Enabled</i> .
MDIX	<p><i>Auto</i> - Select auto for auto sensing of the optimal type of cabling.</p> <p><i>Normal</i> - 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.</p> <p><i>Cross</i> - 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.</p>
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 refresh 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 show below:

Port	Description
01	
02	
03	
04	
05	
06	
07	
08	
09	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21 (C)	
21 (F)	
22 (C)	
22 (F)	
23 (C)	
23 (F)	
24 (C)	
24 (F)	

Figure 5-4 Port Description Settings window

The fields that can be configured are described below:

Parameter	Description
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 <i>Copper</i> or <i>Fiber</i> .
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 show below:



Port	Port State	Connection Status	Reason
------	------------	-------------------	--------

Figure 5-5 Port Error Disabled

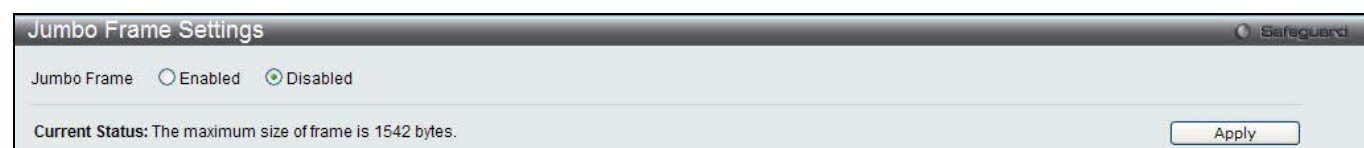
The fields that can be displayed are described below:

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 13312 bytes.

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



Jumbo Frame Settings

Jumbo Frame Enabled Disabled

Current Status: The maximum size of frame is 1542 bytes.

Apply

Figure 5-6 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. When disabled, the maximum frame size is 1536 bytes. When enabled, the maximum frame size is 13312 bytes.

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

PoE

The DWS-3160-24PC switches support Power over Ethernet (PoE) as defined by the IEEE 802.3af and 802.3at. All ports can support PoE up to 30W. Ports 1-24 can supply about 48 VDC power to Powered Devices (PDs) over Category 5 or Category 3 UTP Ethernet cables. The Switch follows the standard PSE (Power Sourcing Equipment) pinout *Alternative A*, whereby power is sent out over pins 1, 2, 3 and 6. The Switches work with all D-Link 802.3af capable devices.

The Switch 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	15.4W
1	4.0W
2	7.0W
3	15.4W

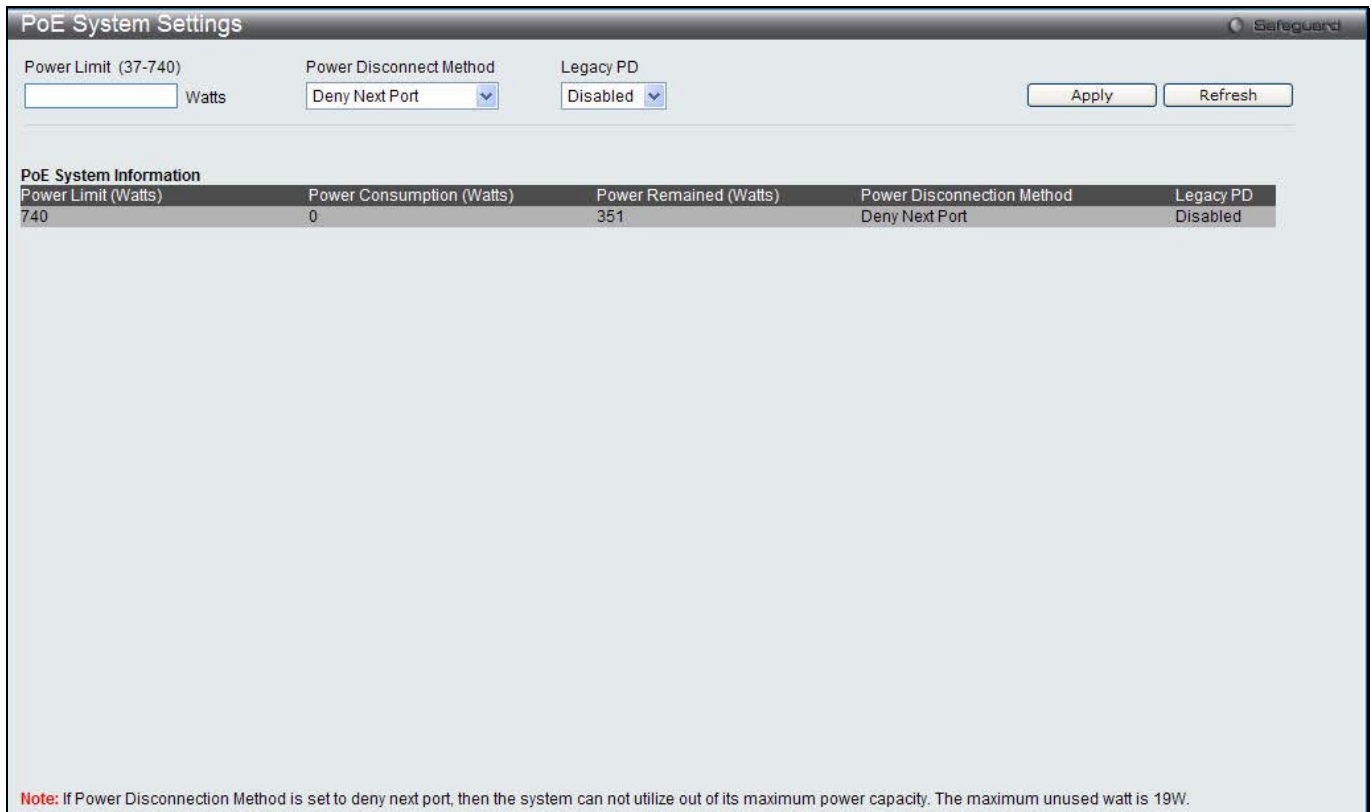
PSE provides power according to the following classification:

Class	Max power used by PSE
0	15.4W
1	4.0W
2	7.0W
3	15.4W
User define	31.2W

To configure the PoE features on the Switch, click **System 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 1W and 370W for the Switch in the Power Limit field. 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 show below:



PoE System Settings Safeguard

Power Limit (37-740) Watts: Power Disconnect Method: Deny Next Port Legacy PD: Disabled

Apply Refresh

PoE System Information

Power Limit (Watts)	Power Consumption (Watts)	Power Remained (Watts)	Power Disconnection Method	Legacy PD
740	0	351	Deny Next Port	Disabled

Note: If Power Disconnection Method is set to deny next port, then the system can not utilize out of its maximum power capacity. The maximum unused watt is 19W.

Figure 5-7 PoE System Settings window

The following parameters can be configured:

Parameter	Description
Power Limit (37-760)	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 760W. The default setting is 760W.
Power Disconnect Method	The PoE controller uses either <i>Deny Next Port</i> or <i>Deny Low Priority Port</i> 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 <i>Deny Next Port</i> . Both Power Disconnection Methods are described below: <i>Deny Next Port</i> – 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 <i>Deny Next Port</i> , the system cannot utilize out of its maximum power capacity. The maximum unused watt is 19W. <i>Deny Low Priority Port</i> – 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 **Apply** to implement changes made.

PoE Port Settings

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

PoE Port Settings Safeguard

From Port: 01 To Port: 01 State: Enabled Time Range: Priority: Low Power Limit: Class 2

Apply Refresh

Port	State	Time Range	Priority	Power Limit (mW)	Class	Power (mW)	Voltage (Decivolt)	Current (mA)	Status
1	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
2	Enabled		Low	15400(Class 0)	3	8900	535	167	ON : 802...
3	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
4	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
5	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
6	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
7	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
8	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
9	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
10	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
11	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
12	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
13	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
14	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
15	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
16	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
17	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
18	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
19	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
20	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
21	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
22	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
23	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...
24	Enabled		Low	15400(Class 0)	0	0	0	0	OFF : Int...

Figure 5-8 PoE Port Settings window

The following parameters can be configured:

Parameter	Description
From Port / To Port	Select a range of ports from the drop-down menus to be enabled or disabled for PoE.
State	Use the drop-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 drop-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, <i>Critical</i> , <i>High</i> , and <i>Low</i> . 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	<p>This function is used to configure the per-port power limit. If a port exceeds its power limit, it will shut down.</p> <p>Based on 802.3af/802.3at, there are different PD classes and power consumption ranges;</p> <p>Class 0 – 0.44~15.4W Class 1 – 0.44~4.0W Class 2 – 4~7.0W Class 3 – 7~15.4W</p> <p>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;</p> <p><i>Class 0</i> – 15400mW <i>Class 1</i> – 4000mW <i>Class 2</i> – 7000mW <i>Class 3</i> – 15400mW User Define – 35000mW</p>

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.

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 show below:

Figure 5-9 Serial Port Settings window

The fields that can be configured or displayed 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, <i>9600</i> , <i>19200</i> , <i>38400</i> and <i>115200</i> . For a connection to the Switch using the console port, the baud rate must be set to <i>115200</i> , 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: <i>2</i> , <i>5</i> , <i>10</i> , <i>15 minutes</i> or <i>Never</i> . The default setting is <i>10 minutes</i> .
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.

Warning Temperature Settings

This window allows the user to configure the system warning temperature parameters.

To view the following window, click **System Configuration > Warning Temperature Settings**, as show below:

Figure 5-10 Warning Temperature Settings window

The fields that can be configured are described below:

Parameter	Description
Traps State	Use the drop-down menu to enable or disable the traps state option of the warning temperature setting.
Log State	Use the drop-down menu to enable or disable the log state option of the warning

	temperature setting.
High Threshold	Enter the high threshold value of the warning temperature setting.
Low Threshold	Enter the low threshold value of the warning temperature setting.

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 show below:

Figure 5-11 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.
Save Mode	Use the drop-down menu to choose the method for saving the switch log to the flash memory. The user has three options: <i>On Demand</i> – 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. <i>Time Interval</i> – 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. <i>Log Trigger</i> – 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 show below:

Figure 5-12 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 <i>Emergency, Alert, Critical, Error, Warning, Notice, Informational</i> and <i>Debug</i> .
Server IPv4 Address	The IPv4 address of the Syslog server.
Server IPv6 Address	The IPv6 address of the Syslog server.
Facility	Use the drop-down menu to select <i>Local 0, Local 1, Local 2, Local 3, Local 4, Local 5, Local 6, or Local 7</i> .
UDP Port (514 or 6000-65535)	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.

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

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

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 show below:

Figure 5-13 System Log window

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

Parameter	Description
-----------	-------------

Log Type	In the drop-down menu the user can select the log type that will be displayed. <i>Severity</i> - When selecting <i>Severity</i> 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. <i>Module List</i> - When selecting <i>Module List</i> , the module name must be manually entered. Available modules are MSTP, ERROR_LOG, CFM_EXT, and ERPS. <i>Attack Log</i> - When selecting <i>Attack Log</i> 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.

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

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 show below:

Figure 5-14 System Log & Trap Settings window

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. 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 show below:

Figure 5-15 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 <i>Log</i> to send the alert of the Severity Type configured to the Switch's log for analysis. Choose <i>Trap</i> to send it to an SNMP agent for analysis, or select <i>All</i> 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 <i>Emergency (0)</i> , <i>Alert (1)</i> , <i>Critical (2)</i> , <i>Error (3)</i> , <i>Warning (4)</i> , <i>Notice (5)</i> , <i>Information (6)</i> and <i>Debug (7)</i> .

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 show below:

Figure 5-16 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: <i>Start Time</i> - Use this parameter to identify the starting time of the time range, in hours, minutes and seconds, based on the 24-hour time system. <i>End Time</i> - 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 **Time Range Information** table in the bottom half of the window shown above.

Port Group Settings

This window is used to create port groups, and add or delete ports from the port groups.

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

Figure 5-17 Port Group Settings window

The fields that can be configured are described below:

Parameter	Description
Group Name	Enter the name of a port group.
Group ID (1-64)	Enter the ID of a port group
Port List	Enter a port or list of ports. Tick the All check box to apply to all ports.
Action	Use the drop-down menu to select <i>Create Port Group</i> , <i>Add Ports</i> or <i>Delete Ports</i> .

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

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

Time Settings

Users can configure the time settings for the Switch.

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

Figure 5-18 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 show below:

Figure 5-19 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	Read/Write	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.
Encryption	Specifies that encryption will be applied to this account. Option to choose from are <i>Plain Text</i> , and <i>SHA-1</i> .

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.

Command Logging Settings

This window is used to enable or disable the command logging settings.

To view this window, click **System Configuration > Command Logging Settings**, as shown below:



Figure 5-20 Command Logging Settings window

The fields that can be configured are described below:

Parameter	Description
Command Logging State	Use the radio buttons to enable or disable the function.

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



NOTE: When the switch is under the booting procedure, all configuration commands will not be logged. When the user uses AAA authentication to logged in, the user name should not be changed if the user has used the Enable Admin function to replace its privilege.

Chapter 2 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 show below:

Interface Name	IP Address	MAC Address	Type	Edit	Delete
System	10.0.0.0	FF-FF-FF-FF-FF-FF	Local/Broadcast	Edit	Delete
System	10.90.90.90	00-01-02-03-04-00	Local	Edit	Delete
System	10.255.255.255	FF-FF-FF-FF-FF-FF	Local/Broadcast	Edit	Delete

Figure 6-1 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 show below:

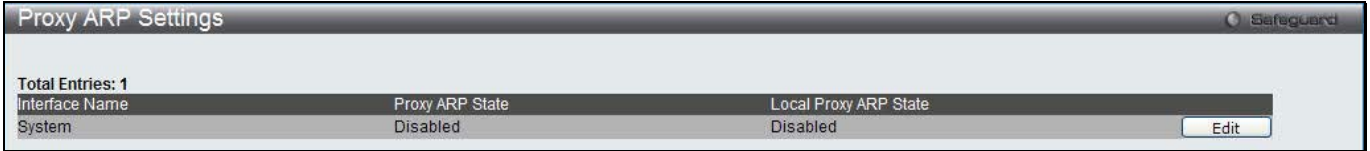


Figure 6-2 Proxy ARP Settings window

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 show below:

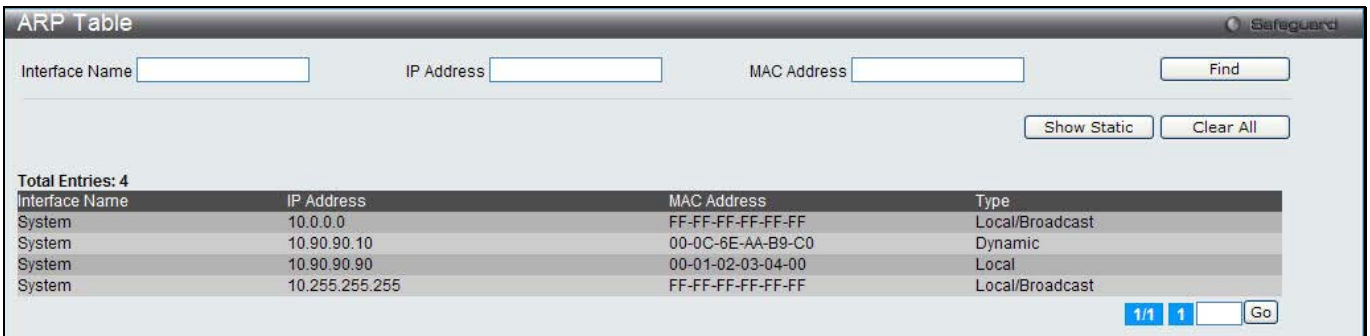


Figure 6-3 ARP Table window

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

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 show below:

Parameter	Enabled	Disabled
Send On IP Interface Status Up	<input type="radio"/>	<input checked="" type="radio"/>
Send On Duplicate IP Detected	<input type="radio"/>	<input checked="" type="radio"/>
Gratuitous ARP Learning	<input type="radio"/>	<input checked="" type="radio"/>

Figure 6-4 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 show below:

Gratuitous ARP Settings

Gratuitous ARP Trap/Log

Trap: Disabled | Log: Enabled | Interface Name: All

Gratuitous ARP Periodical Send Interval

Interface Name: | Interval Time (0-65535):

Total Entries: 1

Interface Name	Gratuitous ARP Trap	Gratuitous ARP Log	Gratuitous ARP Periodical Send Interval
System	Disabled	Enabled	0

Figure 6-5 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 (0-65535)	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 show below:

IPv6 Neighbor Settings
Safeguard

Interface Name

Neighbor IPv6 Address

Link Layer MAC Address

Interface Name All

State

Total Entries: 0

Neighbor	Link Layer Address	Interface Name	State	Port	VID

State: (I) means Incomplete state. (R) means Reachable state. (S) means State state.
 (D) means Delay state. (P) means Probe state. (T) means Static state.

Figure 6-6 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 name of the IPv6 neighbor. Tick the All check box to search for all current interfaces on the Switch.
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 show below:

Figure 6-7 System IP Address Settings window

The fields that can be configured are described below:

Parameter	Description
Static	Allow the entry of an IP address, subnet mask, and a default gateway for the Switch. 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.
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.

The following table will describe the fields that are about the **System** Interface.

Parameter	Description
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 window (Security > Trusted Host). 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. If the state is disabled, the IP interface cannot be accessed.
IP Address	This field allows the entry of an IPv4 address to be assigned to this IP interface.
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 show below:

The screenshot shows the 'Interface Settings' window. At the top, there is a search field for 'Interface Name' and a 'Find' button. Below the search field are 'Add' and 'Delete All' buttons. A table displays the current interface settings:

Interface Name	VLAN Name	Interface Admin State	Secondary	Link State	
System	default	Enabled	No	Link Up	IPv4 Edit IPv6 Edit Delete

Figure 6-8 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.

The screenshot shows the 'IPv4 Interface Settings' window. It contains the following fields:

- Interface Name: (Max: 12 characters)
- IPv4 Address: (e.g.: 172.18.211.10)
- Subnet Mask: (e.g.: 255.255.255.254 or 0-32)
- VLAN Name: (Max: 32 characters)
- Interface Admin State: (dropdown menu)
- Secondary Interface:

At the bottom right, there are buttons for '<<Back' and 'Apply'.

Figure 6-9 IPv4 Interface Settings 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.
Secondary Interface	Tick the check box to use this Interface as a Secondary Interface. When the primary IP is not available, the VLAN will switch to the secondary interface. It will switch back when the primary IP was recovered.

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

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

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

Figure 6-10 IPv4 Interface Settings – 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 window.

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

Figure 6-11 IPv6 Interface Settings window

The fields that can be configured or displayed 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	Here the user can enter the neighbor's global or local link address.
NS Retransmit Time (0-429497295)	Enter the Neighbor solicitation's retransmit timer in millisecond here. It has the same value as the RA retransmit time in the config ipv6 nd ra command. If this field is configured, it will duplicate the entry into the RA field.
Automatic Link Local Address	Here the user can select 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 window.

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.

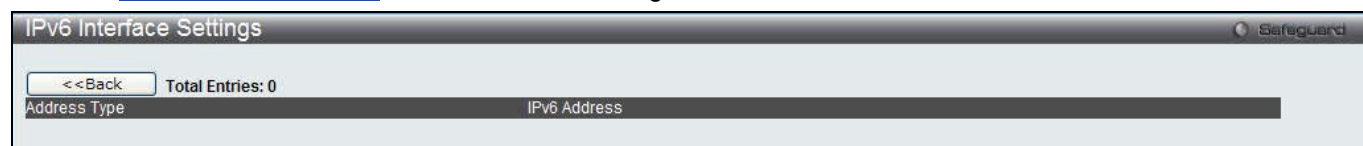


Figure 6-12 IPv6 Interface Settings window

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

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 show below:

Figure 6-13 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.
Power Saving State	Enable or disable the link down power saving mode of each physical port. The switch port will go into sleep mode when a port is not connected.
Length Detection State	Enable or disable the length detection power saving mode on the physical ports. The switch port will reduce the power feed for shorter cables.
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.
Running Configuration	Under the Password Recovery option, the running configuration can be enabled or disabled. Being enabled, will allow the user to perform a password recovery of the running configuration.

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

To learn more about the D-Link Green Technologies, go to <http://green.dlink.com/> for more details.

Session Table

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

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

ID	Live Time	From	Level	Name
8	00:06:02.150	Serial Port	1	Anonymous

Figure 6-14 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).
- A SIM group accepts up to 4switches (numbered 1-4), not including the Commander Switch (numbered 0).
- Members of a SIM group cannot cross a router.
- 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, additional DWS-3160 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.

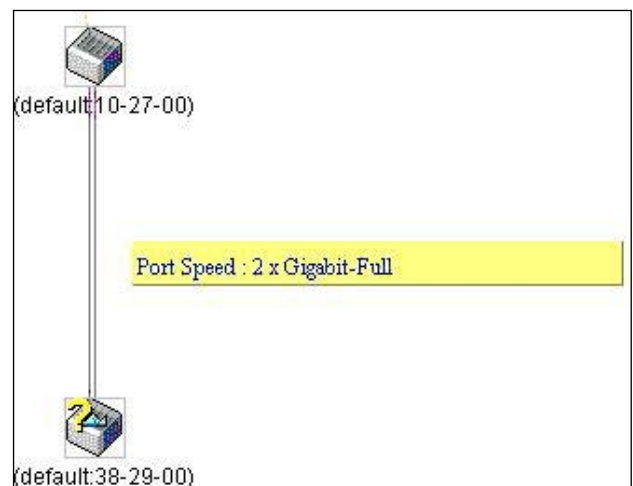
When a CaS becomes a MS, it automatically becomes a member of the first SNMP community (includes read/write and read only) to which the CS belongs. However, if a MS has its own IP address, it can belong to SNMP communities to which other switches in the group, including the CS, do not belong.

Upgrade to v1.61

To better improve SIM management, the DWS-3160 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 show below:

The screenshot shows the 'Single IP Settings' window with the following configuration:

- SIM State:** Disabled
- Role State:** Candidate
- Group Name:** (Empty text box)
- Discovery Interval (30 - 90):** 30 sec
- Hold Time Count (100-255):** 100 sec

An **Apply** button is located at the bottom right of the window.

Figure 6-15 Single IP Settings window

The fields that can be configured are described below:

Parameter	Description
SIM State	Use the drop-down menu to either enable or disable the SIM state on the Switch. <i>Disabled</i> will render all SIM functions on the Switch inoperable.
Role State	Use the drop-down menu to change the SIM role of the Switch. The two choices are: <i>Candidate</i> – 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. <i>Commander</i> – 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.

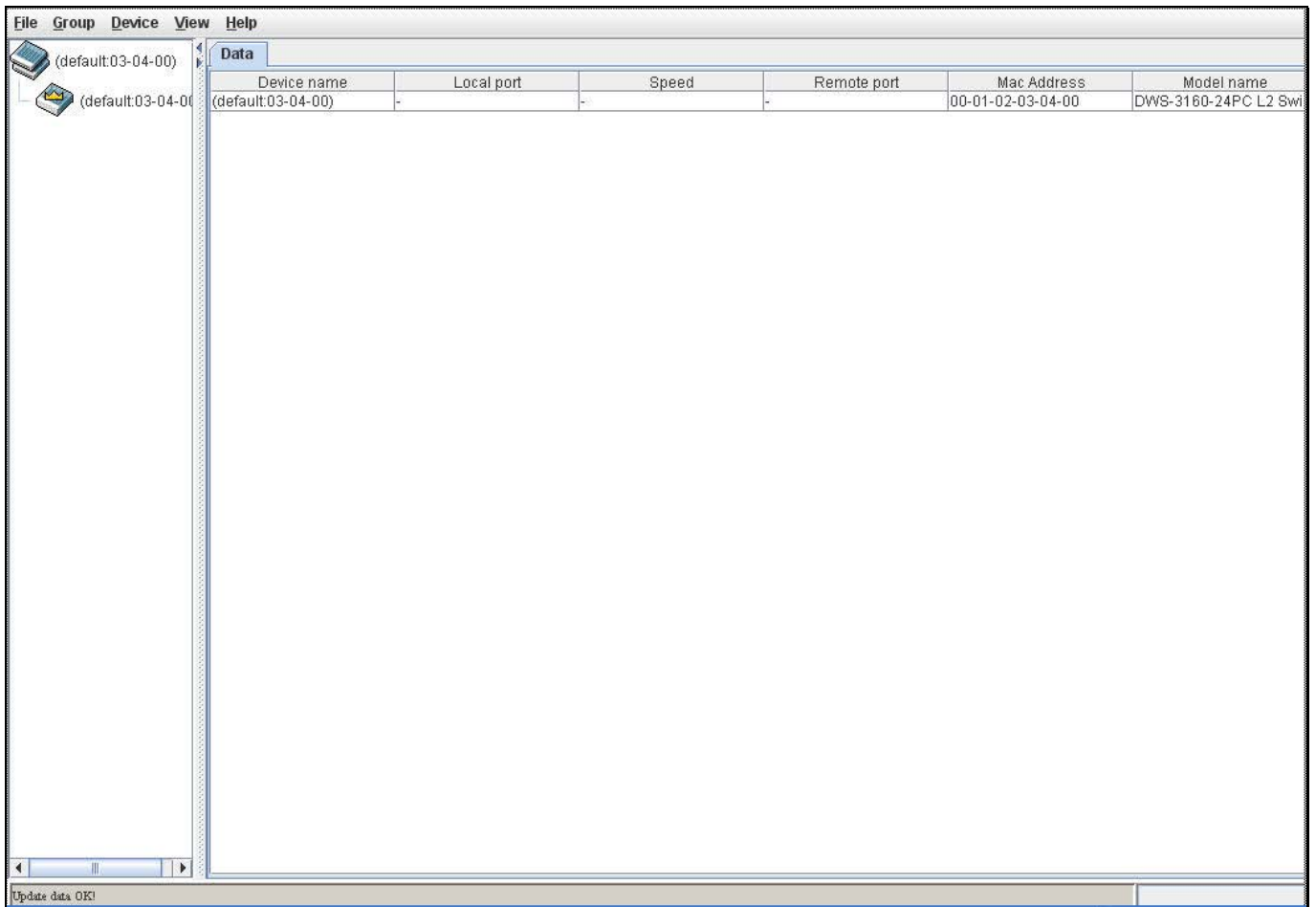


Figure 6-16 Single IP Management window - Tree View

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).

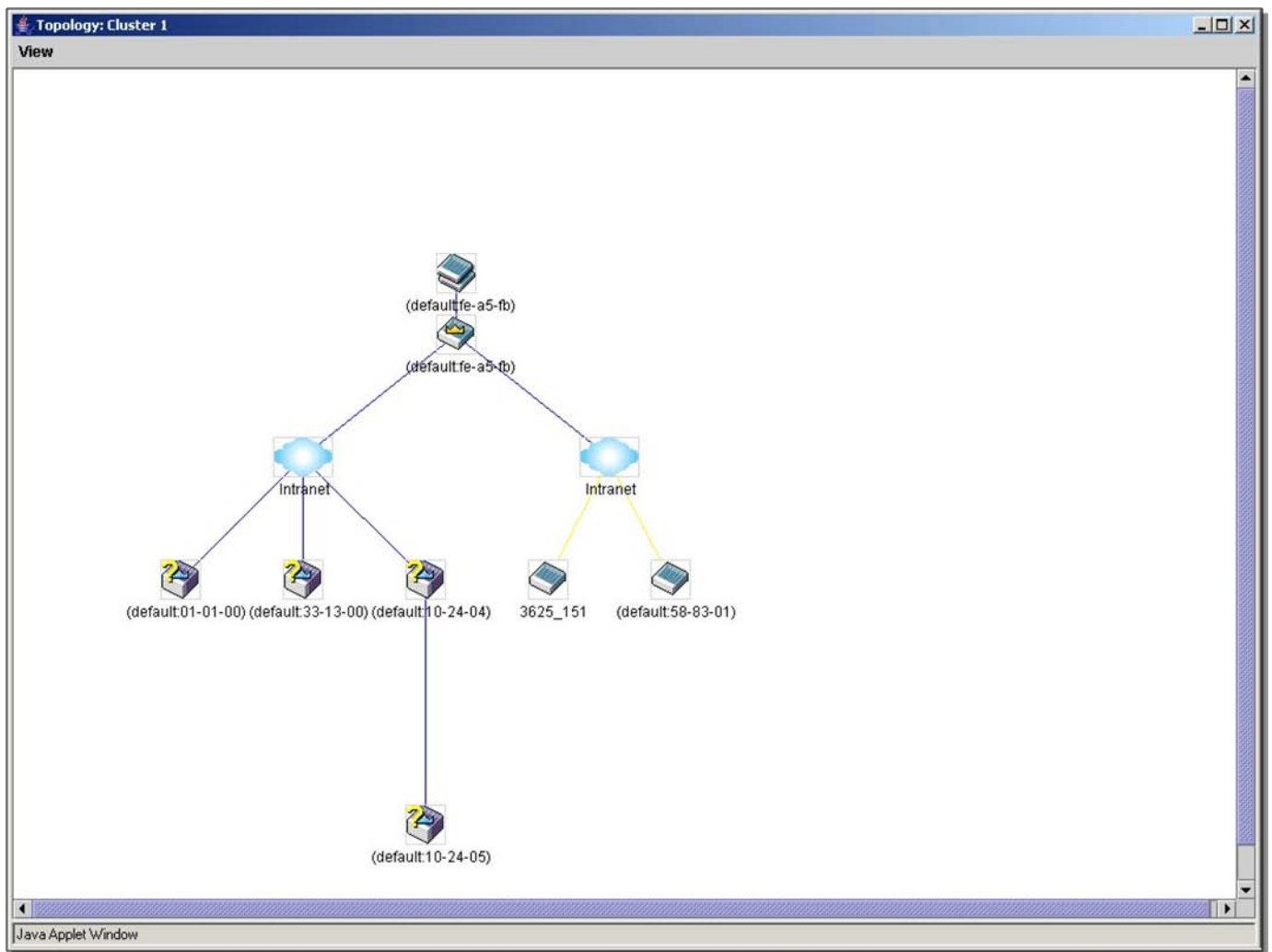


Figure 6-17 Topology view

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.

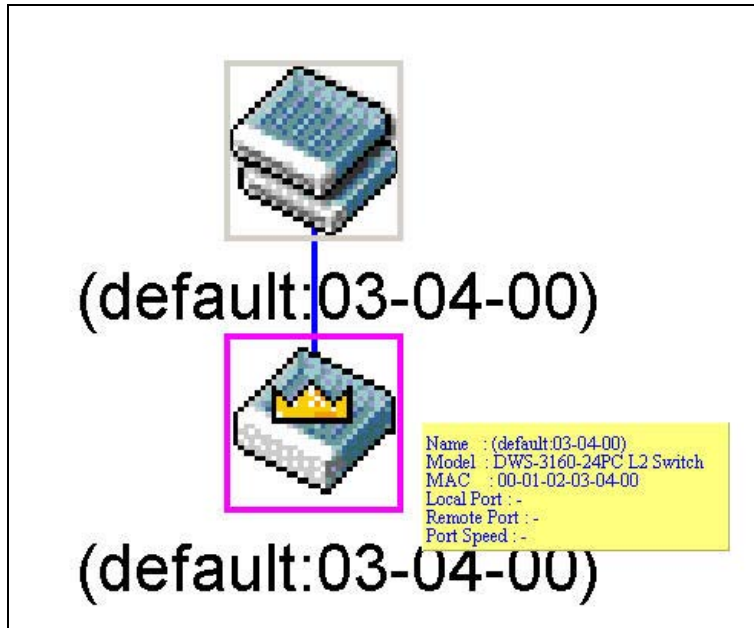


Figure 6-18 Device Information Utilizing the Tool Tip

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

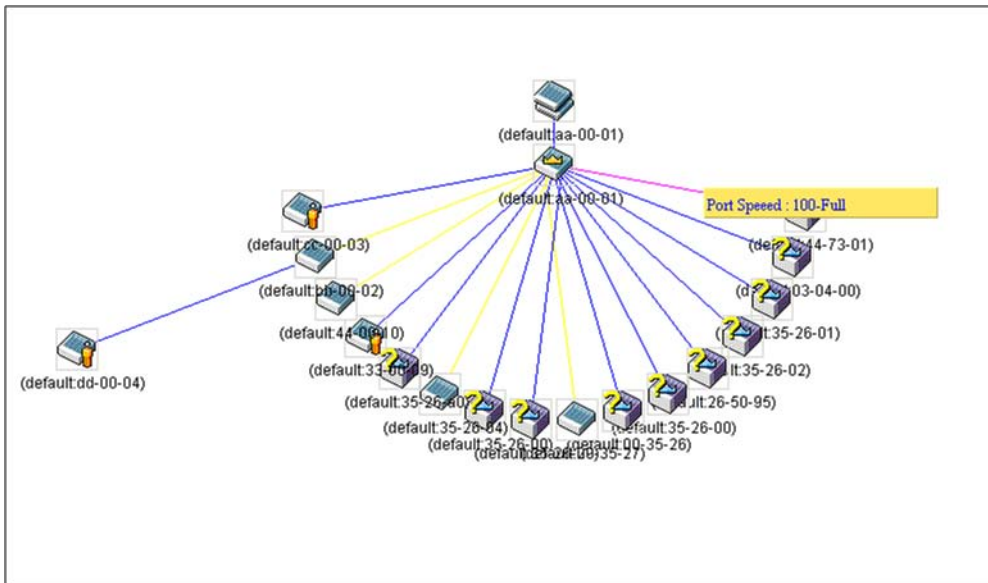


Figure 6-19 Port Speed Utilizing the Tool Tip

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

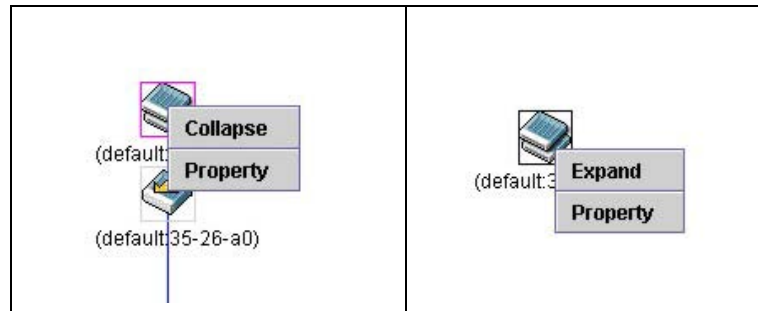


Figure 6-20 Right-Clicking a Group Icon

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.

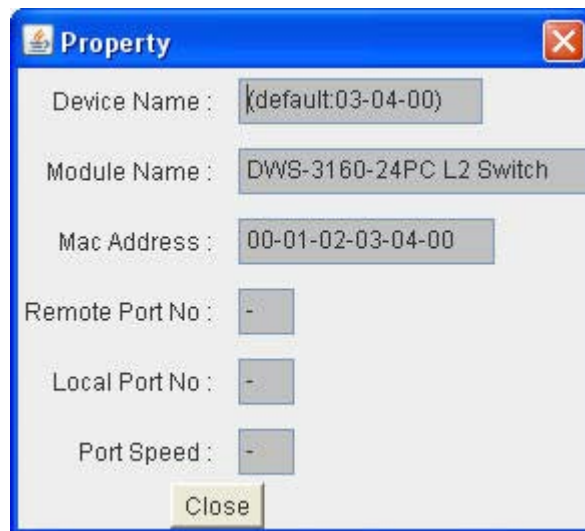


Figure 6-21 Property window

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 6-22 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

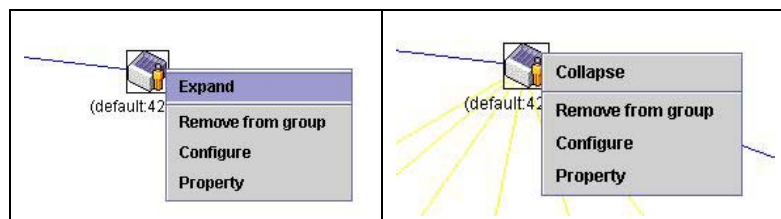


Figure 6-23 Right-clicking a Member icon

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

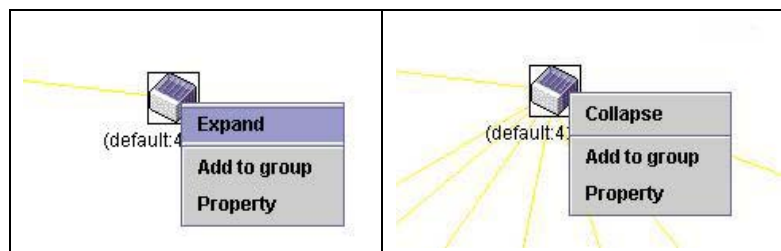


Figure 6-24 Right-clicking a Candidate icon

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 6-25 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 6-26 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.

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 6-27 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.

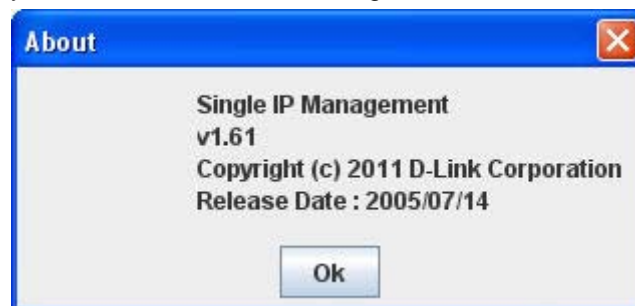


Figure 6-28 About window

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 **Port** (port on the CS where the MS resides), **MAC Address**, **Model Name** and **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 show below:

Figure 6-29 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 show below:

Figure 6-30 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 show below:

Figure 6-31 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 SNMPv1 and SNMPv2c, 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 SNMPv1 and SNMPv2c 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 show below:

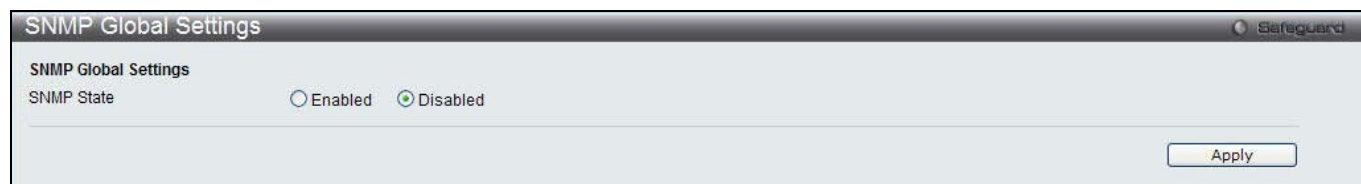


Figure 6-32 SNMP Global Settings window

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 show below:



Figure 6-33 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 show below:

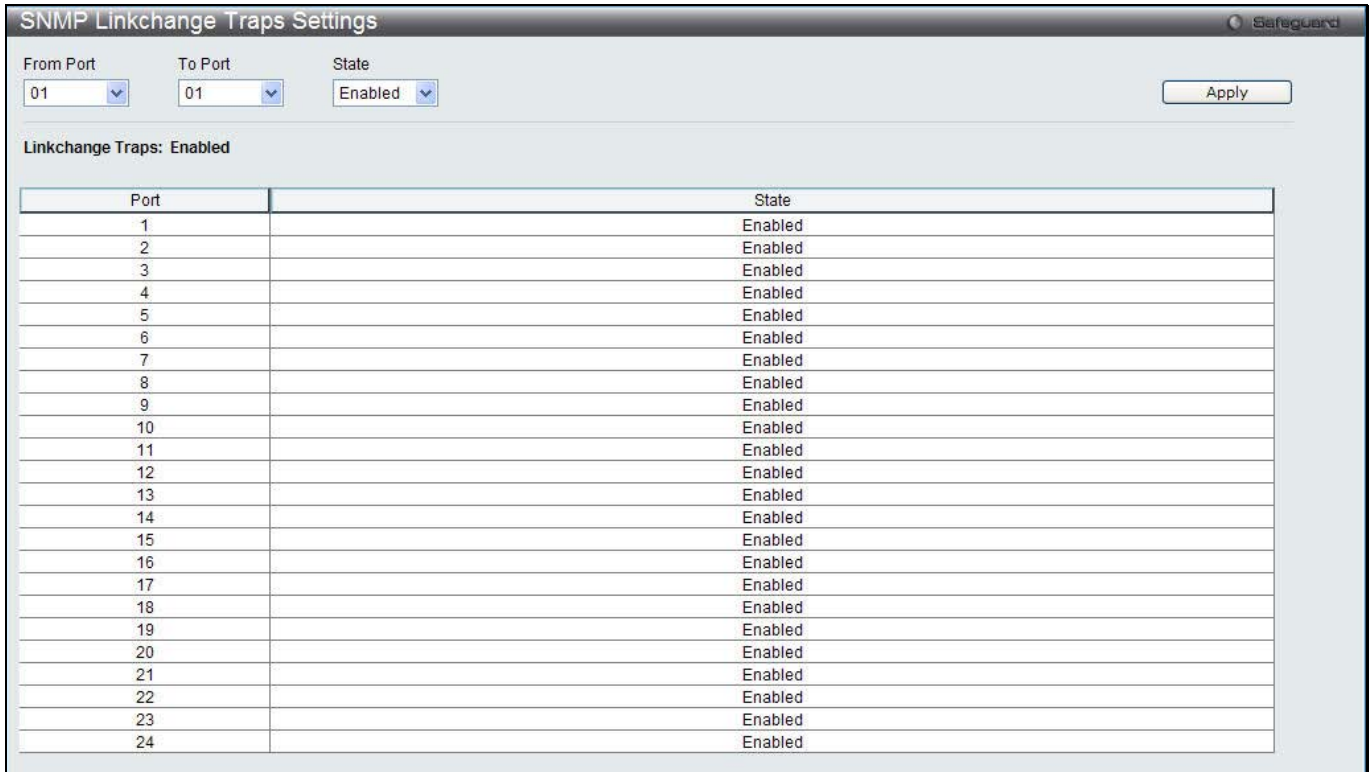


Figure 6-34 SNMP Linkchange Traps Settings window

The fields that can be configured are described below:

Parameter	Description
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 show below:



Figure 6-35 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 show below:

Community Name	View Name	Access Right
private	Community/View	read_write
public	Community/View	read_only

Figure 6-36 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	<i>Read Only</i> – Specify that SNMP community members using the community string created can only read the contents of the MIBs on the Switch. <i>Read Write</i> – Specify that SNMP community members using the community string created can read from, and write to the contents of the MIBs on the Switch.

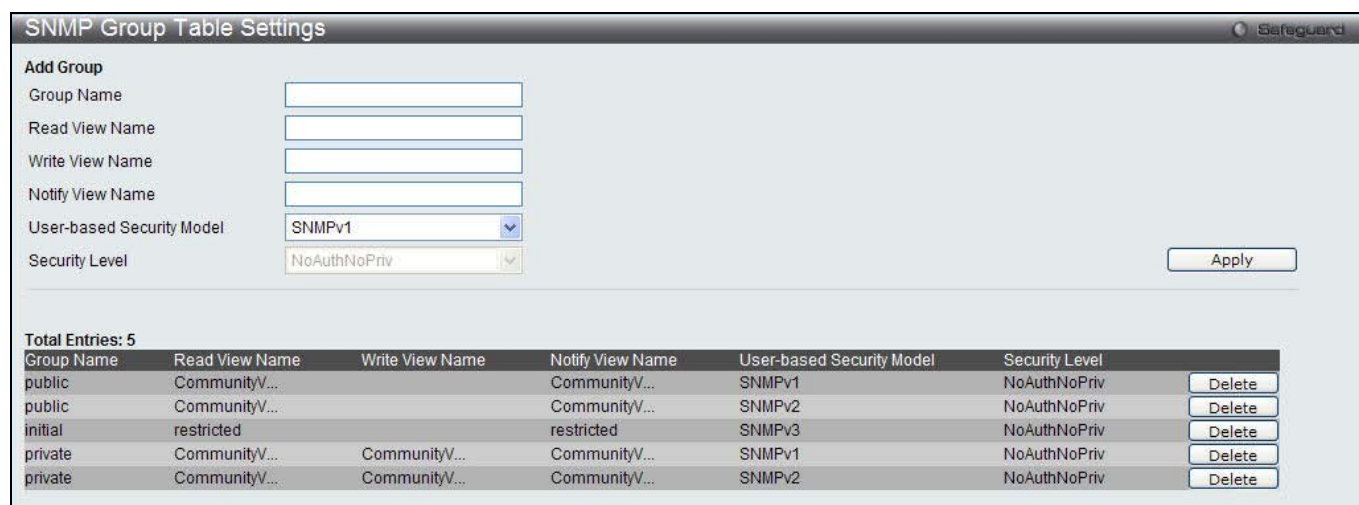
Click the **Apply** button to accept the changes made.

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 show below:



Group Name	Read View Name	Write View Name	Notify View Name	User-based Security Model	Security Level	
public	CommunityV...		CommunityV...	SNMPv1	NoAuthNoPriv	Delete
public	CommunityV...		CommunityV...	SNMPv2	NoAuthNoPriv	Delete
initial	restricted		restricted	SNMPv3	NoAuthNoPriv	Delete
private	CommunityV...	CommunityV...	CommunityV...	SNMPv1	NoAuthNoPriv	Delete
private	CommunityV...	CommunityV...	CommunityV...	SNMPv2	NoAuthNoPriv	Delete

Figure 6-37 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	<p><i>SNMPv1</i> – Specify that SNMP version 1 will be used.</p> <p><i>SNMPv2</i> – 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.</p> <p><i>SNMPv3</i> – 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.</p>
Security Level	<p>The Security Level settings only apply to SNMPv3.</p> <p><i>NoAuthNoPriv</i> – Specify that there will be no authorization and no encryption of packets sent between the Switch and a remote SNMP manager.</p> <p><i>AuthNoPriv</i> – Specify that authorization will be required, but there will be no encryption of packets sent between the Switch and a remote SNMP manager.</p> <p><i>AuthPriv</i> – Specify that authorization will be required, and that packets sent between the Switch and a remote SNMP manger will be encrypted.</p>

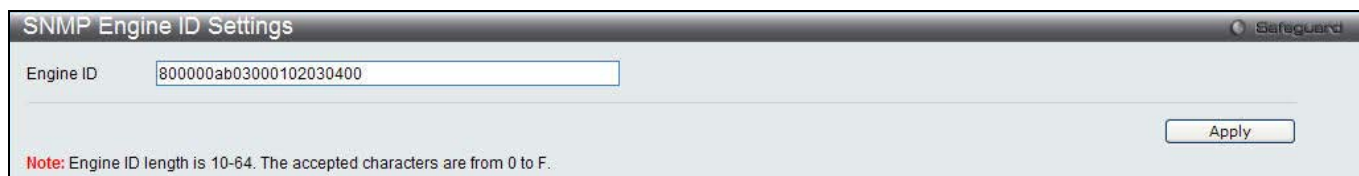
Click the **Apply** button to accept the changes made.

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 show below:



The screenshot shows the 'SNMP Engine ID Settings' window. It features a text input field for 'Engine ID' containing the value '800000ab03000102030400'. Below the input field is a red note: 'Note: Engine ID length is 10-64. The accepted characters are from 0 to F.' An 'Apply' button is located in the bottom right corner.

Figure 6-38 SNMP Engine ID Settings window

The fields that can be configured are described below:

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

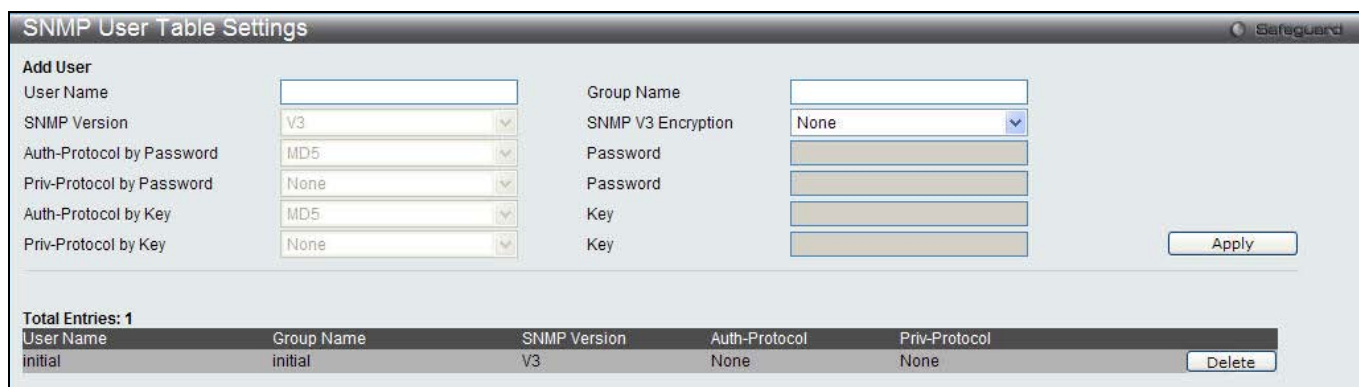


NOTE: The Engine ID length is 10-64 and accepted characters can range from 0 to F.

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 show below:



The screenshot shows the 'SNMP User Table Settings' window. It has an 'Add User' section with fields for User Name, Group Name, SNMP Version (V3), SNMP V3 Encryption (None), Auth-Protocol by Password (MD5), Password, Priv-Protocol by Password (None), Password, Auth-Protocol by Key (MD5), Key, and Priv-Protocol by Key (None). An 'Apply' button is at the bottom right. Below this is a table showing 'Total Entries: 1' with columns for User Name, Group Name, SNMP Version, Auth-Protocol, and Priv-Protocol. The table contains one entry: 'initial', 'initial', 'V3', 'None', 'None'. A 'Delete' button is next to the entry.

Figure 6-39 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 <i>None</i> , <i>Password</i> , or <i>Key</i> .
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. <i>SHA</i> – Specify that the HMAC-SHA authentication protocol will be used. This field is only operable when <i>V3</i> 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	<i>None</i> – Specify that no authorization protocol is in use. <i>DES</i> – Specify that DES 56-bit encryption is in use, based on the CBC-DES (DES-56) standard. This field is only operable when <i>V3</i> 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 show below:

Figure 6-40 SNMP Host Table Settings window

The fields that can be configured are described below:

Parameter	Description
Host IP Address	Type the IP address of the remote management station that will serve as the SNMP host for the Switch.
User-based Security Model	<i>SNMPv1</i> – Specify that SNMP version 1 will be used. <i>SNMPv2</i> – Specify that SNMP version 2 will be used. <i>SNMPv3</i> – Specify that SNMP version 3 will be used.
Security Level	<i>NoAuthNoPriv</i> – To specify that the SNMP version 3 will be used, with a NoAuth-NoPriv security level. <i>AuthNoPriv</i> – To specify that the SNMP version 3 will be used, with an Auth-NoPriv security level. <i>AuthPriv</i> – 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.

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 show below:

6-41 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	<i>SNMPv1</i> – Specifies that SNMP version 1 will be used. <i>SNMPv2</i> – Specifies that SNMP version 2 will be used. <i>SNMPv3</i> – Specifies that SNMP version 3 will be used.
Security Level	<i>NoAuthNoPriv</i> – To specify that the SNMP version 3 will be used, with a NoAuth-NoPriv security level. <i>AuthNoPriv</i> – To specify that the SNMP version 3 will be used, with an Auth-NoPriv security level. <i>AuthPriv</i> – 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 show below:

Figure 6-42 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 show below:

Figure 6-43 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 show below:

Figure 6-44 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 3 L2 Features

VLAN

QinQ

Spanning Tree

Link Aggregation

FDB

L2 Multicast Control

Multicast Filtering

ERPS Settings

LLDP

NLB FDB Settings

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.

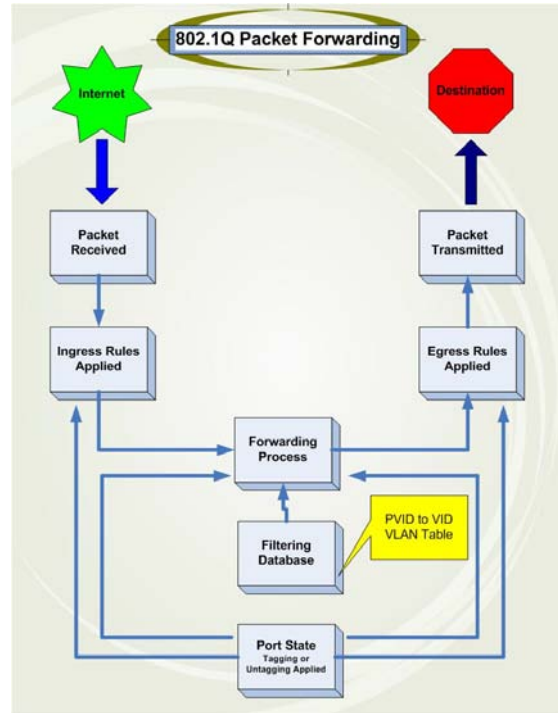


Figure 7-1 IEEE 802.1Q Packet Forwarding

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.

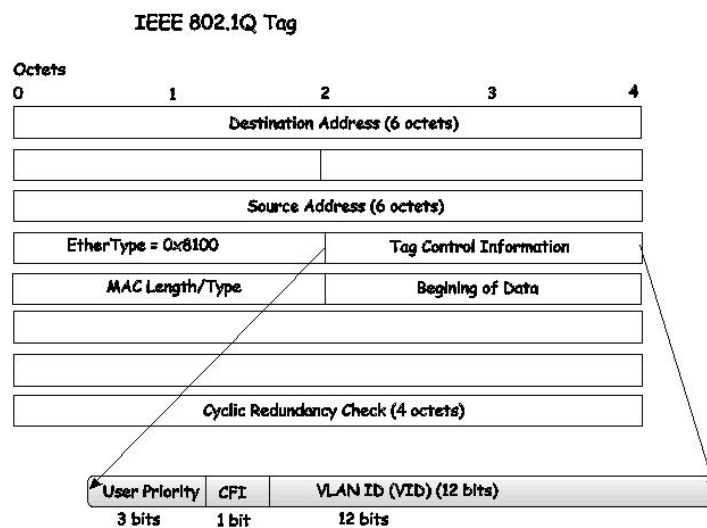


Figure 7-2 IEEE 802.1Q Tag

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.

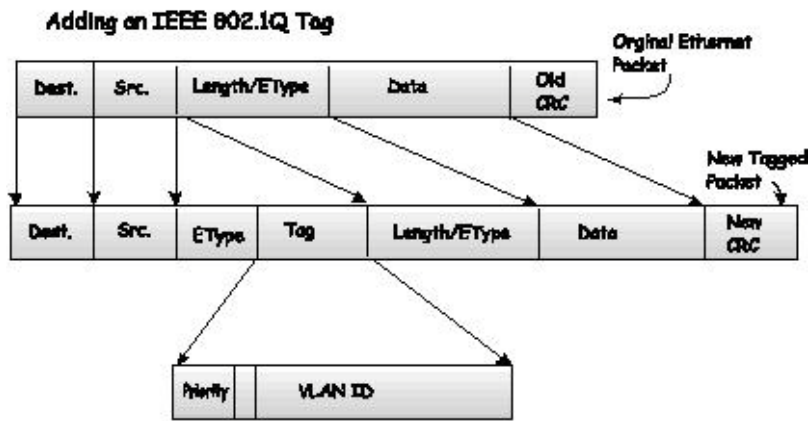


Figure 7-3 Adding an IEEE 802.1Q Tag

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 (if the port is a tagging port). 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 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 show below:

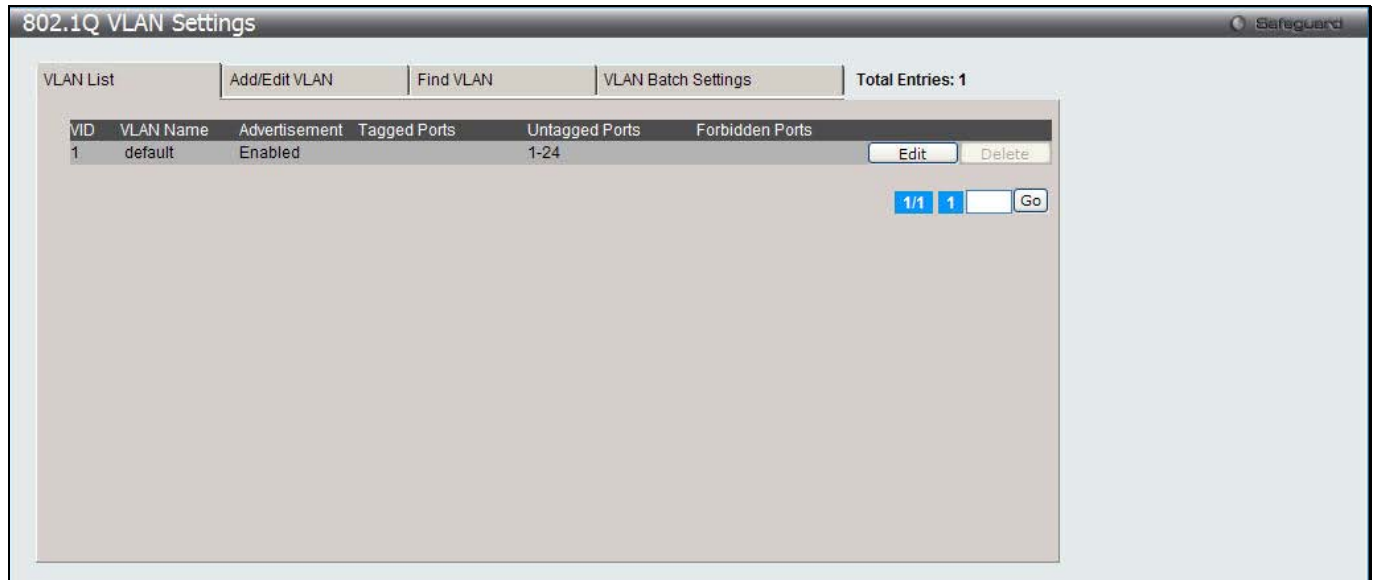


Figure 7-4 802.1Q VLAN Settings –VLAN List Tab window

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 7-5 802.1Q 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 you want 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.

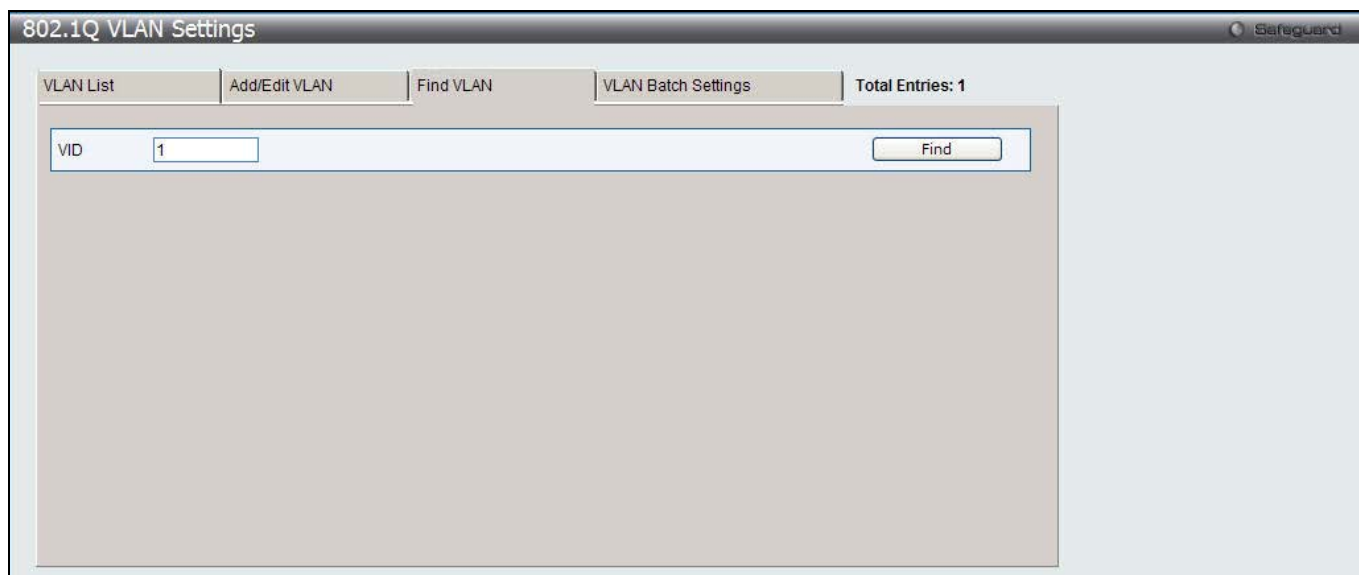


Figure 7-6 802.1Q VLAN Settings – Find VLAN Tab window

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.

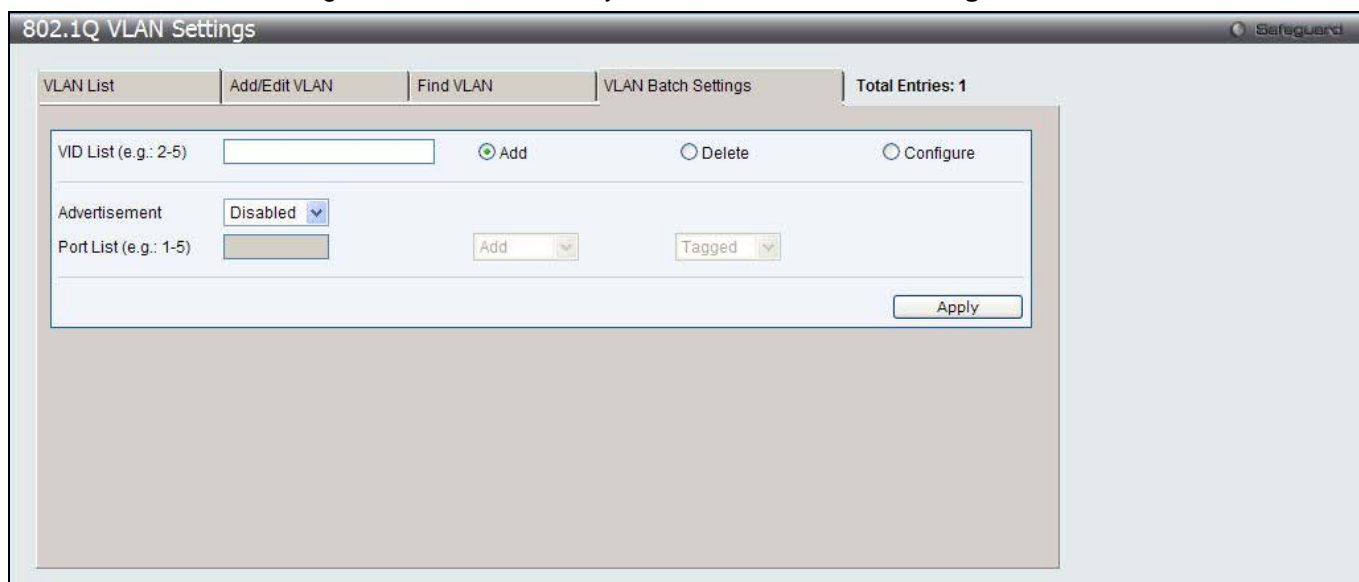


Figure 7-7 802.1Q VLAN Settings – VLAN Batch Settings Tab window

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 that group. 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 show below:

Figure 7-8 802.1v 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 <i>Ethernet II</i> , <i>IEEE802.3 SNAP</i> , and <i>IEEE802.3 LLC</i> .
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 800, IPv6 is 86dd, ARP is 806, 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 show below:

Figure 7-9 802.1v 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	<p>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.</p> <p>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.</p> <p>For more information on priority queues, CoS queues and mapping for 802.1p, see the QoS section of this manual.</p>
Port List	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	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**, as show below:

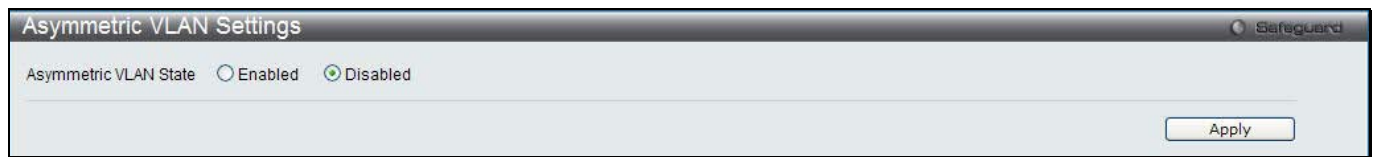


Figure 7-10 Asymmetric VLAN Settings window

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 show below:

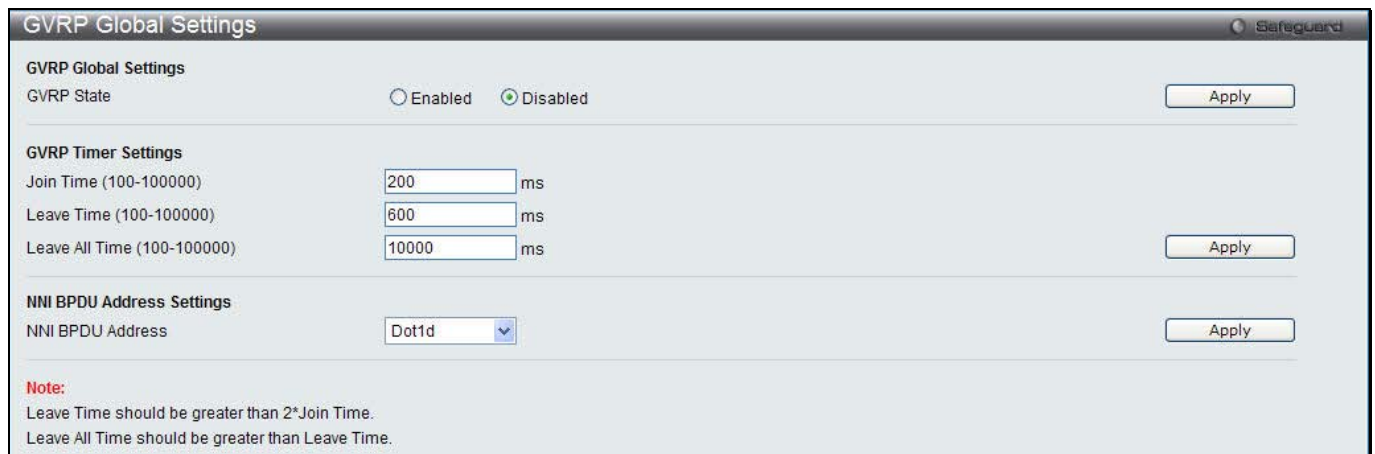


Figure 7-11 GVRP Global Settings window

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 (100-100000)	Enter the Join Time value in milliseconds.

Leave Time (100-100000)	Enter the Leave Time value in milliseconds.
Leave All Time (100-100000)	Enter the Leave All Time value in milliseconds.
NNI BPDU Address	Used to determine the BPDU protocol address for GVRP in service provide site. It can use 802.1d GVRP address, 802.1ad service provider GVRP address or a user defined multicast address. The range of the user defined address is 0180C2000000 - 0180C2FFFFFF.

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 show below:

GVRP Port Settings Safeguard

From Port: 01 To Port: 01 PVID (1-4094): GVRP: Disabled Ingress Checking: Enabled Acceptable Frame Type: All Apply

Port	PVID	GVRP	Ingress Checking	Acceptable Frame Type
1	1	Disabled	Enabled	All
2	1	Disabled	Enabled	All
3	1	Disabled	Enabled	All
4	1	Disabled	Enabled	All
5	1	Disabled	Enabled	All
6	1	Disabled	Enabled	All
7	1	Disabled	Enabled	All
8	1	Disabled	Enabled	All
9	1	Disabled	Enabled	All
10	1	Disabled	Enabled	All
11	1	Disabled	Enabled	All
12	1	Disabled	Enabled	All
13	1	Disabled	Enabled	All
14	1	Disabled	Enabled	All
15	1	Disabled	Enabled	All
16	1	Disabled	Enabled	All
17	1	Disabled	Enabled	All
18	1	Disabled	Enabled	All
19	1	Disabled	Enabled	All
20	1	Disabled	Enabled	All
21	1	Disabled	Enabled	All
22	1	Disabled	Enabled	All
23	1	Disabled	Enabled	All
24	1	Disabled	Enabled	All

Figure 7-12 GVRP Port Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select the starting and ending ports to use.
PVID (1-4094)	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 <i>Enabled</i> , 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 <i>Disabled</i> by default.
Ingress Checking	This drop-down menu allows the user to enable the port to compare the VID tag of an incoming packet with the port VLAN membership. If enable ingress checking and the reception port is not the member port of the frame's VLAN, the frame shall be discarded.
Acceptable Frame Type	This field denotes the type of frame that will be accepted by the port. The user may choose between <i>Tagged Only</i> , which means only VLAN tagged frames will be accepted, and <i>All</i> , which mean both tagged and untagged frames will be accepted. <i>All</i> 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 show below:

Figure 7-13 MAC-based VLAN Settings

The fields that can be configured are described below:

Parameter	Description
MAC Address	Specify the MAC address.
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.

Private VLAN Settings

A private VLAN is comprised of a primary VLAN, up to one isolated VLAN, and a number of community VLANs. A private VLAN ID is presented by the VLAN ID of the primary VLAN. The command used to associate or de-associate a secondary VLAN with a primary VLAN.

A secondary VLAN cannot be associated with multiple primary VLANs. The untagged member port of the primary VLAN is named as the promiscuous port. The tagged member port of the primary VLAN is named as the trunk port. A promiscuous port of a private VLAN cannot be promiscuous port of other private VLANs. The primary VLAN member port cannot be a secondary VLAN member at the same time, or vice versa. A secondary VLAN can only have the untagged member port. The member port of a secondary VLAN cannot be member port of other secondary VLAN at the same time. When a VLAN is associated with a primary VLAN as the secondary VLAN, the promiscuous port of the primary VLAN will behave as the untagged member of the secondary VLAN, and the trunk

port of the primary VLAN will behave as the tagged member of the secondary VLAN. A secondary VLAN cannot be specified with advertisement. Only the primary VLAN can be configured as a layer 3 interface. The private VLAN member port cannot be configured with the traffic segmentation function.

This window allows the user to configure the private VLAN parameters.

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

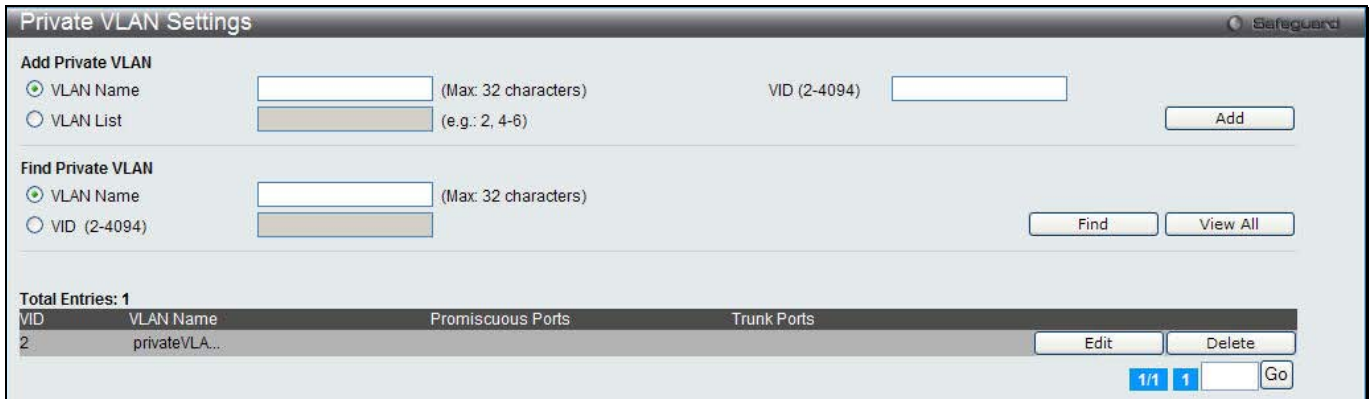


Figure 7-14 Private VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Enter a VLAN name.
VID (2-4094)	Enter a VID value.
VLAN List	Enter a list of VLAN IDs.

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 **Edit** button to configure the secondary VLAN.

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.

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

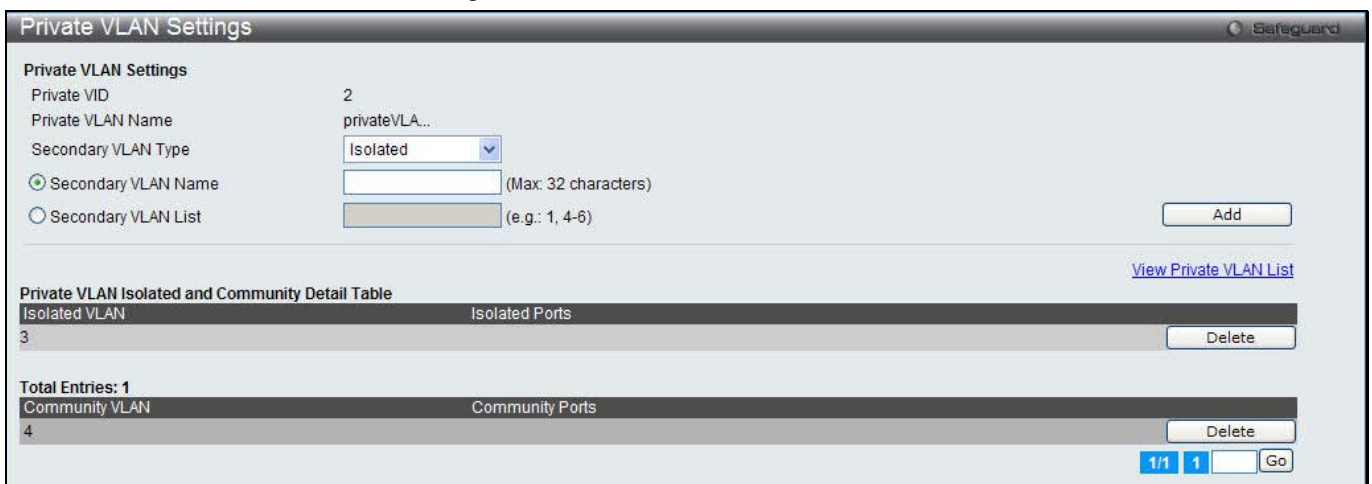


Figure 7-15 Private VLAN Settings - Edit window

The fields that can be configured are described below:

Parameter	Description
Secondary VLAN Type	Use the drop-down menu to select secondary VLAN type between <i>Isolated</i> or

	<i>Community.</i>
Secondary VLAN Name	Enter a secondary VLAN name.
Secondary VLAN List	Enter a list of secondary VLAN ID.

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 [View Private VLAN List](#) link to view all the private VLAN.

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 show below:

Figure 7-16 PVID Auto Assign Settings window

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

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 show below:

Figure 7-17 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 – 7. The default priority is 5.
Aging Time (1-65535)	The aging time to set, the range is 1 – 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/disable sending of issue of voice VLAN log.

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 show below:

Port	State	Mode
1	Disabled	Auto
2	Disabled	Auto
3	Disabled	Auto
4	Disabled	Auto
5	Disabled	Auto
6	Disabled	Auto
7	Disabled	Auto
8	Disabled	Auto
9	Disabled	Auto
10	Disabled	Auto
11	Disabled	Auto
12	Disabled	Auto
13	Disabled	Auto
14	Disabled	Auto
15	Disabled	Auto
16	Disabled	Auto
17	Disabled	Auto
18	Disabled	Auto
19	Disabled	Auto
20	Disabled	Auto
21	Disabled	Auto
22	Disabled	Auto
23	Disabled	Auto
24	Disabled	Auto

Figure 7-18 Voice VLAN Port Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menu to select a range of port to display.
State	Use the drop-down menu to enable or disable the state of the port.
Mode	Use the drop-down menu to configure 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 show below:

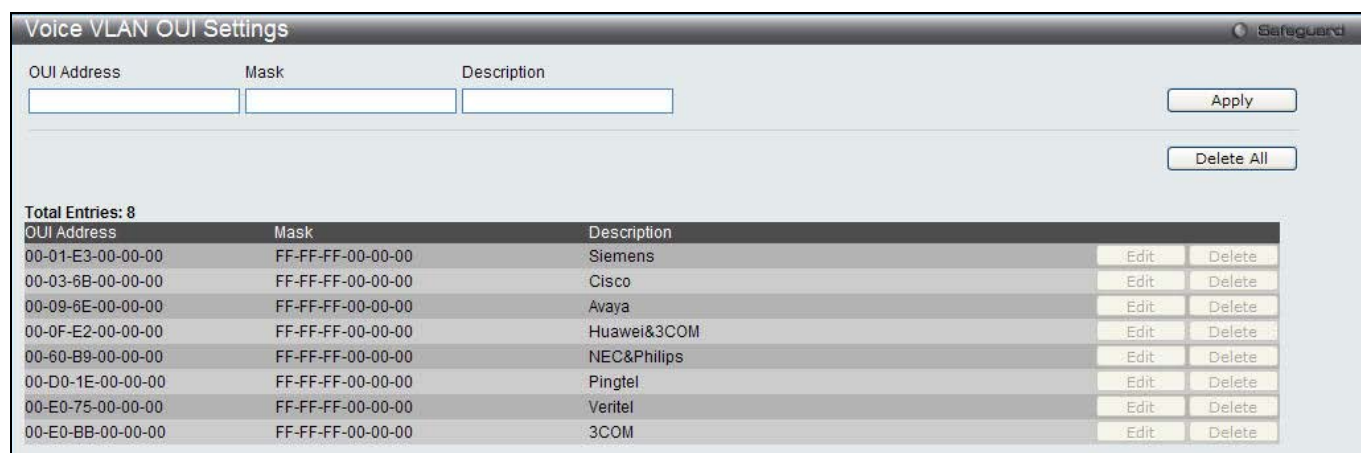


Figure 7-19 Voice VLAN OUI Settings window

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 show below:

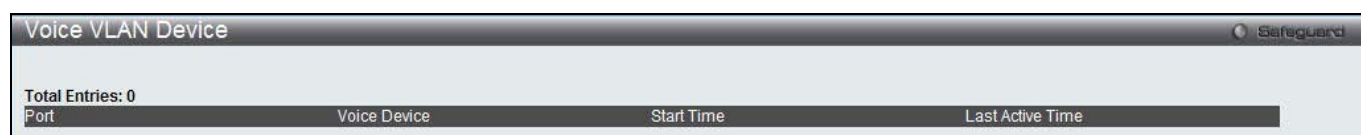


Figure 7-20 Voice VLAN Device window

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.

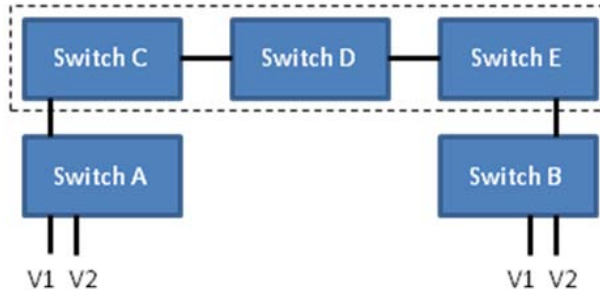


Figure 7-21 Example of VLAN Trunk

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 show below:

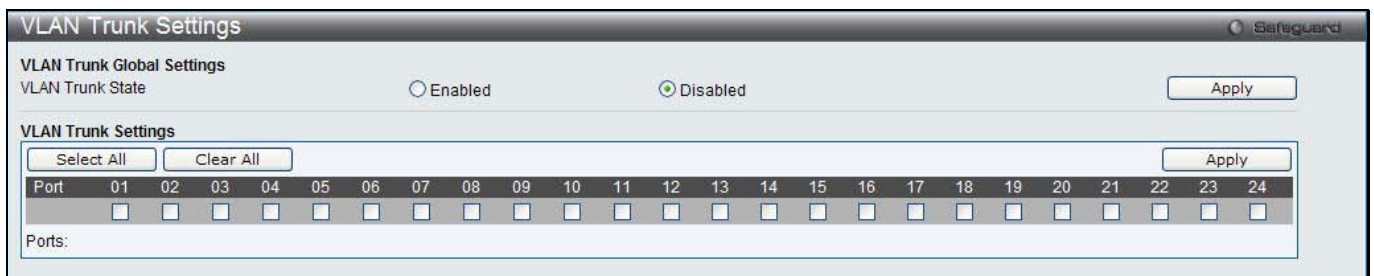


Figure 7-22 VLAN Trunk Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Trunk State	Enable or disable the VLAN trunking global state.
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.

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 show below:

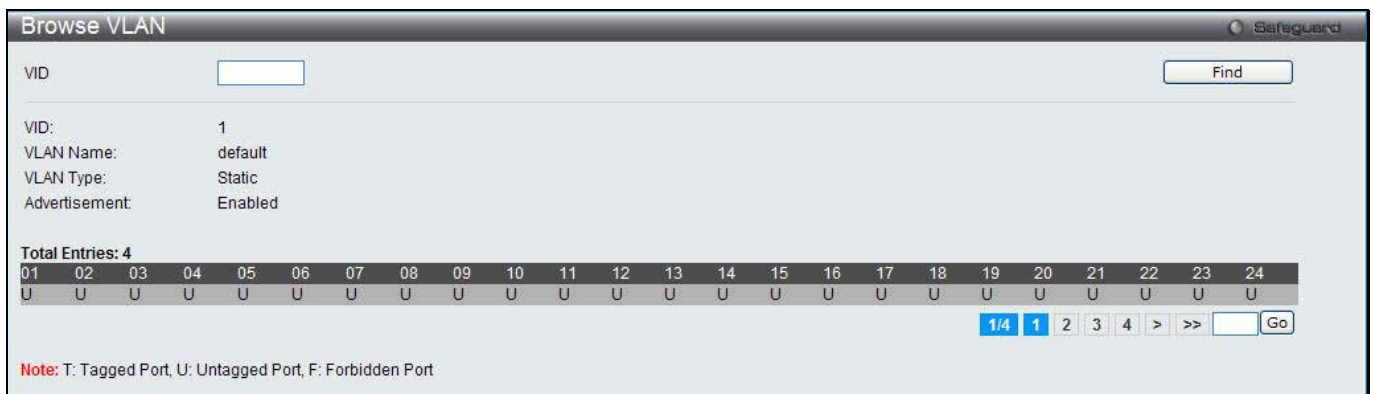


Figure 7-23 Browse VLAN window

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 show below:

Ports	VID	Untagged	Tagged	Dynamic	Forbidden
1	1	X	-	-	-
2	1	X	-	-	-
3	1	X	-	-	-
4	1	X	-	-	-
5	1	X	-	-	-
6	1	X	-	-	-
7	1	X	-	-	-
8	1	X	-	-	-
9	1	X	-	-	-
10	1	X	-	-	-

Figure 7-24 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.

QinQ

Double or Q-in-Q VLANs allow network providers to expand their VLAN configurations to place customer VLANs within a larger inclusive VLAN, which adds a new layer to the VLAN configuration. This basically lets large ISP's create L2 Virtual Private Networks and also create transparent LANs for their customers, which will connect two or more customer LAN points without over-complicating configurations on the client's side. Not only will over-complication be avoided, but also now the administrator has over 4000 VLANs in which over 4000 VLANs can be placed, therefore greatly expanding the VLAN network and enabling greater support of customers utilizing multiple VLANs on the network.

Double VLANs are basically VLAN tags placed within existing IEEE 802.1Q VLANs which we will call SPVIDs (Service Provider VLAN IDs). These VLANs are marked by a TPID (Tagged Protocol ID), configured in hex form to be encapsulated within the VLAN tag of the packet. This identifies the packet as double-tagged and segregates it from other VLANs on the network, therefore creating a hierarchy of VLANs within a single packet.

Here is an example Double VLAN tagged packet.

Destination Address	Source Address	SPVLAN (TPID + Service Provider VLAN Tag)	802.1Q CEVLAN Tag (TPID + Customer VLAN Tag)	Ether Type	Payload
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Consider the example below:

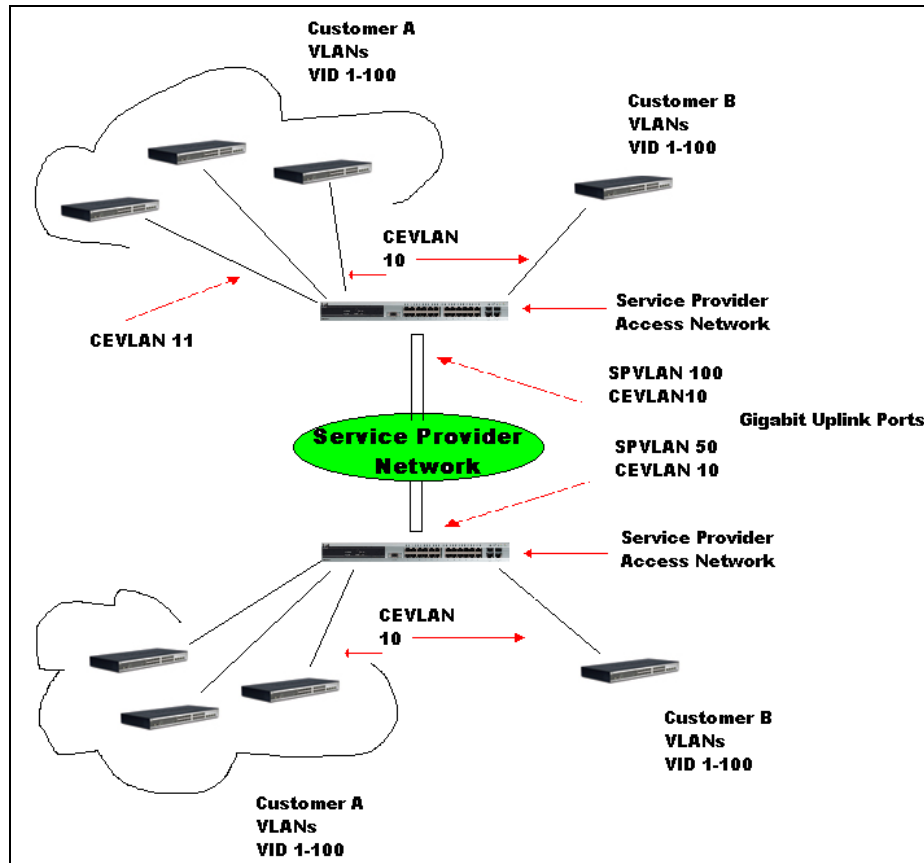


Figure 7-25 QinQ example window

In this example, the Service Provider Access Network switch (Provider edge switch) is the device creating and configuring Double VLANs. Both CEVLANS (Customer VLANs), 10 and 11, are tagged with the SPVID 100 on the Service Provider Access Network and therefore belong to one VLAN on the Service Provider's network, thus being a member of two VLANs. In this way, the Customer can retain its normal VLAN and the Service Provider can congregate multiple Customer VLANs within one SPVLAN, thus greatly regulating traffic and routing on the Service Provider switch. This information is then routed to the Service Provider's main network and regarded there as one VLAN, with one set of protocols and one routing behavior.

Regulations for Double VLANs

Some rules and regulations apply with the implementation of the Double VLAN procedure.

1. All ports must be configured for the SPVID and its corresponding TPID on the Service Provider's edge switch.
2. All ports must be configured as Access Ports or Uplink ports. Access ports can only be Ethernet ports while Uplink ports must be Gigabit ports.
3. Provider Edge switches must allow frames of at least 1522 bytes or more, due to the addition of the SPVID tag.
4. Access Ports must be an un-tagged port of the service provider VLANs. Uplink Ports must be a tagged port of the service provider VLANs.
5. The switch cannot have both double and normal VLANs co-existing. Once the change of VLAN is made, all Access Control lists are cleared and must be reconfigured.
6. Once Double VLANs are enabled, GVRP must be disabled.
7. All packets sent from the CPU to the Access ports must be untagged.
8. The following functions will not operate when the switch is in Double VLAN mode:
 - Guest VLANs.
 - Web-based Access Control.
 - IP Multicast Routing.
 - GVRP.
 - All Regular 802.1Q VLAN functions.

QinQ Settings

This window is used to configure the Q-in-Q parameters.

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

Port	Role	Missdrop	Outer TPID	Add Inner Tag
1	NNI	Disabled	0x8100	Disabled
2	NNI	Disabled	0x8100	Disabled
3	NNI	Disabled	0x8100	Disabled
4	NNI	Disabled	0x8100	Disabled
5	NNI	Disabled	0x8100	Disabled
6	NNI	Disabled	0x8100	Disabled
7	NNI	Disabled	0x8100	Disabled
8	NNI	Disabled	0x8100	Disabled
9	NNI	Disabled	0x8100	Disabled
10	NNI	Disabled	0x8100	Disabled
11	NNI	Disabled	0x8100	Disabled
12	NNI	Disabled	0x8100	Disabled
13	NNI	Disabled	0x8100	Disabled
14	NNI	Disabled	0x8100	Disabled
15	NNI	Disabled	0x8100	Disabled
16	NNI	Disabled	0x8100	Disabled
17	NNI	Disabled	0x8100	Disabled
18	NNI	Disabled	0x8100	Disabled
19	NNI	Disabled	0x8100	Disabled
20	NNI	Disabled	0x8100	Disabled
21	NNI	Disabled	0x8100	Disabled

Figure 7-26 QinQ Settings Window

The fields that can be configured are described below:

Parameter	Description
QinQ State	Click to enable or disable the Q-in-Q state.
Inner TPID	Enter an Inner TPID in SP-VLAN tag here.
From Port / To Port	Use the drop-down menus to select a range of ports to use in the configuration.
Role	Port role in Q-in-Q mode, it can be UNI port or NNI port
Missdrop	This option enables or disables C-VLAN based SP-VLAN assignment miss drop. If Missdrop is enabled, the packet that does not match any assignment rule in the Q-in-Q profile will be dropped. If disabled, then the packet will be forwarded and will be assigned to the PVID of the received port.
Outer TPID	Enter an Outer TPID in SP-VLAN tag here.
Add Inner Tag	Specifies that an Inner Tag will be added to the entry. By default the Disabled option is selected.

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

VLAN Translation Settings

This window is used to add translation relationship between C-VLAN and SP-VLAN. On ingress at UNI port, the C-VLAN tagged packets will be translated to SP-VLAN tagged packets by adding or replacing according the

configured rule. On egress at this port, the SP-VLAN tag will be recovered to C-VLAN tag or be striped. The priority will be the priority in the SP-VLAN tag if the inner priority flag is disabled for the receipt port.

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

Figure 7-27 VLAN Translation Settings Window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menus to select a range of ports to use in the configuration.
CVID (1, 5-7)	Enter the C-VLAN ID to match.
Action	The action indicates to add an S-tag before a C-tag or to replace the original C-tag by an S-tag.
SVID (1-4094)	Enter the SP-VLAN ID.
Priority	Use the drop-down menu to select the priority of the s-tag.

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 a specific entry.

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 BPDU 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
<i>Discarding</i>	<i>Discarding</i>	<i>Blocking</i>	No	No
<i>Discarding</i>	<i>Discarding</i>	<i>Listening</i>	No	No
<i>Learning</i>	<i>Learning</i>	<i>Learning</i>	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.

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 show below:

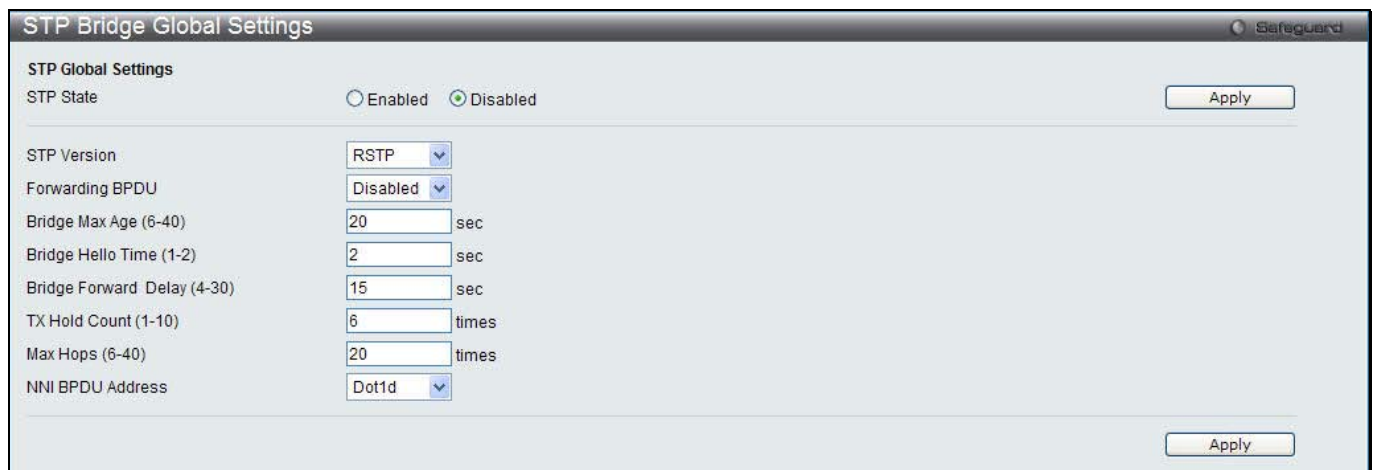


Figure 7-28 STP Bridge Global Settings window

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 drop-down menu to choose the desired version of STP: <i>STP</i> - Select this parameter to set the Spanning Tree Protocol (STP) globally on the switch. <i>RSTP</i> - Select this parameter to set the Rapid Spanning Tree Protocol (RSTP) globally on the Switch.

	<i>MSTP</i> - Select this parameter to set the Multiple Spanning Tree Protocol (MSTP) globally on the Switch.
Forwarding BPDU	This field can be <i>Enabled</i> or <i>Disabled</i> . When <i>Enabled</i> , it allows the forwarding of STP BPDU packets from other network devices. The default is <i>Enabled</i> .
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 BPDU 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	Used to determine the BPDU protocol address for GVRP in service provide site. It can use 802.1d GVRP address, 802.1ad service provider GVRP address or a user defined multicast address. The range of the user defined address is 0180C2000000 - 0180C2FFFFFF.

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

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

STP Port Settings
Safeguard

From Port:

To Port:

External Cost (0 = Auto):

Migrate:

Edge:

P2P:

Port STP:

Restricted Role:

Restricted TCN:

Forward BPDU:

Port	External Cost	Edge	P2P	Port STP	Restricted Role	Restricted TCN	Forward BPDU	Hello Time
1	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
2	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
3	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
4	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
5	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
6	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
7	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
8	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
9	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
10	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
11	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
12	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2
13	Auto/200000	False/No	Auto/Yes	Enabled	False	False	Disabled	2/2

Port field:
M = Trunk Master, T = Trunk Member
External Cost, Edge, P2P and Hello Time fields:
Value1/Value2 (Value1 = Configured value; Value2 = Actual value)

Figure 7-29 STP Port Settings window

The fields that can be configured are described below:

Parameter	Description
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 <i>True</i> 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 <i>False</i> indicates that the port cannot have P2P status. <i>Auto</i> allows the port to have P2P status whenever possible and operate as if the P2P status were <i>True</i> . 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 <i>False</i> . The default setting for this parameter is <i>Auto</i> .
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 <i>True</i> and <i>False</i> . If set to <i>True</i> , this stops the port from propagating received topology change notifications and topology changes to other ports. The default is <i>False</i> .
Migrate	When operating in RSTP mode, selecting <i>Yes</i> 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 <i>Enabled</i> .
Forward BPDU	Use the drop-down menu to enable or disable the flooding of BPDU packets when STP is disabled.
Edge	Choosing the <i>True</i> 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 <i>False</i> parameter indicates that the port does not have edge port status. Alternatively, the <i>Auto</i> option is available.
Restricted Role	Use the drop-down menu to toggle Restricted Role between <i>True</i> and <i>False</i> . If set to <i>True</i> , the port will never be selected to be the Root port. The default is <i>False</i> .

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 show below:

Figure 7-30 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 (1-15)	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: <i>Add VID</i> - Select this parameter to add VIDs to the MSTI ID, in conjunction with the VID List parameter. <i>Remove VID</i> - Select this parameter to remove VIDs from the MSTI ID, in conjunction with the VID List parameter.
VID List	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 show below:

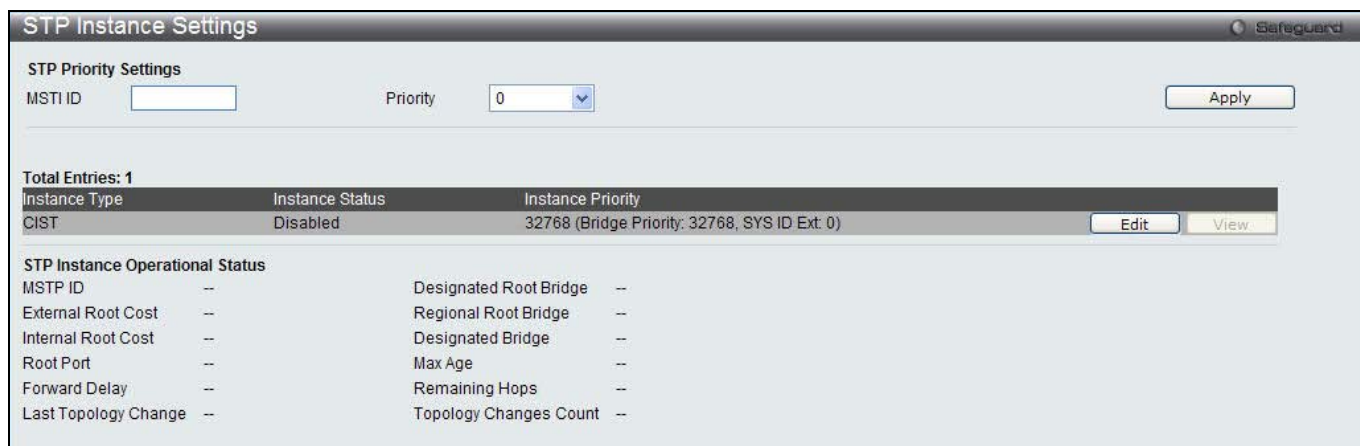


Figure 7-31 STP Instance Settings window

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 show below:



Figure 7-32 MSTP Port Information window

The fields that can be configured are described below:

Parameter	Description
Port	Select the port you want 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 (1-200000000)	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.

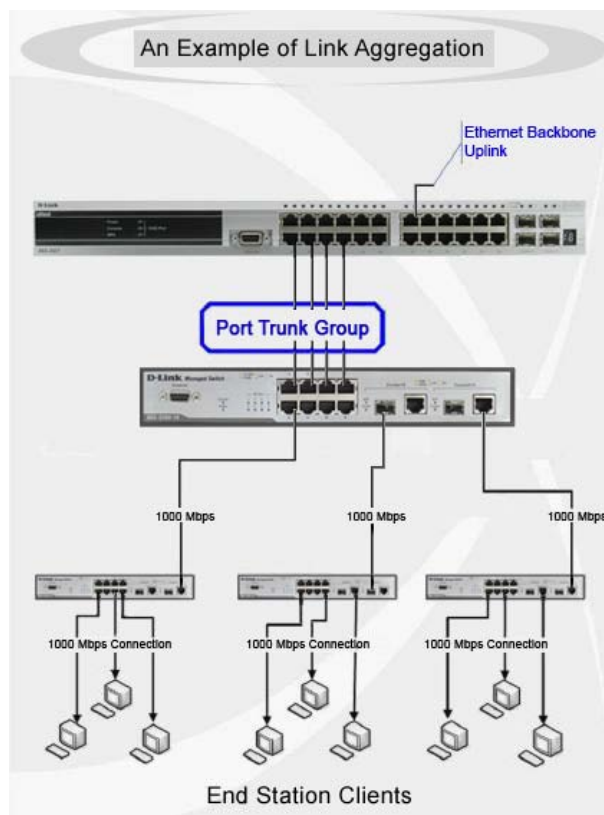
Click the **Apply** button to accept the changes made.

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 32 port trunk groups with two to eight ports in each group. A potential bit rate of 8000 Mbps can be achieved.



7-33 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 32 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, port mirroring and 802.1X must not be enabled on the trunk group. Further, the LACP aggregated links must all be of the same speed and 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 show below:

Figure 7-34 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 Dest, IP Source Dest and Lay4 Source Dest.
Group ID (1-32)	Select an ID number for the group, between 1 and 32.
Type	This drop-down menu allows users to select between <i>Static</i> and <i>LACP</i> (Link Aggregation Control Protocol). <i>LACP</i> 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 <i>Enabled</i> and <i>Disabled</i> . 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.
Member Ports	Choose the members of a trunked group. Up to eight ports can be assigned to a group.

Active Ports	Shows the ports that are currently forwarding packets.
---------------------	--

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 show below:

From Port	To Port	Activity
01	01	Passive

Port	Activity
1	Passive
2	Passive
3	Passive
4	Passive
5	Passive
6	Passive
7	Passive
8	Passive
9	Passive
10	Passive
11	Passive
12	Passive
13	Passive
14	Passive
15	Passive
16	Passive
17	Passive
18	Passive
19	Passive
20	Passive
21	Passive
22	Passive
23	Passive
24	Passive

Figure 7-35 LACP Port Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	A consecutive group of ports may be configured starting with the selected port.
Activity	<p><i>Active</i> - 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.</p> <p><i>Passive</i> - 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).</p>

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 show below:

Figure 7-36 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. 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. When selecting <i>Port</i> , enter the port number in the field. The format can be "unit ID:port number" (e.g. 1:5) or "port number" (e.g. 5). When only entering port number, the default unit ID is 1.

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 show below:

Multicast Static FDB Settings Safeguard

Multicast Forwarding Settings

VID:

Multicast MAC Address: Clear All Apply

Port	Select All	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
None	All	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
Egress	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Egress Ports

Total Entries: 0

VID	MAC Address	Mode	Egress Ports
-----	-------------	------	--------------

Figure 7-37 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.
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: <i>None</i> - No restrictions on the port dynamically joining the multicast group. When <i>None</i> is chosen, the port will not be a member of the Static Multicast Group. Click the All button to select all the ports. <i>Egress</i> - 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 show below:

Figure 7-38 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 (1-2147483647)	The time in seconds between notifications. Value range to use is 1 to 2147483647.
History Size (1-500)	The maximum number of entries listed in the history log used for notification. Up to 500 entries can be specified.
From Port / To Port	Select the starting and ending ports for MAC notification.
State	Enable MAC Notification for the ports selected using the drop-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 show below:

Figure 7-39 MAC Address Aging Time Settings window

The fields that can be configured are described below:

Parameter	Description
MAC Address Aging	This field specify the length of time a learned MAC Address will remain in the

Time (10-1000000)	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 show below:

MAC Address Table

Port: 01 Find Clear Dynamic Entries

VLAN Name: Find Clear Dynamic Entries

VID List: Find

MAC Address: 00-00-00-00-00-00 Find

Security: Find

View All Entries Clear All Entries

Total Entries: 3

VID	VLAN Name	MAC Address	Port	Type	Status	
1	default	00-00-01-02-03-04	5	Static	Forward	Add to Static MAC table
1	default	00-01-02-03-04-00	CPU	Self	Forward	Add to Static MAC table
1	default	00-0C-6E-AA-B9-C0	1	Dynamic	Forward	Add to Static MAC table

1/1 1 Go

Figure 7-40 MAC Address Table window

The fields that can be configured are described below:

Parameter	Description
Port	The port to which the MAC address below corresponds.
VLAN Name	Enter a VLAN Name for the forwarding table to be browsed by.
VID List	Enter a list of VLAN IDs 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 show below:

Interface	IP Address	MAC Address	VLAN Name	Port
System	10.90.90.10	00-0C-6E-AA-B9-C0	default	1

Figure 7-41 ARP & FDB Table window

The fields that can be configured are described below:

Parameter	Description
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 the specific entry to the 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 show below:

Figure 7-42 IGMP Snooping Settings window

The fields that can be configured are described below:

Parameter	Description
IGMP Snooping State	Click 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 7-43 IGMP Snooping Parameters Settings window

The fields that can be configured are described below:

Parameter	Description
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 enable, it allows the switch to be selected as a IGMP Querier (sends IGMP query packets). If the state is disabled, then the switch can not play the role as a querier. NOTE: that 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 port. If an IGMP packet received by the interface has a version higher than the specified version, this packet will be dropped.

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

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

After clicking the [Modify Router Port](#) link, the following page will appear:

Figure 7-44 IGMP Snooping Router Port Settings window

The fields that can be configured are described below:

Parameter	Description
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 propagate routing packets out.
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 window.

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 show below:

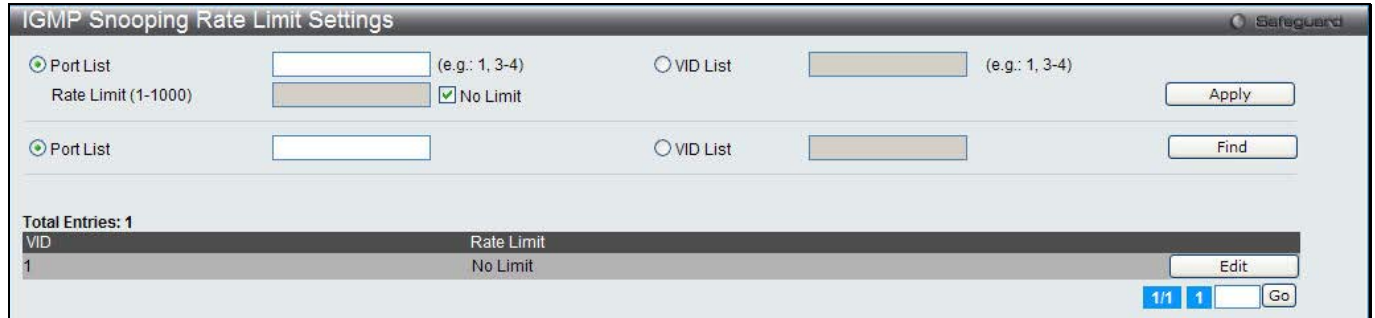


Figure 7-45 IGMP Snooping Rate Limit Settings window

The fields that can be configured are described below:

Parameter	Description
Port List	Click the radio button and enter the port list used for this configuration.
VID List	Click the radio button and enter the VID list used for this configuration.
Rate Limit (1-1000)	Enter the IGMP snooping rate limit used. Tick the No Limit check box to ignore the rate limit.

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 show below:



Figure 7-46 IGMP Snooping Static Group Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Enter the VLAN name of the multicast group.
VID List	Enter the VID list or 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 7-47 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 window.

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 show below:

Figure 7-48 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 show below:

Figure 7-49 IGMP Snooping Group 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	Specify the port number(s) used to find a multicast group.
Group IPv4 Address	Enter the IPv4 address.
Data Driven	If 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 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 show below:

Figure 7-50 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 show below:

Figure 7-51 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 <i>Port List</i> 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:

IGMP Snooping Counter Table

Port : 5
Group Number : 0

Receive Statistics

Query	Report & Leave
IGMP v1 Query	IGMP v1 Report
IGMP v2 Query	IGMP v2 Report
IGMP v3 Query	IGMP v3 Report
Total	IGMP v2 Leave
Dropped By Rate Limitation	Total
Dropped By Multicast VLAN	Dropped By Rate Limitation
	Dropped By Max Group Limitation
	Dropped By Group Filter
	Dropped By Multicast VLAN

Transmit Statistics

Query	Report & Leave
IGMP v1 Query	IGMP v1 Report
IGMP v2 Query	IGMP v2 Report
IGMP v3 Query	IGMP v3 Report
Total	IGMP v2 Leave
	Total

Figure 7-52 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 window.

IGMP Host Table

This window is used to view the IGMP host table.

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

IGMP Host Table

VLAN Name

VID List (e.g.: 1, 4-6)

Port List (e.g.: 1, 3-5)

Group Address (e.g.: 224.1.1.1)

Find

View All

Total Entries: 0

VID	Group	Port	Host
-----	-------	------	------

Figure 7-53 IGMP Host Table window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the radio button and enter the name of VLAN to be displayed.
VID List	Click the radio button and enter a list of VLAN IDs to be displayed.
Port List	Click the radio button and enter a list of ports to be displayed.
Group Address	Click the radio button and enter the group address 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.

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 flooded.



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 show below:

Figure 7-54 MLD Snooping Settings window

The fields that can be configured are described below:

Parameter	Description
MLD Snooping State	Click 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 7-55 MLD Snooping Parameters Settings window

The fields that can be configured are described below:

Parameter	Description
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: <i>Group listener interval</i> - Amount of time that must pass before a multicast router decides there are no more listeners of a group on a network.

	<p><i>Other Querier present interval</i> - Amount of time that must pass before a multicast router decides that there is no longer another multicast router that is the Querier.</p> <p><i>Last listener query count</i> - 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.</p> <p>By default, the robustness variable is set to 2. You might want to increase this value if you expect a subnet to be loosely.</p>
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	Use the drop-down menu to enable or disable the fast done feature.
State	Used to enable or disable MLD snooping for the specified VLAN. This field is <i>Disabled</i> by default.
Report Suppression	Use the drop-down menu to 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. If a MLD packet received by the interface has a version higher than the specified version, this packet will be dropped.

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

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

After clicking the [Modify Router Port](#) link, the following page will appear:

Figure 7-56 MLD Snooping Router Port Settings window

The fields that can be configured are described below:

Parameter	Description
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 propagate routing packets out.
Dynamic Router Port	Display 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 window.

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 show below:

Figure 7-57 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 (1-1000)	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. Tick the No Limit check box to lift 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 show below:



Figure 7-58 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:

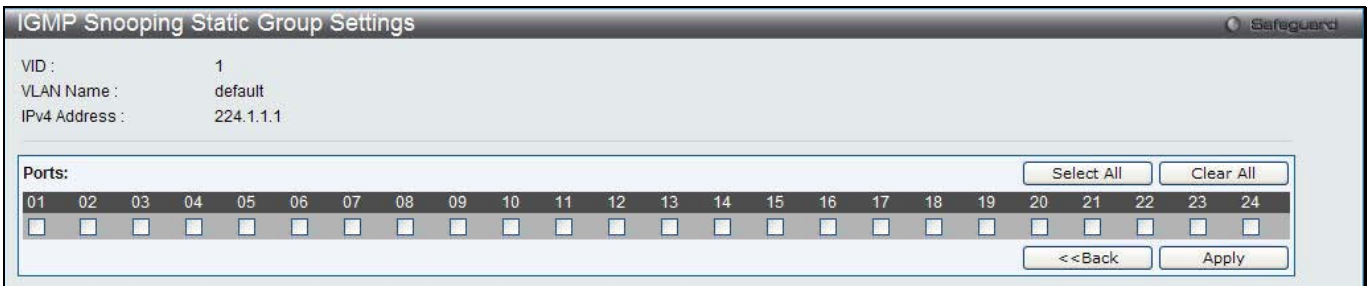


Figure 7-59 MLD Snooping Static Group Settings – Edit window

Parameter	Description
Ports	Tick the check boxes to select the ports to be configured.

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 window.

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 show below:

Figure 7-60 MLD Router Port window

Parameter	Description
VID	Enter a VLAN ID.

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 show below:

Figure 7-61 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 Drive 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 show below:

Figure 7-62 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 show below:

Figure 7-63 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 7-64 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 window.

MLD Host Table

This window is used to view the MLD host table.

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

Figure 7-65 MLD Host Table window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the radio button and enter the name of VLAN to be displayed.
VID List	Click the radio button and enter a list of VLAN IDs to be displayed.
Port List	Click the radio button and enter a list of ports to be displayed.
Group Address	Click the radio button and enter the group address 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.

Multicast VLAN

In a switching environment, multiple VLANs may exist. Every time 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 show below:

Figure 7-66 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 7-67 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 window.

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 show below:

Figure 7-68 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 Unmatched state.
VLAN Name	Enter the VLAN Name used.
VID (2-4094)	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. <i>None</i> – If this is specified, the packet's original priority is used. The default setting is <i>None</i> .
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 7-69 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. <i>None</i> – If None is specified, the packet's original priority is used. The default setting is <i>None</i> .
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.
Untagged Member Ports	Specify the untagged member port of the multicast VLAN.
Tagged Member Ports	Specify the tagged member port of the multicast VLAN.
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 window.

After clicking the [Profile List](#) link, the following page will appear:



Figure 7-70 IGMP Snooping Multicast VLAN Group List Settings window

The fields that can be configured are described below:

Parameter	Description
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 show below:



Figure 7-71 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 7-72 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 window.

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 show below:

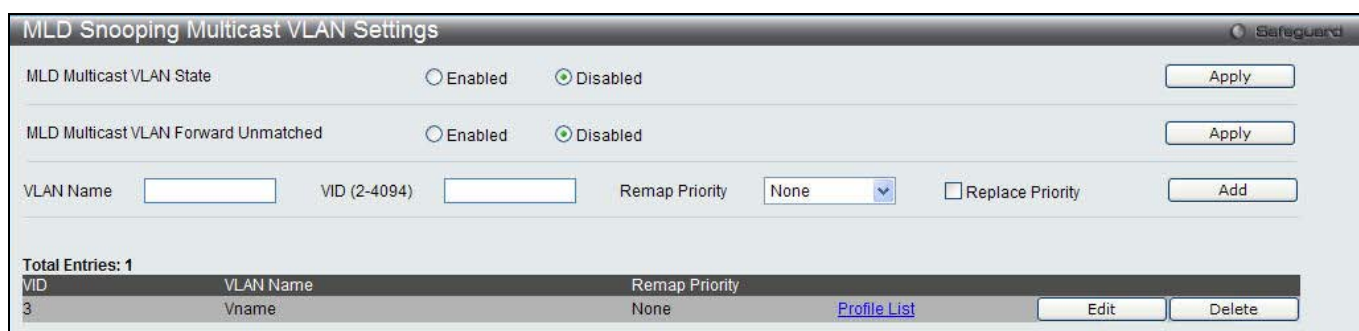


Figure 7-73 MLD Snooping Multicast VLAN Settings window

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 can enable or disable the MLD multicast VLAN Forward Unmatched state.
VLAN Name	Enter the VLAN name used.
VID (2-4094)	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 7-74 MLD 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 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. <i>None</i> – If this is specified, the packet's original priority is used. The default setting is <i>None</i> .
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.
Tagged Member Ports	Specify the tagged member port of the multicast VLAN.
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 window.

After clicking the [Profile List](#) link, the following page will appear:

Figure 7-75 MLD Snooping Multicast VLAN Group List Settings window

The fields that can be configured are described below:

Parameter	Description
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 show below:

Figure 7-76 IPv4 Multicast Profile Settings window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-24)	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 7-77 Multicast Address Group List 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 window.

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 show below:

Figure 7-78 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 show below:

VID	Max Multicast Group Number	Action
1	Infinite	Drop
2	Infinite	Drop
3	Infinite	Drop

Figure 7-79 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 checkbox Infinite is not selected, 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.

IPv6 Multicast Filtering

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 IPv6 Multicast address or range of IPv6 Multicast addresses to accept reports (Permit) or deny reports (Deny) coming into the specified switch ports.

IPv6 Multicast Profile Settings

Users can add, delete, and configure the IPv6 multicast profile on this page.

To view the following window, click **L2 Features > Multicast Filtering > IPv6 Multicast Filtering > IPv6 Multicast Profile Settings**, as show below:

Figure 7-80 IPv6 Multicast Profile Settings window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-24)	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 7-81 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 window.

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

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

IPv6 Limited Multicast Range Settings

Users can configure the ports and VLANs on the Switch that will be involved in the Limited IPv6 Multicast Range.

To view the following window, click **L2 Features > Multicast Filtering > IPv6 Multicast Filtering > IPv6 Limited Multicast Range Settings**, as show below:

Figure 7-82 IPv6 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 here.
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.

IPv6 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.

Figure 7-83 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	If the checkbox Infinite is not selected, 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 show below:

VLAN ID	VLAN Name	Multicast Filter Mode
1	default	Forward Unregistered Groups
2	VLANname	Forward Unregistered Groups
3	Vname	Forward Unregistered Groups

Figure 7-84 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. <i>Forward All Groups</i> – This will instruct the Switch to forward all multicast packets to the specified VLAN. <i>Forward Unregistered Groups</i> – The multicast packets whose destination is an unregistered multicast group will be forwarded within the range of ports specified above. <i>Filter Unregistered Groups</i> – 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 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

RPL (Ring Protection Link) – Link designated by mechanism that is blocked during Idle state to prevent loop on Bridged ring

RPL Owner – Node connected to RPL that blocks traffic on RPL during Idle state and unblocks during 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

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. The ERPS cannot be enabled before the R-APS VLAN is created, and ring ports, RPL port, 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 show below:



Figure 7-85 ERPS Settings Window

The fields that can be configured are described below:

Parameter	Description
ERPS State	Click to enable or disable the ERPS State.
ERPS Log	Click to enable or disable the ERPS Log.
ERPS Trap	Click to enable or disable the ERPS Trap.
R-APS VLAN (1-4094)	Specifies 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 to find a specific entry based on the information entered.

Click the **View All** button to view all the entries configured.

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

Click the [Detail Information](#) link to view detailed information of the R-APS entry.

Click the [Sub-Ring Information](#) link to view the Sub-Ring information of the R-APS entry.

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

After clicking the [Detail Information](#) link, the following window will appear:

ERPS Settings			Safeguard
ERPS Information			
R-APS VLAN	1		
Ring Status	Disabled		
Admin West Port	Virtual Channel		
Operational West Port			
Admin East Port	Virtual Channel		
Operational East Port			
Admin RPL Port	None		
Operational RPL Port	None		
Admin RPL Owner	Disabled		
Operational RPL Owner	Disabled		
Protected VLAN(s)			
Ring MEL (0-7)	1		
Holdoff Time (0-10000)	0	ms	
Guard Time (10-2000)	500	ms	
WTR Time (5-12)	5	min	
Revertive	Enabled		
Current Ring State	-		
			<input type="button" value="Edit"/> <input type="button" value=" <<Back"/>

Figure 7-86 ERPS Settings - Detail Information window

Click on the **Edit** button to re-configure the specific entry.
 Click on the **<<Back** button to return to the ERPS settings page.

After click the **Edit** button, the following window will appear:

ERPS Settings			Safeguard
ERPS Information			
R-APS VLAN	1		
Ring Status	Disabled <input type="checkbox"/>		
Admin West Port	Unit 1 Virtual Channel <input type="checkbox"/>		
Operational West Port			
Admin East Port	Unit 1 Virtual Channel <input type="checkbox"/>		
Operational East Port			
Admin RPL Port	None <input type="checkbox"/>		
Operational RPL Port	None		
Admin RPL Owner	Disabled <input type="checkbox"/>		
Operational RPL Owner	Disabled		
Protected VLAN(s) (e.g.: 4-6)	<input type="text"/>	<input checked="" type="radio"/> Add <input type="radio"/> Delete	
Ring MEL (0-7)	1 <input type="checkbox"/>		
Holdoff Time (0-10000)	0 <input type="checkbox"/>	ms	
Guard Time (10-2000)	500 <input type="checkbox"/>	ms	
WTR Time (5-12)	5 <input type="checkbox"/>	min	
Revertive	Enabled <input type="checkbox"/>		
Current Ring State	-		
			<input type="button" value="Apply"/> <input type="button" value=" <<Back"/>

Figure 7-87 ERPS Settings - Edit Detail Information window

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

Parameter	Description
R-APS VLAN	Here the R-APS VLAN ID will be displayed.
Ring Status	Specifies to enable or disable the specified ring.
Admin West Port	Specifies the port as the west ring port and also specifies the virtual port channel used.
Operational West Port	Here the operational west port value will be displayed.
Admin East Port	Specifies the port as the east ring port and also specifies the virtual port channel used.

Operational East Port	Here the operational east port value will be displayed.
Admin RPL Port	Specifies the RPL port used. Options to choose from are West Port , East Port , and None .
Operational RPL Port	Here the operational RPL port value will be displayed.
Admin RPL Owner	Specifies to enable or disable the RPL owner node.
Operational RPL Owner	Here the operational RPL owner value will be displayed.
Protected VLAN(s)	Specifies to add or delete the protected VLAN group.
Ring MEL (0-7)	Specifies the ring MEL of the R-APS function. The default ring MEL is 1.
Holdoff Time (0-10000)	Specifies the hold-off time of the R-APS function. The default hold-off time is 0 milliseconds.
Guard Time (10-20000)	Specifies the guard time of the R-APS function. The default guard time is 500 milliseconds.
WTR Time (5-12)	Specifies the WTR time of the R-APS function.
Revertive	Specifies the state of the R-APS revertive option.
Current Ring State	Here the current Ring state will be displayed.

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

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

After clicking the [Sub-Ring Information](#) link, the following window will appear:

Figure 7-88 ERPS Sub-Ring Settings window

The fields that can be configured are described below:

Parameter	Description
R-APS VLAN	Here the R-APS VLAN ID will be displayed.
Sub-Ring R-APS VLAN	Enter the Sub-Ring R-APS VLAN ID used here.
State	Specifies the ERPS Sub-Ring state here. Options to choose from are Add and Delete .
TC Propagation State	Specifies the TC Propagation state here. Options to choose from are Enabled and Disabled .

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

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

LLDP

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 > LLDP Global Settings**, as show below:

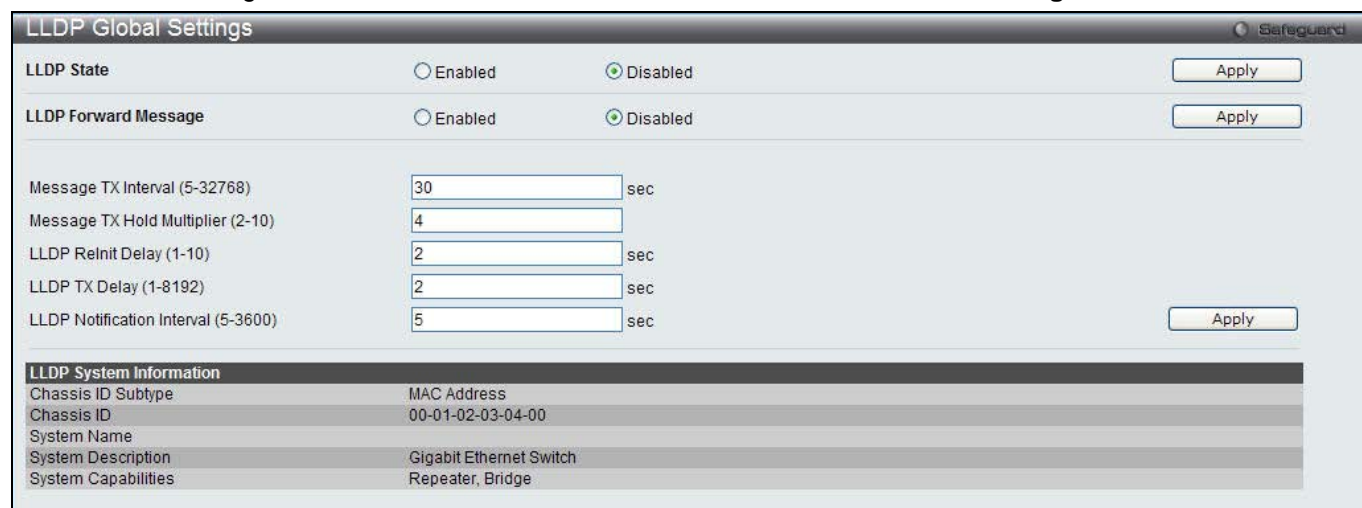


Figure 7-89 LLDP Global Settings window

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 > LLDP Port Settings**, as show below:

Port ID	Notification	Admin Status	IPv4 (IPv6) Address
1	Disabled	TX and RX	
2	Disabled	TX and RX	
3	Disabled	TX and RX	
4	Disabled	TX and RX	
5	Disabled	TX and RX	
6	Disabled	TX and RX	
7	Disabled	TX and RX	
8	Disabled	TX and RX	
9	Disabled	TX and RX	
10	Disabled	TX and RX	
11	Disabled	TX and RX	
12	Disabled	TX and RX	
13	Disabled	TX and RX	
14	Disabled	TX and RX	
15	Disabled	TX and RX	
16	Disabled	TX and RX	
17	Disabled	TX and RX	
18	Disabled	TX and RX	
19	Disabled	TX and RX	
20	Disabled	TX and RX	
21	Disabled	TX and RX	
22	Disabled	TX and RX	
23	Disabled	TX and RX	
24	Disabled	TX and RX	

Figure 7-90 LLDP Port Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menu to select the ports used for this configuration.
Notification	Use the drop-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.

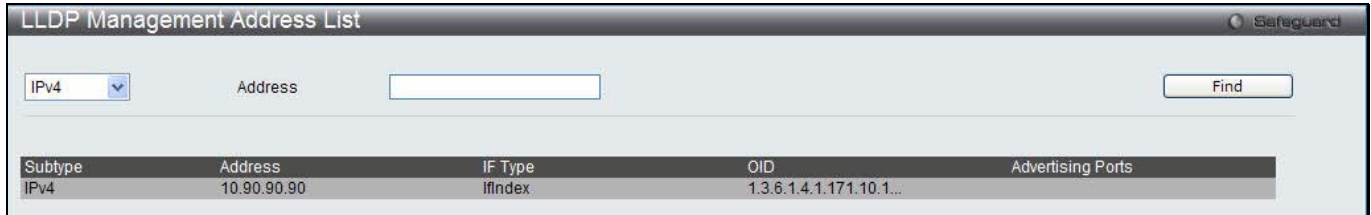


NOTE: The IPv4 or IPv6 address entered here should be an existing LLDP management IP address.

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 > LLDP management Address List**, as show below:



Subtype	Address	IF Type	OID	Advertising Ports
IPv4	10.90.90.90	IfIndex	1.3.6.1.4.1.171.10.1...	

Figure 7-91 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 IP address of the entity you wish to advertise to. 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 > LLDP Basic TLVs Settings**, as show below:

LLDP Basic TLVs Settings Safeguard

From Port: To Port:

Port Description: System Name:

System Description: System Capabilities:

Port	Port Description	System Name	System Description	System Capabilities
1	Disabled	Disabled	Disabled	Disabled
2	Disabled	Disabled	Disabled	Disabled
3	Disabled	Disabled	Disabled	Disabled
4	Disabled	Disabled	Disabled	Disabled
5	Disabled	Disabled	Disabled	Disabled
6	Disabled	Disabled	Disabled	Disabled
7	Disabled	Disabled	Disabled	Disabled
8	Disabled	Disabled	Disabled	Disabled
9	Disabled	Disabled	Disabled	Disabled
10	Disabled	Disabled	Disabled	Disabled
11	Disabled	Disabled	Disabled	Disabled
12	Disabled	Disabled	Disabled	Disabled
13	Disabled	Disabled	Disabled	Disabled
14	Disabled	Disabled	Disabled	Disabled
15	Disabled	Disabled	Disabled	Disabled
16	Disabled	Disabled	Disabled	Disabled
17	Disabled	Disabled	Disabled	Disabled
18	Disabled	Disabled	Disabled	Disabled
19	Disabled	Disabled	Disabled	Disabled
20	Disabled	Disabled	Disabled	Disabled
21	Disabled	Disabled	Disabled	Disabled
22	Disabled	Disabled	Disabled	Disabled
23	Disabled	Disabled	Disabled	Disabled
24	Disabled	Disabled	Disabled	Disabled

Figure 7-92 LLDP Basic TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
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 > LLDP Dot1 TLVs Settings**, as show below:

Port	PVID State	Port and Protocol VID State	VID	VLAN Name State	VID	Protocol Identity State	Protocol Identity
1	Disabled	Disabled		Disabled		Disabled	
2	Disabled	Disabled		Disabled		Disabled	
3	Disabled	Disabled		Disabled		Disabled	
4	Disabled	Disabled		Disabled		Disabled	
5	Disabled	Disabled		Disabled		Disabled	
6	Disabled	Disabled		Disabled		Disabled	
7	Disabled	Disabled		Disabled		Disabled	
8	Disabled	Disabled		Disabled		Disabled	
9	Disabled	Disabled		Disabled		Disabled	
10	Disabled	Disabled		Disabled		Disabled	
11	Disabled	Disabled		Disabled		Disabled	
12	Disabled	Disabled		Disabled		Disabled	
13	Disabled	Disabled		Disabled		Disabled	
14	Disabled	Disabled		Disabled		Disabled	
15	Disabled	Disabled		Disabled		Disabled	
16	Disabled	Disabled		Disabled		Disabled	
17	Disabled	Disabled		Disabled		Disabled	
18	Disabled	Disabled		Disabled		Disabled	
19	Disabled	Disabled		Disabled		Disabled	
20	Disabled	Disabled		Disabled		Disabled	
21	Disabled	Disabled		Disabled		Disabled	
22	Disabled	Disabled		Disabled		Disabled	
23	Disabled	Disabled		Disabled		Disabled	
24	Disabled	Disabled		Disabled		Disabled	

Figure 7-93 LLDP Dot1 TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
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 to the user can select to use either 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 to the user can select to use either 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 either 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 > LLDP Dot3 TLVs Settings**, as show below:

LLDP Dot3 TLVs Settings Safeguard

From Port: To Port:

MAC / PHY Configuration Status: Link Aggregation:

Maximum Frame Size: Power Via MDI:

Port	MAC / PHY Configuration Status	Link Aggregation	Maximum Frame Size	Power Via MDI
1	Disabled	Disabled	Disabled	Disabled
2	Disabled	Disabled	Disabled	Disabled
3	Disabled	Disabled	Disabled	Disabled
4	Disabled	Disabled	Disabled	Disabled
5	Disabled	Disabled	Disabled	Disabled
6	Disabled	Disabled	Disabled	Disabled
7	Disabled	Disabled	Disabled	Disabled
8	Disabled	Disabled	Disabled	Disabled
9	Disabled	Disabled	Disabled	Disabled
10	Disabled	Disabled	Disabled	Disabled
11	Disabled	Disabled	Disabled	Disabled
12	Disabled	Disabled	Disabled	Disabled
13	Disabled	Disabled	Disabled	Disabled
14	Disabled	Disabled	Disabled	Disabled
15	Disabled	Disabled	Disabled	Disabled
16	Disabled	Disabled	Disabled	Disabled
17	Disabled	Disabled	Disabled	Disabled
18	Disabled	Disabled	Disabled	Disabled
19	Disabled	Disabled	Disabled	Disabled
20	Disabled	Disabled	Disabled	Disabled
21	Disabled	Disabled	Disabled	Disabled
22	Disabled	Disabled	Disabled	Disabled
23	Disabled	Disabled	Disabled	Disabled
24	Disabled	Disabled	Disabled	Disabled

Figure 7-94 LLDP Dot3 TLVs Settings window

The fields that can be configured are described below:

Parameter	Description
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. The Power Via MDI TLV allows network management to advertise and discover the MDI power support capabilities of the sending IEEE 802.3 LAN station.

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.

To view the following window, click **L2 Features > LLDP > LLDP > LLDP Statistic System**, as show below:

LLDP Statistics System		Safeguard
LLDP Statistics		
Last Change Time	1977	
Number of Table Insert	0	
Number of Table Delete	0	
Number of Table Drop	0	
Number of Table Ageout	0	
Port	01	<input type="button" value="Find"/>
LLDP Statistics Ports		
Total TX Frames	0	
Total Discarded RX Frames	0	
RX Errors Frames	0	
Total RX Frames	0	
Total Discarded RX TLVs	0	
Total Unrecognized RX TLVs	0	
Total Aged out Neighbor Information	0	

Figure 7-95 LLDP Statistics System window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select a port.

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

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 > LLDP Local Port Information**, as show below:

LLDP Local Port Information				Safeguard
LLDP Local Port Brief Table				<input type="button" value="Show Normal"/>
Port	Port ID Subtype	Port ID	Port Description	
1	Local	1/1	D-Link DWS-3160...	
2	Local	1/2	D-Link DWS-3160...	
3	Local	1/3	D-Link DWS-3160...	
4	Local	1/4	D-Link DWS-3160...	
5	Local	1/5	D-Link DWS-3160...	
6	Local	1/6	D-Link DWS-3160...	
7	Local	1/7	D-Link DWS-3160...	
8	Local	1/8	D-Link DWS-3160...	
9	Local	1/9	D-Link DWS-3160...	
10	Local	1/10	D-Link DWS-3160...	
11	Local	1/11	D-Link DWS-3160...	
12	Local	1/12	D-Link DWS-3160...	
13	Local	1/13	D-Link DWS-3160...	
14	Local	1/14	D-Link DWS-3160...	
15	Local	1/15	D-Link DWS-3160...	
16	Local	1/16	D-Link DWS-3160...	
17	Local	1/17	D-Link DWS-3160...	
18	Local	1/18	D-Link DWS-3160...	
19	Local	1/19	D-Link DWS-3160...	
20	Local	1/20	D-Link DWS-3160...	
21	Local	1/21	D-Link DWS-3160...	
22	Local	1/22	D-Link DWS-3160...	
23	Local	1/23	D-Link DWS-3160...	
24	Local	1/24	D-Link DWS-3160...	

Figure 7-96 LLDP Local Port Information window

To view the normal LLDP Local Port information page per port, click the **Show Normal** button.

After clicking the **Show Normal** button, the following page will appear:

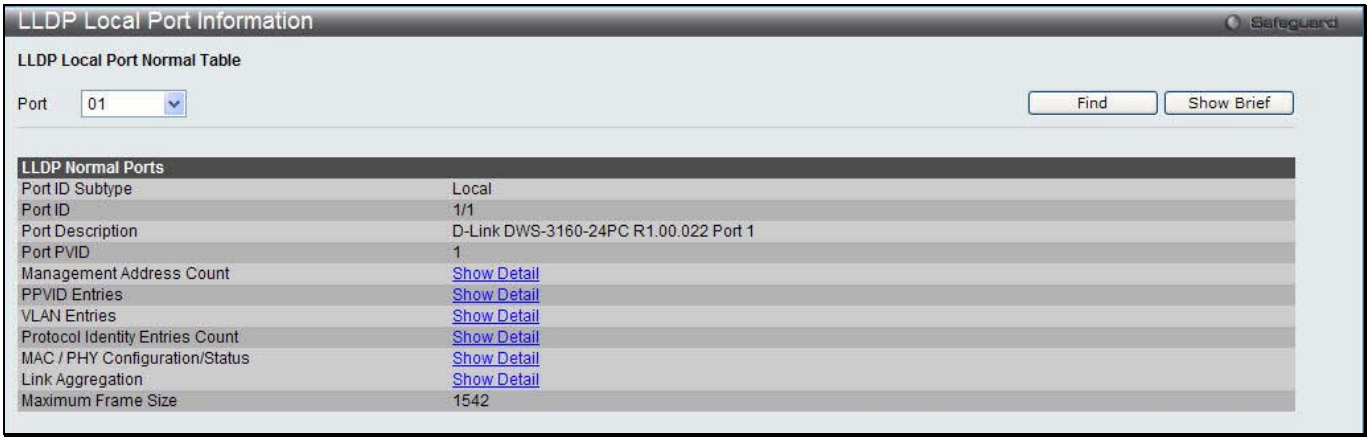


Figure 7-97 LLDP Local Port Information – Show Normal window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit you want to configure.
Port	Use the drop-down menu to select a port.

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

To view the brief LLDP Local Port information page per port, click the **Show Brief** button.

To view more details about, for example, the Management Address Count, click the [Show Detail](#) hyperlink.

After clicking the [Show Detail](#) hyperlink under Management Address Count, the following page will appear:



Figure 7-98 LLDP Local Port Information – Show Detail window

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

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 > LLDP Remote Port Information**, as show below:

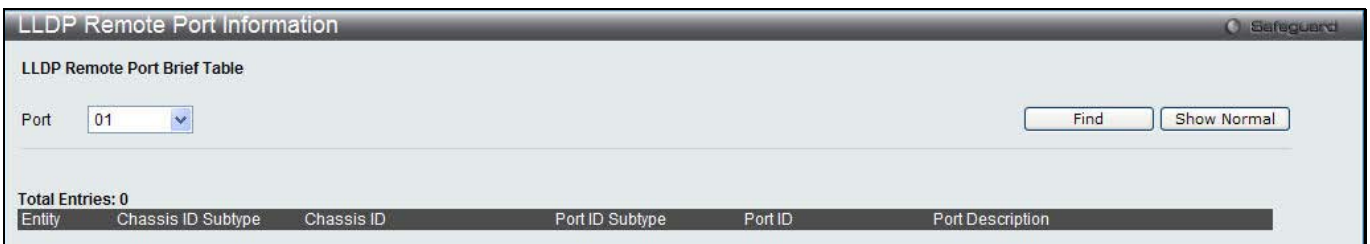


Figure 7-99 LLDP Remote Port Information window

The fields that can be configured are described below:

Parameter	Description
-----------	-------------

Port	Use the drop-down menu to select a port.
-------------	--

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

To view the normal LLDP Remote Port information page per port, click the **Show Normal** button.

After clicking the **Show Normal** button, the following page will appear:



Figure 7-100 LLDP Remote Port Information – Show Normal window

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

NLB FDB Settings

The Switch supports Network Load Balancing (NLB). This is a MAC forwarding control for supporting the Microsoft server load balancing application where multiple servers can share the same IP address and MAC address. The requests from clients will be forwarded to all servers, but will only be processed by one of them. In multicast mode, the client uses a multicast MAC address as the destination MAC to reach the server. Regardless of the mode, the destination MAC is the shared MAC. The server uses its own MAC address (rather than the shared MAC) as the source MAC address of the reply packet. The NLB multicast FDB entry will be mutually exclusive with the L2 multicast entry.

To view this window, click **L2 Features > NLB FDB Settings**, as shown below.

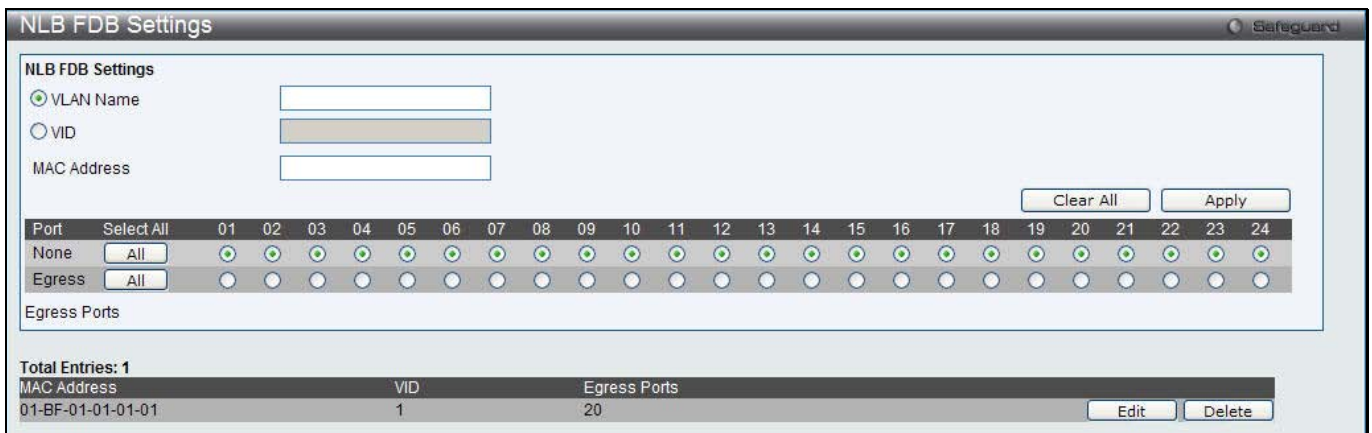


Figure 7-101 NLB FDB Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the radio button and enter the VLAN of the NLB multicast FDB entry to be created.
VID (1-4094)	Click the radio button and enter the VLAN by the VLAN ID.
MAC Address	Enter the MAC address of the NLB multicast FDB entry to be created.
Ports	Click the ports to be configured. Click the All button to select all ports.

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

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

Click the **Edit** button to update the information of the corresponding entry.

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

Chapter 4 L3 Features

IPv4 Static/Default Route Settings

IPv4 Route Table

IPv6 Static/Default Route Settings

IPv6 Route Table

IP Forwarding Table

VRRP

IPv4 Static/Default Route Settings

The Switch supports static routing for IPv4 formatted addressing. Users can create up to 512 static route entries for IPv4. 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.

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.

Entries into the Switch's forwarding table can be made using both an IP address subnet mask and a gateway. To view the following window, click **L3 Features > IPv4 Static/Default Route Settings**, as show below:

Figure 8-1 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 route. Tick the Default check box to assign to the 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. This window is used to display all the external route information on the switch.

To view the following window, click **L3 Features > IPv4 Route Table**, as show below:

Figure 8-2 IPv4 Route Table window

The fields that can be configured are described below:

Parameter	Description
Network Address	Click the radio button and enter the destination network address of the route to be displayed.
IP Address	Click the radio button and enter the destination IP address of the route to be displayed. The longest prefix matched route will be displayed.
Hardware	Tick the check box to display only the routes that have been written into the chip.

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.

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 show below:

Figure 8-3 IPv6 Static/Default Route Settings window

The fields that can be configured are described below:

Parameter	Description
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 failed, the switch will try the

	backup routes according to the order learnt 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.

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 show below:

The screenshot shows the 'IP Forwarding Table' web interface. At the top, there are three radio buttons for search criteria: 'IP Address' (selected), 'Interface Name', and 'Port'. Each has a corresponding input field. A 'Find' button is on the right. Below the search area, it says 'Total Entries: 1'. A table follows with the following data:

Interface Name	IP Address	Port	Learned
System	10.90.90.10	1	Dynamic

At the bottom right of the table, there is a pagination control showing '1/1' and a 'Go' button.

Figure 8-4 IP Forwarding Table

The fields that can be configured are described below:

Parameter	Description
IP Address	Click the radio button and enter the IP address.
Interface Name	Click the radio button and enter the interface name.
Port	Click the radio button and enter the port.

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.

VRRP

Virtual Routing Redundancy Protocol (VRRP) is a function that dynamically assigns responsibility for a virtual router to one of the VRRP routers on a LAN. The VRRP router that controls the IP address associated with a virtual router is called the Master. The Master forwards packets sent to this IP address. This allows any Virtual Router IP address on the LAN to be used as the default first hop router by end hosts. Utilizing VRRP, the administrator can achieve a higher available default path cost without configuring every end host for dynamic routing or routing discovery protocols.

Statically configured default routes on the LAN are prone to a single point of failure. VRRP is designed to eliminate these failures by setting an election protocol that will assign a responsibility for a virtual router to one of the VRRP routers on the LAN. When a virtual router fails, the election protocol selects a virtual router with the highest priority to be the Master router on the LAN. This retains the link and the connection is kept alive, regardless of the point of failure.

To configure VRRP for virtual routers on the Switch, an IP interface must be present on the system and it must be a part of a VLAN. VRRP IP interfaces may be assigned to every VLAN, and therefore IP interface, on the Switch. VRRP routers within the same VRRP group must be consistent in configuration settings for this protocol to function optimally.

VRRP Global Settings

This window is used to configure the VRRP Global settings.

To view the following window, click **L3 Features > VRRP > VRRP Global Settings**, as show below:

Figure 8-5 VRRP Global Settings window

The fields that can be configured are described below:

Parameter	Description
VRRP State	Use the drop-down menu to enable or disable the VRRP state.
Non-owner response Ping	Specify that the virtual IP address is allowed to be pinged from other host end nodes to verify connectivity.

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

VRRP Virtual Router Settings

This window is used to configure VRRP virtual router settings.

To view the following window, click **L3 Features > VRRP > VRRP Virtual Router Settings**, as show below:

Figure 8-6 VRRP Virtual Router Settings window

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter the IP interface name used to create a VRRP entry.
VRID (1-255)	Enter the ID of the virtual router. All the routers participating in this group must be assigned the same VRID value. This value must be different from other VRRP groups set on the Switch.
IP Address	Enter the virtual router's IP address. This IP address is also the default gateway that will be statically assigned to end hosts and must be set for all routers that participate in this group.
State	Use the drop-down menu to enable or disable the state of the virtual router function of the interface.
Priority (1-254)	Enter the priority to be used for the Virtual Router Master election process. The VRRP Priority value may determine if a higher priority VRRP router overrides a lower priority VRRP router. A higher priority increases the possibility to become the Master router of the group. A lower priority increases the possibility to become the backup router. For VRRP routers with the same priority value, the VRRP router with the highest physical IP address is chosen to be the Master router.
Advertisement	Enter the interval between sending advertisement messages.

Interval (1-255)	
Preempt Mode	Use the drop-down menu to determine the behavior of backup routers within the VRRP group by controlling whether a higher priority backup router will preempt a lower priority Master router. If True is selected, and the backup router's priority is higher than the Master's priority, the backup router will become the Master router. If False is selected, the backup router with higher priority will not become the Master router. This setting must be consistent with all routers participating within the same VRRP group.
Critical IP Address	Enter an IP address of the physical device that provides the most direct route to the Internet or other critical network connections from this virtual router. This must be a real IP address of a real device on the network. If the connection from the virtual router to this IP address fails, the virtual router will automatically disabled. A new Master will be chosen from the backup routers in the same VRRP group. Different critical IP addresses may be assigned to different routers in the same VRRP group, and can therefore define multiple routes to the Internet or other critical network connections.
Checking Critical IP	Use the drop-down menu to enable or disable checking the status of a critical IP address.

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

Click the **View** button to see the detail information of the corresponding entry.

Click the **Edit** button to update the information of the corresponding entry.

Click the **Delete** button to delete the corresponding 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 8-7 VRRP Virtual Router Settings - Edit window

The fields that can be configured are described below:

Parameter	Description
Interface Name	Enter the IP interface name used to create a VRRP entry.
VRID (1-255)	Enter the ID of the virtual router. All the routers participating in this group must be assigned the same VRID value. This value must be different from other VRRP groups set on the Switch.
IP Address	Enter the virtual router's IP address. This IP address is also the default gateway that will be statically assigned to end hosts and must be set for all routers that participate in this group.
State	Use the drop-down menu to enable or disable the state of the virtual router function of the interface.
Priority (1-254)	Enter the priority to be used for the Virtual Router Master election process. The VRRP Priority value may determine if a higher priority VRRP router overrides a lower priority VRRP router. A higher priority increases the possibility to become the Master router of the group. A lower priority increases the possibility to become the backup router. For VRRP routers with the same priority value, the VRRP router with the highest physical IP address is chosen to be the Master router.

Advertisement Interval (1-255)	Enter the interval between sending advertisement messages.
Preempt Mode	Use the drop-down menu to determine the behavior of backup routers within the VRRP group by controlling whether a higher priority backup router will preempt a lower priority Master router. If True is selected, and the backup router's priority is higher than the Master's priority, the backup router will become the Master router. If False is selected, the backup router with higher priority will not become the Master router. This setting must be consistent with all routers participating within the same VRRP group.
Critical IP Address	Enter an IP address of the physical device that provides the most direct route to the Internet or other critical network connections from this virtual router. This must be a real IP address of a real device on the network. If the connection from the virtual router to this IP address fails, the virtual router will automatically disabled. A new Master will be chosen from the backup routers in the same VRRP group. Different critical IP addresses may be assigned to different routers in the same VRRP group, and can therefore define multiple routes to the Internet or other critical network connections.
Checking Critical IP	Use the drop-down menu to enable or disable checking the status of a critical IP address.

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

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

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

VRRP Virtual Router Detail Information	
Interface Name	System
Authentication Type	No Authentication
VRID	1
Virtual IP Address	10.90.90.1
Virtual MAC Address	00-00-5E-00-01-01
Virtual Router State	Initialize
State	Disabled
Priority	2
Master IP Address	10.90.90.90
Critical IP Address	10.90.90.2
Checking Critical IP	Disabled
Advertisement Interval	20
Preempt Mode	True
Virtual Router Up Time	0

Figure 8-8 VRRP Virtual Router Settings - Details window

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

VRRP Authentication Settings

This window is used to configure a virtual router authentication type on an interface.

To view the following window, click **L3 Features > VRRP > VRRP Authentication Settings**, as show below:

Interface Name	Authentication Type
System	No Authentication

Figure 8-9 VRRP Authentication Settings window

Click the **Edit** button to update the information of the corresponding entry.

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

Figure 8-10 VRRP Authentication Settings - Edit window

The fields that can be configured are described below:

Parameter	Description
Authentication Type	<p>Use the drop-down menu to select the VRRP's authentication type.</p> <p><i>None</i> - The VRRP protocol exchanges will not be authenticated.</p> <p><i>Simple</i> - Specify to configure a simple password in the Authentication Data field for comparing VRRP message packets received by a router. If the two passwords are not exactly the same, the packet will be dropped.</p> <p><i>IP</i> - Specify to set an IP for authentication in comparing VRRP messages received by the router. If the two values are not the same, the packet will be dropped.</p>
Authentication Data	<p>Specify the authentication data used in the Simple and IP authentication algorithm. This entry must be consistent with all routers participating in the same IP interface.</p> <p>When <i>Simple</i> is selected in Authentication type, enter an alphanumeric string of no more than eight characters to identify VRRP packets received by a router.</p> <p>When <i>IP</i> is selected, enter an alphanumeric string of no more than sixteen characters to identify VRRP packets received by a router.</p>

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

Chapter 5 QoS

802.1p Settings

Bandwidth Control

Traffic Control Settings

DSCP

HOL Blocking Prevention

Scheduling Settings

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.

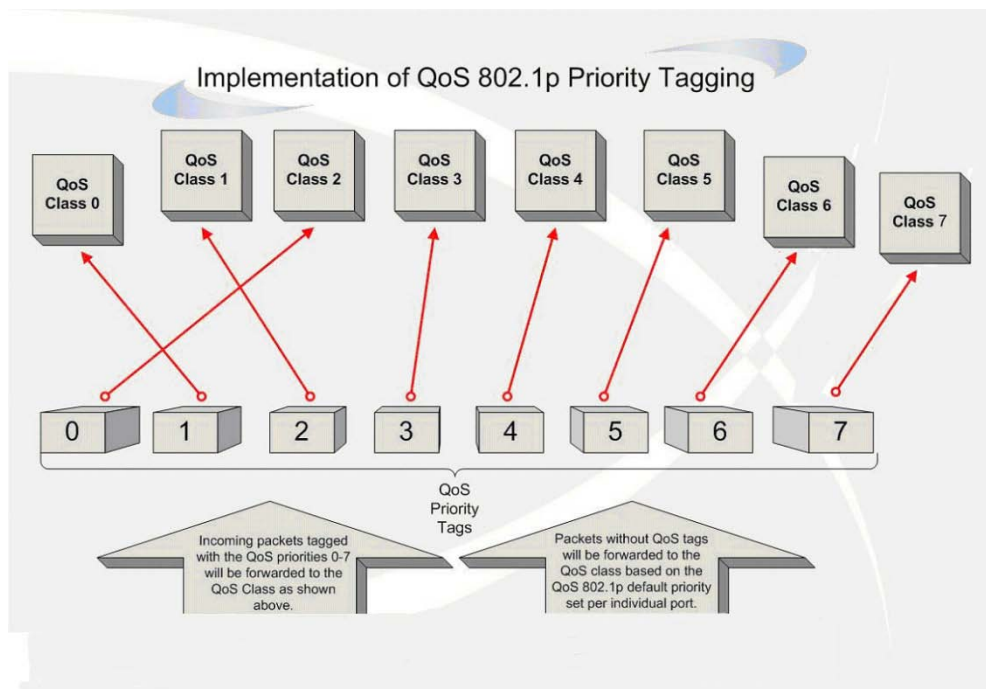


Figure 9-1 Mapping QoS on the Switch

The picture above shows the default priority setting for the Switch. Class-7 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 7) — the highest priority queue — to 0 (Class 0) — the lowest priority queue. 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 Q7 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 eight CoS queues, A~H with their respective weight value: 8~1, the packets are sent in the following sequence: A1, B1, C1, D1, E1, F1, G1, H1, A2, B2, C2, D2, E2, F2, G2, A3, B3, C3, D3, E3, F3, A4, B4, C4, D4, E4, A5, B5, C5, D5, A6, B6, C6, A7, B7, A8, A1, B1, C1, D1, E1, F1, G1, H1.

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.

For weighted round-robin queuing, if the weight for a CoS is set to 0, then it will continue processing the packets from this CoS until there are no more packets for this CoS. The other CoS queues that have been given a nonzero value, and depending upon the weight, will follow a common weighted round-robin scheme.

Remember that the Switch has eight configurable priority queues (and eight 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 eight 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 show 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

Figure 9-2 Default Priority Settings window

The fields that can be configured are described below:

Parameter	Description
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 show below:

Priority	Class ID
0	Class-2
1	Class-0
2	Class-1
3	Class-3
4	Class-4
5	Class-5
6	Class-6
7	Class-7

Figure 9-3 802.1p User Priority Settings window

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.

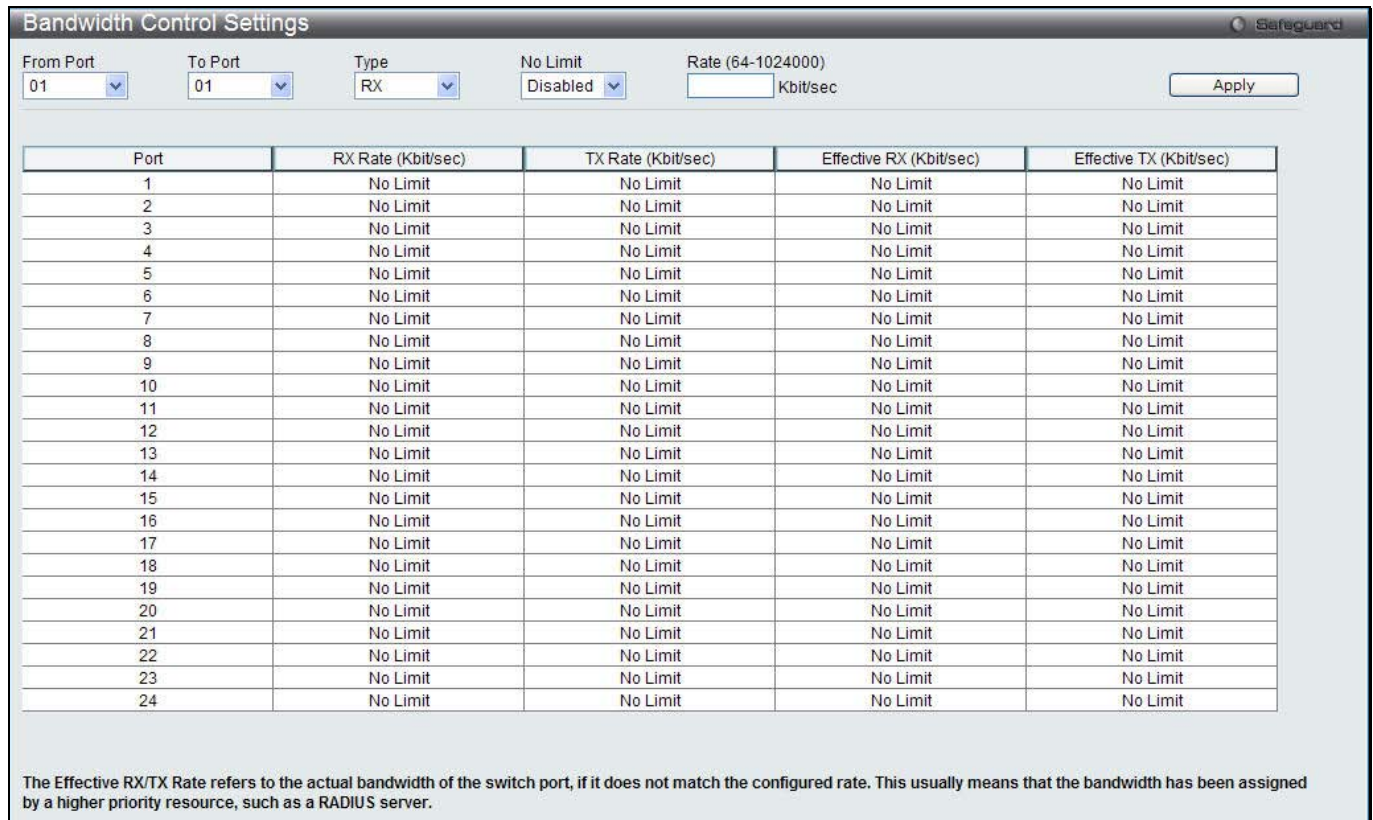
Bandwidth Control

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 show below:



Port	RX Rate (Kbit/sec)	TX Rate (Kbit/sec)	Effective RX (Kbit/sec)	Effective TX (Kbit/sec)
1	No Limit	No Limit	No Limit	No Limit
2	No Limit	No Limit	No Limit	No Limit
3	No Limit	No Limit	No Limit	No Limit
4	No Limit	No Limit	No Limit	No Limit
5	No Limit	No Limit	No Limit	No Limit
6	No Limit	No Limit	No Limit	No Limit
7	No Limit	No Limit	No Limit	No Limit
8	No Limit	No Limit	No Limit	No Limit
9	No Limit	No Limit	No Limit	No Limit
10	No Limit	No Limit	No Limit	No Limit
11	No Limit	No Limit	No Limit	No Limit
12	No Limit	No Limit	No Limit	No Limit
13	No Limit	No Limit	No Limit	No Limit
14	No Limit	No Limit	No Limit	No Limit
15	No Limit	No Limit	No Limit	No Limit
16	No Limit	No Limit	No Limit	No Limit
17	No Limit	No Limit	No Limit	No Limit
18	No Limit	No Limit	No Limit	No Limit
19	No Limit	No Limit	No Limit	No Limit
20	No Limit	No Limit	No Limit	No Limit
21	No Limit	No Limit	No Limit	No Limit
22	No Limit	No Limit	No Limit	No Limit
23	No Limit	No Limit	No Limit	No Limit
24	No Limit	No Limit	No Limit	No Limit

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.

Figure 9-4 Bandwidth Control Settings window

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

Parameter	Description
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.
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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. To view the following window, click **QoS > Bandwidth Control > Queue Bandwidth Control Settings**, as show below:

Figure 9-5 Queue Bandwidth Control Settings window

The fields that can be configured are described below:

Parameter	Description
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)	Specify the packet limit, in Kbps that the ports are allowed to receive. Tick the No limit check box to have unlimited rate of packets received by the specified queue.
Max Rate (64-1024000)	Enter the maximum rate for the queue. For no limit select the No Limit option.

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

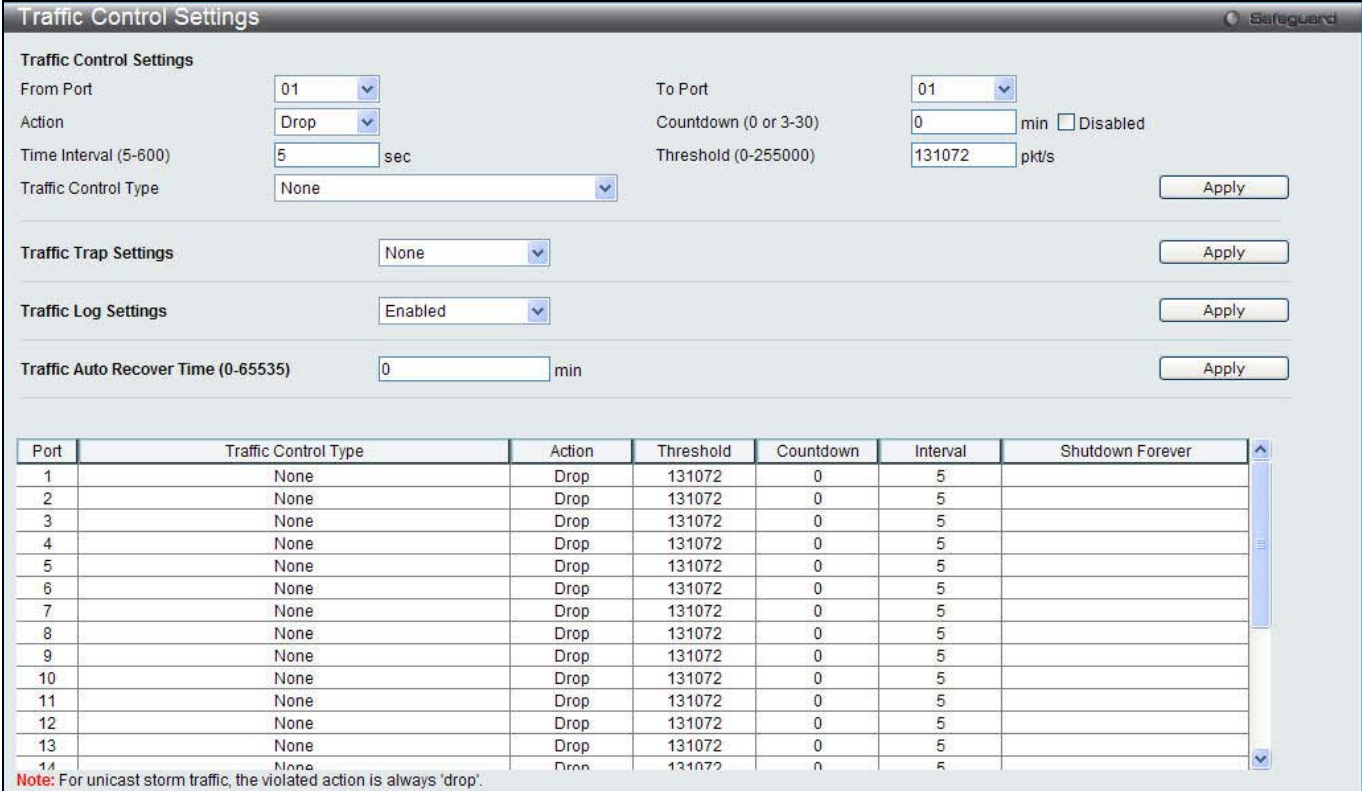
On a computer network, packets such as Multicast packets and Broadcast packets continually flood the network as normal procedure. At times, this traffic may increase due to a malicious end station on the network or a malfunctioning device, such as a faulty network card. Thus, switch throughput problems 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 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 **System Configuration > Port configuration > Port Settings** window 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 show below:



Port	Traffic Control Type	Action	Threshold	Countdown	Interval	Shutdown Forever
1	None	Drop	131072	0	5	
2	None	Drop	131072	0	5	
3	None	Drop	131072	0	5	
4	None	Drop	131072	0	5	
5	None	Drop	131072	0	5	
6	None	Drop	131072	0	5	
7	None	Drop	131072	0	5	
8	None	Drop	131072	0	5	
9	None	Drop	131072	0	5	
10	None	Drop	131072	0	5	
11	None	Drop	131072	0	5	
12	None	Drop	131072	0	5	
13	None	Drop	131072	0	5	
14	None	Drop	131072	0	5	

Note: For unicast storm traffic, the violated action is always 'drop'.

Figure 9-6 Traffic Control Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menu to select the port range to use for this configuration.
Action	<p>Select the method of traffic control from the drop-down menu. The choices are:</p> <p><i>Drop</i> – 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.</p> <p><i>Shutdown</i> – 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.</p>
Countdown (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 <i>Shutdown</i> 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. To disable this feature select the Disable option.
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: <i>None</i> , <i>Broadcast</i> , <i>Multicast</i> , <i>Unknown Unicast</i> , <i>Broadcast + Multicast</i> , <i>Broadcast + Unknown Unicast</i> , <i>Multicast + Unknown Unicast</i> , and <i>Broadcast + Multicast + Unknown Unicast</i> .
Traffic Trap Settings	<p>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:</p> <p><i>None</i> – Will send no Storm trap warning messages regardless of action taken by the Traffic Control mechanism.</p> <p><i>Storm Occurred</i> – Will send Storm Trap warning messages upon the occurrence of a Traffic Storm only.</p> <p><i>Storm Cleared</i> – Will send Storm Trap messages when a Traffic Storm has been cleared by the Switch only.</p> <p><i>Both</i> – Will send Storm Trap messages when a Traffic Storm has been both detected and cleared by the Switch.</p> <p>This function cannot be implemented in the hardware mode. (When <i>Drop</i> is chosen for the Action parameter)</p>
Traffic Log Settings	Use the drop-down menu to enable or disable the function. If enabled, the traffic control states are logged when a storm occurs and when a storm is cleared. If the log state is disabled, the traffic control events are not logged.
Traffic Auto Recover Time (0-65535)	Enter the time allowed for auto recovery from shutdown for a port. The default value is 0, which means there is no auto recovery and the port remains in shutdown forever mode. This requires manual entry of the CLI command config ports [<portlist> all] state enable to return the port to a forwarding state.

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 Forever 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 show below:

Port	DSCP Trust
1	Disabled
2	Disabled
3	Disabled
4	Disabled
5	Disabled
6	Disabled
7	Disabled
8	Disabled
9	Disabled
10	Disabled
11	Disabled
12	Disabled
13	Disabled
14	Disabled
15	Disabled
16	Disabled
17	Disabled
18	Disabled
19	Disabled
20	Disabled
21	Disabled
22	Disabled
23	Disabled
24	Disabled

Figure 9-7 DSCP Trust Settings window

The fields that can be configured are described below:

Parameter	Description
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 show 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

Figure 9-8 DSCP Map Settings - DSCP Priority window

To view the following window, click **QoS > DSCP > DSCP Map Settings** and select **DSCP DSCP** from the DSCP Map drop-down menu, as show below:

Port 1	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	10	11	12	13	14	15	16	17	18	19
2	20	21	22	23	24	25	26	27	28	29
3	30	31	32	33	34	35	36	37	38	39
4	40	41	42	43	44	45	46	47	48	49
5	50	51	52	53	54	55	56	57	58	59
6	60	61	62	63						

Figure 9-9 DSCP Map Settings - DSCP DSCP window

The fields that can be configured are described below:

Parameter	Description
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: <i>DSCP Priority</i> – Specifies a list of DSCP values to be mapped to a specific priority. <i>DSCP DSCP</i> – Specifies a list of DSCP value to be mapped to a specific DSCP.
DSCP List (0-63)	Enter a DSCP List value.
Priority	Use the drop-down menu to select a Priority value. This appears when selecting DSCP Priority in the DSCP Map drop-down menu.
DSCP (0-63)	Enter a DSCP value. This appears when selecting DSCP Priority in the DSCP DSCP drop-down menu.
Port	Use the drop-down menu to select a port

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

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

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 show below:



Figure 9-10 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 allows the user to configure the way the Switch will map an incoming packet per port based on its 802.1p user priority, to one of the eight available hardware priority queues available on the Switch.

To view this window, click **QoS > Scheduling Settings > QoS Scheduling** as shown below:

Port	Class ID	Weight
1	Class-0	1
1	Class-1	2
1	Class-2	3
1	Class-3	4
1	Class-4	5
1	Class-5	6
1	Class-6	7
1	Class-7	8
2	Class-0	1
2	Class-1	2
2	Class-2	3
2	Class-3	4
2	Class-4	5
2	Class-5	6
2	Class-6	7
2	Class-7	8
3	Class-0	1
3	Class-1	2
3	Class-2	3
3	Class-3	4
3	Class-4	5
3	Class-5	6
3	Class-6	7
3	Class-7	8
4	Class-0	1
4	Class-1	2
4	Class-2	3
4	Class-3	4
4	Class-4	5
4	Class-5	6
4	Class-6	7

Figure 9-11 QoS Scheduling window

The following parameters can be configured:

Parameter	Description
From Port / To Port	Enter the port or port list you wish to configure.
Class ID	Select the Class ID, from 0-7 to configure for the QoS parameters.
Scheduling Mechanism	<p><i>Strict</i> – The highest class of service is the first to process traffic. That is, the highest class of service will finish before other queues empty.</p> <p><i>Weight</i> – Use the weighted round-robin (<i>WRR</i>) algorithm to handle packets in an even distribution in priority classes of service.</p>

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:

QoS Scheduling Mechanism
Safeguard

QoS Scheduling Mechanism Settings

From Port: To Port: Scheduling Mechanism: Apply

Port	Mode
1	Strict
2	Strict
3	Strict
4	Strict
5	Strict
6	Strict
7	Strict
8	Strict
9	Strict
10	Strict
11	Strict
12	Strict
13	Strict
14	Strict
15	Strict
16	Strict
17	Strict
18	Strict
19	Strict
20	Strict
21	Strict
22	Strict
23	Strict
24	Strict

Figure 9-12 QoS Scheduling Mechanism

The following parameters can be configured:

Parameter	Description
From Port / To Port	Enter the port or port list you wish to configure.
Scheduling Mechanism	<p><i>Strict</i> – The highest class of service is the first to process traffic. That is, the highest class of service will finish before other queues empty.</p> <p><i>Weighted Round Robin</i> – Use the weighted round-robin algorithm to handle packets in an even distribution in priority classes of service.</p>

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.

Chapter 6 ACL

ACL Configuration Wizard

Access Profile List

CPU Access Profile List

ACL Finder

ACL Flow Meter

Egress Access Profile List

Egress 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:

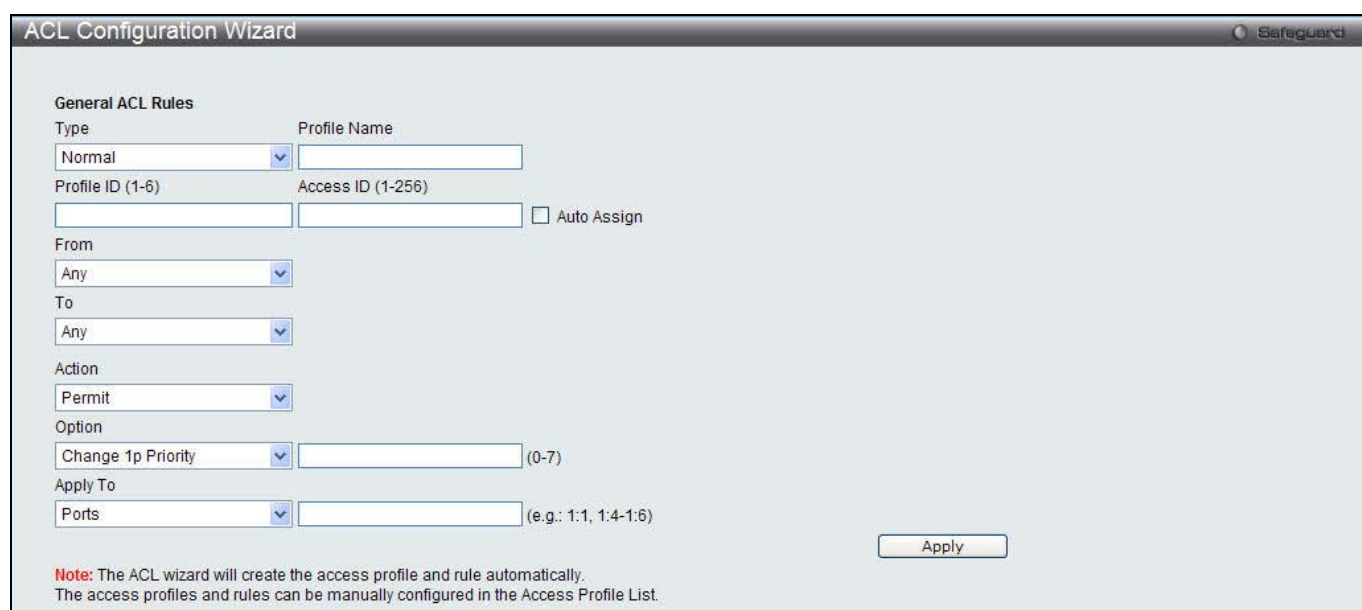


Figure 10-1 ACL Configuration Wizard window

The fields that can be configured are described below:

Parameter	Description
Type	Use the drop-down menu to select the general ACL Rule types: <i>Normal</i> – Selecting this option will create a Normal ACL Rule. <i>CPU</i> – Selecting this option will create a CPU ACL Rule. <i>Egress</i> - Selecting this option will create an Egress ACL Rule.
Profile Name	After selecting to configure a Normal type rule, the user can enter the Profile Name for the new rule here.
Profile ID (1-6)	Enter the Profile ID for the new rule.
Access ID (1-256)	Enter the Access ID for the new rule. Tick the Auto Assign check box to allow the Switch automatically assigning an unused access ID to this rule.
From / To	This rule can be created to apply to four different categories: <i>Any</i> – Selecting this option will include any starting category to this rule. <i>MAC Address</i> – Selecting this option will allow the user to enter a range of MAC addresses for this rule. <i>IPv4 Address</i> – Selecting this option will allow the user to enter a range of IPv4 addresses for this rule.

	<i>IPv6</i> – Selecting this option will allow the user to enter a range of IPv6 addresses for this rule.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select <i>Mirror</i> 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: <i>Change 1p Priority</i> – Here the user can enter the 1p priority value. <i>Replace DSCP</i> – Here the user can enter the DSCP value. <i>Replace ToS Precedence</i> – Here the user can enter the ToS Precedence value.
Apply To	Use the drop-down menu to select and enter the information that this rule will be applied to. <i>Ports</i> – Enter a port number or a port range. <i>VLAN Name</i> – Enter a VLAN name. <i>VLAN ID</i> – Enter a VLAN ID.

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.

Profile ID	Profile Name	Profile Type	
1	EthernetACL	Ethernet	Show Details Add/View Rules Delete
2	IPv4	IP	Show Details Add/View Rules Delete
3	IPv6	IPv6	Show Details Add/View Rules Delete
4	PacketACL	Packet Content	Show Details Add/View Rules Delete

Figure 10-2 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 fields to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:

Figure 10-3 Add ACL Profile window (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-6)	Enter a unique identifier number for this profile set. This value can be set from 1 to 6.
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 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, e.g. FF-FF-FF-FF-FF-FF.
Destination MAC Mask	Enter a MAC address mask for the destination MAC address, e.g. FF-FF-FF-FF-FF-FF.
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 window.

After clicking the **Show Details** button, the following page will appear:

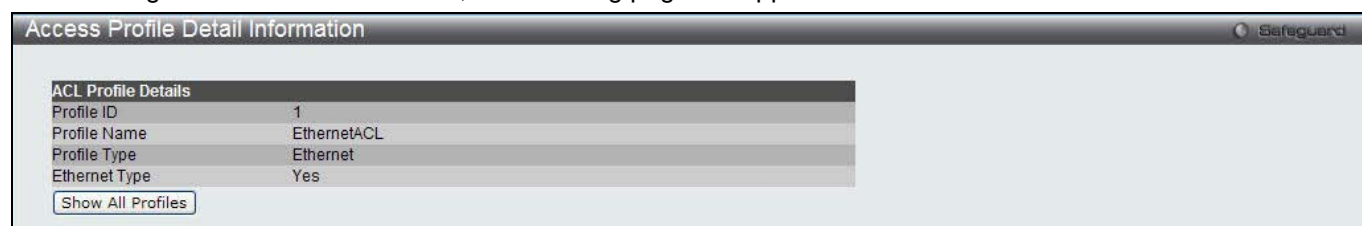


Figure 10-4 Access Profile Detail Information window (Ethernet ACL)

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:

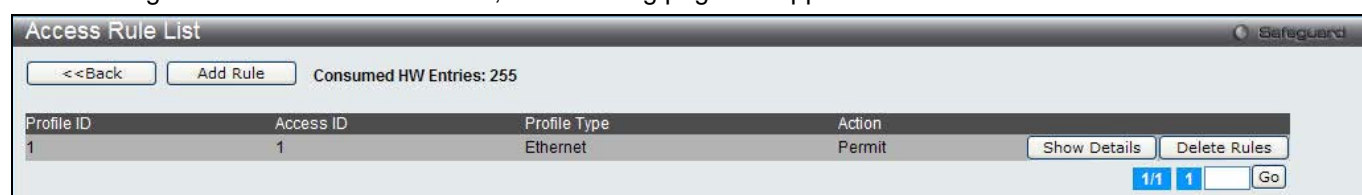


Figure 10-5 Access Rule List window (Ethernet ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.

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

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 10-6 Add Access Rule window (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-256)	Type in a unique identifier number for this access. This value can be set from 1 to 256. Auto Assign – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select <i>Mirror</i> 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 traffic class.
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	Here the user can 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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



Figure 10-7 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 10-8 Add ACL Profile window (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-6)	Enter a unique identifier number for this profile set. This value can be set from 1 to 6.
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 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, e.g. 255.255.255.255.
IPv4 Destination IP Mask	Enter an IP address mask for the destination IP address, e.g. 255.255.255.255.
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:

	<p>Select <i>ICMP</i> to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.</p> <p>Select <i>Type</i> to further specify that the access profile will apply an ICMP type value, or specify <i>Code</i> to further specify that the access profile will apply an ICMP code value.</p> <p>Select <i>IGMP</i> to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header.</p> <p>Select <i>Type</i> to further specify that the access profile will apply an IGMP type value.</p> <p>Select <i>TCP</i> 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.</p> <p><i>src port mask</i> - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter.</p> <p><i>dst port mask</i> - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter.</p> <p><i>flag bit</i> - 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 between urg (urgent), ack (acknowledgement), psh (push), rst (reset), syn (synchronize), fin (finish).</p> <p>Select <i>UDP</i> 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.</p> <p><i>src port mask</i> - Specify a UDP port mask for the source port in hex form (hex 0x0-0xffff).</p> <p><i>dst port mask</i> - Specify a UDP port mask for the destination port in hex form (hex 0x0-0xffff).</p> <p>Select <i>Protocol ID</i> - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xff).</p> <p><i>Protocol ID Mask</i> - Specify that the rule applies to the IP protocol ID traffic.</p> <p><i>User Define</i> - Specify the Layer 4 part mask</p>
--	--

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 window.

After clicking the **Show Details** button, the following page will appear:



Figure 10-9 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:

Profile ID	Access ID	Profile Type	Action
2	1	IP	Permit

Figure 10-10 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 window.

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:

Profile Information

Profile ID	2	Profile Name	IPv4
Profile Type	IP	DSCP	Yes

Rule Detail
(Keep the input field blank to specify that the corresponding option does not matter).

Access ID (1-256): Auto Assign

DSCP: (e.g.: 0-63)

Rule Action

Action:

Priority (0-7):

Replace Priority:

Replace DSCP (0-63):

Replace ToS Precedence (0-7):

Time Range Name:

Counter:

Ports: (e.g.: 1, 4-6, 9)

Figure 10-11 Add Access Rule (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-256)	Type in a unique identifier number for this access. This value can be set from 1 to 256. Auto Assign – Ticking this check box will 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	Here the user can 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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



Figure 10-12 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 10-13 Add ACL Profile window (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-6)	Enter a unique identifier number for this profile set. This value can be set from 1 to 6.
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 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 <i>class</i> 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 <i>flow label</i> 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	<i>Source Port Mask</i> – Specify that the rule applies to the range of TCP source ports. <i>Destination Port Mask</i> – Specify the range of the TCP destination port range.
IPv6 UDP	<i>Source Port Mask</i> – Specify the range of the TCP source port range. <i>Destination Port Mask</i> – Specify the range of the TCP destination port mask.

ICMP	Select <i>ICMP</i> to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.
IPv6 Source Mask	The user may specify an IP address mask for the source IPv6 address by ticking the corresponding check box and entering the IP address mask.
IPv6 Destination Mask	The user may specify an IP address mask for the destination IPv6 address by ticking the corresponding check box and entering the IP 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 window.

After clicking the **Show Details** button, the following page will appear:

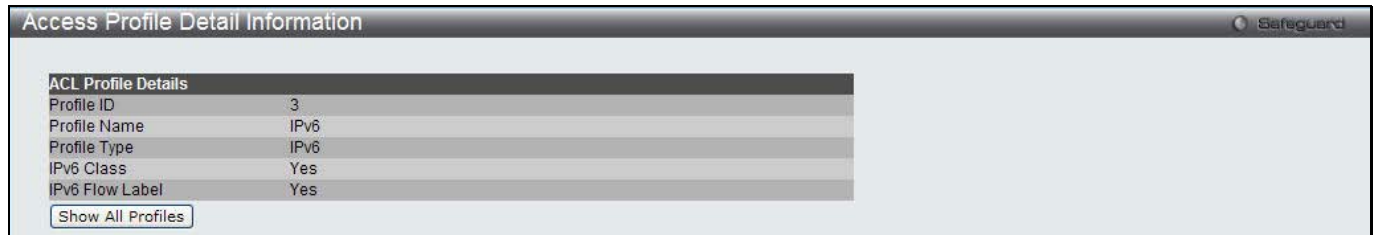


Figure 10-14 Access Profile Detail Information window (IPv6 ACL)

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 10-15 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 window.

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 10-16 Add Access Rule (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-256)	Type in a unique identifier number for this access. This value can be set from 1 to 256. Auto Assign – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that packets that match the access profile are not forwarded by the Switch and will be filtered. Select <i>Mirror</i> 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	Here the user can 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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:

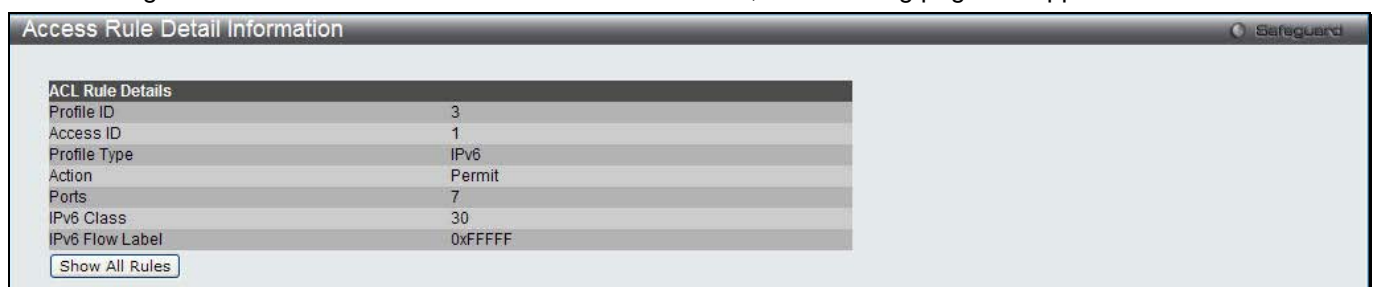


Figure 10-17 Access Rule Detail Information (IPv6 ACL)

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 files to the mask.

After clicking the **Add ACL Profile** button, the following page will appear:

The screenshot shows the 'Add ACL Profile' configuration page. At the top, 'Profile ID (1-6)' is set to 4 and 'Profile Name' is 'PacketACL'. Under 'Select ACL Type', 'Packet Content ACL' is selected. A red bar highlights the 'Packet Content' section. Below it, four 'Chunk' options (1-4) are listed, each with a 'mask' field set to '00000000'. At the bottom are '<<Back' and 'Create' buttons.

Figure 10-18 Add ACL Profile (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-6)	Enter a unique identifier number for this profile set. This value can be set from 1 to 6.
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 to instruct the Switch to examine the packet content in each frame's header.
Packet Content	Allows users to examine up to 4 specified offset_chunks within a packet at one time and specifies the frame content offset and mask. There are 4 chunk offsets and masks that can be configured. A chunk mask presents 4 bytes. 4 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,	B2, B3,	B6, B7,	B114, B115,	B118, B119,	B122, B123,

B0, B1	B4, B5	B8, B9		B116, B117	B120, B121	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 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 window.

After clicking the **Show Details** button, the following page will appear:

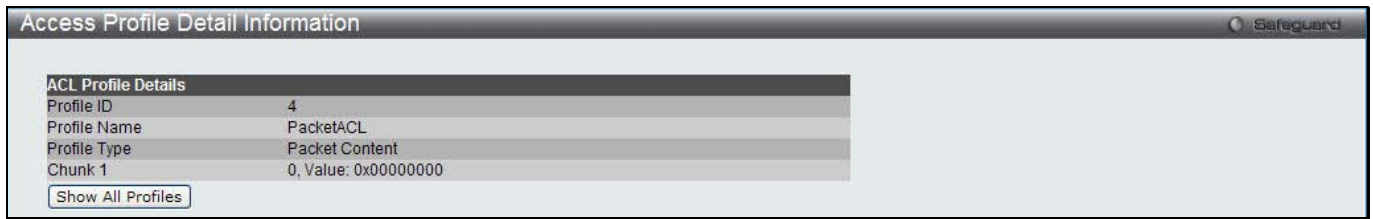


Figure 10-19 Access Profile Detail Information (Packet Content ACL)

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:

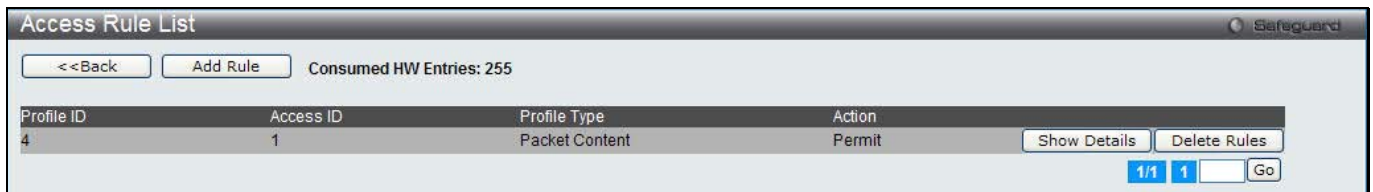


Figure 10-20 Access Rule List (Packet Content ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.

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

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:

Add Access Rule
Safeguard

Profile Information

Profile ID	4	Profile Name	PacketACL
Profile Type	Packet Content	Chunk 1	0, Value: 0x00000000

Rule Detail
(Keep the input field blank to specify that the corresponding option does not matter).

Access ID (1-256)	<input type="text" value="1"/>	<input type="checkbox"/>	Auto Assign
Chunk 1	<input type="text"/>	<input type="checkbox"/>	Mask
Chunk 2	<input type="text"/>	<input type="checkbox"/>	Mask
Chunk 3	<input type="text"/>	<input type="checkbox"/>	Mask
Chunk 4	<input type="text"/>	<input type="checkbox"/>	Mask

Rule Action

Action	<input type="text" value="Permit"/>	<input type="checkbox"/>	
Priority (0-7)	<input type="text"/>	<input type="checkbox"/>	
Replace Priority	<input type="text"/>	<input type="checkbox"/>	
Replace DSCP (0-63)	<input type="text"/>	<input type="checkbox"/>	
Replace ToS Precedence (0-7)	<input type="text"/>	<input type="checkbox"/>	
Time Range Name	<input type="text"/>	<input type="checkbox"/>	
Counter	<input type="text" value="Disabled"/>	<input type="checkbox"/>	

Ports

(e.g.: 1, 4-6, 9)

Figure 10-21 Add Access Rule (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Access ID (1-256)	Type in a unique identifier number for this access. This value can be set from 1 to 256. Auto Assign – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered. Select <i>Mirror</i> 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	Specify that the IP precedence of the outgoing packet is changed with the new

(0-7)	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	Here the user can 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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



Figure 10-22 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, an 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.

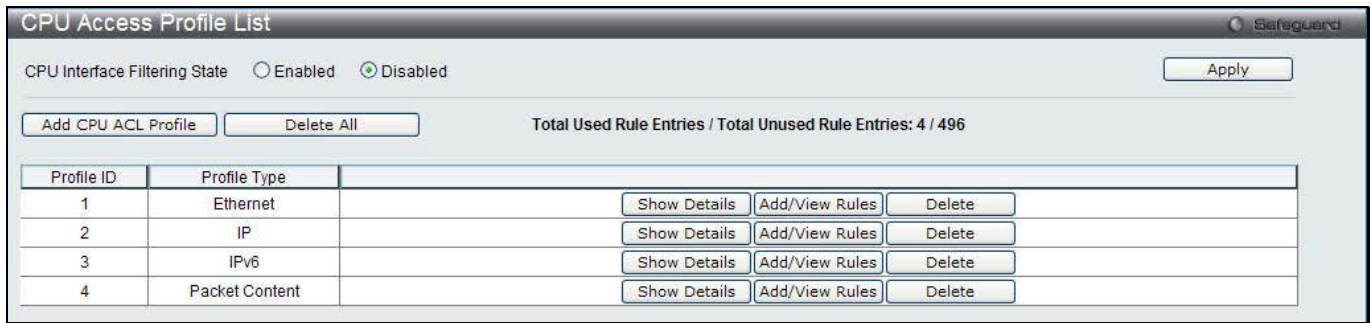


Figure 10-23 CPU Access Profile List window

The fields that can be configured are described below:

Parameter	Description
CPU Interface Filtering State	Click to 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 files to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

Add CPU ACL Profile Safeguard

Profile ID (1-5)

Select ACL Type

Ethernet ACL IPv4 ACL Packet Content ACL

IPv6 ACL

You can select the field in the packet to create filtering mask

MAC Address	VLAN	802.1p	Ethernet Type	Payload
-------------	------	--------	---------------	---------

MAC Address

Source MAC Mask

Destination MAC Mask

802.1Q VLAN

VLAN

802.1p

802.1p

Ethernet Type

Ethernet Type

Figure 10-24 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 to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 to instruct the Switch to examine the IP address in each frame's header. Select IPv6 to instruct the Switch to examine the IP address in each frame's header. Select Packet Content Mask 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 a 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 window.

After clicking the **Show Details** button, the following page will appear:

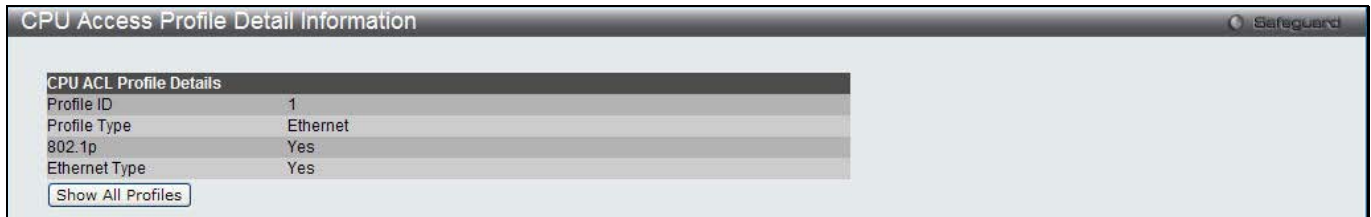


Figure 10-25 CPU Access Profile Detail Information (Ethernet ACL)

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:

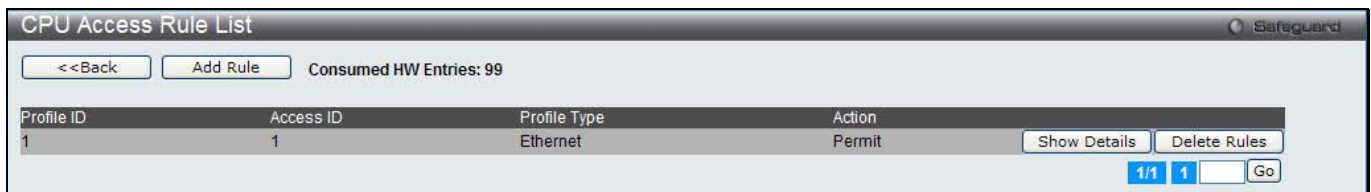


Figure 10-26 CPU Access Rule List (Ethernet ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.

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

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 10-27 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.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
Ethernet Type (0-FFFF)	Enter the appropriate Ethernet Type information.
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 window.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:



Figure 10-28 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 files to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

Figure 10-29 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 menu according to the requirements for the type of profile. Select Ethernet to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 to instruct the Switch to examine the IP address in each frame's header. Select IPv6 to instruct the Switch to examine the IP address in each frame's header. Select Packet Content Mask 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, e.g. 255.255.255.255.
Destination IP Mask	Enter an IP address mask for the destination IP address, e.g. 255.255.255.255.
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 <i>ICMP</i> to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.

	<p>Select <i>Type</i> to further specify that the access profile will apply an ICMP type value, or specify <i>Code</i> to further specify that the access profile will apply an ICMP code value.</p> <p>Select <i>IGMP</i> to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header.</p> <p>Select <i>Type</i> to further specify that the access profile will apply an IGMP type value.</p> <p>Select <i>TCP</i> 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. The user may choose between urg (urgent), ack (acknowledgement), psh (push), rst (reset), syn (synchronize), fin (finish).</p> <p><i>src port mask</i> - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter.</p> <p><i>dst port mask</i> - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter.</p> <p>Select <i>UDP</i> 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.</p> <p><i>src port mask</i> - Specify a UDP port mask for the source port in hex form (hex 0x0-0xffff).</p> <p><i>dst port mask</i> - Specify a UDP port mask for the destination port in hex form (hex 0x0-0xffff).</p> <p>Select <i>Protocol ID</i> - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xff).</p> <p><i>Protocol ID Mask</i> – Specify that the rule applies to the IP Protocol ID Traffic.</p> <p><i>User Define</i> – Specify the L4 part mask.</p>
--	--

Click the **Select** button to select a 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 window.

After clicking the **Show Details** button, the following page will appear:

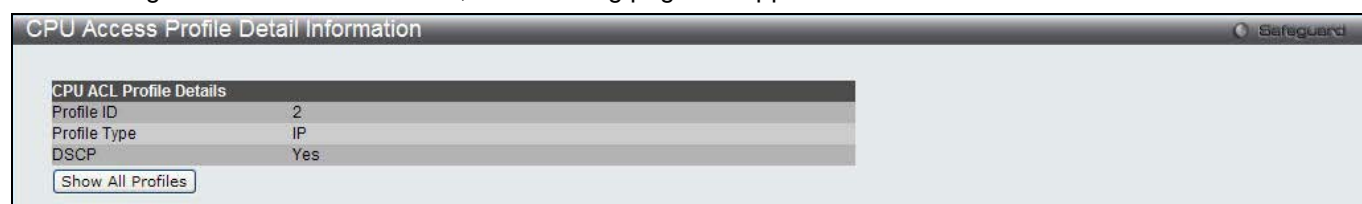


Figure 10-30 CPU Access Profile Detail Information (IPv4 ACL)

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 10-31 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 window.

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 10-32 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 <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
VLAN Name	Allows the entry of a name for a previously configured VLAN.
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 window.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

CPU ACL Rule Details	
Profile ID	2
Access ID	1
Profile Type	IP
Action	Permit
Ports	6
DSCP	20

Show All Rules

Figure 10-33 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 fields to the mask.

After clicking the **Add CPU ACL Profile** button, the following page will appear:

Profile ID (1-5)

Select ACL Type

Ethernet ACL IPv4 ACL IPv6 ACL Packet Content ACL

You can select the field in the packet to create filtering mask

IPv6 Class

IPv6 Class

IPv6 Flow Label

IPv6 Flow Label

IPv6 Address

IPv6 Source Mask

IPv6 Destination Mask

Figure 10-34 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

	<p>packet content mask. This will change the menu according to the requirements for the type of profile.</p> <p>Select Ethernet to instruct the Switch to examine the layer 2 part of each packet header.</p> <p>Select IPv4 to instruct the Switch to examine the IP address in each frame's header.</p> <p>Select IPv6 to instruct the Switch to examine the IP address in each frame's header.</p> <p>Select Packet Content Mask to specify a mask to hide the content of the packet header.</p>
IPv6 Class	Checking this field will instruct the Switch to examine the <i>class</i> 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 <i>flow label</i> 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 IP address mask for the source IPv6 address by checking the corresponding box and entering the IP address mask.
IPv6 Destination Mask	The user may specify an IP address mask for the destination IPv6 address by checking the corresponding box and entering the IP address mask.

Click the **Select** button to select a 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 window.

After clicking the **Show Details** button, the following page will appear:



Figure 10-35 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:

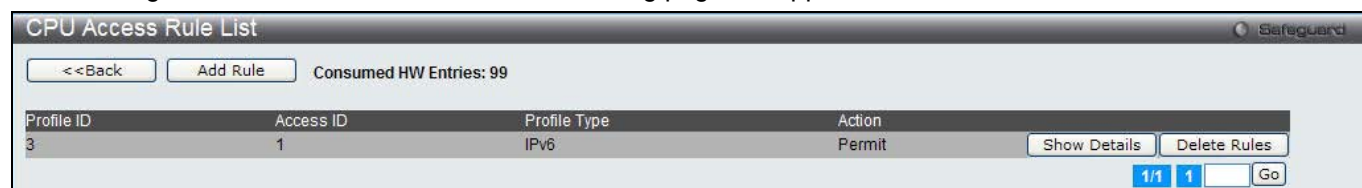


Figure 10-36 CPU Access Rule List (IPv6 ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.

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

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 10-37 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 <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> 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 window.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

Figure 10-38 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:

The screenshot shows the 'Add CPU ACL Profile' window. At the top, the title is 'Add CPU ACL Profile' with a 'Safeguard' icon. Below the title, there is a 'Profile ID (1-5)' input field containing the number '4'. Under 'Select ACL Type', there are three radio buttons: 'Ethernet ACL', 'IPv4 ACL', and 'Packet Content ACL', with 'Packet Content ACL' selected. A 'Select' button is to the right. Below this, a red bar highlights the 'Packet Content' section. Underneath, there is a 'Packet Content' section with five rows of checkboxes and mask fields. Each row represents an offset range (0-15, 16-31, 32-47, 48-63, 64-79) and has a 'mask' field with a hexadecimal value '00000000'. At the bottom of the window, there are '<<Back' and 'Create' buttons.

Figure 10-39 Add CPU ACL Profile (Packet Content ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-5)	Here the user can 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 menu according to the requirements for the type of profile. Select Ethernet to instruct the Switch to examine the layer 2 part of each packet header. Select IPv4 to instruct the Switch to examine the IP address in each frame's header. Select IPv6 to instruct the Switch to examine the IP address in each frame's header. Select Packet Content Mask 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 a 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 window.

After clicking the **Show Details** button, the following page will appear:

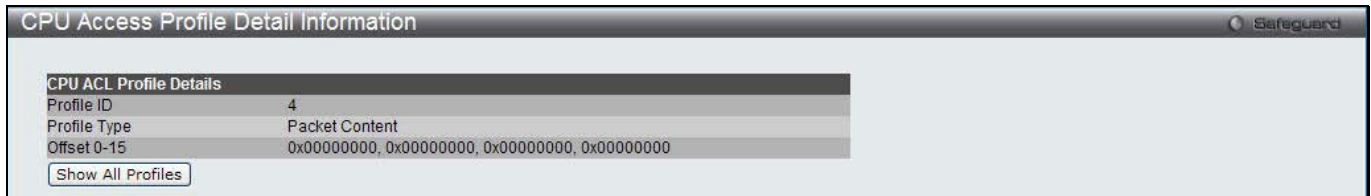


Figure 10-40 CPU Access Profile Detail Information (Packet Content ACL)

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:

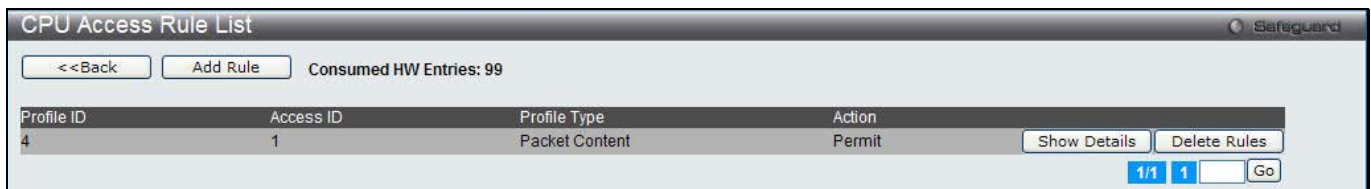


Figure 10-41 CPU Access Rule List (Packet Content ACL)

Click the **Add Rule** button to create a new CPU ACL rule in this profile.

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

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 10-42 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 <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> 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 window.

After clicking the **Show Details** button in the **CPU Access Rule List**, the following page will appear:

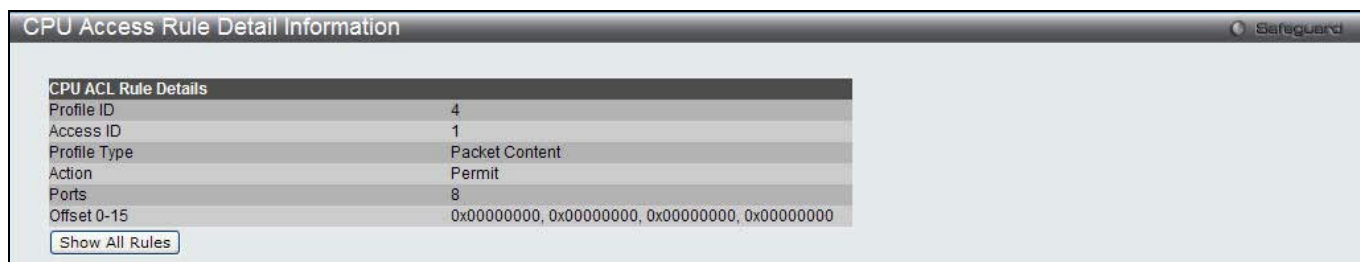


Figure 10-43 CPU Access Rule Detail Information (Packet Content ACL)

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:

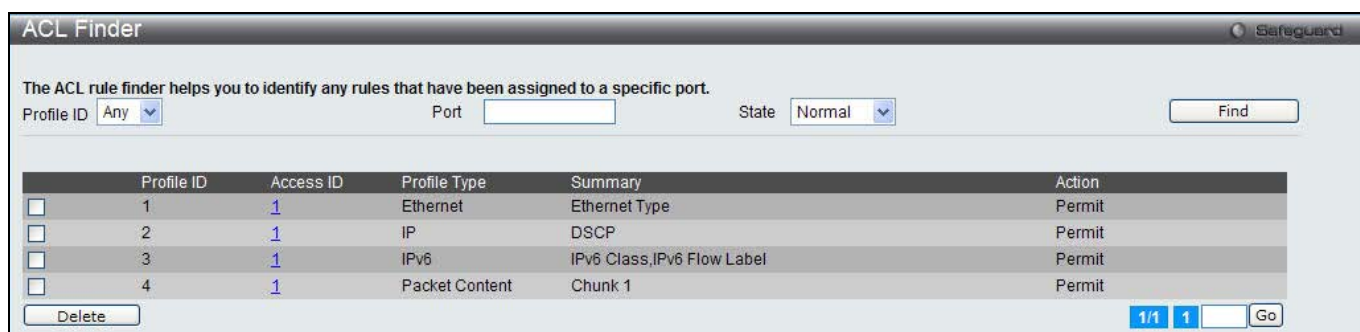


Figure 10-44 ACL Finder window

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 you want 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. <i>Normal</i> - Allow the user to find normal ACL rules. <i>CPU</i> - Allow the user to find CPU ACL rules. <i>Egress</i> – Allow the user to find Egress 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

Before configuring the ACL Flow Meter, here is a list of acronyms and terms users will need to know.

trTCM – Two Rate Three Color Marker. This, along with the srTCM, are two methods available on the switch for metering and marking packet flow. The trTCM meters and IP flow and marks it as a color based on the flow's surpassing of two rates, the CIR and the PIR.

CIR – Committed Information Rate. Common to both the trTCM and the srTCM, the CIR is measured in bytes of IP packets. IP packet bytes are measured by taking the size of the IP header but not the link specific headers. For the

trTCM, the packet flow is marked green if it doesn't exceed the CIR and yellow if it does. The configured rate of the CIR must not exceed that of the PIR. The CIR can also be configured for unexpected packet bursts using the CBS and PBS fields.

CBS – Committed Burst Size. Measured in bytes, the CBS is associated with the CIR and is used to identify packets that exceed the normal boundaries of packet size. The CBS should be configured to accept the biggest IP packet that is expected in the IP flow.

PIR – Peak Information Rate. This rate is measured in bytes of IP packets. IP packet bytes are measured by taking the size of the IP header but not the link specific headers. If the packet flow exceeds the PIR, that packet flow is marked red. The PIR must be configured to be equal or more than that of the CIR.

PBS – Peak Burst Size. Measured in bytes, the PBS is associated with the PIR and is used to identify packets that exceed the normal boundaries of packet size. The PBS should be configured to accept the biggest IP packet that is expected in the IP flow.

srTCM – Single Rate Three Color Marker. This, along with the trTCM, are two methods available on the switch for metering and marking packet flow. The srTCM marks its IP packet flow based on the configured CBS and EBS. A packet flow that does not reach the CBS is marked green, if it exceeds the CBS but not the EBS its marked yellow, and if it exceeds the EBS its marked red.

CBS – Committed Burst Size. Measured in bytes, the CBS is associated with the CIR and is used to identify packets that exceed the normal boundaries of packet size. The CBS should be configured to accept the biggest IP packet that is expected in the IP flow.

EBS – Excess Burst Size. Measured in bytes, the EBS is associated with the CIR and is used to identify packets that exceed the boundaries of the CBS packet size. The EBS is to be configured for an equal or larger rate than the CBS.

DSCP – Differentiated Services Code Point. The part of the packet header where the color will be added. Users may change the DSCP field of incoming packets.

The ACL Flow Meter function will allow users to color code IP packet flows based on the rate of incoming packets. Users have two types of Flow metering to choose from, trTCM and srTCM, as explained previously. When a packet flow is placed in a color code, the user can choose what to do with packets that have exceeded that color-coded rate.

Green – When an IP flow is in the green mode, its configurable parameters can be set in the Conform field, where the packets can have their DSCP field changed. This is an acceptable flow rate for the ACL Flow Meter function.

Yellow – When an IP flow is in the yellow mode, its configurable parameters can be set in the Exceed field. Users may choose to either Permit or Drop exceeded packets. Users may also choose to change the DSCP field of the packets.

Red – When an IP flow is in the red mode, its configurable parameters can be set in the Violate field. Users may choose to either Permit or Drop exceeded packets. Users may also choose to change the DSCP field of the packets.

Users may also choose to count exceeded packets by clicking the Counter check box. If the counter is enabled, the counter setting in the access profile will be disabled. 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 10-45 ACL Flow Meter

The fields that can be configured are described below:

Parameter	Description
Profile ID	Use the drop-down menu to select it and enter the Profile ID for the flow meter.
Profile Name	Use the drop-down menu to select it and enter the Profile Name for the flow meter.
Access ID (1-256)	Here the user can 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.

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

After clicking the **Add** or **Modify** button, the following page will appear:

Figure 10-46 ACL Flow meter Configuration window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-6)	Click the radio button and enter the Profile ID for the flow meter.
Profile Name	Click the radio button and enter the Profile Name for the flow meter.
Access ID (1-256)	Enter the Access ID for the flow meter.
Mode	<p>Rate – Specify the rate for single rate two color mode.</p> <p><i>Rate</i> – Specify the committed bandwidth in Kbps for the flow.</p> <p><i>Burst Size</i> – Specify the burst size for the single rate two color mode. The unit is in kilobyte.</p> <p><i>Rate Exceeded</i> – 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:</p> <p><i>Drop Packet</i> – Drop the packet immediately.</p> <p><i>Remark DSCP</i> – Mark the packet with a specified DSCP. The packet is set to drop for</p>

	<p>packets with a high precedence.</p> <p>trTCM – Specify the “two-rate three-color mode.”</p> <p><i>CIR</i> – Specify the Committed information Rate. The unit is Kbps. CIR should always be equal or less than PIR.</p> <p><i>PIR</i> – Specify the Peak information Rate. The unit is Kbps. PIR should always be equal to or greater than CIR.</p> <p><i>CBS</i> – Specify the Committed Burst Size. The unit is in kilobyte.</p> <p><i>PBS</i> – Specify the Peak Burst Size. The unit is in kilobyte.</p> <p>srTCM – Specify the “single-rate three-color mode”.</p> <p><i>CIR</i> – Specify the Committed Information Rate. The unit is in kilobyte.</p> <p><i>CBS</i> – Specify the Committed Burst Size. The unit is in kilobyte.</p> <p><i>EBS</i> – Specify the Excess Burst Size. The unit is in kilobyte.</p>
Action	<p>Conform – This field denotes the green packet flow. Green packet flows may have their <i>DSCP</i> field rewritten to a value stated in this field. Users may also choose to count green packets by using counter parameter.</p> <p><i>Replace DSCP</i> – Packets that are in the green flow may have their DSCP field rewritten using this parameter and entering the DSCP value to replace.</p> <p><i>Counter</i> – Use this parameter to enable or disable the packet counter for the specified ACL entry in the green flow.</p> <p>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.</p> <p><i>Counter</i> – Use this parameter to enable or disable the packet counter for the specified ACL entry in the yellow flow.</p> <p>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.</p> <p><i>Counter</i> – Use this parameter to enable or disable the packet counter for the specified ACL entry in the red flow.</p>

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

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

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

ACL Flow Meter Display			
Profile ID	1		
Access ID	1		
Mode	Rate	Rate (Kbps)	3000
		Burst Size (Kbyte)	3000
		Rate Exceeded	3
		Remark DSCP	
			<<Back

Figure 10-47 ACL Flow meter Display window

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

Egress Access Profile List

Egress ACL performs per-flow processing of packets when they egress the Switch. The Switch supports three Profile Types, Ethernet ACL, IPv4 ACL, and IPv6 ACL.

To view this window, click **ACL > Egress Access Profile List** as shown below:

Profile ID	Profile Name	Profile Type	
1	EthernetACL	Ethernet	Show Details Add/View Rules Delete
2	IPv4ACL	IP	Show Details Add/View Rules Delete
3	IPv6ACL	Ethernet	Show Details Add/View Rules Delete

Figure 10-48 Egress Access Profile List window

Click the **Add Egress ACL** button to add an entry to the **Egress 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 Egress 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 three **Add Egress ACL** windows;

- one for Ethernet profile configuration,
- one for IPv6 address-based profile configuration, and
- one for IPv4 address-based profile configuration.

Add an Ethernet ACL Profile

The window shown below is the Add Egress ACL Profile window for Ethernet. To use specific filtering masks in this egress ACL profile, click the packet filtering mask field to highlight it red. This will add more files to the mask.

After clicking the **Add Egress ACL** button, the following page will appear:

Figure 10-49 Add Egress ACL Profile window (Ethernet ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-4)	Enter a unique identifier number for this profile set. This value can be set from 1 to 4.
Profile Name	Enter a profile name for the profile created.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, or IPv6 address. 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.
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 window.

After clicking the **Show Details** button, the following page will appear:

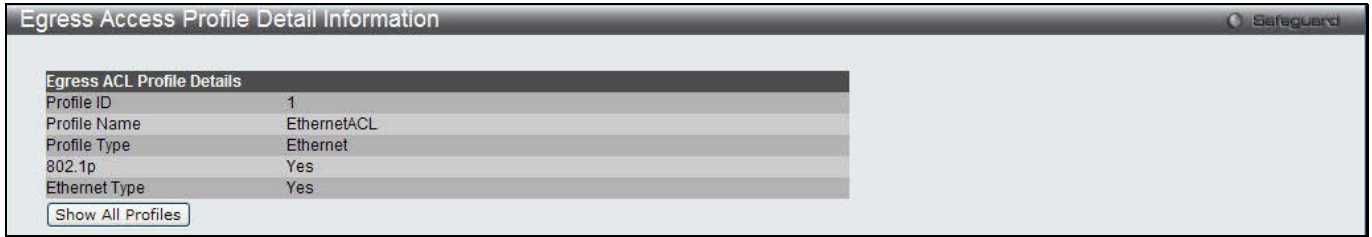


Figure 10-50 Egress Access Profile Detail Information window (Ethernet ACL)

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 10-51 Egress 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 window.

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:

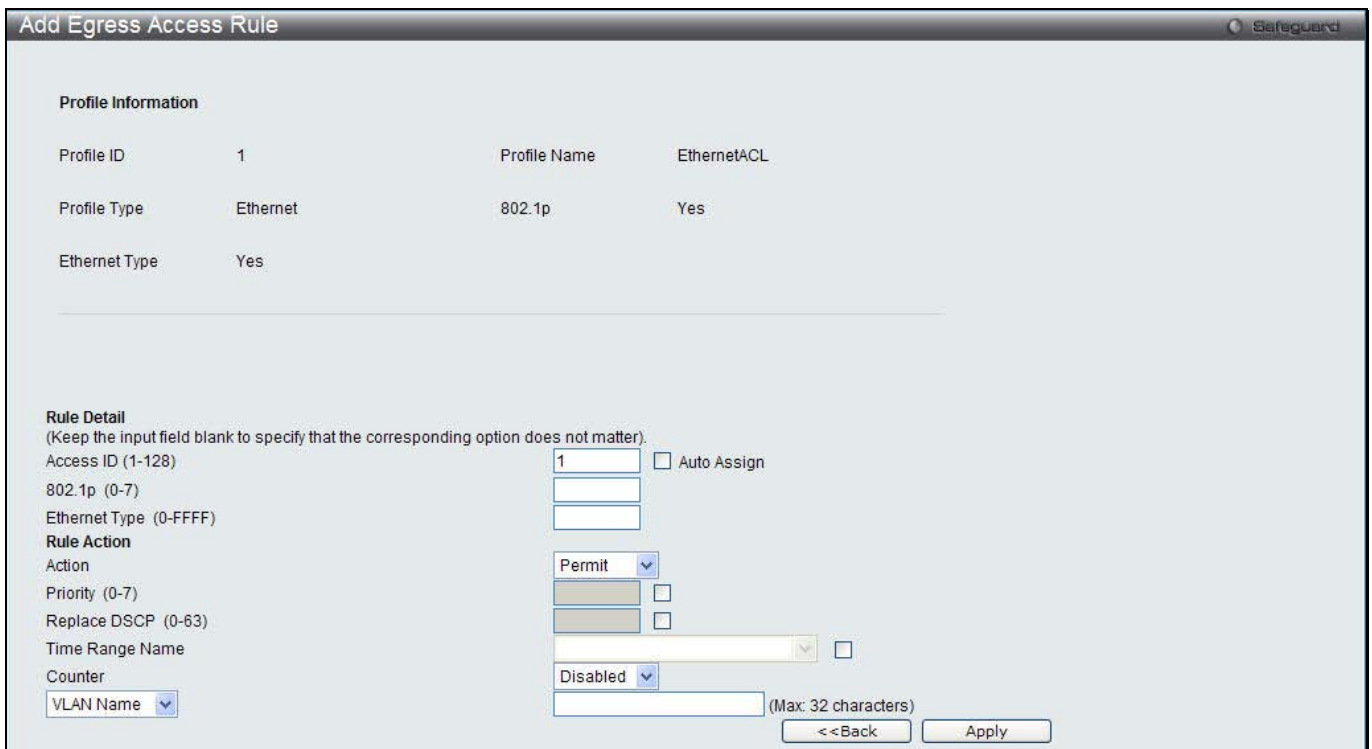


Figure 10-52 Add Egress Access Rule window (Ethernet ACL)

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. <i>Auto Assign</i> – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
Ethernet Type	Specify the Ethernet type.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that the packets that match the access profile are not forwarded by the Switch and will be filtered.
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 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.
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	Here the user can select the counter. By checking the counter, the administrator can see how many times that the rule was hit.
Port	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.
Port Group ID	Specify the port group ID to apply to the access rule.
Port Group Name	Specify the port group name to apply to the access rule.
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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



Egress ACL Rule Details	
Profile ID	1
Access ID	1
Profile Type	Ethernet
Action	Permit
Ports	5
802.1p	3
Ethernet Type	0xFFFF

Show All Rules

Figure 10-53 Egress 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 Egress ACL Profile window for IPv4. To use specific filtering masks in this egress ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add Egress ACL** button, the following page will appear:

Figure 10-54 Add Egress ACL Profile window (IPv4 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-4)	Enter a unique identifier number for this profile set. This value can be set from 1 to 4.
Profile Name	Enter a profile name for the profile created.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, or IPv6 address. 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.
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	Enter an IP address mask for the destination IP address.

Mask	
Protocol	<p>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:</p> <p>Select <i>ICMP</i> to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.</p> <p>Select <i>Type</i> to further specify that the access profile will apply an ICMP type value, or specify <i>Code</i> to further specify that the access profile will apply an ICMP code value.</p> <p>Select <i>IGMP</i> to instruct the Switch to examine the Internet Group Management Protocol (IGMP) field in each frame's header.</p> <p>Select <i>Type</i> to further specify that the access profile will apply an IGMP type value.</p> <p>Select <i>TCP</i> 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.</p> <p><i>src port mask</i> - Specify a TCP port mask for the source port in hex form (hex 0x0-0xffff), which you wish to filter.</p> <p><i>dst port mask</i> - Specify a TCP port mask for the destination port in hex form (hex 0x0-0xffff) which you wish to filter.</p> <p><i>flag bit</i> - 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 between urg (urgent), ack (acknowledgement), psh (push), rst (reset), syn (synchronize), fin (finish).</p> <p>Select <i>UDP</i> 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.</p> <p><i>src port mask</i> - Specify a UDP port mask for the source port in hex form (hex 0x0-0xffff).</p> <p><i>dst port mask</i> - Specify a UDP port mask for the destination port in hex form (hex 0x0-0xffff).</p> <p>Select <i>Protocol ID</i> - Enter a value defining the protocol ID in the packet header to mask. Specify the protocol ID mask in hex form (hex 0x0-0xff).</p> <p><i>Protocol ID Mask</i> - Specify that the rule applies to the IP protocol ID traffic.</p> <p><i>User Define</i> - Specify the Layer 4 part mask</p>

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 window.

After clicking the **Show Details** button, the following page will appear:

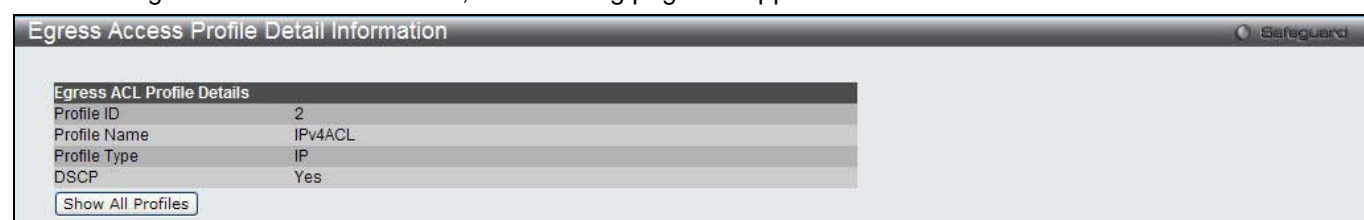


Figure 10-55 Egress Access Profile Detail Information window (IPv4 ACL)

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:

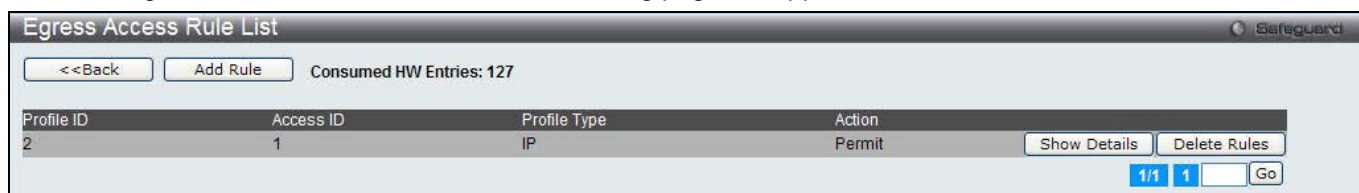


Figure 10-56 Egress Access Rule List window (IPv4 ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.

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

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:

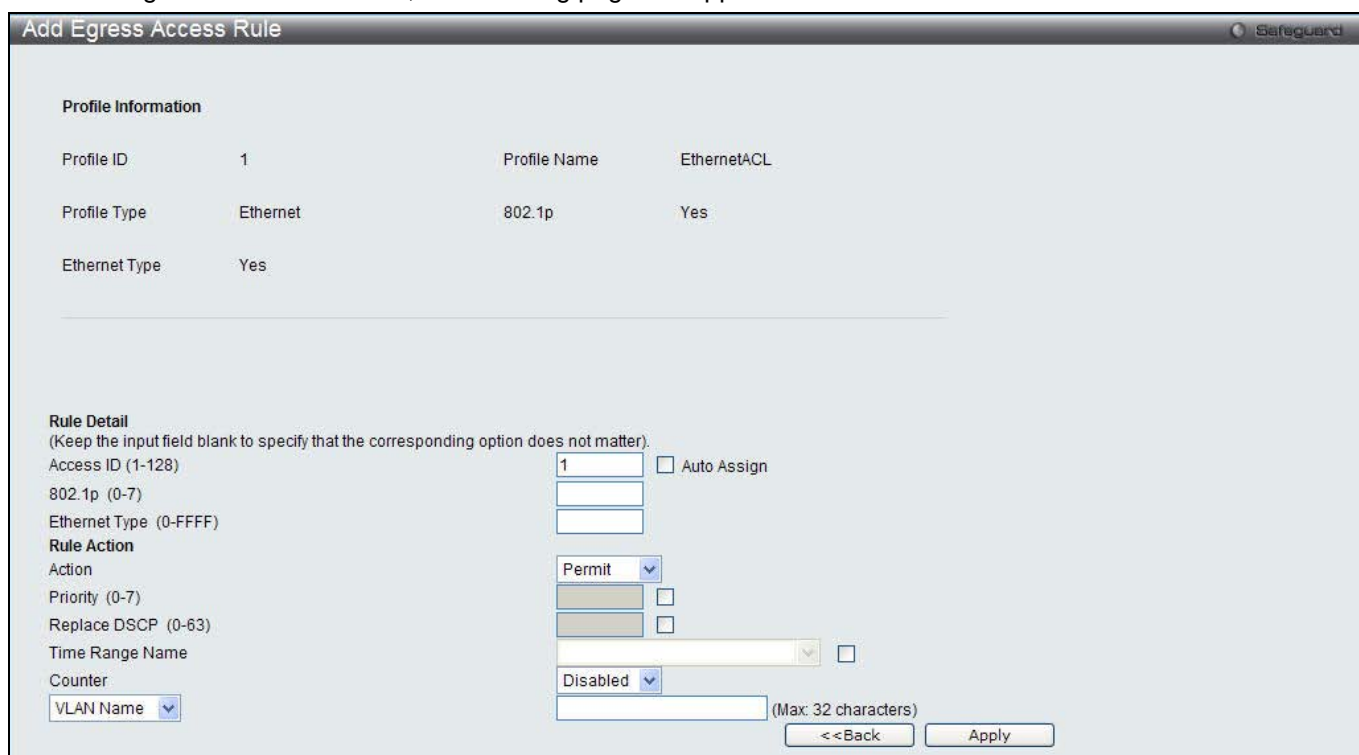


Figure 10-57 Add Egress Access Rule (IPv4 ACL)

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. Auto Assign – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
DSCP	Specify the value of DSCP. The DSCP value ranges from 0 to 63.
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.

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 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.
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	Here the user can 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.
Port Group ID	Specify the port group ID to apply to the access rule.
Port Group Name	Specify the port group name to apply to the access rule.
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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



The screenshot shows a window titled "CPU Access Rule Detail Information" with a "Safeguard" icon in the top right. The main content area is titled "CPU ACL Rule Details" and contains the following information:

Profile ID	1
Access ID	1
Profile Type	Ethernet
Action	Permit
Ports	5
802.1p	3
Ethernet Type	0xFFFF

At the bottom left of the window, there is a button labeled "Show All Rules".

Figure 10-58 Egress 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 Egress ACL Profile window for IPv6. To use specific filtering masks in this egress ACL profile, click the packet filtering mask field to highlight it red. This will add more filed to the mask.

After clicking the **Add Egress ACL** button, the following page will appear:

Figure 10-59 Add Egress ACL Profile window (IPv6 ACL)

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-4)	Enter a unique identifier number for this profile set. This value can be set from 1 to 4.
Profile Name	Enter a profile name for the profile created.
Select ACL Type	Select profile based on Ethernet (MAC Address), IPv4 address, or IPv6 address. 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.
IPv6 Class	Ticking this check box will instruct the Switch to examine the <i>class</i> 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 TCP	<i>Source Port Mask</i> – Specify that the rule applies to the range of TCP source ports. <i>Destination Port Mask</i> – Specify the range of the TCP destination port range.
IPv6 UDP	<i>Source Port Mask</i> – Specify the range of the UDP source port range. <i>Destination Port Mask</i> – Specify the range of the UDP destination port mask.
ICMP	Select <i>ICMP</i> to instruct the Switch to examine the Internet Control Message Protocol (ICMP) field in each frame's header.
IPv6 Source Mask	The user may specify an IP address mask for the source IPv6 address by ticking the corresponding check box and entering the IP address mask, e.g.

	255.255.255.255.
IPv6 Destination Mask	The user may specify an IP address mask for the destination IPv6 address by ticking the corresponding check box and entering the IP address mask, e.g. 255.255.255.255.

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 window.

After clicking the **Show Details** button, the following page will appear:

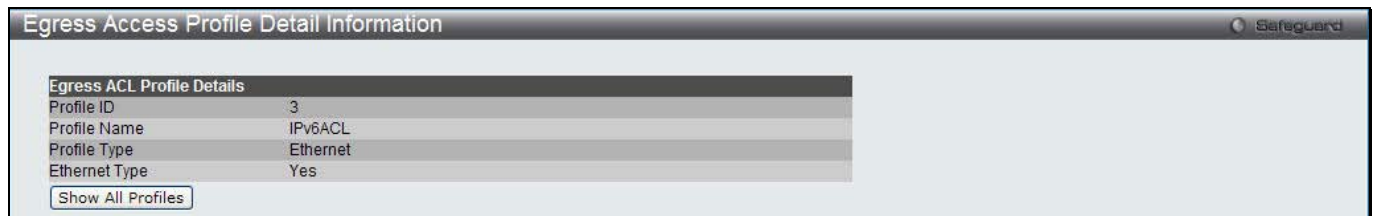


Figure 10-60 Egress Access Profile Detail Information window (IPv6 ACL)

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:

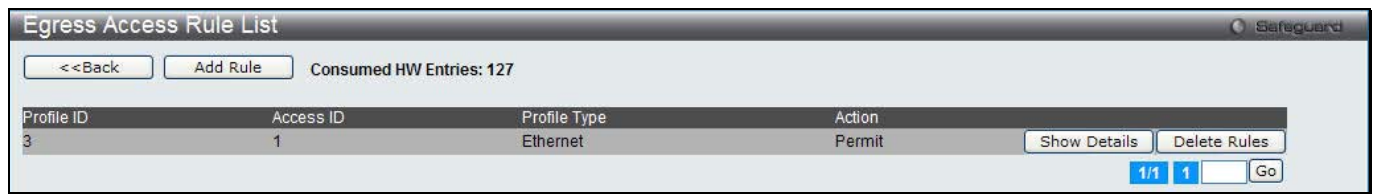


Figure 10-61 Egress Access Rule List window (IPv6 ACL)

Click the **Add Rule** button to create a new ACL rule in this profile.

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

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 10-62 Add Egress 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. Auto Assign – Ticking this check box will instruct the Switch to automatically assign an Access ID for the rule being created.
Class	Specify the value of IPv6 class.
Action	Select <i>Permit</i> to specify that the packets that match the access profile are forwarded by the Switch, according to any additional rule added (see below). Select <i>Deny</i> to specify that packets that match the access profile are not forwarded by the Switch and will be filtered.
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 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.
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	Here the user can 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.
Port Group ID	Specify the port group ID to apply to the access rule.
Port Group Name	Specify the port group name to apply to the access rule.
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 window.

After clicking the **Show Details** button in the **Access Rule List**, the following page will appear:



Figure 10-63 Egress Access Rule Detail Information (IPv6 ACL)

Click the **Show All Rules** button to navigate back to the Access Rule List.

Egress ACL Flow Meter

This window is used to configure the packet flow-based metering based on an egress access profile and rule.

To view this window, click **ACL > Egress ACL Flow Meter** as shown below:



Figure 10-64 Egress ACL Flow Meter window

The fields that can be configured are described below:

Parameter	Description
Profile ID	Use the drop-down menu to select it and enter the Profile ID for the flow meter.
Profile Name	Use the drop-down menu to select it and enter the Profile Name for the flow meter.
Access ID (1-128)	Here the user can 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 10-65 Egress ACL Flow Meter Configuration window

The fields that can be configured are described below:

Parameter	Description
Profile ID (1-4)	Here the user can enter the Profile ID for the flow meter.
Profile Name	Here the user can enter the Profile Name for the flow meter.
Access ID (1-128)	Here the user can enter the Access ID for the flow meter.
Mode	<p>Rate – Specify the rate for single rate two color mode.</p> <p><i>Rate</i> – Specify the committed bandwidth in Kbps for the flow.</p> <p><i>Burst Size</i> – Specify the burst size for the single rate two color mode. The unit is in kilobyte.</p> <p><i>Rate Exceeded</i> – 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:</p> <p><i>Drop Packet</i> – Drop the packet immediately.</p> <p><i>Remark DSCP</i> – Mark the packet with a specified DSCP. The packet is set to drop for packets with a high precedence.</p> <p>trTCM – Specify the “two-rate three-color mode.”</p> <p><i>CIR</i> – Specify the Committed information Rate. The unit is Kbps. CIR should always be equal or less than PIR.</p> <p><i>PIR</i> – Specify the Peak information Rate. The unit is Kbps. PIR should always be equal to or greater than CIR.</p> <p><i>CBS</i> – Specify the Committed Burst Size. The unit is in kilobyte.</p> <p><i>PBS</i> – Specify the Peak Burst Size. The unit is in kilobyte.</p> <p>srTCM – Specify the “single-rate three-color mode”.</p> <p><i>CIR</i> – Specify the Committed Information Rate. The unit is in kilobyte.</p> <p><i>CBS</i> – Specify the Committed Burst Size. The unit is in kilobyte.</p> <p><i>EBS</i> – Specify the Excess Burst Size. The unit is in kilobyte.</p>
Action	<p>Conform – This field denotes the green packet flow. Green packet flows may have their <i>DSCP</i> field rewritten to a value stated in this field. Users may also choose to count green packets by using counter parameter.</p> <p><i>Replace DSCP</i> – Packets that are in the green flow may have their DSCP field rewritten</p>

	<p>using this parameter and entering the DSCP value to replace.</p> <p>Counter – Use this parameter to enable or disable the packet counter for the specified ACL entry in the green flow.</p> <p>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.</p> <p>Counter – Use this parameter to enable or disable the packet counter for the specified ACL entry in the yellow flow.</p> <p>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.</p> <p>Counter – Use this parameter to enable or disable the packet counter for the specified ACL entry in the red flow.</p>
--	---

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

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

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

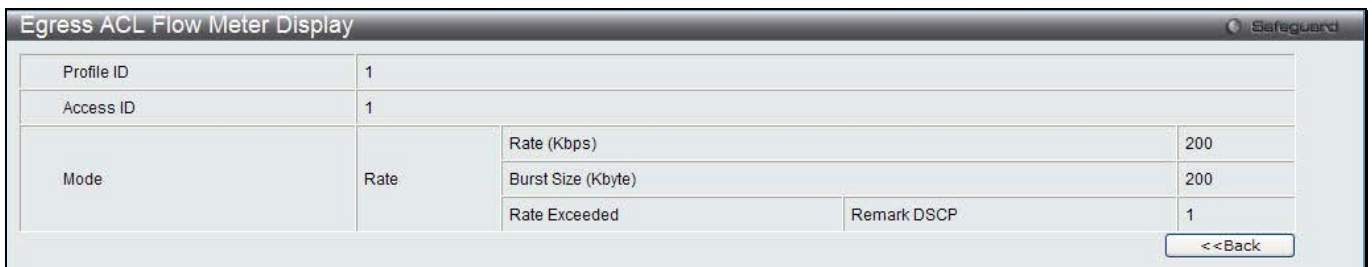


Figure 10-66 Egress ACL Flow meter Display window

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

Chapter 7 Security

802.1X

RADIUS

IP-MAC-Port Binding (IMPB)

MAC-based Access Control (MAC)

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

Captive Portal (CP)

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:

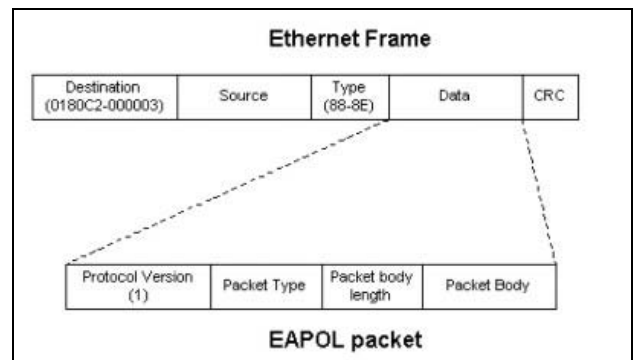


Figure 11-1 The EAPOL Packet

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.

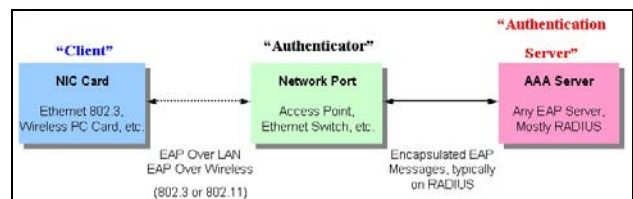


Figure 11-2 The three roles of 802.1X

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.

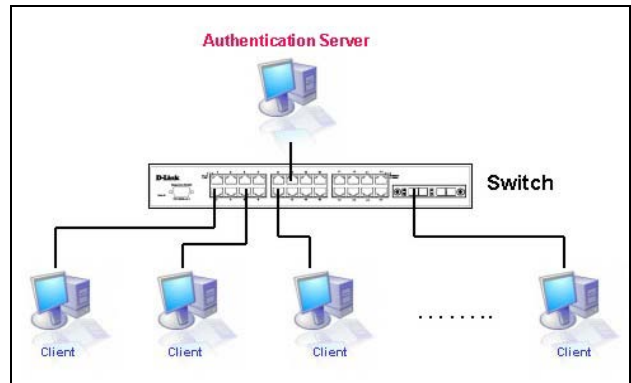


Figure 11-3 The Authentication Server

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.

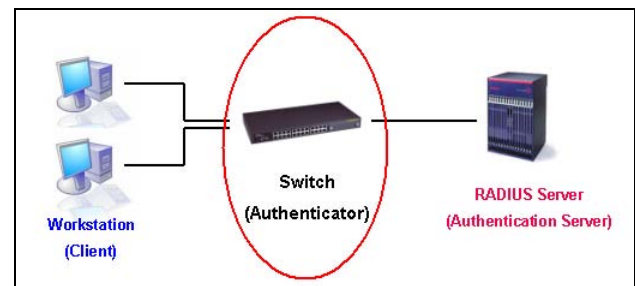


Figure 11-4 The Authenticator

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.

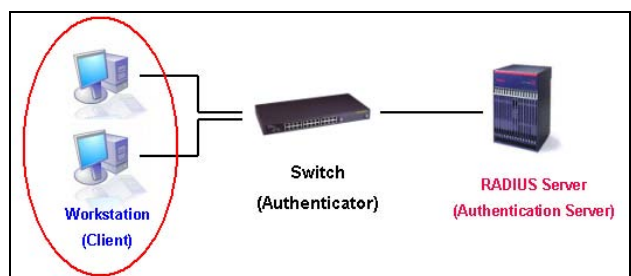


Figure 11-5 The Client

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.

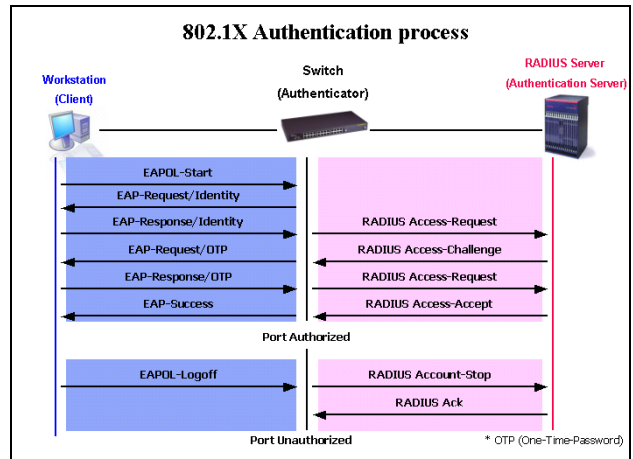


Figure 11-6 The 802.1X Authentication Process

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.

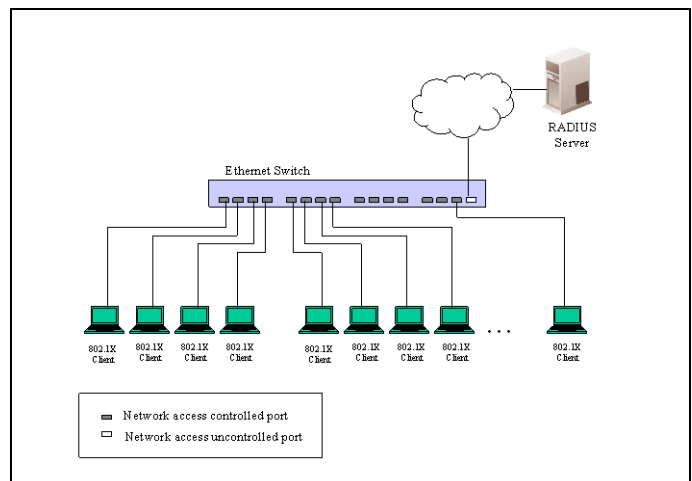


Figure 11-7 Example of Typical Port-based Configuration

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.

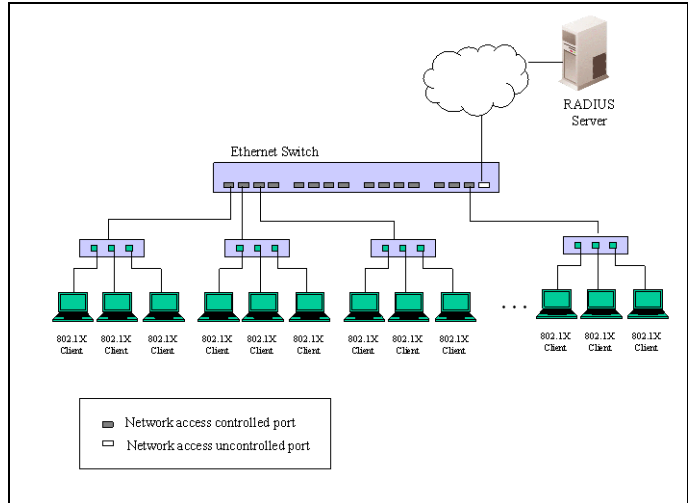


Figure 11-8 Example of Typical Host-based Configuration

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 11-9 802.1X Global Settings window

The fields that can be configured are described below:

Parameter	Description
Authentication Mode	Choose the 802.1X authenticator mode, <i>Disabled</i> , <i>Port-based</i> , or <i>MAC-based</i> .
Authentication Protocol	Choose the authenticator protocol, <i>Local</i> or <i>RADIUS EAP</i> .
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. Tick the No Limit check box to have unlimited users.
RADIUS Authorization	This option is used to enable or disable acceptance 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:

802.1X Port Settings

802.1X Port Access Control

From Port: 01 To Port: 01

QuietPeriod (0-65535): 60 sec SuppTimeout (1-65535): 30 sec

ServerTimeout (1-65535): 30 sec MaxReq (1-10): 2 times

TX Period (1-65535): 30 sec ReAuthPeriod (1-65535): 3600 sec

ReAuthentication: Disabled Port Control: Auto

Capability: None Direction: Both

Forward EAPOL PDU: Disabled Max User (1-448): 16 No Limit

Refresh Apply

Port	AdmDir	OpenCriDir	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
19	Both	Both	Auto	30	60	30	30	2	3600	Disabled	None	Disabled	16

Figure 11-10 802.1X Port Settings

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports you wish 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. It is defined in SuppTimeout, IEEE-802.1X-2001, page 47. The initialization value is used for the awhile timer when timing out the Supplicant. Its default value is 30 seconds; however, if the type of challenge involved in the current exchange demands a different value of timeout (for example, if the challenge requires an action on the part of the user), then the timeout value is adjusted accordingly. It can be set by management to any value in the range from 1 to 65535 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. It is defined in MaxReq, IEEE-802.1X-2001 page 47. The maximum number of times that the state machine will retransmit an EAP Request packet to the Supplicant before it times out the authentication session. Its default value is 2; it can be set by management to any value in the range from 1 to 10.
TxPeriod (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 (1-65535)	A constant that defines a nonzero number of seconds between periodic re-authentication 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 <i>Disabled</i> .
Port Control	<p>This allows the user to control the port authorization state.</p> <p>Select <i>ForceAuthorized</i> 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.</p> <p>If <i>ForceUnauthorized</i> 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.</p> <p>If <i>Auto</i> 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.</p> <p>The default setting is <i>Auto</i>.</p>
Capability	This allows the 802.1X Authenticator settings to be applied on a per-port basis. Select <i>Authenticator</i> 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 <i>None</i> disable 802.1X functions on the port.
Direction	Sets the administrative-controlled direction to <i>Both</i> or <i>In</i> . If <i>Both</i> is selected, control is exerted over both incoming and outgoing traffic through the controlled port selected in the first field. If <i>In</i> 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 Users (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 11-11 802.1X User Settings window

The fields that can be configured are described below:

Parameter	Description
802.1X User	The user can enter an 802.1X user's username in here.
Password	The user can enter an 802.1X user's password in here.
Confirm Password	The user can re-enter an 802.1X user's password in here.

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.

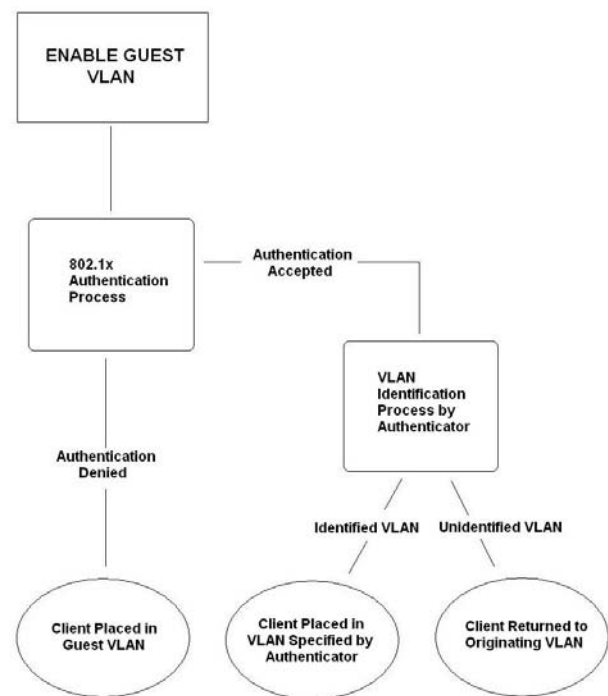


Figure 11-12 Guest VLAN Authentication Process

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 11-13 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.
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

This window is used to display the authenticator state.

To view this window, click **Security > 802.1X > Authenticator State** as shown below:

Figure 11-14 Authenticator State window

The fields that can be configured are described below:

Parameter	Description
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 user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

Authenticator Statistics

This window is used to display the authenticator statistics information.

To view this window, click **Security > 802.1X > Authenticator Statistics** as shown below:

The screenshot shows a window titled "Authenticator Statistics" with a "Time Interval" dropdown menu set to "1s" and an "OK" button. Below the menu is a table with the following data:

Port	Frames RX	Frames TX	RX Start	TX Reqld	RX LogOff	TX Req	RX Respld
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0

Figure 11-15 Authenticator Statistics window

The fields that can be configured are described below:

Parameter	Description
Time Interval	Use the drop-down menu to select the interval.

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



NOTE: The user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

Authenticator Session Statistics

This window is used to display the authenticator session statistics information.

To view this window, click **Security > 802.1X > Authenticator Session Statistics** as shown below:

Port	Octets RX	Octets TX	Frames RX	Frames TX	ID	Auth
1	0	0	0	0	N/A	Remote A
2	0	0	0	0	N/A	Remote A
3	0	0	0	0	N/A	Remote A
4	0	0	0	0	N/A	Remote A
5	0	0	0	0	N/A	Remote A
6	0	0	0	0	N/A	Remote A
7	0	0	0	0	N/A	Remote A
8	0	0	0	0	N/A	Remote A
9	0	0	0	0	N/A	Remote A
10	0	0	0	0	N/A	Remote A
11	0	0	0	0	N/A	Remote A
12	0	0	0	0	N/A	Remote A
13	0	0	0	0	N/A	Remote A
14	0	0	0	0	N/A	Remote A
15	0	0	0	0	N/A	Remote A

Figure 11-16 Authenticator Session Statistics window

The fields that can be configured are described below:

Parameter	Description
Time Interval	Use the drop-down menu to select the interval.

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



NOTE: The user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

Authenticator Diagnostics

This window is used to display the authenticator diagnostics information.

To view this window, click **Security > 802.1X > Authenticator Diagnostics** as shown below:

Port	Connect Enter	Connect LogOff	Auth Enter	Auth Success	Auth Timeout	Auth Fail
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

Figure 11-17 Authenticator Diagnostics window



NOTE: The user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

Initialize Port(s)

This window is used to display the authenticator diagnostics information. The window shows various information based on the **Authentication Mode** configured in the 802.1X Global Settings window.

To view this window, click **Security > 802.1X > Initialize Port(s)** as shown below:

Initialize Port(s) Safeguard

From Port: To Port: Apply

Port	MAC Address	PAE State	Backend State	Status	VID	Priority
------	-------------	-----------	---------------	--------	-----	----------

Figure 11-18 Initialize P Port(s) – Port-based window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports to be displayed.

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

Figure 11-19 Initialize Port(s) – MAC-based window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports to be displayed.
MAC Address	Tick the check box and enter the authenticated MAC address of the client connected to the corresponding port.

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



NOTE: The user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

Reauthenticate Port(s)

This window is used to display the current status of the re-authenticated port-based port(s). The window shows various information based on the **Authentication Mode** configured in the 802.1X Global Settings window.

To view this window, click **Security > 802.1X > Reauthenticate Port(s)** as shown below:

Figure 11-20 Reauthenticate Port(s) – Port-based window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports to be displayed.

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

Figure 11-21 Reauthenticate Port(s) – MAC-based window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports to be displayed.
MAC Address	Tick the check box and enter the authenticated MAC address of the client connected to the corresponding port.

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



NOTE: The user must first globally enable **Authentication Mode** in the 802.1X Global Settings window before initializing ports. Information in this window cannot be viewed before enabling the authentication mode for either **Port-based** or **MAC-based**.

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 11-22 Authentication RADIUS Server Settings window

The fields that can be configured are described below:

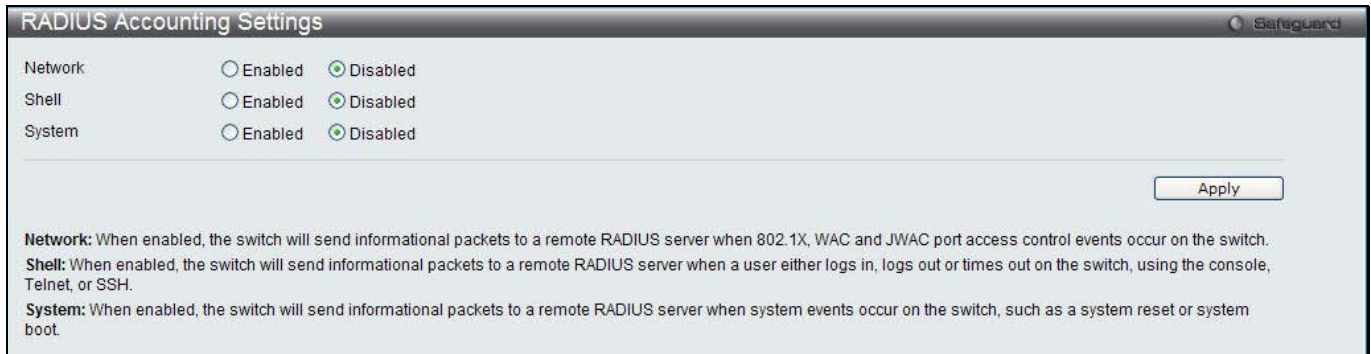
Parameter	Description
Index	Choose the desired RADIUS server to configure: 1, 2 or 3 and select the IPv4 Address.
IPv4 Address	Set the RADIUS server IP address.
IPv6 Address	Set the RADIUS server IPv6 address.
Authentication Port (1-65535)	Set the RADIUS authentic server(s) UDP port which is used to 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	Set the key the same as that of the RADIUS server.
Confirm Key	Confirm the key the same as that of the RADIUS server.

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

RADIUS Accounting Settings

This window is used to configure the state of the specified RADIUS accounting service.

To view this window, click **Security > RADIUS > RADIUS Accounting Settings** as shown below:



RADIUS Accounting Settings Safeguard

Network Enabled Disabled

Shell Enabled Disabled

System Enabled Disabled

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.

Figure 11-23 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 and WAC 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:

ServerIndex	InvalidServerAddr	Identifier	AuthServerAddr	ServerPortNumber	RoundTripTime	AccessRequests	AccessReplies
1	0			0	0	0	
2	0			0	0	0	
3	0			0	0	0	

Figure 11-24 RADIUS 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
InvalidServerAddr	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.
AuthServerAddr	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.
AccessRetrans	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

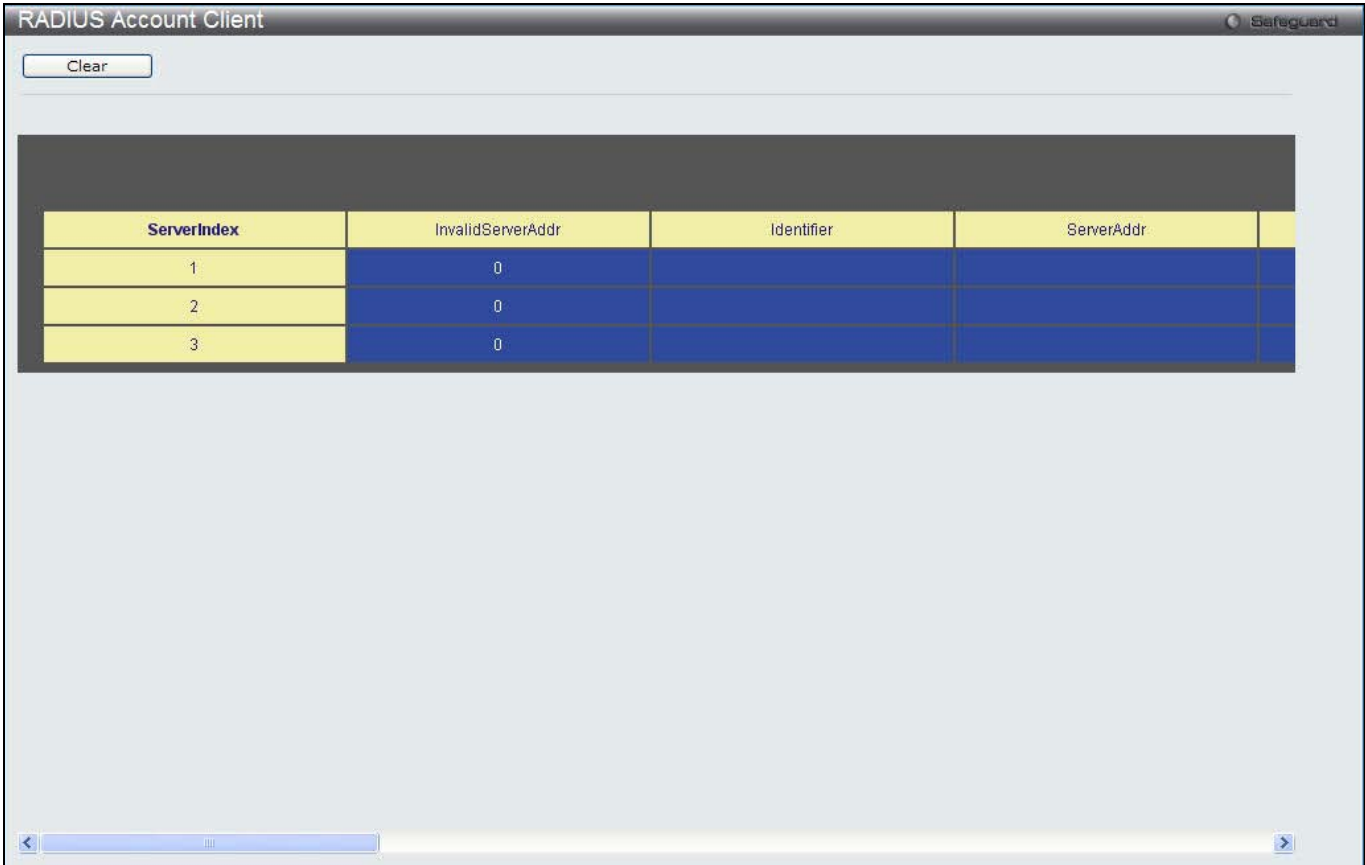
	this server.
AccessResponses	The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or Signature attributes or known types are not included as malformed access responses.
BadAuthenticators	The number 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:



The screenshot shows a web interface window titled "RADIUS Account Client" with a "Clear" button at the top left. Below the button is a table with the following data:

ServerIndex	InvalidServerAddr	Identifier	ServerAddr
1	0		
2	0		
3	0		

Figure 11-25 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 IP address of the RADIUS authentication server referred to in this table entry.
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 DWS-3160 series of switches, active and inactive entries use the same database. The maximum number of entries is 510. 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 and DHCP Snoop 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 11-26 IMPB Global Settings

The fields that can be configured are described below:

Parameter	Description
Trap / Log	Click the radio buttons to enable or disable the sending of trap/log messages for IP-MAC-port binding. When <i>Enabled</i> , 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 <i>Disabled</i> .
DHCP Snooping	Click the radio buttons to enable or disable DHCP snooping for IP-MAC-port binding. The default is <i>Disabled</i> .
Recover Learning Ports	Enter the port numbers used to recover the learning port state. Tick the All check box to apply to 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:

IMPB Port Settings Safeguard

From Port: 01 To Port: 01 ARP Inspection: Disabled IP Inspection: Disabled Protocol: IPv4 Zero IP: Disabled DHCP Packet: Enabled Stop Learning Threshold: (0-500)

Apply

Port	ARP Inspection	IP Inspection	Protocol	Zero IP	DHCP Packet	Stop Learning Threshold/Mode
1	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
2	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
3	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
4	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
5	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
6	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
7	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
8	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
9	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
10	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
11	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
12	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
13	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
14	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
15	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
16	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
17	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
18	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
19	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
20	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
21	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
22	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
23	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal
24	Disabled	Disabled	IPv4	Not Allow	Forward	500/Normal

Figure 11-27 IMPB Port Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports to set for IP-MAC-port binding.
ARP Inspection	<p>When the ARP inspection function is enabled, the legal ARP packets are forwarded, while the illegal packets are dropped.</p> <p><i>Disabled</i> - Disable the ARP inspection function.</p> <p><i>Enabled (Strict)</i> - This mode disables hardware learning of the MAC address. All packets are dropped by default until a legal ARP or IP packets are detected. When enabling this mode, the Switch stops writing dropped FDB entries on these ports. If detecting legal packets, the Switch needs to write forward FDB entry.</p> <p><i>Enabled (Loose)</i> - In this mode, all packets are forwarded by default until an illegal ARP packet is detected.</p> <p>The default value is Disabled.</p>
IP Inspection	<p>When both ARP and IP inspections are enabled, all IP packets are checked. The legal IP packets are forwarded, while the illegal IP packets are dropped. When IP Inspection is enabled, and ARP Inspection is disabled, all non-IP packets (Ex. L2 packets, or ARP) are forwarded by default.</p> <p>The default value is Disabled.</p>
Protocol	Use the drop-down menu to select the protocol.
Zero IP	Use the drop-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.
Stop Learning Threshold	Here is displayed the number of blocked entries on the port. The default value is 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 11-28 IMPB Entry Settings window

The fields that can be configured are described below:

Parameter	Description
IP Address	Enter the IP address to bind to the MAC address set below.
MAC Address	Enter the MAC address to bind to the IP Address set above.
Ports	Specify the switch ports for which to configure this IP-MAC binding entry (IP Address + MAC Address). Tick the All Ports 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 **Edit** button to configure the specified entry.

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

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 11-29 MAC Block List

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:

Port	Maximum Entry
1	No Limit
2	No Limit
3	No Limit
4	No Limit
5	No Limit
6	No Limit
7	No Limit
8	No Limit
9	No Limit
10	No Limit
11	No Limit
12	No Limit
13	No Limit
14	No Limit
15	No Limit
16	No Limit
17	No Limit
18	No Limit
19	No Limit
20	No Limit
21	No Limit
22	No Limit
23	No Limit
24	No Limit

Figure 11-30 DHCP Snooping Max Entry Settings window

The fields that can be configured are described below:

Parameter	Description
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 lift the maximum entry.

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 11-31 DHCP Snooping Entry window

The fields that can be configured are described below:

Parameter	Description
Unit	Select the unit you want to configure.
Port	Use the drop-down menu to select the desired port.
Ports	Specify the ports for which to view DHCP snooping entries. Tick the All Ports check box to 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-based access control, the method decides port access rights, while for host-based MAC-based access control, 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:

MAC-based Access Control Settings Safeguard

MAC-based Access Control Global Settings

MAC-based Access Control State Enabled Disabled Apply

Method Password

RADIUS Authorization Local Authorization

Trap State Log State

Max User (1-1000) No Limit Apply

Guest VLAN Settings

VLAN Name VID (1-4094)

Member Ports (e.g.: 1-5, 9) Add Delete

Port Settings

From Port	To Port	State	Mode	Aging Time (1-1440)	Block Time (0-300)	Max User (1-1000)
<input type="text" value="01"/>	<input type="text" value="01"/>	<input type="text" value="Disabled"/>	<input type="text" value="Host-based"/>	<input type="text" value="1440"/> min <input type="checkbox"/> Infinite	<input type="text" value="300"/> sec	<input type="text" value="128"/> <input type="checkbox"/> No Limit

Apply

Port	State	Mode	Aging Time (min)	Block Time (sec)	Max User
1	Disabled	Host-based	1440	300	128
2	Disabled	Host-based	1440	300	128
3	Disabled	Host-based	1440	300	128
4	Disabled	Host-based	1440	300	128
5	Disabled	Host-based	1440	300	128
6	Disabled	Host-based	1440	300	128
7	Disabled	Host-based	1440	300	128
8	Disabled	Host-based	1440	300	128
9	Disabled	Host-based	1440	300	128
10	Disabled	Host-based	1440	300	128
11	Disabled	Host-based	1440	300	128
12	Disabled	Host-based	1440	300	128
13	Disabled	Host-based	1440	300	128

Figure 11-32 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: <i>Local</i> – 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. <i>RADIUS</i> – 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.
Trap State	Use the drop-down menu to enable or disable trap state.
Log State	Use the drop-down menu to enable or disable log state.
Max User (1-1000)	Enter the maximum amount of users of the Switch. Tick the No Limit check box to have unlimited users.
VLAN Name	Enter the name of the previously configured Guest VLAN being used for this function.
VID (1-4094)	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.
From Port / To Port	Use the drop-down menus to select 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.
Mode	Toggle between <i>Port-based</i> and <i>Host-based</i> .
Aging Time (1-1440)	Enter a value between 1 and 1440 minutes. The default is 1440. To set this value to have no aging time, select the Infinite option.
Block Time (0-300)	Enter a value between 0 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 **Add** button to add a new entry based on the information entered.

Click the **Delete** button to remove the specified 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 11-33 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 11-34 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 11-35 MAC-based Access Control Local Settings – Edit by ID window

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

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 11-36 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.

Complete the JWAC authentication information on this window to set the JWAC page settings. Click the **Apply** button to implement the changes made. Click the **Set to default** button to go back to the default settings of all elements.

Compound Authentication

Compound Authentication settings allows for multiple authentication to be supported on the Switch.

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:

Compound Authentication Settings Safeguard

Authorization Attributes State Enabled Disabled Apply

Authentication Server Failover Block Local Permit Apply

Compound Authentication Port Settings

From Port: 01 To Port: 01 Authentication Methods: None Authorized Mode: Host-based CP Configuration: 1 VID List (e.g.: 1, 6-9): State: Disabled Apply

Port	Authentication Methods	Authorized Mode	Authentication VLAN	CP Configuration
1	None	Host-based		1
2	None	Host-based		1
3	None	Host-based		1
4	None	Host-based		1
5	None	Host-based		1
6	None	Host-based		1
7	None	Host-based		1
8	None	Host-based		1
9	None	Host-based		1
10	None	Host-based		1
11	None	Host-based		1
12	None	Host-based		1
13	None	Host-based		1
14	None	Host-based		1
15	None	Host-based		1
16	None	Host-based		1
17	None	Host-based		1
18	None	Host-based		1
19	None	Host-based		1
20	None	Host-based		1
21	None	Host-based		1
22	None	Host-based		1
23	None	Host-based		1
24	None	Host-based		1

Figure 11-37 Compound Authentication Settings window

The fields that can be configured are described below:

Parameter	Description
Authorization Attributes State	Click the radio buttons to enable or disable the Authorization Network State.
Authentication Server Failover	Click the radio buttons to configure the authentication server failover function. Local. The switch will resort to using the local database to authenticate the client. 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. Block (default setting). The client is always regarded as un-authenticated.
From Port / To Port	Use the drop-down menus to select a range of ports to be enabled as compound authentication ports.
Authentication Methods	The compound authentication method options include: None, Any (MAC, 802.1X, or CP), 802.1X+IMPB, MAC+IMPB, and IMPB+CP. <i>None</i> - all compound authentication methods are disabled. <i>Any (MAC, 802.1X or CP)</i> - if any of the authentication methods pass, then access will be granted. In this mode, MAC, 802.1X, and CP can be enabled

	<p>on a port at the same time. In Any (MAC, 802.1X, or CP) mode, whether an individual security module is active on a port depends on its system state.</p> <p><i>802.1X+IMPB</i> - 802.1X will be verified first, and then IMPB will be verified. Both authentication methods need to be passed.</p> <p><i>MAC+IMPB</i> - MAC will be verified first, and then IMPB will be verified. Both authentication methods need to be passed.</p> <p><i>IMPB+CP</i> - IMPB will be verified first, and then CP will be verified. Both authentication methods need to be passed.</p>
Authorized Mode	Toggle between <i>Host-based</i> and <i>Port-based</i> . When <i>Port-based</i> 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 <i>Host-based</i> is selected, users are authenticated individually.
CP Configuration	Select a captive portal configuration ID between 1 and 10.
VID List	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.



NOTE: Per VLAN authentication is only supported by Captive Portal. If Authentication Method is not *None*, the port will work as authentication VLAN disabled.

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 11-38 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	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: <i>Create VLAN</i> , <i>Add Ports</i> , or <i>Delete Ports</i> .

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** drop-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 11-39 Port Security Settings window

The fields that can be configured are described below:

Parameter	Description
Port Security Trap/Log Settings	Click to enable or disable Port Security traps and logs on the Switch.
System Max Address (1-3072)	Enter the system maximum address. Tick the No Limit check box to have unlimited system addresses.
From Port / To Port	Use the drop-down menus to select a range of ports to be configured.
Admin State	Use the drop-down menu to enable or disable Port Security (locked MAC address table for the selected ports).
Lock Address Mode	This drop-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: <i>Permanent</i> – The locked addresses will only age out after the Switch has been reset. <i>DeleteOnTimeout</i> – The locked addresses will age out after the aging timer expires.

	<i>DeleteOnReset</i> – The locked addresses will not age out until the Switch has been reset or rebooted.
Max Learning Address (0-3072)	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 Detail** button to display the information of the specific entry.

After clicking the **View Detail** button, the following page will appear:

Figure 11-40 Port Security Port-VLAN Settings window

The fields that can be configured are described below:

Parameter	Description
VLAN Name	Click the button and enter the name of the VLAN that the port security settings will be displayed for.
VID List	Click the button and enter VLAN IDs that the port security settings will be displayed for.
Max Learning Address (0-3072)	Specify the maximum value of port security entries that can be learned on this port. Tick the No Limit check box to have unlimited number of port security entries that can be learned by the system.

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

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

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 11-41 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. Tick the No Limit check box to have unlimited number of port security entries that can be learned by the 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 11-42 Port Security Entries window

The fields that can be configured or displayed 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:

ARP Spoofing Prevention Settings

Gateway IP Address: Gateway MAC Address: Ports: All Ports

Total Entries: 1

Gateway IP Address	Gateway MAC Address	Ports
192.168.69.1	00-22-33-44-55-66	1:5

Figure 11-43 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 select 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:

BPDU Attack Protection Safeguard

BPDU Attack Protection Global Settings

BPDU Attack Protection State Enabled Disabled Apply

Trap State Log State Apply

Recover Time (60-1000000) sec Infinite Apply

From Port To Port State Mode Apply

Port	State	Mode	Status
1	Disabled	Shutdown	Normal
2	Disabled	Shutdown	Normal
3	Disabled	Shutdown	Normal
4	Disabled	Shutdown	Normal
5	Disabled	Shutdown	Normal
6	Disabled	Shutdown	Normal
7	Disabled	Shutdown	Normal
8	Disabled	Shutdown	Normal
9	Disabled	Shutdown	Normal
10	Disabled	Shutdown	Normal
11	Disabled	Shutdown	Normal
12	Disabled	Shutdown	Normal
13	Disabled	Shutdown	Normal
14	Disabled	Shutdown	Normal
15	Disabled	Shutdown	Normal
16	Disabled	Shutdown	Normal
17	Disabled	Shutdown	Normal
18	Disabled	Shutdown	Normal
19	Disabled	Shutdown	Normal
20	Disabled	Shutdown	Normal
21	Disabled	Shutdown	Normal

Figure 11-44 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 (60-1000000)	Specify the BPDU protection Auto-Recovery timer. The default value of the recovery timer is 60. Tick the Infinite check box for not recovering the port.
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. <i>Drop</i> – Drop all received BPDU packets when the port enters under attack state. <i>Block</i> – Drop all packets (include BPDU and normal packets) when the port enters under attack state. <i>Shutdown</i> – 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 normal 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 drop-down menu.

To view this window, click **Security > Loopback Detection Settings** as shown below:

Port	Loopback Detection State	Loop Status
1	Disabled	Normal
2	Disabled	Normal
3	Disabled	Normal
4	Disabled	Normal
5	Disabled	Normal
6	Disabled	Normal
7	Disabled	Normal
8	Disabled	Normal
9	Disabled	Normal
10	Disabled	Normal
11	Disabled	Normal
12	Disabled	Normal
13	Disabled	Normal
14	Disabled	Normal
15	Disabled	Normal

Figure 11-45 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 <i>Port-based</i> and <i>VLAN-based</i> .
Trap State	Set the desired trap status: <i>None</i> , <i>Loop Detected</i> , <i>Loop Cleared</i> , or <i>Both</i> .
Log State	Specifies the state of the log for loopback detection.
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.
Recover Time (0 or 60-1000000)	Time allowed (in seconds) for recovery when a Loopback is 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.
From Port / To Port	Use the drop-down menus to select a range of ports to be configured.
State	Use the drop-down menu to toggle between <i>Enabled</i> and <i>Disabled</i> .

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:

Port	Forward Port List
1	1-24
2	1-24
3	1-24
4	1-24
5	1-24
6	1-24
7	1-24
8	1-24
9	1-24
10	1-24
11	1-24
12	1-24
13	1-24
14	1-24
15	1-24
16	1-24
17	1-24
18	1-24
19	1-24
20	1-24
21	1-24
22	1-24
23	1-24
24	1-24

Figure 11-46 Traffic Segmentation Settings window

The fields that can be configured are described below:

Parameter	Description
Port List	Enter a list of ports to be included in the traffic segmentation setup. Tick the All ports check box to select all ports.
Forward Port List	Enter a list of ports to be included in the traffic segmentation setup. by simply ticking the corresponding port's tick box. Tick the All ports check box to select 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 11-47 NetBIOS Filtering Settings window

The fields that can be configured are described below:

Parameter	Description
NetBIOS Filtering Ports	Select the appropriate port to include in the NetBIOS filtering configuration.
Extensive NetBIOS Filtering Ports	Select the appropriate port to include in the Extensive NetBIOS filtering configuration. Extensive NetBIOS is NetBIOS over 802.3. The Switch will deny the NetBIOS over 802.3 frame on these enabled ports.
Ports	Tick the appropriate ports to be configured. Click the Select All button to select all ports. Click the Clear All button to deselect all 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:

Port	State
1	Disabled
2	Disabled
3	Disabled
4	Disabled
5	Disabled
6	Disabled
7	Disabled
8	Disabled
9	Disabled
10	Disabled
11	Disabled
12	Disabled
13	Disabled
14	Disabled
15	Disabled
16	Disabled
17	Disabled
18	Disabled
19	Disabled
20	Disabled
21	Disabled
22	Disabled
23	Disabled
24	Disabled

Figure 11-48 DHCP Server Screening Port Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Server Trap Log State	Click to enable or disable filtering DHCP server trap and log.
Illegal Server Log Suppress Duration	Choose an illegal server log suppress duration of 1 minute, 5 minutes, or 30 minutes.
From Port / To Port	Use the drop-down menus to select a range of ports to be configured.
State	Choose <i>Enabled</i> to enable the DHCP server screening or <i>Disabled</i> to disable it. The default is <i>Disabled</i> .

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 11-49 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 11-50 Enable Admin window

When this window appears, click the **Enable Admin** button revealing a window for the user to enter authentication (password, username), as shown below. A successful entry will promote the user to Administrator level privileges on the Switch.



Figure 11-51 Log-in Page

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 11-52 Authentication Policy Settings window

The fields that can be configured are described below:

Parameter	Description
Authentication Policy	Use the drop-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 11-53 Application Authentication Settings window

The fields that can be configured or displayed 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, and the Web (HTTP) application.
Login Method List	Using the drop-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 drop-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:

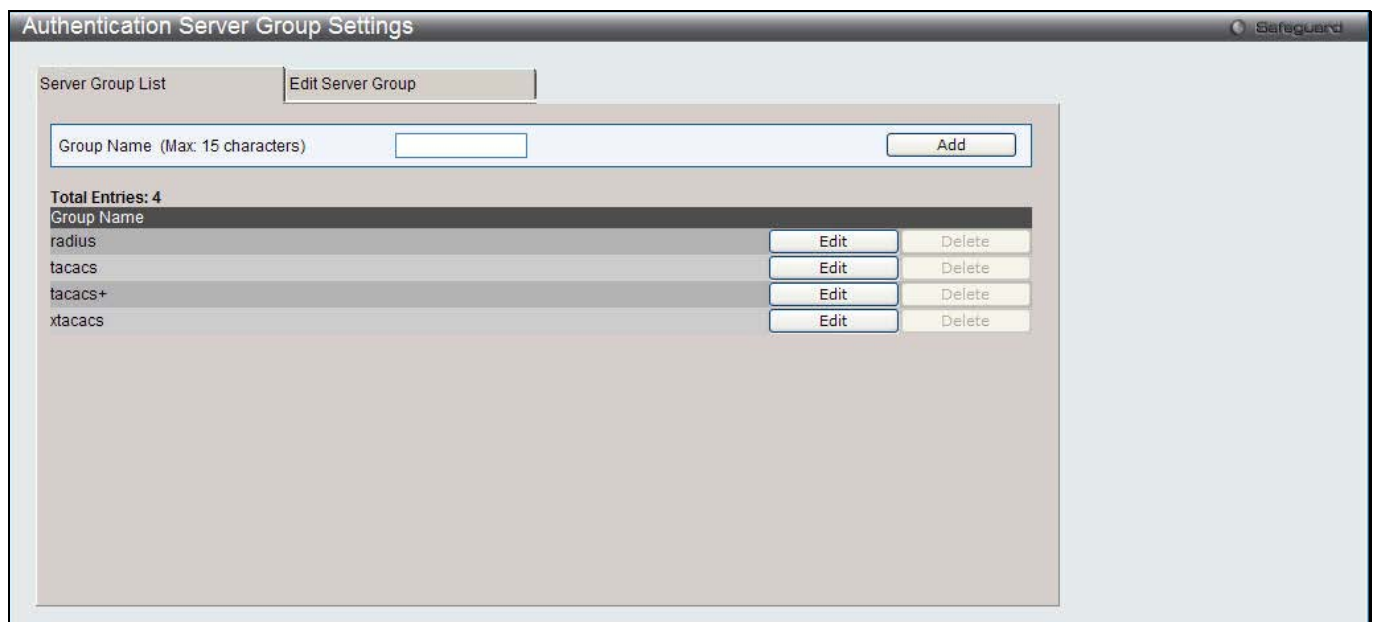


Figure 11-54 Authentication Server Group Settings – Server Group List window

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 11-55 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 11-56 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: <i>TACACS</i> - Enter this parameter if the server host utilizes the TACACS protocol. <i>XTACACS</i> - Enter this parameter if the server host utilizes the XTACACS protocol. <i>TACACS+</i> - Enter this parameter if the server host utilizes the TACACS+ protocol. <i>RADIUS</i> - Enter this parameter if the server host utilizes the RADIUS protocol.
Key	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 server does not respond. This value will not take effect when configuring to TACACS+. The default value is 2.

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:

Method List Name	Priority 1	Priority 2	Priority 3	Priority 4
default	local	----	----	----

Figure 11-57 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	<p>The user may add one, or a combination of up to four of the following authentication methods to this method list:</p> <p><i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p> <p><i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</p> <p><i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS+ protocol from a remote TACACS+ server.</p> <p><i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</p> <p><i>local</i> - Adding this parameter will require the user to be authenticated using the local user account database on the Switch.</p> <p><i>none</i> - Adding this parameter will require no authentication needed to access the Switch.</p>

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:

Method List Name	Priority 1	Priority 2	Priority 3	Priority 4
default	local_enable	-----	-----	-----

Figure 11-58 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	<p>The user may add one, or a combination of up to four of the following authentication methods to this method list:</p> <p><i>local_enable</i> - 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.</p> <p><i>none</i> - Adding this parameter will require no authentication needed to access the Switch.</p> <p><i>radius</i> - Adding this parameter will require the user to be authenticated using the RADIUS protocol from a remote RADIUS server.</p> <p><i>tacacs</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p> <p><i>xtacacs</i> - Adding this parameter will require the user to be authenticated using the XTACACS protocol from a remote XTACACS server.</p> <p><i>tacacs+</i> - Adding this parameter will require the user to be authenticated using the TACACS protocol from a remote TACACS server.</p>

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 11-59 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 Cipher suite 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 11-60 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 Status	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 Nam	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 Settings 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:



The screenshot shows the 'SSH Settings' window. At the top, there's a title bar with 'SSH Settings' and a 'Safeguard' icon. Below the title bar, there's a section for 'SSH Server State' with radio buttons for 'Enabled' and 'Disabled', and an 'Apply' button. The main section is 'SSH Global Settings' with several input fields: 'Max Session (1-8)' with a value of 8, 'Connection Timeout (120-600)' with a value of 120 and 'sec' label, 'Authfail Attempts (2-20)' with a value of 2 and 'times' label, 'Rekey Timeout' with a dropdown menu set to 'Never', and 'TCP Port Number (1-65535)' with a value of 22. There is an 'Apply' button at the bottom right.

Figure 11-61 SSH Settings window

The fields that can be configured are described below:

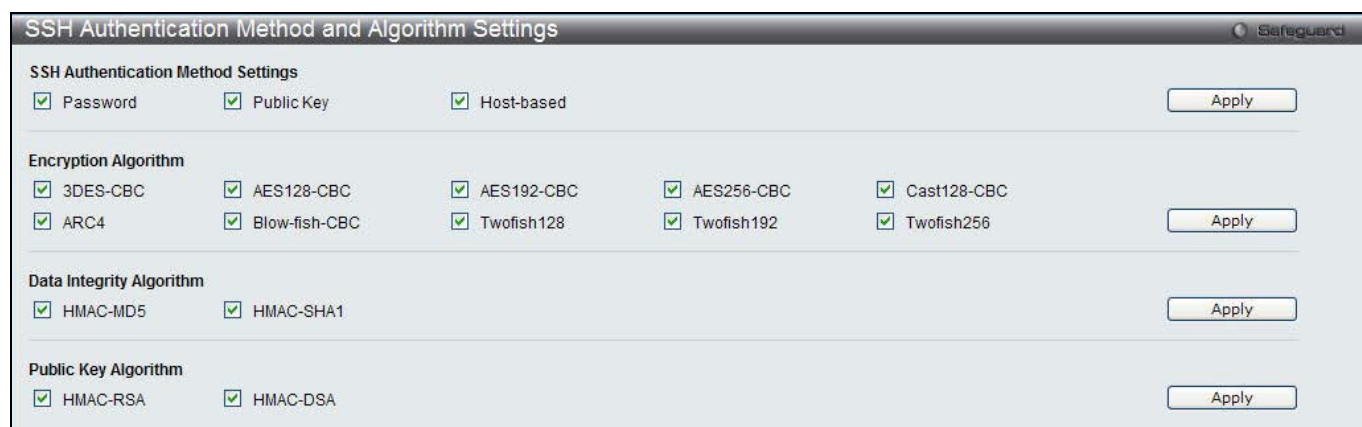
Parameter	Description
SSH Server State	Use the radio buttons to enable or disable SSH on the Switch. The default is Disabled.
Max. Session (1-8)	Enter a value between 1 and 8 to set the number of users that may simultaneously access the Switch. The default setting is 8.
Connection Timeout (120-600)	Allows 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 drop-down menu. The available options are <i>Never</i> , <i>10 min</i> , <i>30 min</i> , and <i>60 min</i> . The default setting is <i>Never</i> .
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:



The screenshot shows the 'SSH Authentication Method and Algorithm Settings' window. It has a title bar with 'SSH Authentication Method and Algorithm Settings' and a 'Safeguard' icon. The main content is divided into four sections, each with an 'Apply' button:

- SSH Authentication Method Settings:** Three checked checkboxes for 'Password', 'Public Key', and 'Host-based'.
- Encryption Algorithm:** Ten checked checkboxes for '3DES-CBC', 'AES128-CBC', 'AES192-CBC', 'AES256-CBC', 'Cast128-CBC', 'ARC4', 'Blow-fish-CBC', 'Twofish128', 'Twofish192', and 'Twofish256'.
- Data Integrity Algorithm:** Two checked checkboxes for 'HMAC-MD5' and 'HMAC-SHA1'.
- Public Key Algorithm:** Two checked checkboxes for 'HMAC-RSA' and 'HMAC-DSA'.

Figure 11-62 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.
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.
Cast128-CBC	Use the check box to enable or disable the Cast128 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.
Blow-fish CBC	Use the check box to enable or disable the Blowfish 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-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.
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.

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:



User Name	Authentication Method	Host Name	Host IP
admin	Password		
user	Password		

Note: Maximum 8 entries and Host Name should be less than 33 characters.

Figure 11-63 SSH User Authentication List window

The fields that can be configured or displayed 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. <i>Host Based</i> – 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. <i>Password</i> – 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. <i>Public Key</i> – 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 <i>Host Based</i> 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 Authentication Mode field.

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

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

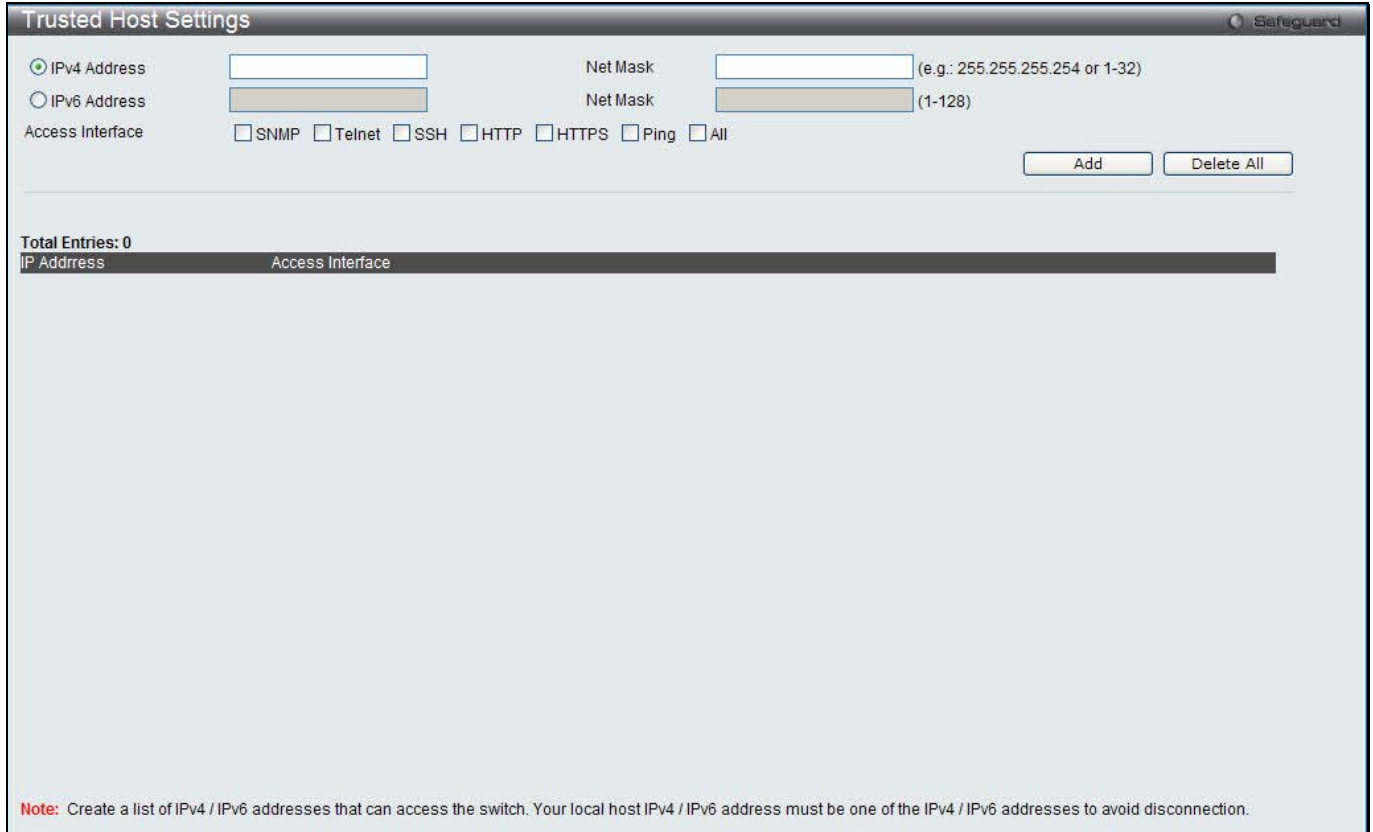


NOTE: To set the SSH User Authentication Mode parameters on the Switch, a User Account must be previously configured.

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:



Trusted Host Settings Safeguard

IPv4 Address Net Mask (e.g.: 255.255.255.254 or 1-32)
 IPv6 Address Net Mask (1-128)

Access Interface: SNMP Telnet SSH HTTP HTTPS Ping All

Add Delete All

Total Entries: 0

IP Address	Access Interface
Total Entries: 0	

Note: Create a list of IPv4 / IPv6 addresses that can access the switch. Your local host IPv4 / IPv6 address must be one of the IPv4 / IPv6 addresses to avoid disconnection.

Figure 11-64 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.

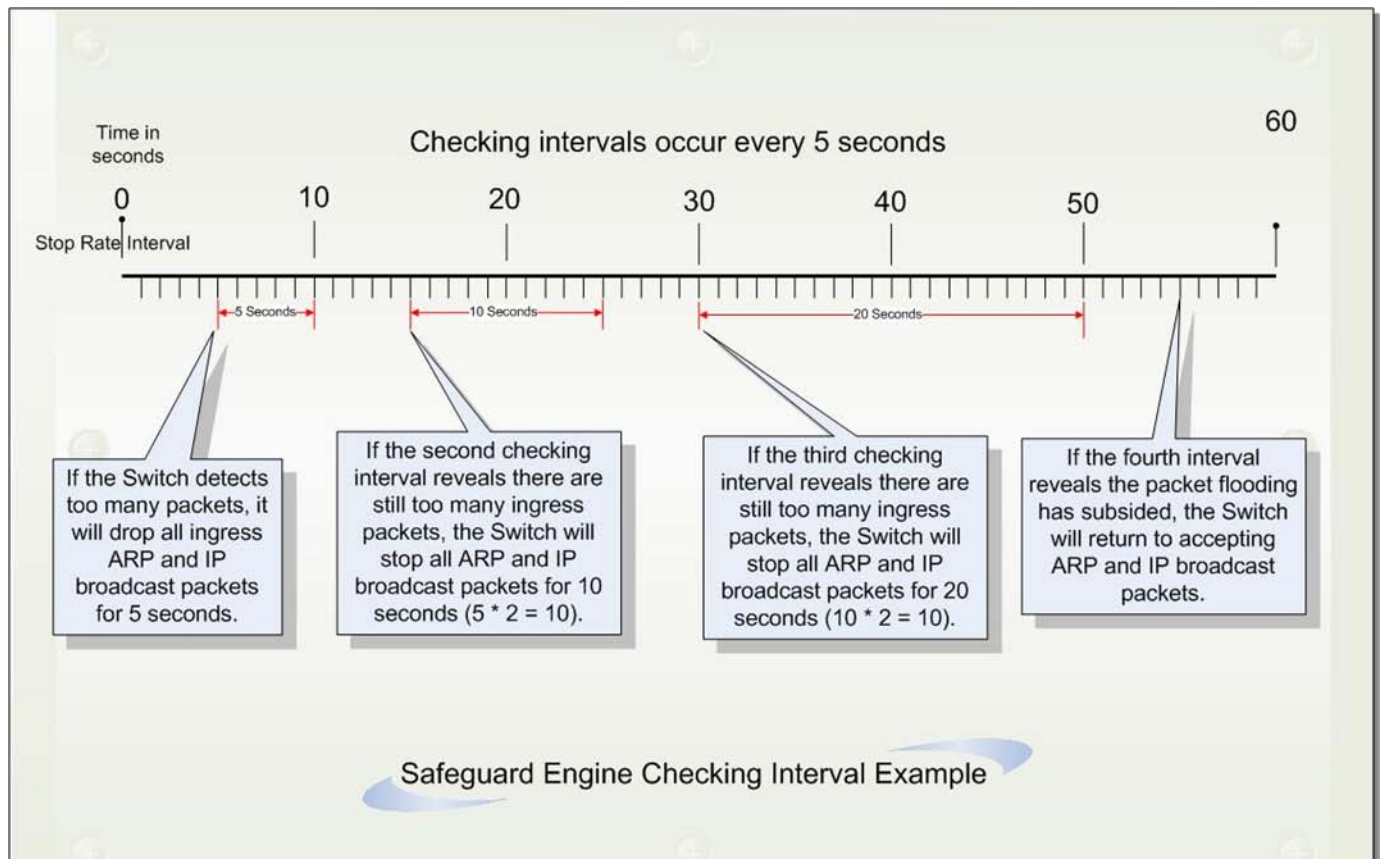


Figure 11-65 Mapping QoS on the Switch

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 11-66 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.
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.
Trap / Log	Use the drop-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: <i>Fuzzy</i> – 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. <i>Strict</i> – 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 <i>Fuzzy</i> mode.

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

Captive Portal (CP)

Captive Portal (CP) is the feature that controls the accessibility of both wired and wireless users to the network. The verification can be configured to allow access for guests and authenticated users in this section.



NOTE: The Captive Portal (CP) folder is also accessible from the WLAN tab in the navigation window. Any configuration within this folder will be exactly the same as the Captive Portal (CP) folder in the WLAN tab.

Global Configuration

This window is used to globally configure the CP settings.

To view this window, click **Security > Captive Portal (CP) > Global Configuration** as shown below:

Figure 11-67 Global Configuration window

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

Parameter	Description
CP Global State	Click the radio buttons to enable or disable the CP global state.
CP Global Operational Status	Display the status of the CP operational status.
CP Global Disable Reason	When captive portal is disabled, the field displays the reason being disabled. Available reasons are: <i>Administrator Disabled</i> , <i>IP Address Not Configured</i> , <i>No IP Routing Interface</i> and <i>Routing Disabled</i> .
Additional HTTP Port (0-65535)	Enter the additional HTTP port number between 0 and 65535, except 80 and 443. 80 is reserved for HTTP default port, and 443 is reserved for HTTPS default port. The default value is 0 which represents that no additional port is used, and the default port (80) is used.
Additional HTTP Secure Port (0-65535)	Enter the additional HTTPS port number between 0 and 65535, except 80 and 443. 80 is reserved for HTTP default port, and 443 is reserved for HTTPS default port. The default value is 0 which represents that no additional port is used, and the default port (443) is used.
Peer Switch Statistics Reporting Interval (15-3600)	When clustering is supported on the switch, enter an interval that the peer switches send its authenticated client statistics to the Cluster Controller periodically. The reporting interval is in the range of 0, 15-3600 seconds. The value 0 means the function is disabled. The default value is 120.
Authentication Timeout (60-600)	Enter a time for authentication. If a CP user does not enter valid credentials within the time, the authentication page needs to be served again in order for the client to gain access to the network. The value is between 60 and 600 seconds.

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

CP Configuration

This window is used to create CP configuration.

To view this window, click **Security > Captive Portal (CP) > CP Configuration** as shown below:

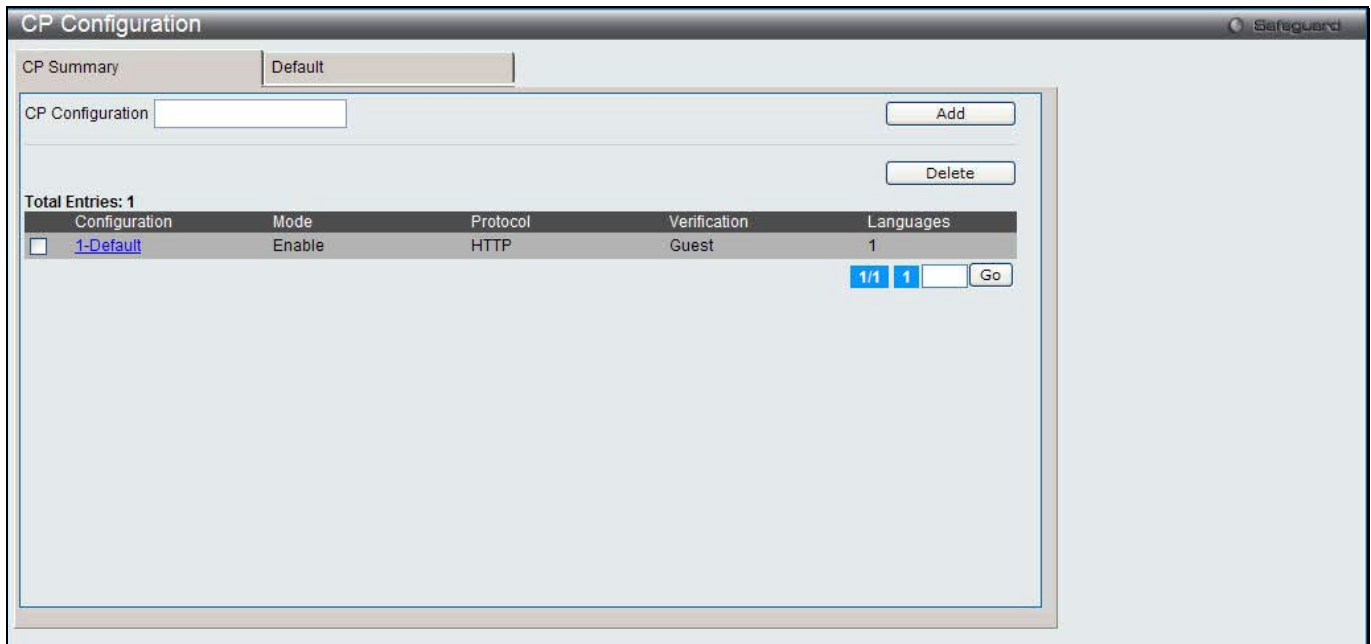


Figure 11-68 CP configuration - CP Summary window

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

Parameter	Description
CP Configuration	Enter a name of CP configuration.
Configuration	Display the captive portal ID and name.
Mode	Display whether the CP is enabled.
Protocol	Display whether the portal uses HTTP or HTTPS.
Verification	Display which type of user verification to perform. <ul style="list-style-type: none"> <i>Guest</i> - The user does not need to be authenticated by a database. <i>Local</i> - The switch uses a local database to authenticated users. <i>RADIUS</i> - The switch uses a database on a remote RADIUS server to authenticate users.
Languages	Display the number of languages that are configured for this captive portal.

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

Tick the check box of the specific entry, and 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.

Click the link under Configuration in the table, or the tab to configure the detail information about CP configuration.

After clicking the link or the tab, the following page will appear:

The screenshot shows the 'CP Configuration - Edit window' with the following settings:

- Enable Captive Portal: Enabled Disabled
- Configuration Name: Default
- Protocol Mode: HTTP HTTPS
- Verification Mode: Guest Local RADIUS
- User Logout Mode: Enabled Disabled
- Redirect Mode: Enabled Disabled
- Redirect URL: (empty)
- User Group: 1-Default
- Idle Timeout(0-900 secs): 0
- Session Timeout(0-86400 secs): 86400
- Max Up Rate(bytes/sec, 0=unlimited): 0
- Max Down Rate(bytes/sec, 0=unlimited): 0
- Max Receive(bytes, 0=unlimited): 0
- Max Transmit(bytes, 0=unlimited): 0
- Max Total(bytes, 0=unlimited): 0

The language configuration table is as follows:

Code	Language	...	Clear
en	(English)	...	Clear
		...	Clear
		...	Clear

Figure 11-69 CP Configuration - Edit window

The fields that can be configured are described below:

Parameter	Description
Enable Captive Portal	Click the radio buttons to enable or disable the CP configuration.
Configuration Name	Enter to modify the configuration name.
Protocol Mode	Click the radio buttons to use HTTP or HTTPS as the protocol that CP configuration is used during verification process.
Verification Mode	Click the radio buttons to select the verification mode for the CP to verify clients. <ul style="list-style-type: none"> <i>Guest</i> – The user does not need to be authenticated by a database. <i>Local</i> – The Switch uses a local database to authenticate users. <i>RADIUS</i> – The Switch uses a database on a remote RADIUS server to authenticate users.
User Logout Mode	Click the radio buttons to enable or disable the ability for an authenticated user to de-authenticate from the network.
Redirect Mode	Click the radio buttons to enable or disable the redirect mode for a CP configuration.
Redirect URL	When the Redirect Mode is enabled, enter the URL to which the newly authenticated client is redirected.
Idle Time	Enter the idle time in seconds to allow a user remain idle before automatically being logged out. The value 0 indicates that the timeout is not enforced. The default value is 0.
Session Timeout	Enter the waiting time in seconds before terminating a session. A user is logged out once the session timeout is reached. The value 0 indicates that the timeout is not enforced.
Max Up Rate	Enter the maximum rate, in bytes per second, that a client can transmit data into the network when using the captive portal. The rate is between 0 and 536870911.
Max Down Rate	Enter the maximum rate, in bytes per second, that a client can receive data from the network when using the captive portal. The rate is between 0 and 536870911.
Max Receive	Enter the maximum number of bytes that a client is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.
Max Transmit	Enter the maximum number of bytes that a client is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.

Max Total	Enter the maximum sum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.
User Group	<p>When <i>Local</i> or <i>RADIUS</i> is selected in Verification Mode, a user group needs to be assigned. All users who belong to the group are permitted to access the network through this portal. You may create, delete, or change user groups for all captive portals.</p> <ul style="list-style-type: none"> To assign an existing user group to the CP, select the user group from the drop-down menu. To create a new user group, enter the name in the field and click the Add button. To change the name of an existing user group, select the user group from the drop-down menu, enter the new name in the field and click the Modify button.
Code	Enter the IANA Language Subtag code for the language. All codes are listed in the IANA Language Subtag Registry . If the language is supported by the Switch, this field is filled in automatically when selecting the language.
Language	Click the ... button to select the language to use for CP. Click the Clear button to remove the language from the list.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the language tab to customize the CP web pages. For example, to customize the English version of the captive portal page looks, click the **(English)** tab. The web page shows when a wireless client connects to the access point.

Use the drop-down menu to customize different web pages for the CP web. Select *Global Parameters* from the drop-down menu on the top of the page to see the following page:

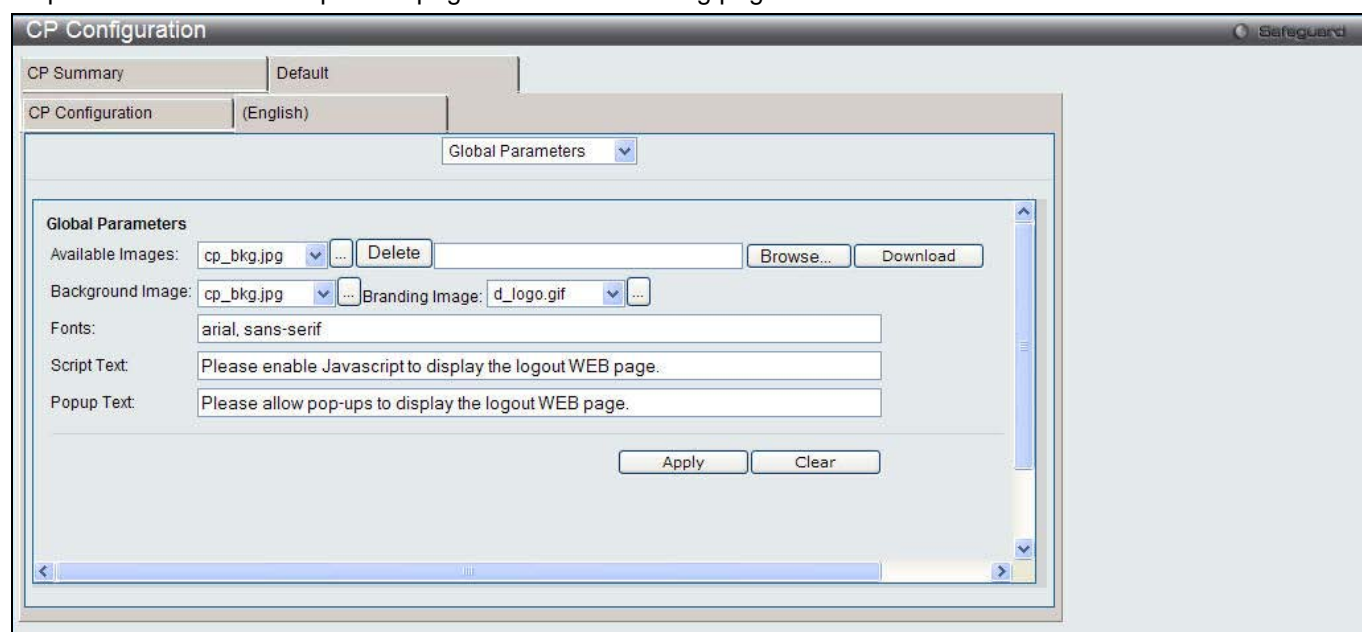


Figure 11-70 CP Configuration – Customize window (Global Parameters)

The fields that can be configured are described below:

Parameter	Description
Available Images	The drop-down menu shows the images that are available to use for the page background, branding and the account image. Click the ... button to view the images. To add a new image, click the Browse button to select the image on the local system, and click the Download to download the image to the Switch. To remove an image from the list, select the file name from the drop-down menu and click the Delete button. You can only delete images that you download.
Background Image	Use the drop-down menu to select the name of the image to display as the page

	background. Alternatively, click the ... button to display the available images. Click the image to select it. To specify that no background image is to be used, select <i>(No Selection)</i> from the drop-down menu.
Branding Image	Use the drop-down menu to select the name of the image file to display on the top left corner of the page. This image is used for branding purposes, such as the company logo. Alternatively, Click the ... button to display the available images. Click the image to select it. To specify that no branding image is to be used, select <i>(No Selection)</i> from the drop-down menu.
Fonts	Enter the name of the font that is used for the CP web pages.
Script Text	Enter the information to indicate that users must enable JavaScript to display the logout web page. This field is only applicable when the User Logout Mode is enabled.
Popup Text	Enter the information to indicate that users must allow pop-up windows to display the logout web page. This field is only applicable when the User Logout Mode is enabled.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Select *Authentication Page* from the drop-down menu on the top of the page to see the following page:

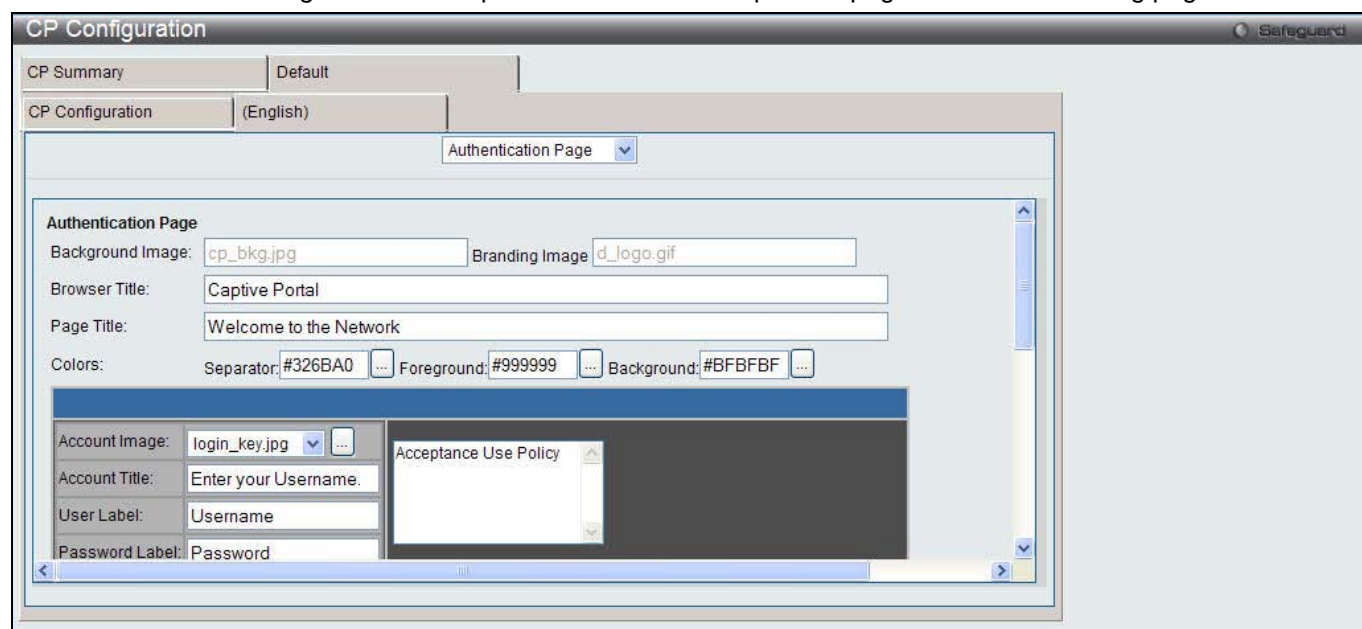


Figure 11-71 CP Configuration – Customize window (Authentication Page)

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

Parameter	Description
Background Image	Display the name of the current background image on the Authentication Page.
Branding Image	Display the name of the current branding image on the Authentication Page.
Browser Title	Enter the text to display on the client's web browser title bar or tab.
Page Title	Enter the text to use as the page title.
Colors	Specify the colors of different areas on the CP page. Enter the color codes in the fields or click the ... button to select a color.
Account Image	Use the drop-down menu to select an image to display on the CP web page above the login field. Alternatively, click the ... button to display the available images. Click the image to select it.
Account Title	Enter the text to instruct users to authenticate.
User Label	Enter the text to display next to the user name text box.

Password Label	Enter the text to display next to the password text box.
Button Label	Enter the text to display on the button for users to click and connect to the network.
Acceptance Use Policy Text Box	Enter the text to display in the Acceptance Use Policy text box. The acceptance use policy instructs users about the conditions under which they are allowed to access the network.
Acceptance Use Policy Check Box	Enter the text to display next to the check box to indicate that the user has to accept the terms of use.
Instructional Text	Enter the detailed information to instruct users to authenticate. This text appears under the button.
Denied message	Enter the message to display when the user does not provide valid authentication information.
Resource Message	Enter the message to display when the system has rejected authentication due to system resource limitations.
Timeout Message	Enter the message to display when the system has rejected authentication because the authentication transaction took too long.
Busy Message	Enter the message to display when the CP is processing the authentication request.
No Accept Message	Enter the message to display when the user did not tick the Acceptance Use Policy check box.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Welcome Page* from the drop-down menu on the top of the page to see the following page:

Figure 11-72 CP Configuration – Customize window (Welcome Page)

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

Parameter	Description
Branding Image	Display the name of the current branding image on the Welcome Page.
Browser Title	Display the text to display on the client's web browser title bar or tab.
Title	Enter the title to greet the user after successfully connecting to the network.
Text	Enter the optional text to further identify the network to be access by the CP user.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Logout Page* from the drop-down menu on the top of the page to see the following page:

Figure 11-73 CP Configuration – Customize window (Logout Page)

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

Parameter	Description
Browser Title	Enter the text to display on the title bar of the Logout page.
Page Title	Enter the text to use as the page title.
Instruction Text	Enter the detailed information to confirm that the user has been authenticated and instructs the user how to de-authenticate.
Button Label	Enter the text to display on the button to de-authenticate.
Confirmation Text	Enter the message to confirm the de-authentication process.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Logout Success Page* from the drop-down menu on the top of the page to see the following page:

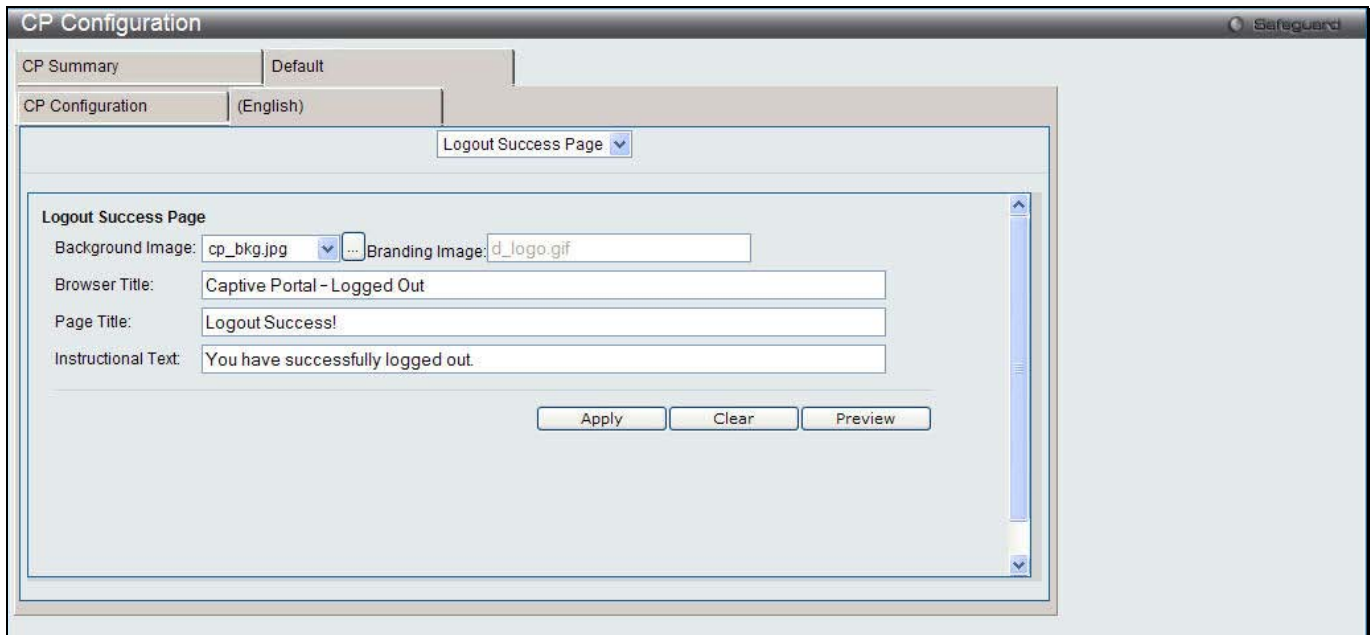


Figure 11-74 CP Configuration – Customize window (Logout Success Page)

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

Parameter	Description
Background Image	Display the name of the current background image on the Logout Success Page.
Branding Image	Display the name of the current branding image on the Logout Success Page.
Browser Title	Enter the text to display on the title bar of the Logout Success page.
Page Title	Enter the text to use as the page title.
Instructional Text	Enter the message to confirm that the user has been de-authenticated.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Local User

This window is used to create, modify or delete authorized users to the local database.

To view this window, click **Security > Captive Portal (CP) > Local User** as shown below:

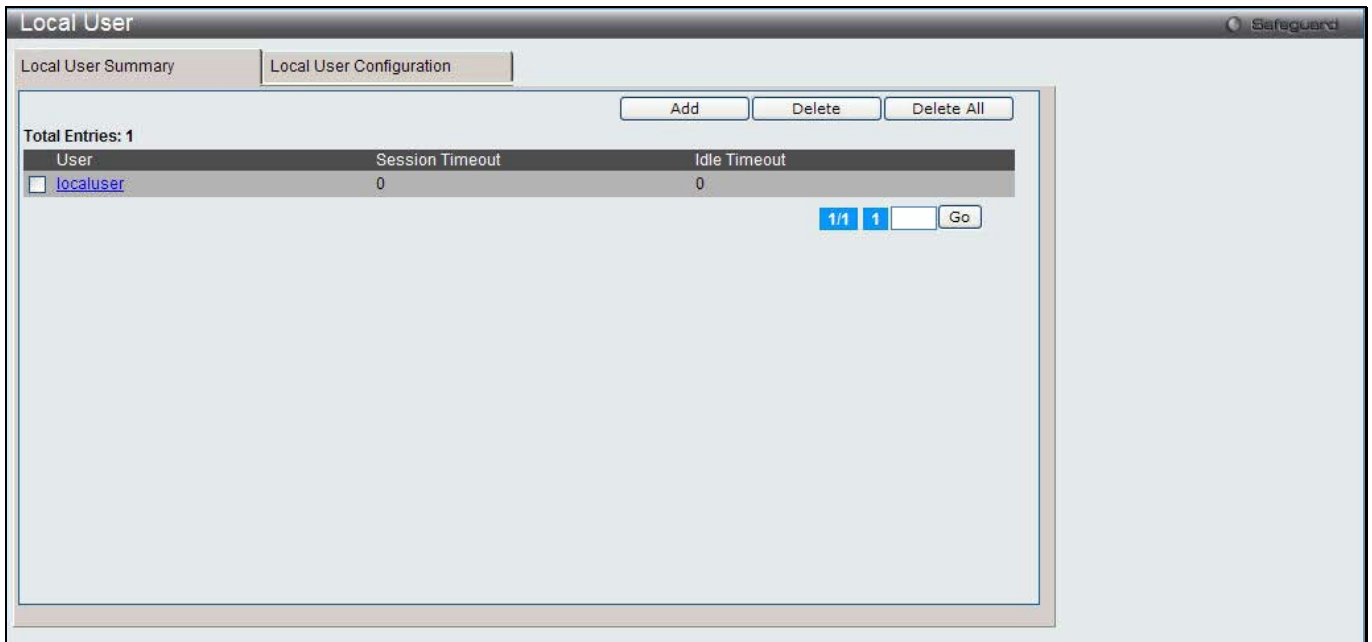


Figure 11-75 Local User - Summary window

Click the **Add** button to create a new user to the local database.

Tick the corresponding check box, and click the **Delete** button to remove the specific entry.

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

Click the specific User hyperlink to modify the information.

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

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

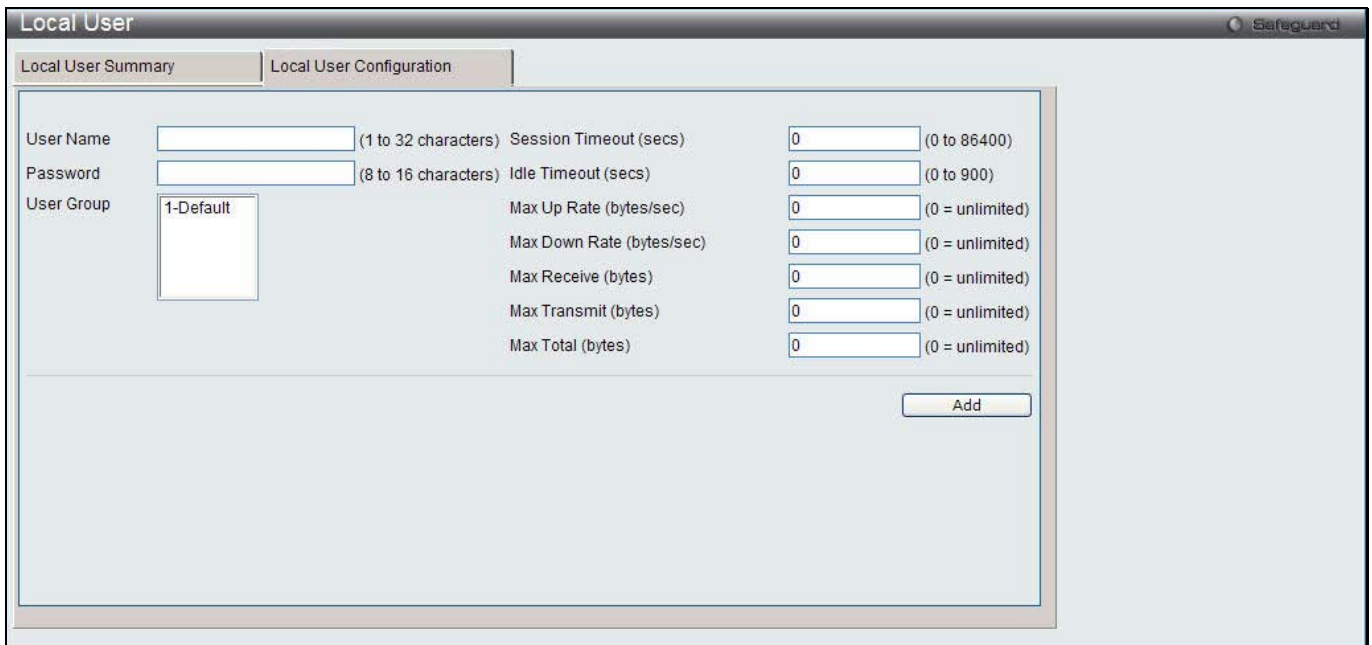


Figure 11-76 Local User - Configuration window (Add)

The fields that can be configured are described below:

Parameter	Description
User Name	Enter the name of the user.
Password	Enter a password for the user.

User Group	Assign the user to at least one User Group. To assign the user to more than one group, press the Ctrl key and click each group.
Session Timeout (secs)	Enter the time in seconds that allows the user to remain connected to the network. Once the Session Timeout value is reached, the user is logged out automatically.
Idle Timeout (secs)	Enter the time in seconds that allows the user to remain idle before the Switch automatically logs the user out.
Max Up Rate (bytes/sec)	Enter the maximum transmitting speed, in bytes per second, when using the captive portal.
Max Down Rate (bytes/sec)	Enter the maximum receiving speed, in bytes per second, when using the captive portal.
Max Receive (bytes)	Enter the maximum number of bytes that the user is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.
Max Transmit (bytes)	Enter the maximum number of bytes that the user is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.
Max Total (bytes)	Enter the maximum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.

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

After clicking the specific User hyperlink, the following page will appear:

The screenshot shows the 'Local User Configuration' window. It has two tabs: 'Local User Summary' and 'Local User Configuration'. The 'Local User Configuration' tab is active. The form contains the following fields:

- User Name: localuser
- Password: [masked with dots] (8 to 16 characters)
- User Group: 1-Default
- Session Timeout (secs): 0 (0 to 86400)
- Idle Timeout (secs): 0 (0 to 900)
- Max Up Rate (bytes/sec): 0 (0 = unlimited)
- Max Down Rate (bytes/sec): 0 (0 = unlimited)
- Max Receive (bytes): 0 (0 = unlimited)
- Max Transmit (bytes): 0 (0 = unlimited)
- Max Total (bytes): 0 (0 = unlimited)

At the bottom right, there are 'Apply' and 'Delete' buttons.

Figure 11-77 Local User - Configuration window (Edit)

The fields that can be configured are described below:

Parameter	Description
Password	Enter a password for the user.
User Group	Assign the user to at least one User Group. To assign the user to more than one group, press the Ctrl key and click each group.
Session Timeout (secs)	Enter the time in seconds that allows the user to remain connected to the network. Once the Session Timeout value is reached, the user is logged out automatically.
Idle Timeout (secs)	Enter the time in seconds that allows the user to remain idle before the Switch automatically logs the user out.
Max Up Rate	Enter the maximum transmitting speed, in bytes per second, when using the captive

(bytes/sec)	portal.
Max Down Rate (bytes/sec)	Enter the maximum receiving speed, in bytes per second, when using the captive portal.
Max Receive (bytes)	Enter the maximum number of bytes that the user is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.
Max Transmit (bytes)	Enter the maximum number of bytes that the user is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.
Max Total (bytes)	Enter the maximum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.

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

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

Interface Association

This window is used to associate a configured CP with interfaces. Interfaces could be physical ports or wireless networks (SSID).

To view this window, click **Security > Captive Portal (CP) > Interface Association** as shown below:



Figure 11-78 Interface Association window

The fields that can be configured are described below:

Parameter	Description
CP Configuration	Use the drop-down menu to select a CP to configure.
Associated Interfaces	Display all the interfaces associated with the CP. To select more than one interface, press the Ctrl key and click each interface.
Interface List	Display all the interfaces that is available to choose. To select more than one interface, press the Ctrl key and click each interface.

Click the **Delete** button to remove the selected interface(s) from the Associated Interfaces box.

Click the **Add** button to add the selected interface(s) in the Interface List box to the Associated Interfaces box.

CP Status

This window is used to display the CP status.

To view this window, click **Security > Captive Portal (CP) > CP Status** as shown below:



Figure 11-79 CP Global Status window

The fields that can be displayed are described below:

Parameter	Description
CP Global Operational Status	Display the status of the CP operational status.
CP Global Disable Reason	When captive portal is disabled, the field displays the reason being disabled. Available reasons are: <i>Administrator Disabled</i> , <i>IP Address Not Configured</i> , <i>No IP Routing Interface</i> and <i>Routing Disabled</i> .
CP IP Address	Display the captive portal IP address.
Supported Local Users	Display the number of entries that the Local User database supports.
Supported Captive Portals	Display the number of supported captive portals in the system.
Configured Local Users	Display the number of users configured in the system.
Configured Captive Portals	Display the number of captive portals configured on the Switch.
System Supported Users	Display the number of authenticated users that the system can support.
Active Captive Portals	Display the number of captive portal instances that are operationally enabled.
Authenticated Users	Display the number of users currently authenticated to all captive portal instances on the Switch.

After clicking the **CP Activation and Activity Status** tab, the following page will appear:

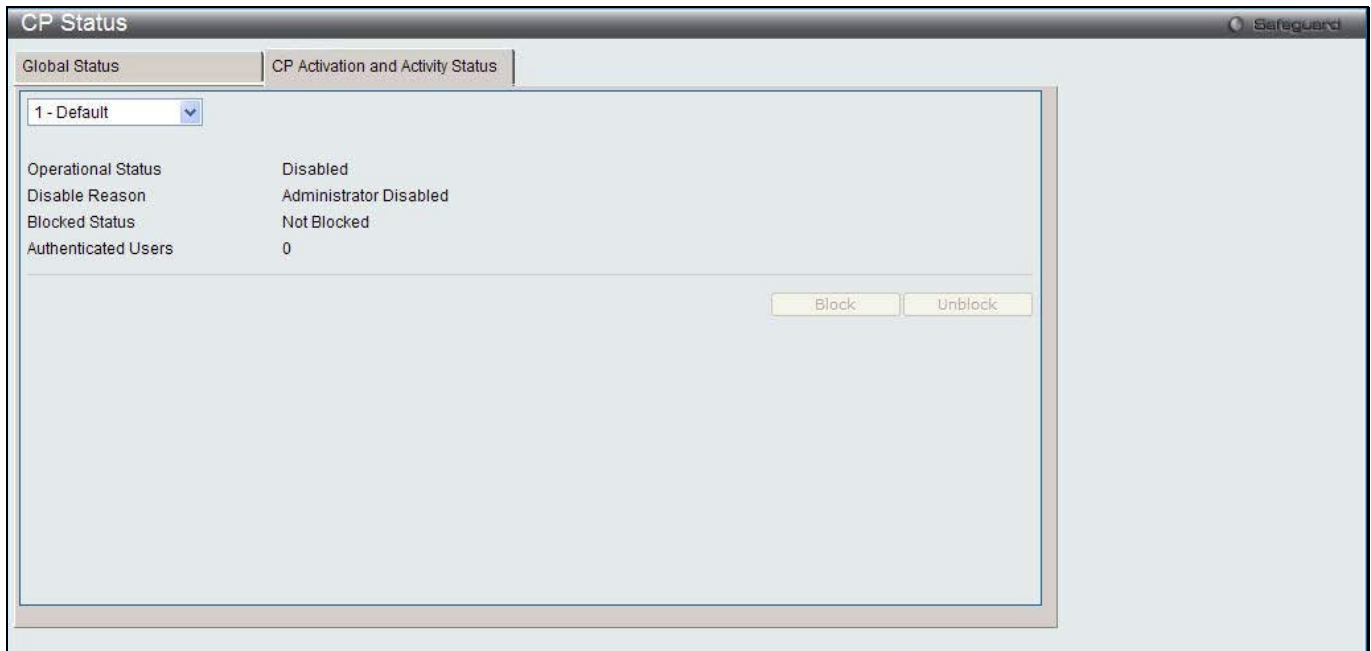


Figure 11-80 CP Activation and Activity Status window

Use the drop-down menu to select a CP to see its activation and activity status. Click **Block** to prevent users from gaining access to the network through the selected captive portal. If the Blocked Status of the selected captive portal is **Blocked**, click **Unblock** to allow access to the network through the captive portal.

Interface Status

This window is used to display the CP interface status.

To view this window, click **Security > Captive Portal (CP) > Interface Status** as shown below:

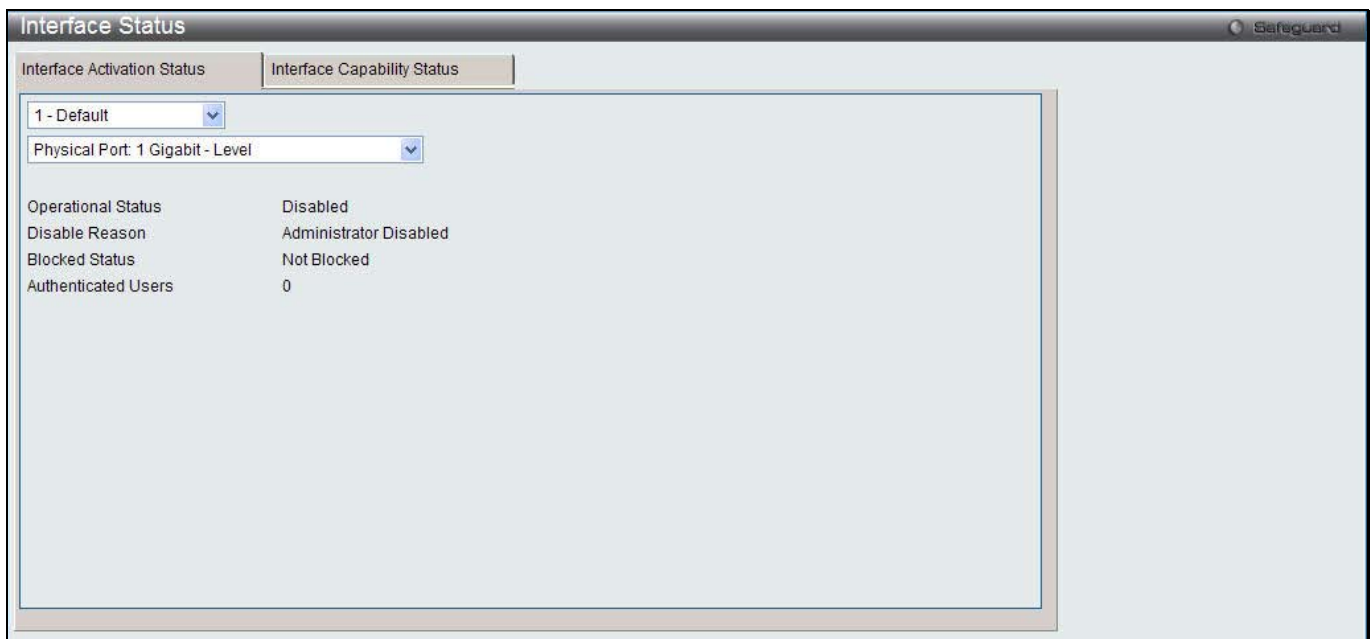


Figure 11-81 Interface Activation Status window

Use the first drop-down menu to select the portal, and the second drop-down menu to select an interface for to view information.

After clicking the **Interface Capability Status** tab, the following page will appear:

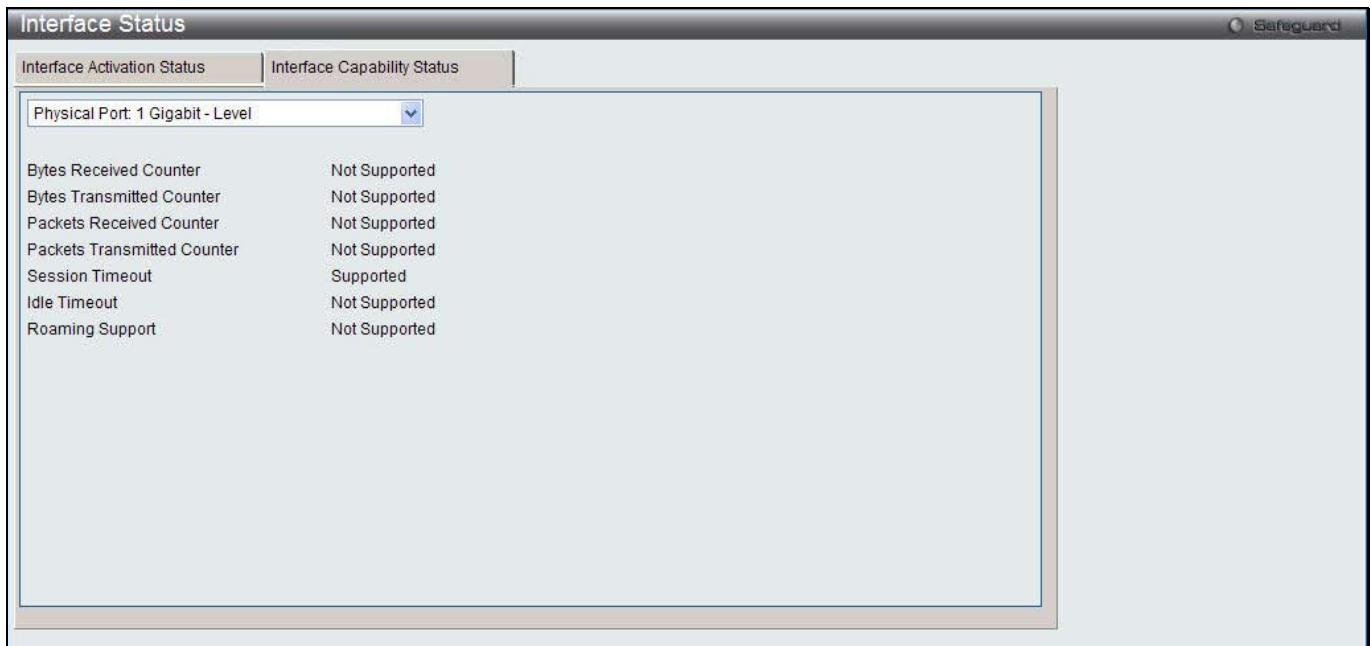


Figure 11-82 Interface Capability Status window

The fields that can be displayed are described below:

Parameter	Description
Bytes Received Counter	Display whether the interface supports displaying the number of bytes received from each client.
Bytes Transmitted Counter	Display whether the interface supports displaying the number of bytes transmitted to each client.
Packets Received Counter	Display whether the interface supports displaying the number of packets received from each client.
Packets Transmitted Counter	Display whether the interface supports displaying the number of packets transmitted to each client.
Session Timeout	Display whether the interface supports client session timeout. This attribute is supported on all interfaces.
Idle Timeout	Display whether the interface supports a timeout when the user does not send or receive any traffic.
Roaming Support	Display whether the interface supports client roaming. Only wireless interfaces support client roaming.

Use the drop-down menu to select an interface to see the detail status.

Client Connection Status

This window is used to display the detail information about the clients that connection to the Switch through CP. To view this window, click **Security > Captive Portal (CP) > Client Connection Status** as shown below:

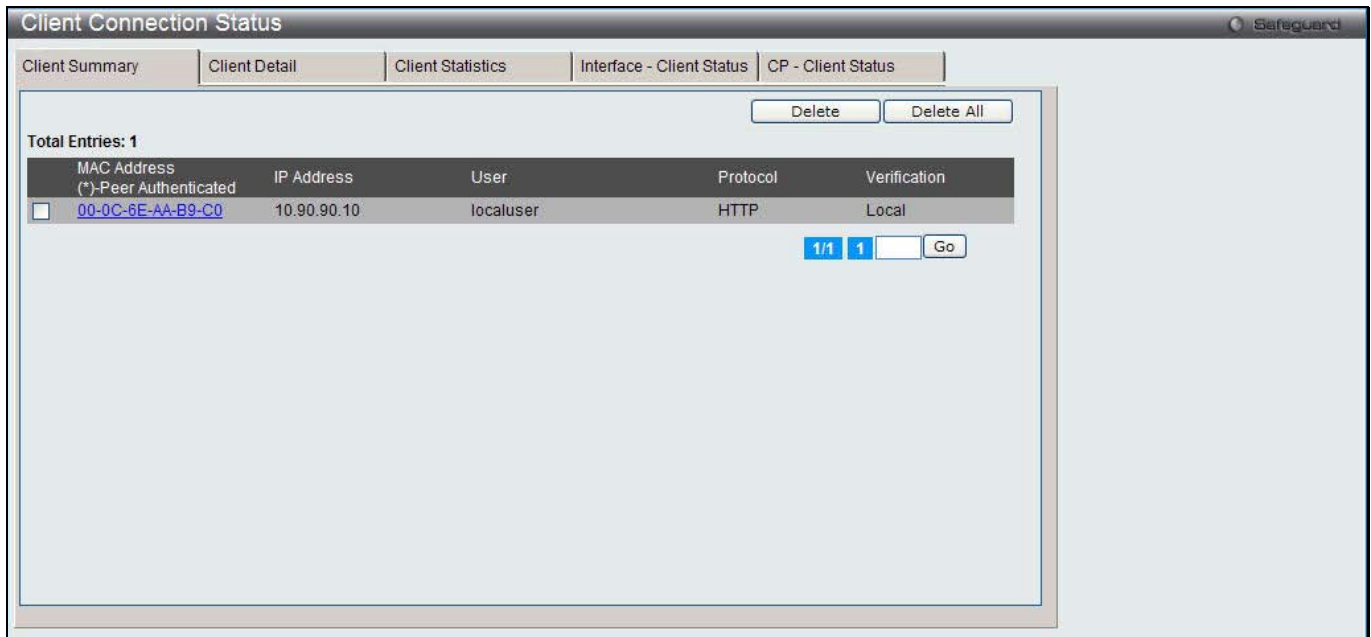


Figure 11-83 Client Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	Display the MAC address of the wired client (if applicable). If the MAC address is marked with an asterisk (*), the authenticated client is authenticated by a peer switch. In other words, the cluster controller was not the authenticator.
IP Address	Display the IP address of the wired client (if applicable).
User	Display the user name (or Guest ID) of the connected client.
Protocol	Display the current connection protocol, which is either <i>HTTP</i> or <i>HTTPS</i> .
Verification	Display the current account type, which is <i>Guest</i> , <i>Local</i> , or <i>RADIUS</i> .

To force the captive portal to disconnect an authenticated client, select the corresponding check box next to the client MAC address and click **Delete**.

To disconnect all clients from all captive portals, click **Delete All**.

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

After clicking the **Client Detail** tab, the following page will appear:

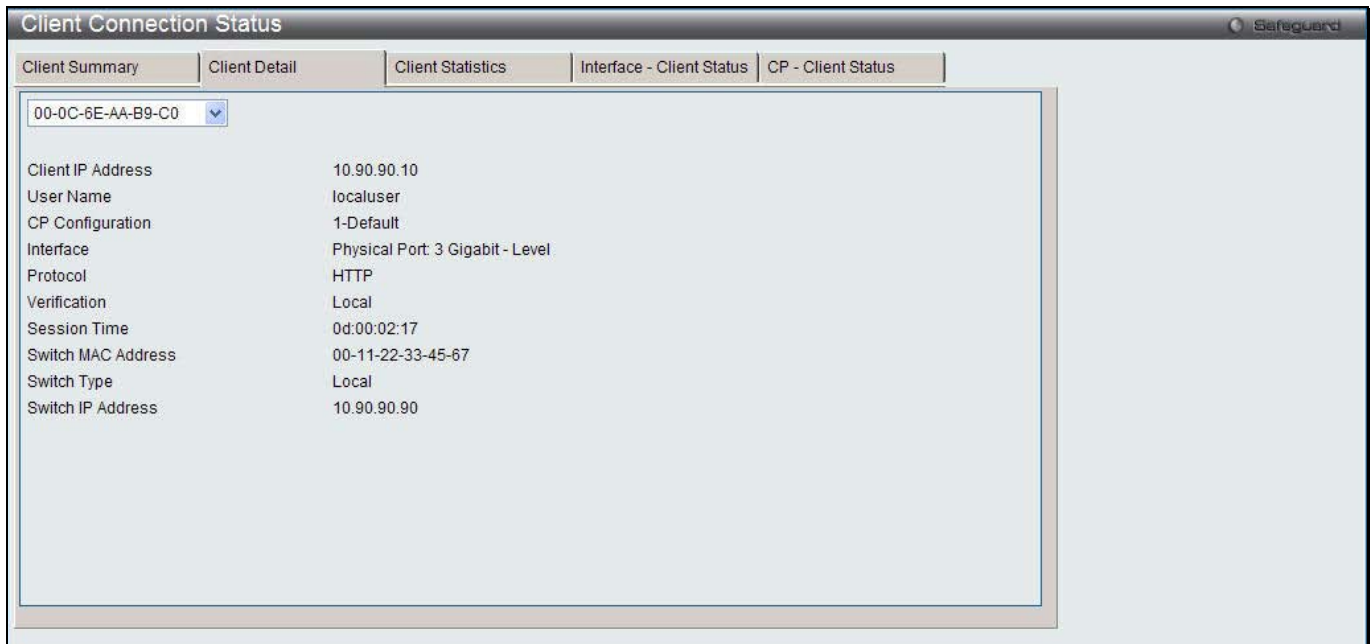


Figure 11-84 Client Connection Status window

The fields that can be displayed are described below:

Parameter	Description
Client IP Address	Display the IP address of the wired client (if applicable).
User Name	Display the user name (or Guest ID) of the connected client.
CP Configuration	Display the CP configuration the wired client is using.
Interface	Display the interface the wired client is using.
Protocol	Display the current connection protocol, which is either <i>HTTP</i> or <i>HTTPS</i> .
Verification	Display the current account type, which is <i>Guest</i> , <i>Local</i> , or <i>RADIUS</i> .
Session Time	Display the amount of time that has passed since the client was authorized.
Switch MAC Address	Display the MAC address of the switch handling authentication for this client. If clustering is supported, this field might display the MAC address of a peer switch in the cluster.
Switch Type	Display whether the switch handling authentication for this client is the local switch or a peer switch in the cluster.
Switch IP Address	Display the IP address of the switch handling authentication for this client. If clustering is supported, this field might display the IP address of a peer switch in the cluster.

Use the drop-down menu to select the MAC address of the associated client to view the detail information.

After clicking the **Client Statistics** tab, the following page will appear:

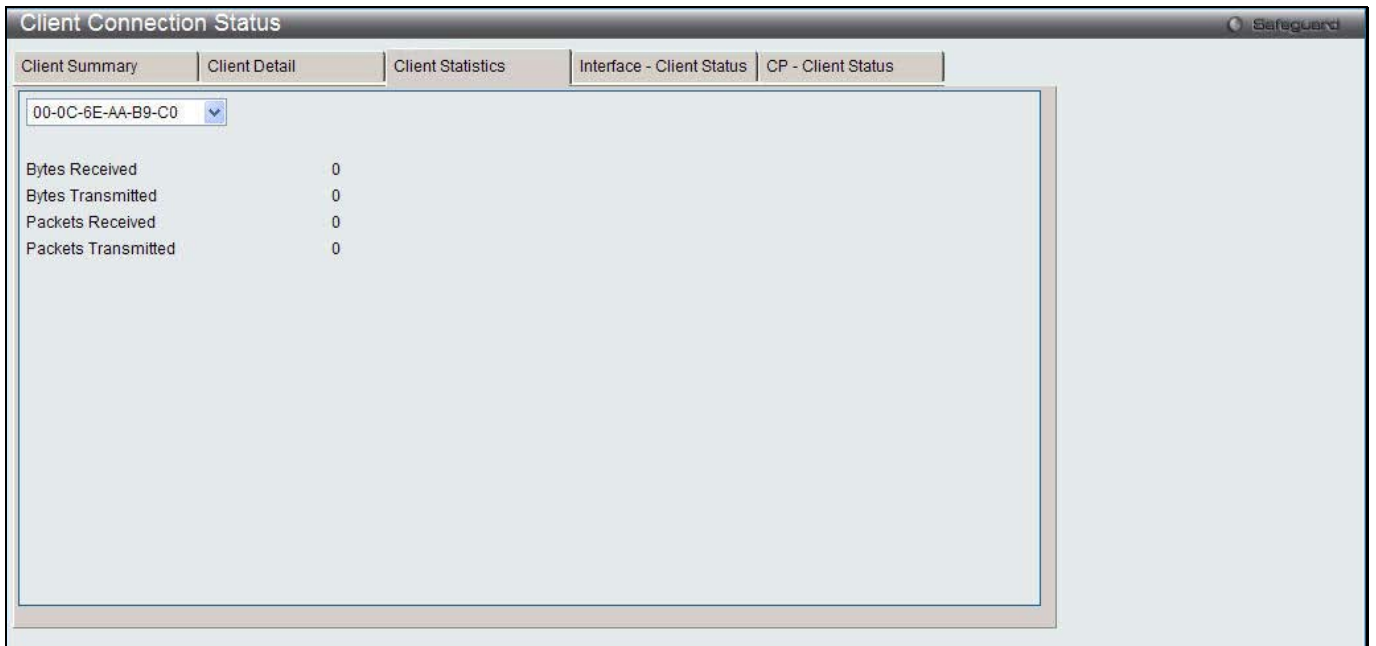


Figure 11-85 Client Statistics window

Use the drop-down menu to select the MAC address of the associated client to view the statistical information.

After clicking the **Interface - Client Status** tab, the following page will appear:

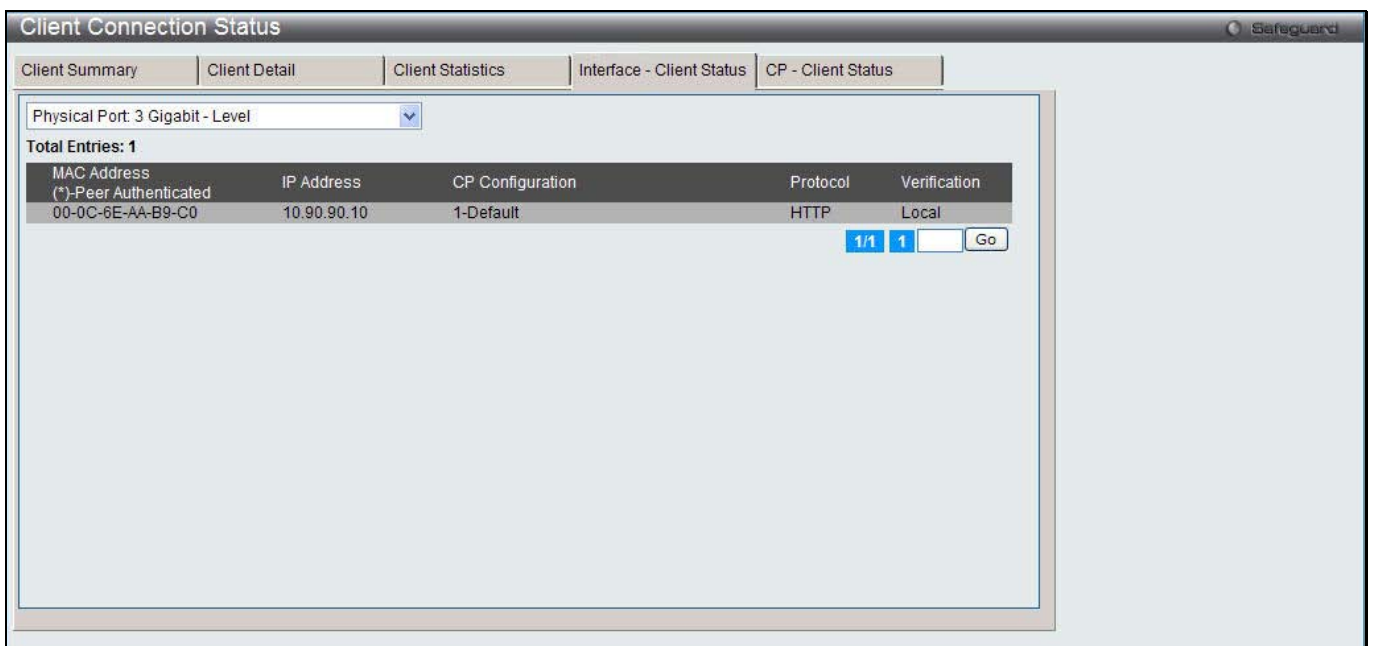


Figure 11-86 Interface - Client Status window

Use the drop-down menu to select an interface to see the information about the clients connected to a CP on this interface.

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

After clicking the **CP - Client Status** tab, the following page will appear:

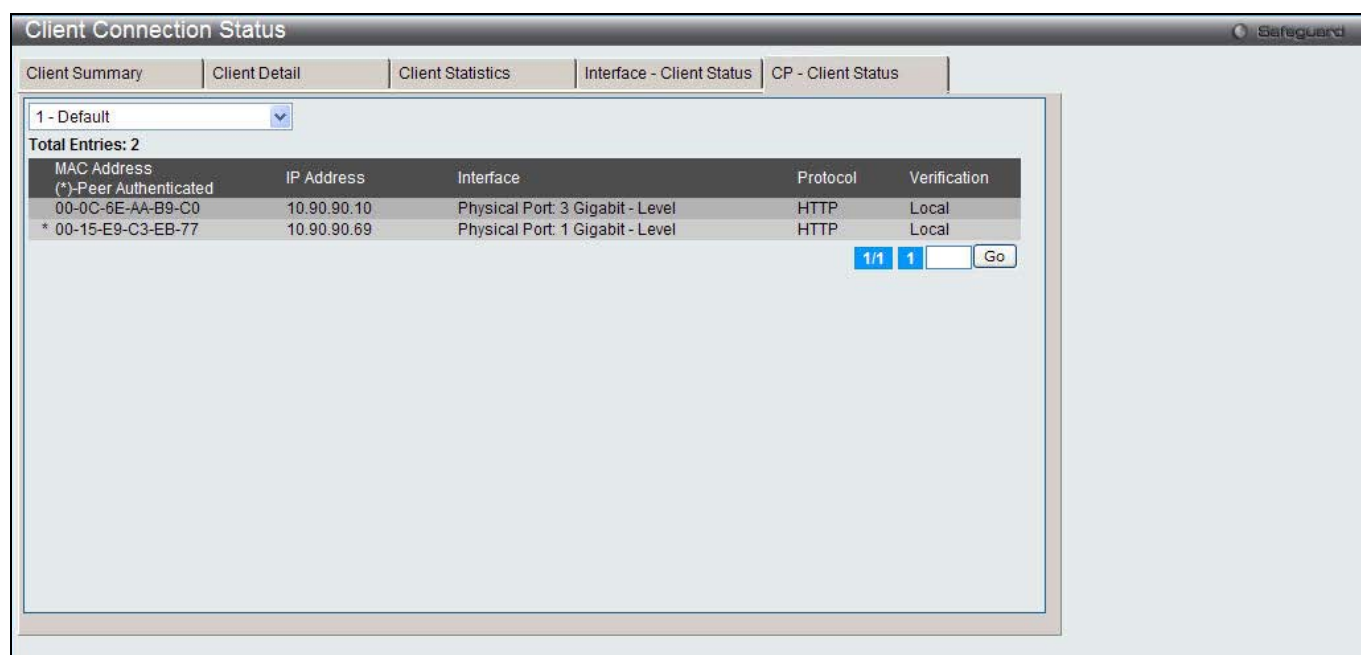


Figure 11-87 CP-Client Status window

Use the drop-down menu to select a CP to see the information of the clients connected to the CP. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

SNMP Trap Configuration

This window is used to configure whether or not SNMP traps are sent from the Captive Portal and to specify captive portal events that will generate a trap.

To view this window, click **Security > Captive Portal (CP) > SNMP Trap Configuration** as shown below:



Figure 11-88 SNMP Trap Configuration window

The fields that can be configured are described below:

Parameter	Description
Client Authentication Failure Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client attempts to authenticate with a captive portal but is unsuccessful.
Client Connection Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client authenticates with and connects to a captive portal.
Client Database Full Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap each time an entry cannot be added to the client database because it is full.
Client Disconnection Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client disconnects from a captive portal.

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

Chapter 8 Network Application

DHCP
SNTP
Flash File System Settings

DHCP

DHCP Relay

DHCP Relay Global Settings

This window is used to 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 12-1 DHCP Relay Global Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Relay State	Use the drop-down menu to enable or disable the DHCP Relay service on the Switch. The default is <i>Disabled</i> .
DHCP Relay Hops Count Limit (1-16)	Enter 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)	Enter 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	Use the drop-down menu to enable or disable the DHCP Relay Agent Information Option 82 on the Switch. The default is <i>Disabled</i> . <i>Enabled</i> –When this field is toggled to <i>Enabled</i> , 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

	<p>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.</p> <p><i>Disabled</i>- When the field is toggled to <i>Disabled</i>, 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.</p>
DHCP Relay Agent Information Option 82 Check	<p>Use the drop-down menu to enable or disable the Switches ability to check the validity of the packet's option 82 field.</p> <p><i>Enabled</i> – When the field is toggled to <i>Enabled</i>, 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.</p> <p><i>Disabled</i> – When the field is toggled to <i>Disabled</i>, the relay agent will not check the validity of the packet's option 82 field.</p>
DHCP Relay Agent Information Option 82 Policy	<p>Use the drop-down menu to set the Switches policy for handling packets when the DHCP Relay Agent Information Option 82 Check is set to <i>Disabled</i>. The default is <i>Replace</i>.</p> <p><i>Replace</i> – The option 82 field will be replaced if the option 82 field already exists in the packet received from the DHCP client.</p> <p><i>Drop</i> – The packet will be dropped if the option 82 field already exists in the packet received from the DHCP client.</p> <p><i>Keep</i> – The option 82 field will be retained if the option 82 field already exists in the packet received from the DHCP client.</p>
DHCP Relay Agent Information Option 82 Remote ID	Enter the DHCP Relay Agent Information Option 82 Remote ID.
DHCP Relay Option 60 State	<p>Use the drop-down menu to enable or disable the use of the DHCP Relay Option 60 State feature. If the packet does not have option 60 enabled, then the relay servers cannot be determined based on the option 60. In this case the relay servers will be determined based on either option 61 or per IPIF configured servers. If the relay servers are determined based on option 60 or option 61, then per IPIF configured servers will be ignored. If the relay servers are not determined by either option 60 or option 61, then per IPIF configured servers will be used to determine the relay servers.</p> <p><i>enable</i> – Select this option to enable the DHCP Relay Option 60 state, in order to relay DHCP packets.</p> <p><i>disable</i> - Select this option to disable the DHCP Relay Option 60 state.</p>
DHCP Relay Option 61 State	<p>Use the drop-down menu to enable or disable the use of the DHCP Relay Option 61 State feature. When option 61 is enabled, if the packet does not have option 61, then the relay servers cannot be determined based on option 61. If the relay servers are determined based on option 60 or option 61, then per IPIF configured servers will be ignored. If the relay servers are not determined either by option 60 or option 61, then per IPIF configured servers will be used to determine the relay servers.</p> <p><i>enable</i> – Select this option to enable the DHCP Relay Option 61 state, in order to relay DHCP packets.</p> <p><i>disable</i> - Select this option to disable the DHCP Relay Option 61 state.</p>

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:

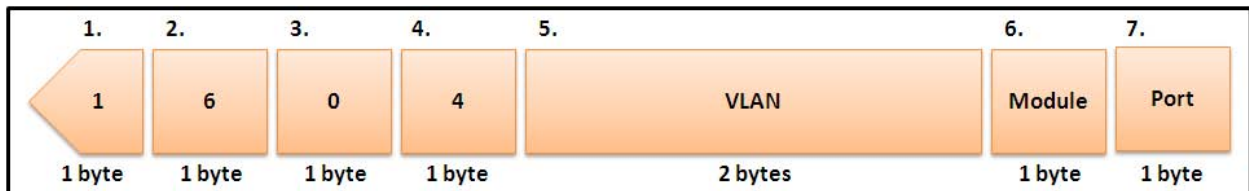


Figure 12-2 Circuit ID Sub-option Format

- 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:

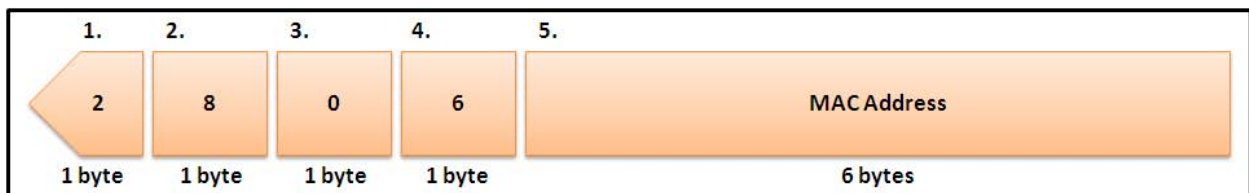


Figure 12-3 Remote ID Sub-option Format

- 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

This window is used to 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 12-4 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 Address	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 Option 60 Server Settings

This window is used to 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 12-5 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 12-6 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	Here the user can enter the DHCP Relay Option 60 Server IP address.
Match Type	Here the user can enter the DHCP Relay Option 60 Match Type value. <i>Exact Match</i> – The option 60 string in the packet must full match with the specified string. <i>Partial Match</i> – 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.

DHCP Relay Option 61 Settings

This window is used to 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 12-7 DHCP Relay Option 61 Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Relay Option 61 Default	Here the user can select the DHCP Relay Option 61 default action. <i>Drop</i> – Specify to drop the packet. <i>Relay</i> – 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	<i>MAC Address</i> – The client’s client-ID which is the hardware address of client. <i>String</i> – The client’s client-ID, which is specified by administrator.
Relay Rule	<i>Drop</i> – Specify to drop the packet. <i>Relay</i> – Specify to relay the packet to an IP address.
Client ID	<i>MAC Address</i> – The client’s client-ID which is the hardware address of client. <i>String</i> – The client’s client-ID, which is specified by administrator.

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 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 12-8 DHCP Local Relay Settings window

The fields that can be configured are described below:

Parameter	Description
DHCP Local Relay	Enable or disable the DHCP Local Relay Global State. The default is Disabled.

State	
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.

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 12-9 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:

Time Zone Settings
Safeguard

Daylight Saving Time State Disabled

Daylight Saving Time Offset in Minutes 60

Time Zone Offset: From GMT in +/-HH:MM + 00 00

DST Repeating Settings

From: Which Week of the Month First

From: Day of the Week Sun

From: Month Apr

From: Time in HH MM 00 00

To: Which Week of the Month Last

To: Day of the Week Sun

To: Month Oct

To: Time in HH MM 00 00

DST Annual Settings

From: Month Apr

From: Day 29

From: Time in HH MM 00 00

To: Month Oct

To: Day 12

To: Time in HH MM 00 00

Figure 12-10 Time Zone Settings window

The fields that can be configured are described below:

Parameter	Description
Daylight Saving Time State	Use this drop-down menu to enable or disable the DST Settings.
Daylight Saving Time Offset In Minutes	Use this drop-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 drop-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.

Flash File System Settings

Why use flash file system:

In old switch system, the firmware, configuration and log information are saved in a flash with fixed addresses and size. This means that the maximum configuration file can only be 2Mb, and even if the current configuration is only 40Kb, it will still take up 2Mb of flash storage space. The configuration file number and firmware numbers are also fixed. A compatible issue will occur in the event that the configuration file or firmware size exceeds the originally designed size.

Flash File System in our system:

The Flash File System is used to provide the user with flexible file operation on the Flash. All the firmware, configuration information and system log information are stored in the Flash as files. This means that the Flash space taken up by all the files are not fixed, it is the real file size. If the Flash space is enough, the user could download more configuration files or firmware files and use commands to display Flash file information, rename file names, and delete it. Furthermore, the user can also configure the **boot up runtime image** or the **running configuration file** if needed.

In case the file system gets corrupted, Z-modem can be used to download the backup files directly to the system. To view this window, click **Network Application > Flash File System Settings** as shown below:



Figure 12-11 Flash File System Settings window

Enter the **Current Path** string and click the **Go** button to navigate to the path entered.

Click the [C:](#) link to navigate the C: drive

After clicking the [C:](#) link button, the following page will appear:

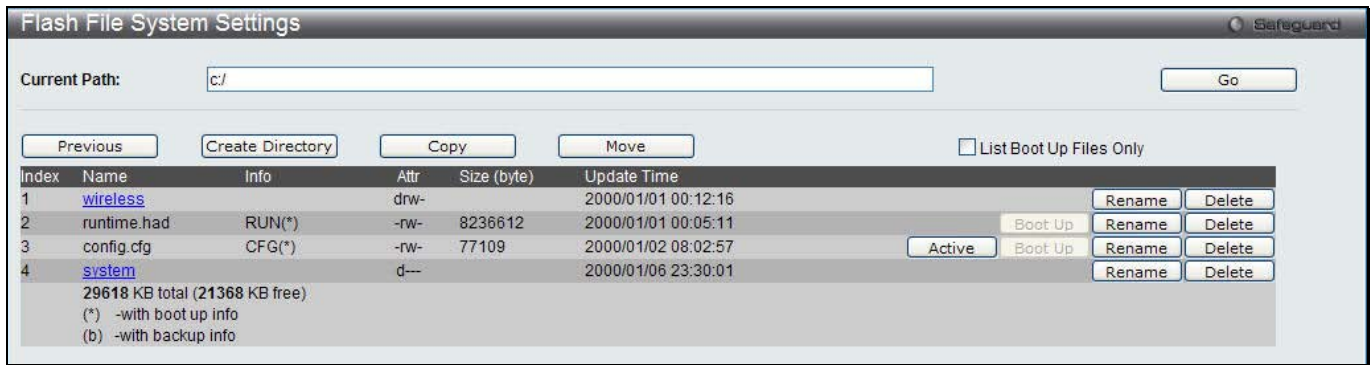


Figure 12-12 Flash File System Setting – Search for Drive window

Click the **Previous** button to return to the previous window.

Click the **Create Directory** to create a new directory within the file system of the switch.

Click the **Copy** button to copy a specific file to the switch.

Click the **Move** button to move a specific file within the switch.

Tick the **List Boot Up Files Only** option to display only the boot up files.

Click the **Active** button to set a specific config file as the active runtime configuration.

Click the **Boot Up** button to set a specific runtime image as the boot up image.

Click the **Rename** button to rename a specific file's name.

Click the **Delete** button to remove a specific file from the file system.

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



Figure 12-13 Flash File System Settings – Copy window

When copying a file to the file system of this switch, the user must enter the **Source** and **Destination** path.

Click the **Apply** button to initiate the copy.

Click the **Cancel** button the discard the process.

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



Figure 12-14 Flash File System Settings – Move window

When moving a file to another place, the user must enter the **Source** and **Destination** path.

Click the **Apply** button to initiate the copy.

Click the **Cancel** button the discard the process.

Chapter 9 OAM

CFM
Ethernet OAM
Cable Diagnostics

CFM

CFM Settings

This window is used to configure the CFM parameters.

To view this window, click **OAM > CFM > CFM Settings**, as shown below:

Figure 13-1 CFM Settings Window

The fields that can be configured are described below:

Parameter	Description
CFM State	Here the user can enable or disable the CFM feature.
All MPs Reply LTRs	Here the user can enable or disable all MPs to reply LTRs.
MD	Here the user can enter the maintenance domain name.
MD Index	Specifies the maintenance domain index used.
Level	Here the user can select the maintenance domain level.
MIP	This is the control creations of MIPs. <i>None</i> – Don't create MIPs. This is the default value. <i>Auto</i> – MIPs can always be created on any ports in this MD, if that port is not configured with a MEP of this MD. For the intermediate switch in a MA, the setting must be auto in order for the MIPs to be created on this device. <i>Explicit</i> – MIPs can be created on any ports in this MD, only if the next existent lower level has a MEP configured on that port, and that port is not configured with a MEP of this MD.
SenderID TLV	This is the control transmission of the SenderID TLV. <i>None</i> – Don't transmit sender ID TLV. This is the default value. <i>Chassis</i> – Transmit sender ID TLV with chassis ID information. <i>Manage</i> – Transmit sender ID TLV with managed address information. <i>Chassis Manage</i> – Transmit sender ID TLV with chassis ID information and manage address information.

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.



NOTE: The MD Name value should be less than 22 characters.

To add a maintenance association (MA), click on the **Add MA** button.

After clicking the **Add MA** button, the following page will appear:

Figure 13-2 CFM MA Settings Window

The fields that can be configured are described below:

Parameter	Description
MA	Here the user can enter the maintenance association name.
MA Index	Here the user can enter the maintenance association index.
VID (1-4094)	VLAN Identifier. Different MA must be associated with different VLANs.

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 window.

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

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

Click the **MIP Port Table** button to view the CFM MIP Table.

Click the **Add MEP** button to add a Maintenance End Point entry.

After click in the **Edit** button the following window appears:

Figure 13-3 CFM MA Settings - Edit Window

The fields that can be configured are described below:

Parameter	Description
MIP	This is the control creation of MIPs. <i>None</i> - Don't create MIPs.

	<p><i>Auto</i> - MIPs can always be created on any ports in this MA, if that port is not configured with a MEP of that MA.</p> <p><i>Explicit</i> - MIP can be created on any ports in this MA, only if the next existent lower level has a MEP configured on that port, and that port is not configured with a MEP of this MA.</p> <p><i>Defer</i> - Inherit the setting configured for the maintenance domain that this MA is associated with. This is the default value.</p>
SenderID	<p>This is the control transmission of the sender ID TLV.</p> <p><i>None</i> - Don't transmit sender ID TLV. This is the default value.</p> <p><i>Chassis</i> - Transmit sender ID TLV with chassis ID information.</p> <p><i>Manage</i> - Transmit sender ID TLV with manage address information.</p> <p><i>Chassis Manage</i> - Transmit sender ID TLV with chassis ID information and manage address information.</p> <p><i>Defer</i> - Inherit the setting configured for the maintenance domain that this MA is associated with. This is the default value.</p>
CCM	<p>This is the CCM interval.</p> <p><i>10ms</i> - 10 milliseconds. Not recommended. For test purpose.</p> <p><i>100ms</i> - 100 milliseconds. Not recommended. For test purpose.</p> <p><i>1sec</i> - One second.</p> <p><i>10sec</i> - Ten seconds. This is the default value.</p> <p><i>1min</i> - One minute.</p> <p><i>10min</i> - Ten minutes.</p>
MEP ID(s)	<p>This is to specify the MEP IDs contained in the maintenance association. The range of the MEP ID is 1-8191.</p> <p><i>Add</i> - Add MEP ID(s).</p> <p><i>Delete</i> - Delete MEP ID(s).</p> <p>By default, there is no MEP ID in a newly created maintenance association.</p>

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

After clicking the **MIP Port Table** button, the following page will appear:

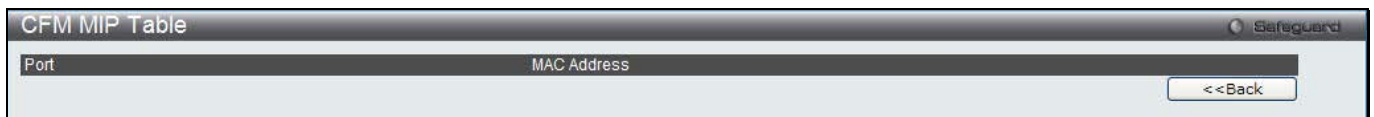


Figure 13-4 CFM MIP Port Table Window

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

After clicking the **Add MEP** button, the following page will appear:

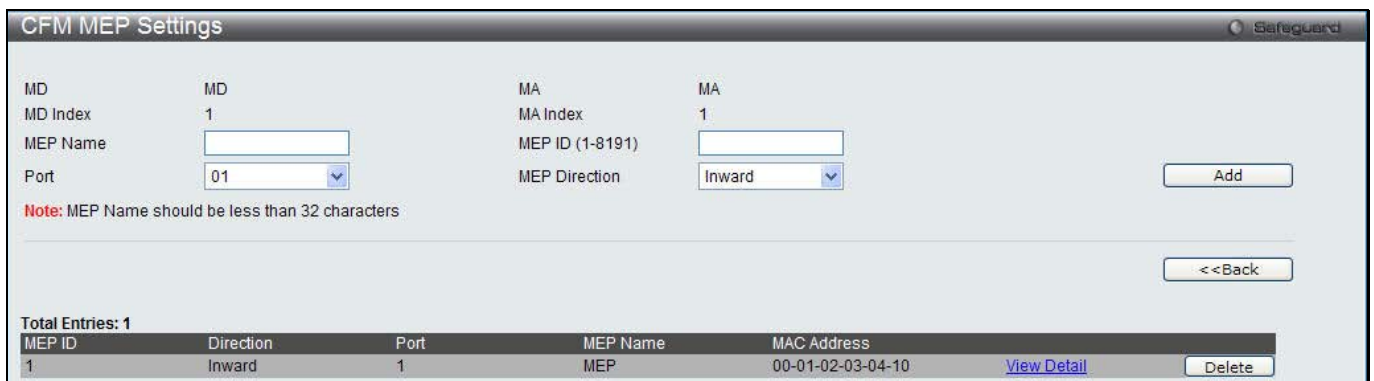


Figure 13-5 CFM MEP Settings (Add) Window

The fields that can be configured are described below:

Parameter	Description
MEP Name	MEP name. It is unique among all MEPs configured on the device.
MEP ID (1-8191)	MEP MEPID. It should be configured in the MA's MEP ID list.
Port	Port number. This port should be a member of the MA's associated VLAN.
MEP Direction	This is the MEP direction. <i>Inward</i> - Inward facing (up) MEP. <i>Outward</i> - Outward facing (down) MEP.

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 window.

Click the [View Detail](#) link to view more information regarding the specific entry.

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



NOTE: The MEP Name value should be less than 32 characters.

After clicking the [View Detail](#) link, the following page will appear:

CFM MEP Information				Safeguard
MD	: MD	MA	: MA	
MD Index	: 1	MA Index	: 1	
MEP Name	: MEP	MEPID	: 1	
Port	: 1	Direction	: Inward	
CFM Port Status	: Disabled	MAC Address	: 00-01-02-03-04-10	
Highest Fault	: None	Out of Sequence CCMs	: 0 Received	
Cross Connect CCMs	: 0 Received	Error CCMs	: 0 Received	
Normal CCMs	: 0 Received	Port Status CCMs	: 0 Received	
If Status CCMs	: 0 Received	CCMs Transmitted	: 0	
In Order LBRs	: 0 Received	Out of Order LBRs	: 0 Received	
Next LTM Trans ID	: 0	Unexpected LTRs	: 0 Received	
LBRs Transmitted	: 0	MEP State	: Disabled	
CCM State	: Disabled	PDU Priority	: 7	
Fault Alarm	: Disabled	Alarm Time (250-1000)	: 250 centisecond((1/100)s)	
Alarm Reset Time (250-1000)	: 1000 centisecond((1/100)s)	AIS State	: Disabled	
AIS Period	: 1 Second	AIS Client Level	: Invalid	
AIS Status	: Not Detected	LCK State	: Disabled	
LCK Period	: 1 Second	LCK Client Level	: Invalid	
LCK Status	: Not Detected	AIS PDUs	: 0 Received	
AIS PDUs Transmitted	: 0	LCK PDUs	: 0 Received	
LCK PDUs Transmitted	: 0			
				<input type="button" value="Edit"/> <input type="button" value="Edit AIS"/> <input type="button" value="Edit LCK"/> <input type="button" value="<<Back"/>
Remote MEP(s)				
MEPID	MAC Address	Status	RDI	Port Status
Interface Status	LCK	Detect Time		

Figure 13-6 CFM MEP Information Window

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

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

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

CFM MEP Information		Safeguard	
MD	: MD	MA	: MA
MD Index	: 1	MA Index	: 1
MEP Name	: MEP	MEPID	: 1
Port	: 1	Direction	: Inward
CFM Port Status	: Disabled	MAC Address	: 00-01-02-03-04-10
Highest Fault	: None	Out of Sequence CCMs	: 0 Received
Cross Connect CCMs	: 0 Received	Error CCMs	: 0 Received
Normal CCMs	: 0 Received	Port Status CCMs	: 0 Received
If Status CCMs	: 0 Received	CCMs Transmitted	: 0
In Order LBRs	: 0 Received	Out of Order LBRs	: 0 Received
Next LTM Trans ID	: 0	Unexpected LTRs	: 0 Received
LBM Transmitted	: 0	MEP State	: Disabled
CCM State	: Disabled	PDU Priority	: 7
Fault Alarm	: All	Alarm Time (250-1000)	: 250 centisecond((1/100)s)
Alarm Reset Time (250-1000)	: 1000 centisecond((1/100)s)	AIS State	: Disabled
AIS Period	: 1 Second	AIS Client Level	: Invalid
AIS Status	: Not Detected	LCK State	: Disabled
LCK Period	: 1 Second	LCK Client Level	: Invalid
LCK Status	: Not Detected	AIS PDUs	: 0 Received
AIS PDUs Transmitted	: 0	LCK PDUs	: 0 Received
LCK PDUs Transmitted	: 0		

Remote MEP(s)							
MEPID	MAC Address	Status	RDI	Port Status	Interface Status	LCK	Detect Time

Figure 13-7 CFM MEP Information - Edit Window

The fields that can be configured are described below:

Parameter	Description
MEP State	This is the MEP administrative state. <i>Enable</i> - MEP is enabled. <i>Disable</i> - MEP is disabled. This is the default value.
CCM State	This is the CCM transmission state. <i>Enable</i> - CCM transmission enabled. <i>Disable</i> - CCM transmission disabled. This is the default value.
PDU Priority	The 802.1p priority is set in the CCMs and the LTM messages transmitted by the MEP. The default value is 7.
Fault Alarm	This is the control types of the fault alarms sent by the MEP. <i>All</i> - All types of fault alarms will be sent. <i>MAC Status</i> - Only the fault alarms whose priority is equal to or higher than "Some Remote MEP MAC Status Error" are sent. <i>Remote CCM</i> - Only the fault alarms whose priority is equal to or higher than "Some Remote MEP Down" are sent. <i>Errors CCM</i> - Only the fault alarms whose priority is equal to or higher than "Error CCM Received" are sent. <i>Xcon CCM</i> - Only the fault alarms whose priority is equal to or higher than "Cross-connect CCM Received" are sent. <i>None</i> - No fault alarm is sent. This is the default value.
Alarm Time	This is the time that a defect must exceed before the fault alarm can be sent. The unit is in centiseconds, the range is 250-1000. The default value is 250.
Alarm Reset Time	This is the dormant duration time before a defect is triggered before the fault can be re-alarmed. The unit is in centiseconds, the range is 250-1000. The default value is 1000

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

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

Click the **Edit AIS** button to configure the AIS settings.

Click the **Edit LCK** button to configure the LCK settings.

After clicking the **Edit AIS** button, the following window will appear:



The screenshot shows the 'CFM Extension AIS Settings' window. It contains the following fields:

- MD Name: MD
- MD Index: 1
- MA Name: MA
- MA Index: 1
- MEP ID: 1
- State: Disabled (dropdown menu) with a checkbox
- Period: 1sec (dropdown menu) with a checkbox
- Level: (empty dropdown menu) with a checkbox

At the bottom right, there are two buttons: 'Apply' and '<<Back'.

Figure 13-8 CFM Extension AIS Window

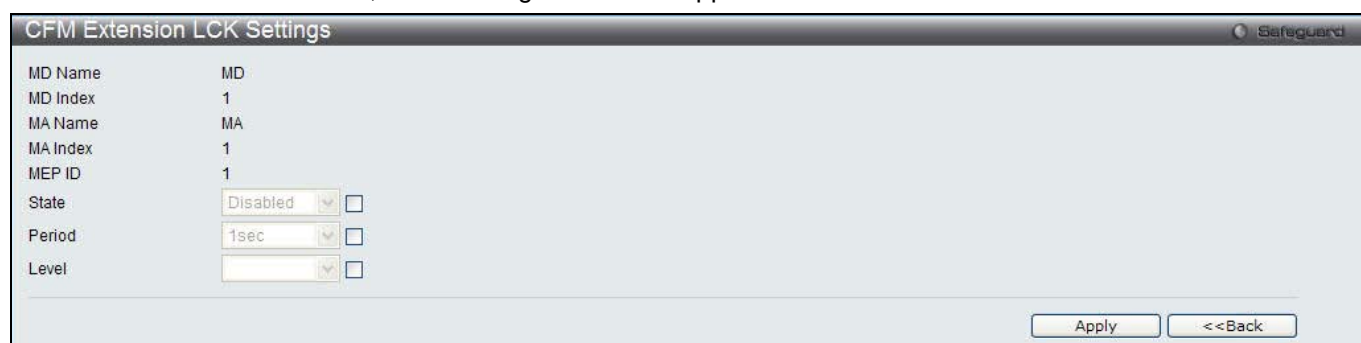
The fields that can be configured are described below:

Parameter	Description
State	Specifies to <i>enable</i> or <i>disable</i> the AIS function.
Period	The transmitting interval of AIS PDU. The default period is 1 second. Options to choose from are: <i>1sec</i> - Specifies that the transmitting interval will be set to 1 second. <i>1min</i> - Specifies that the transmitting interval will be set to 1 minute.
Level	The client level ID to which the MEP sends AIS PDU. The default client MD level is MD level at which the most immediate client layer MIPs and MEPs exist. Options to choose from are values between 0-7.

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

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

After click the **Edit LCK** button, the following window will appear:



The screenshot shows the 'CFM Extension LCK Settings' window. It contains the following fields:

- MD Name: MD
- MD Index: 1
- MA Name: MA
- MA Index: 1
- MEP ID: 1
- State: Disabled (dropdown menu) with a checkbox
- Period: 1sec (dropdown menu) with a checkbox
- Level: (empty dropdown menu) with a checkbox

At the bottom right, there are two buttons: 'Apply' and '<<Back'.

Figure 13-9 CFM Extension LCK Settings Window

The fields that can be configured are described below:

Parameter	Description
State	Specifies to <i>enable</i> or <i>disable</i> the LCK function.
Period	The transmitting interval of LCK PDU. The default period is 1 second. Options to choose from are: <i>1sec</i> - Specifies that the transmitting interval will be set to 1 second. <i>1min</i> - Specifies that the transmitting interval will be set to 1 minute.
Level	The client level ID to which the MEP sends LCK PDU. The default client MD level is MD level at which the most immediate client layer MIPs and MEPs exist. Options to choose from are values between 0-7.

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

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

CFM Port Settings

This window is used to enable or disable the CFM function on a per-port basis.

To view this window, click **OAM > CFM > CFM Port Settings**, as shown below:

From Port	To Port	State
01	01	Disabled

Port	State
1	Disabled
2	Disabled
3	Disabled
4	Disabled
5	Disabled
6	Disabled
7	Disabled
8	Disabled
9	Disabled
10	Disabled
11	Disabled
12	Disabled
13	Disabled
14	Disabled
15	Disabled
16	Disabled
17	Disabled
18	Disabled
19	Disabled
20	Disabled
21	Disabled
22	Disabled
23	Disabled
24	Disabled

Figure 13-10 CFM Port Settings Window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Use the drop-down menus to select a range of ports to be configuration.
State	Use the drop-down menu to enable or disable the state of specific port regarding the CFM configuration.

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

CFM MIPCCM Table

This window is used to show the MIP CCM database entries.

To view this window, click **OAM > CFM > CFM MIPCCM Table**, as shown below:

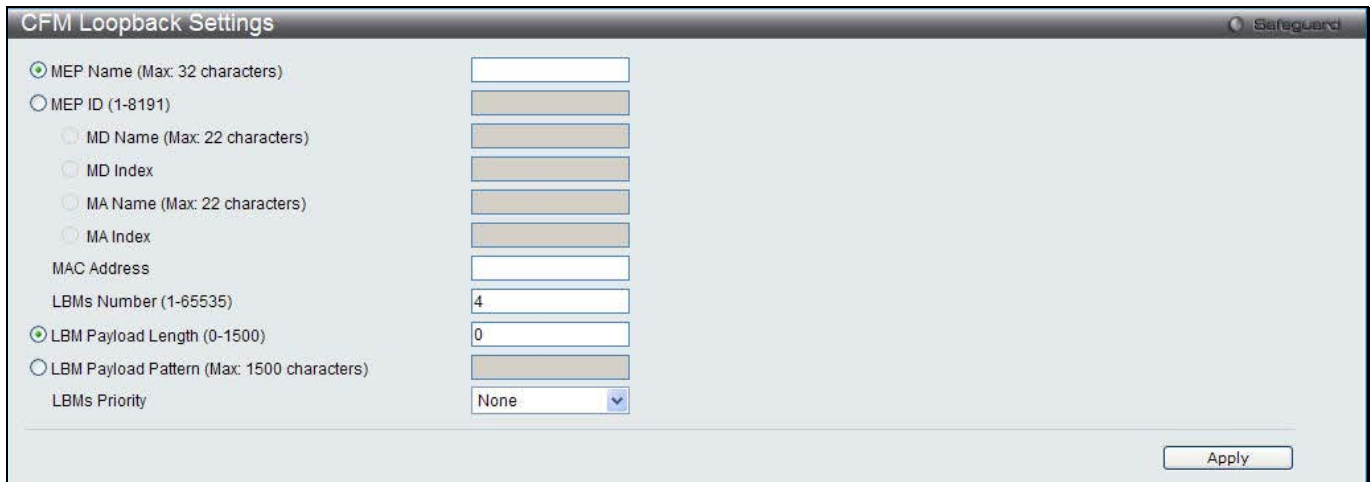
MA	VID	MAC Address	Port
----	-----	-------------	------

Figure 13-11 CFM MIPCCM Table Window

CFM Loopback Settings

This window is used to start a CFM loopback test.

To view this window, click **OAM > CFM > CFM Loopback Settings**, as shown below:



The image shows a web interface window titled "CFM Loopback Settings" with a "Safeguard" icon in the top right corner. The window contains several configuration fields:

- MEP Name (Max: 32 characters) [Text input]
- MEP ID (1-8191) [Text input]
- MD Name (Max: 22 characters) [Text input]
- MD Index [Text input]
- MA Name (Max: 22 characters) [Text input]
- MA Index [Text input]
- MAC Address [Text input]
- LBM's Number (1-65535) [Text input with value 4]
- LBM Payload Length (0-1500) [Text input with value 0]
- LBM Payload Pattern (Max: 1500 characters) [Text input]
- LBM's Priority [Dropdown menu with value None]

An "Apply" button is located in the bottom right corner of the window.

Figure 13-12 CFM Loopback Settings Window

The fields that can be configured are described below:

Parameter	Description
MEP Name	Select and enter the Maintenance End Point name used.
MEP ID (1-8191)	Select and enter the Maintenance End Point ID used.
MD Name	Select and enter the Maintenance Domain name used.
MD Index	Select and enter the Maintenance Domain index used.
MA Name	Select and enter the Maintenance Association name used.
MA Index	Select and enter the Maintenance Association index used.
MAC Address	Enter the destination MAC address used here.
LBM's Number (1-65535)	Number of LBMs to be sent. The default value is 4.
LBM Payload Length (0-1500)	The payload length of LBM to be sent. The default is 0.
LBM Payload Pattern	An arbitrary amount of data to be included in a Data TLV, along with an indication whether the Data TLV is to be included.
LBM's Priority	The 802.1p priority to be set in the transmitted LBMs. If not specified, it uses the same priority as CCMs and LTM's sent by the MA.

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

CFM Linktrace Settings

This window is used to issue a CFM link track message, display or delete the link trace responses.

To view this window, click **OAM > CFM > CFM Linktrace Settings**, as shown below:

Figure 13-13 CFM Linktrace Settings Window

The fields that can be configured are described below:

Parameter	Description
MEP Name	Select and enter the Maintenance End Point name used.
MEP ID (1-8191)	Select and enter the Maintenance End Point ID used.
MD Name	Select and enter the Maintenance Domain name used.
MD Index	Select and enter the Maintenance Domain index used.
MA Name	Select and enter the Maintenance Association name used.
MA Index	Select and enter the Maintenance Association index used.
MAC Address	Here the user can enter the destination MAC address.
TTL (2-255)	Link-trace message TTL value. The default value is 64.
PDU Priority	The 802.1p priority to be set in the transmitted LTM. If not specified, it uses the same priority as CCMs sent by the MA.

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

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

CFM Packet Counter

This window is used to show the CFM packet's RX/TX counters.

To view this window, click **OAM > CFM > CFM Packet Counter**, as shown below:

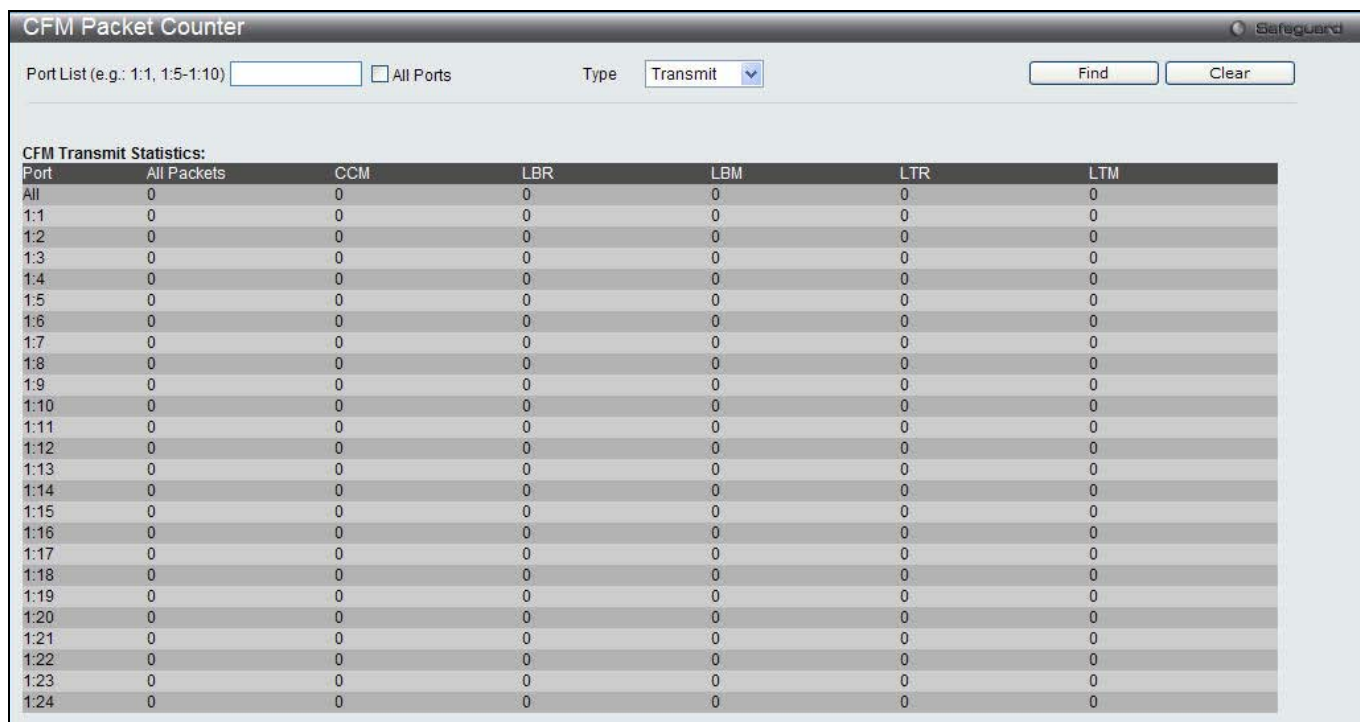


Figure 13-14 CFM Packet Counter Window

The fields that can be configured are described below:

Parameter	Description
Port List	Enter a list of ports to be displayed. Tick the All Ports check box to display all ports.
Type	<i>Transmit</i> – Selecting this option will display all the CFM packets transmitted. <i>Receive</i> – Selecting this option will display all the CFM packets received. <i>CCM</i> – Selecting this option will display all the CFM packets transmitted and received.

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 show the MEPs that have faults.

To view this window, click **OAM > CFM > CFM Fault Table**, as shown below:

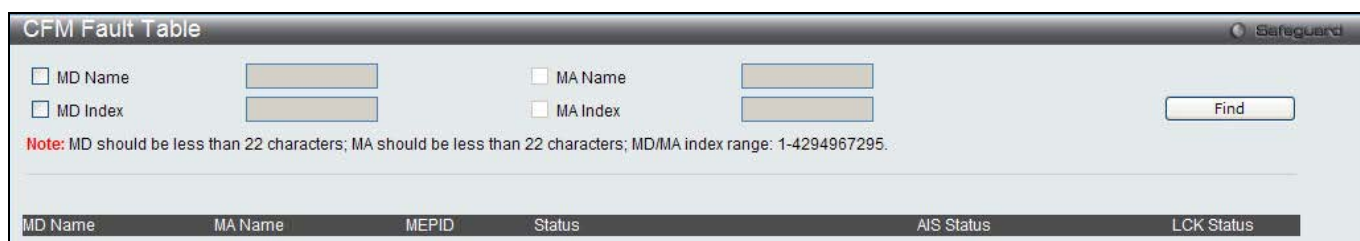


Figure 13-15 CFM Fault Table Window

The fields that can be configured are described below:

Parameter	Description
MD Name	Select and enter the Maintenance Domain name used.
MD Index	Select and enter the Maintenance Domain index used.
MA Name	Select and enter the Maintenance Association name used.

MA Index

Select and enter the Maintenance Association index used.

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

CFM MP Table

To view this window, click **OAM > CFM > CFM MP Table**, as shown below:

Figure 13-16 CFM MP Table Window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select the unit ID and the port number to view.
Level (0-7)	Enter the level to view.
Direction	Use the drop-down menu to select the direction to view. <i>Inward</i> - Inward facing (up) MP. <i>Outward</i> - Outward facing (down) MP.
VID (1-4094)	Enter the VID to view.

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

Ethernet OAM

Ethernet OAM Settings

This window is used to configure the Ethernet OAM settings.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Settings**, as shown below:

Ethernet OAM Settings

From Port: 01 To Port: 01 Mode: Active State: Disabled Remote Loopback: None Received Remote Loopback: Ignore

Ethernet OAM Table

Port 1

Local Client	
OAM	Disabled
Mode	Active
Max OAMPDU	1518 Bytes
Remote Loopback	Supported
Unidirection	Not Supported
Link Monitoring	Supported
Variable Request	Not Supported
PDU Revision	0
Operation Status	Disable
Loopback Status	No Loopback

Port 2

Local Client	
OAM	Disabled
Mode	Active
Max OAMPDU	1518 Bytes
Remote Loopback	Supported
Unidirection	Not Supported
Link Monitoring	Supported
Variable Request	Not Supported
PDU Revision	0
Operation Status	Disable
Loopback Status	No Loopback

Port 3

Local Client	
OAM	Disabled
Mode	Active
Max OAMPDU	1518 Bytes
Remote Loopback	Supported
Unidirection	Not Supported

Figure 13-17 Ethernet OAM Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports you wish to configure.
Mode	Use the drop-down menu to select to operate in either <i>Active</i> or <i>Passive</i> . The default mode is <i>Active</i> .
State	Use the drop-down menu to enable or disable the OAM function.
Remote Loopback	Use the drop-down menu to select Ethernet OAM remote loopback. <i>None</i> – Select to disable the remote loopback. <i>Start</i> – Select to request the peer to change to the remote loopback mode. <i>Stop</i> - Select to request the peer to change to the normal operation mode.
Received Remote Loopback	Use the drop-down menu to configure the client to process or to ignore the received Ethernet OAM remote loopback command. <i>Process</i> – Select to process the received Ethernet OAM remote loopback command. <i>Ignore</i> - Select to ignore the received Ethernet OAM remote loopback command.

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

Ethernet OAM Configuration Settings

This window is used to configure Ethernet OAM configuration settings.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Configuration Settings**, as shown below:

Ethernet OAM Configuration Settings

Ethernet OAM Configuration Settings

From Port: 01 To Port: 01 Link Event: Link Monitor Link Monitor: Error Symbol Threshold (0-4294967295): 1 Window (1000-60000): 1000 ms

Notify: Enabled

Apply

Ethernet OAM Configuration Table

Port 1	
OAM	Disabled
Mode	Active
Dying Gasp	Enabled
Critical Event	Enabled
Remote Loopback OAMPDU	Not Processed
Symbol Error	
Notify State	Enabled
Window	1000 Milliseconds
Threshold	1 Error Symbol
Frame Error	
Notify State	Enabled
Window	1000 Milliseconds
Threshold	1 Error Frame
Frame Period Error	
Notify State	Enabled
Window	1488100 Frames
Threshold	1 Error Frame
Frame Seconds Error	
Notify State	Enabled
Window	60000 Milliseconds
Threshold	1 Error Seconds
Port 2	
OAM	Disabled
Mode	Active
Dying Gasp	Enabled
Critical Event	Enabled
Remote Loopback OAMPDU	Not Processed
Symbol Error	

Figure 13-18 Ethernet OAM Configuration Settings window

The fields that can be configured are described below:

Parameter	Description
From Port / To Port	Select a range of ports you wish to configure.
Link Event	Use the drop-down menu to select the link events, <i>Link Monitor</i> or <i>Critical Link Event</i> .
Link Monitor	Use the drop-down menu to select link monitor. Available options are <i>Error Symbol</i> , <i>Error Frame</i> , <i>Error Frame Period</i> , and <i>Error Frame Seconds</i> .
Critical Link Event	Use the drop-down menu to select between <i>Dying Gasp</i> and <i>Critical Event</i> .
Threshold (0-4294967295)	Enter the number of error frame or symbol in the period is required to be equal to or greater than in order for the event to be generated.
Window (1000-6000)	Enter the period of error frame or symbol in milliseconds summary event.
Notify	Use the drop-down menu to enable or disable the event notification.

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

Ethernet OAM Event Log

The window is used to show ports Ethernet OAM event log information.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Event Log**, as shown below:

Figure 13-19 Ethernet OAM Event Log window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select the port number to view.
Port List	Enter a list of ports. Tick the All Ports check box to select 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 show ports Ethernet OAM statistics information.

To view this window, click **OAM > Ethernet OAM > Ethernet OAM Statistics**, as shown below:

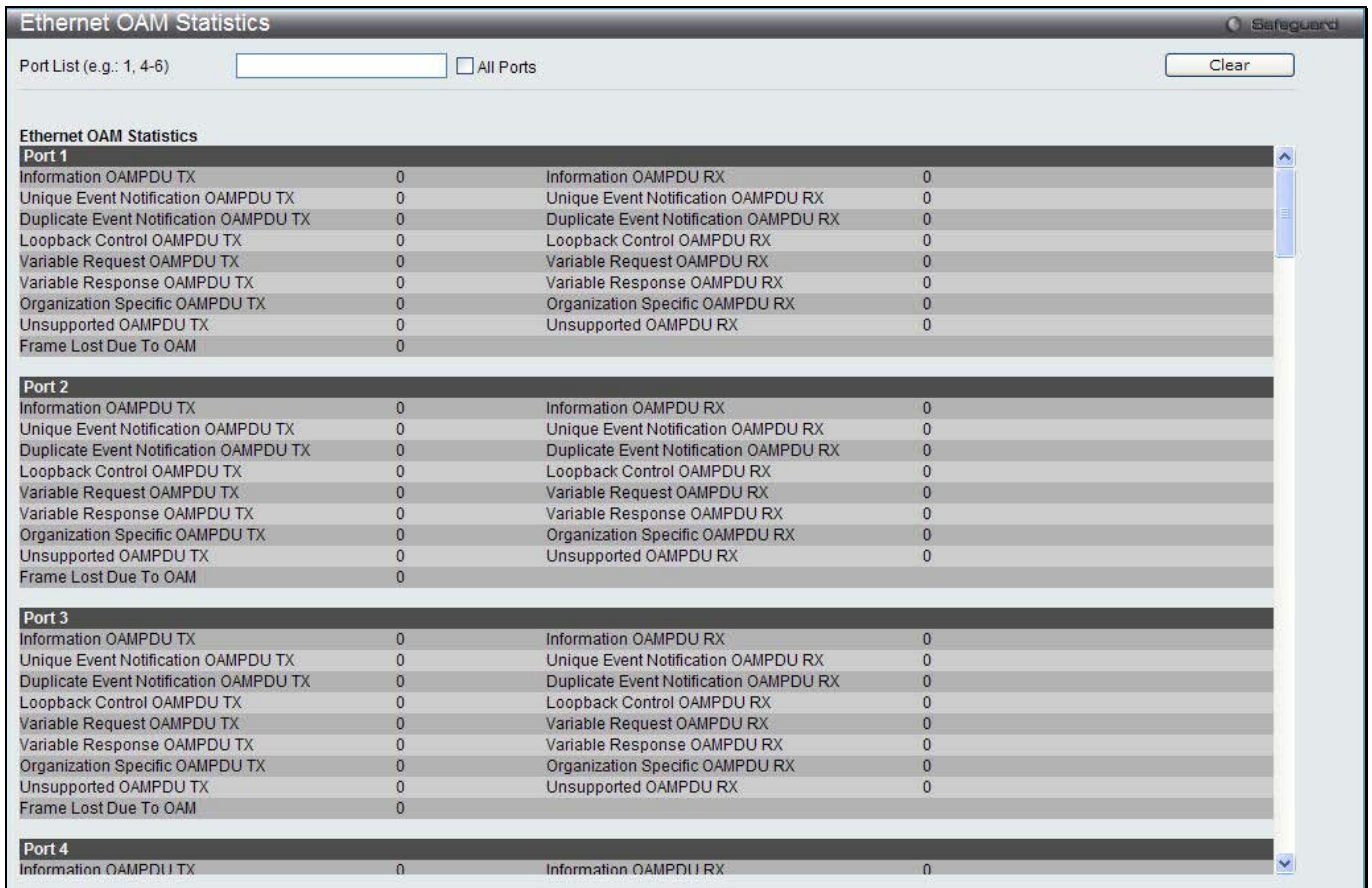


Figure 13-20 Ethernet OAM Statistics window

The fields that can be configured are described below:

Parameter	Description
Port	Use the drop-down menu to select the port number to view.
Port List	Enter a list of ports. Tick the All Ports check box to select all ports.

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

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:

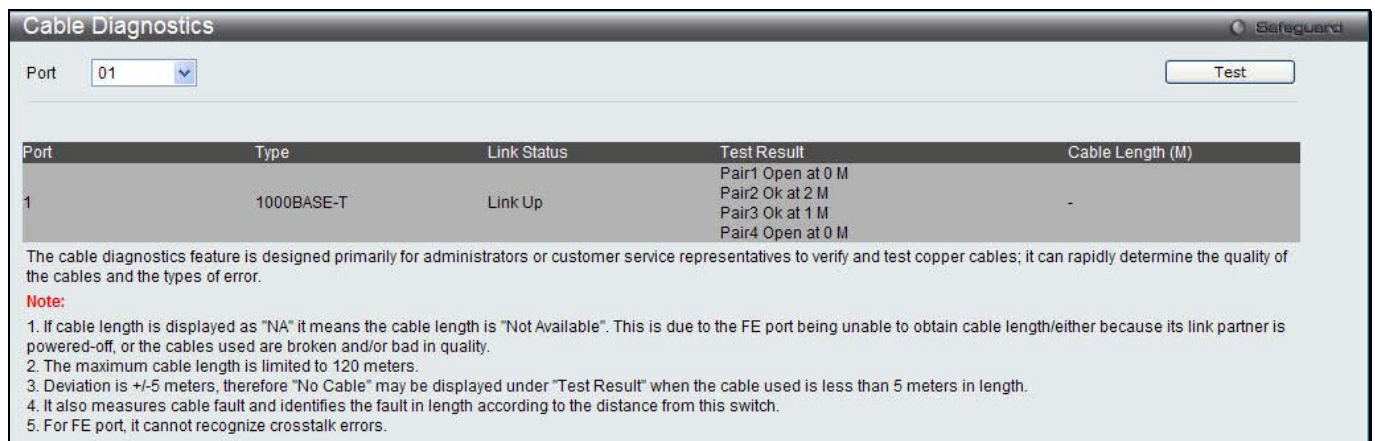


Figure 13-21 Cable Diagnostics window

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 diagnostic function limitations. Cable length detection is only supported on GE ports. Ports must be linked up and running at 1000M speed. 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 for GE ports.

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 10 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:

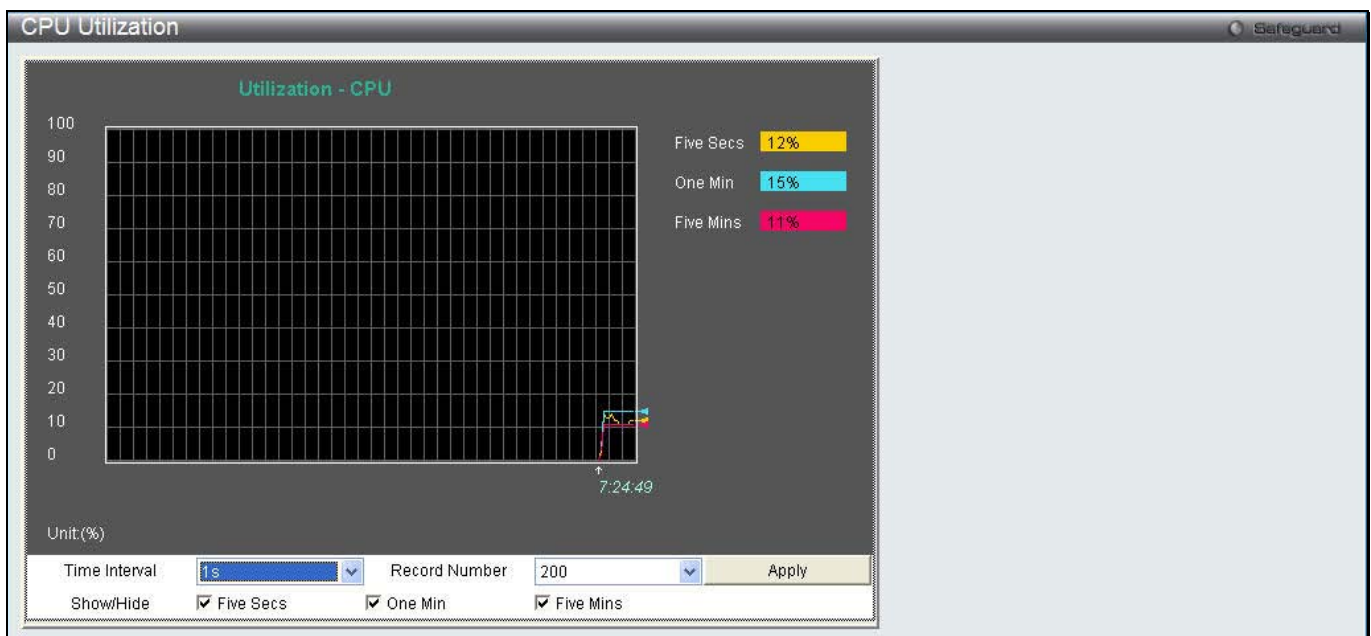


Figure 14-1 CPU Utilization window

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:

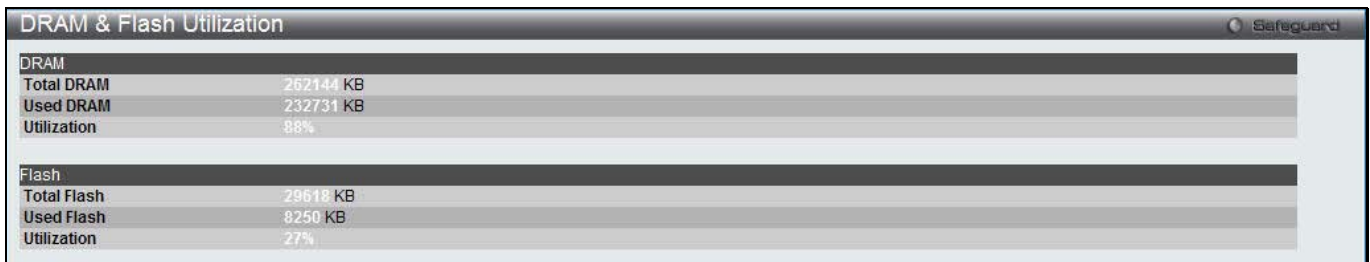


Figure 14-2 DRAM & Flash Utilization window

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:

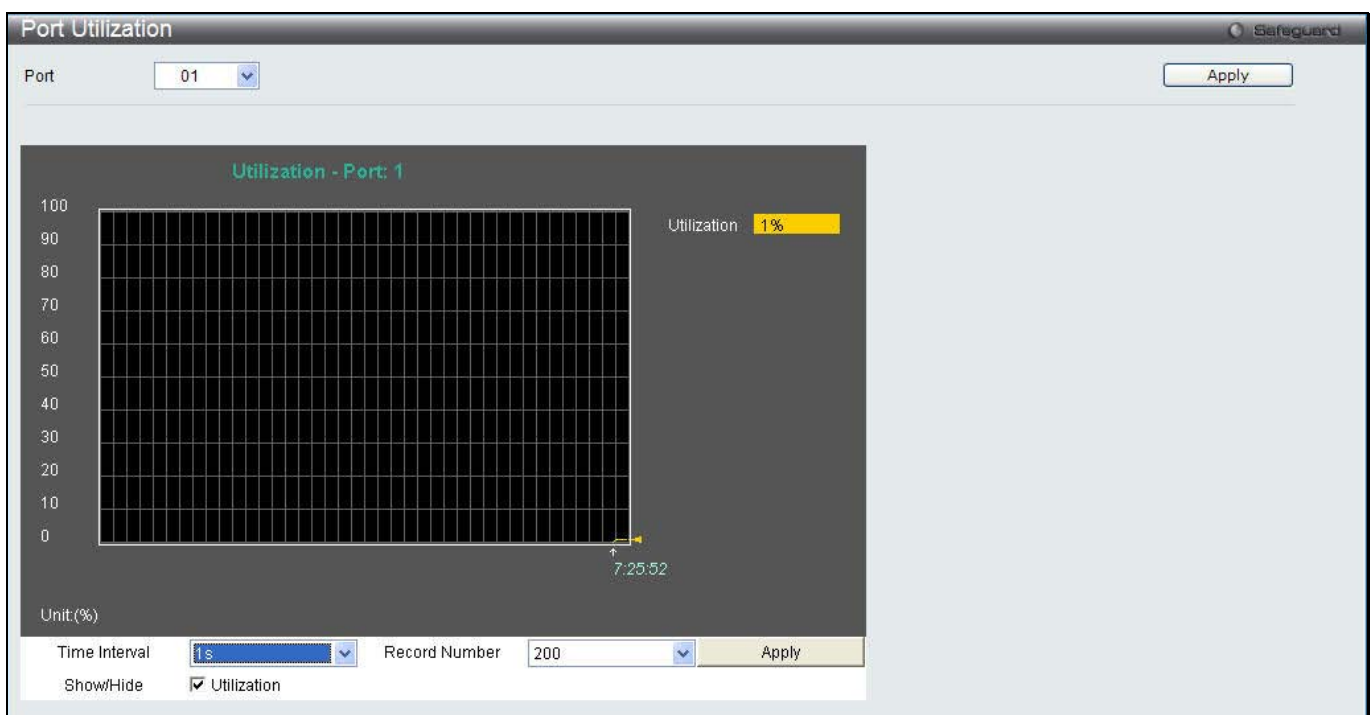


Figure 14-3 Port Utilization window

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 <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>200</i> .
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 drop-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:

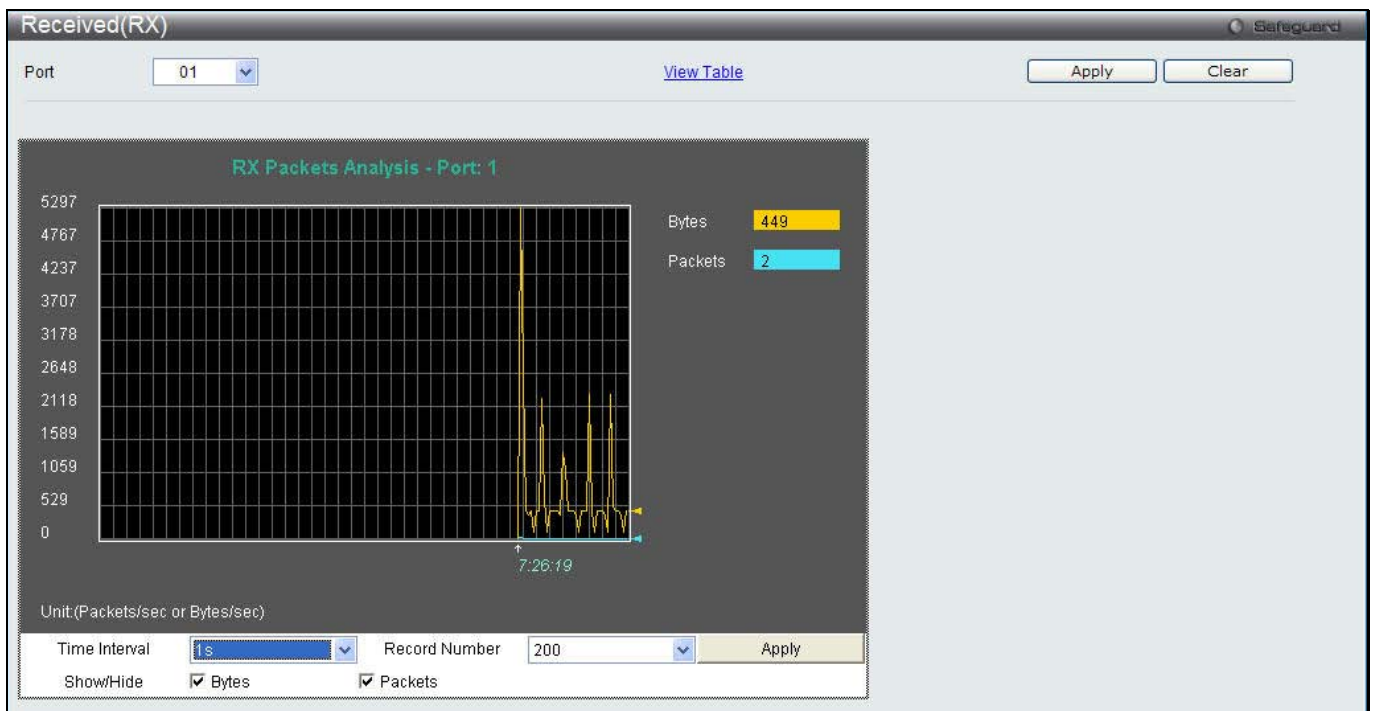


Figure 14-4 Received (RX) window (for Bytes and Packets)

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-5 RX Packets Analysis Table window

The fields that can be configured or displayed 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 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.

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 drop-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:

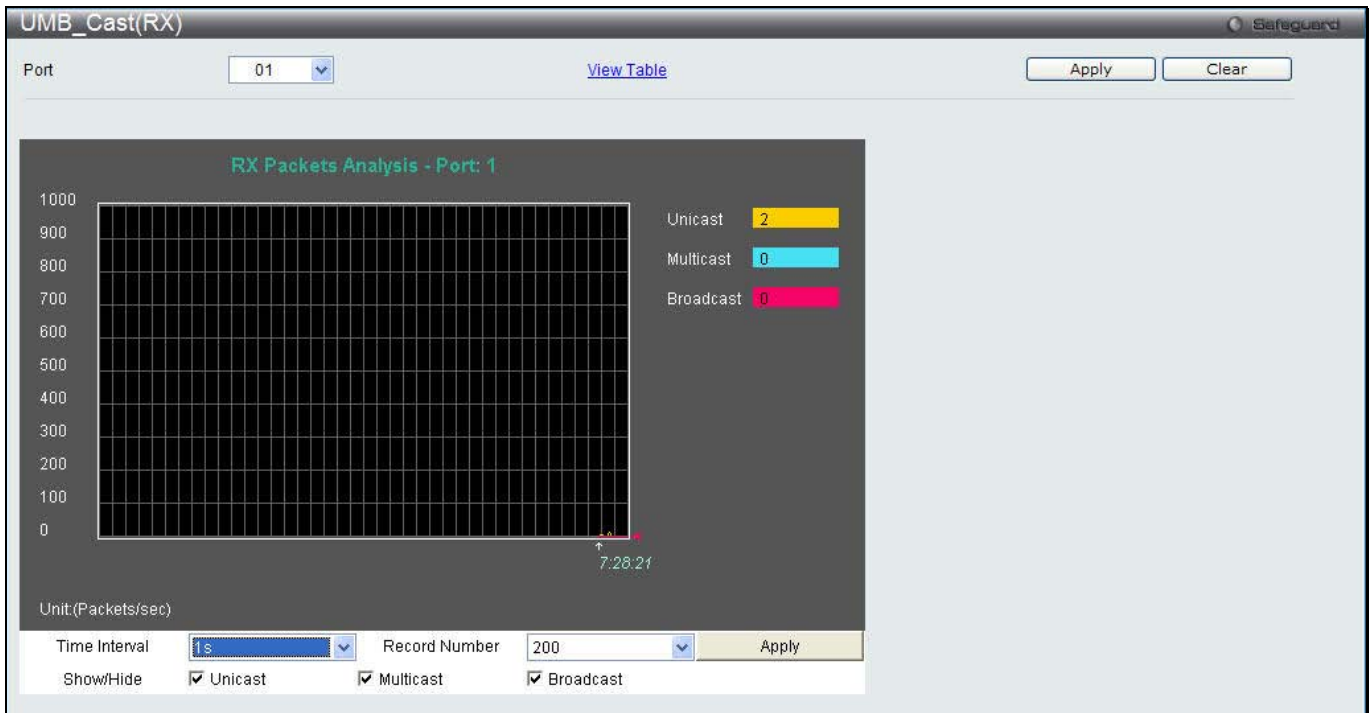


Figure 14-6 UMB_cast (RX) window (for Unicast, Multicast, and Broadcast Packets)

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-7 RX Packets Analysis window (table for Unicast, Multicast, and Broadcast Packets)

The fields that can be configured or displayed 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.
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 drop-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:

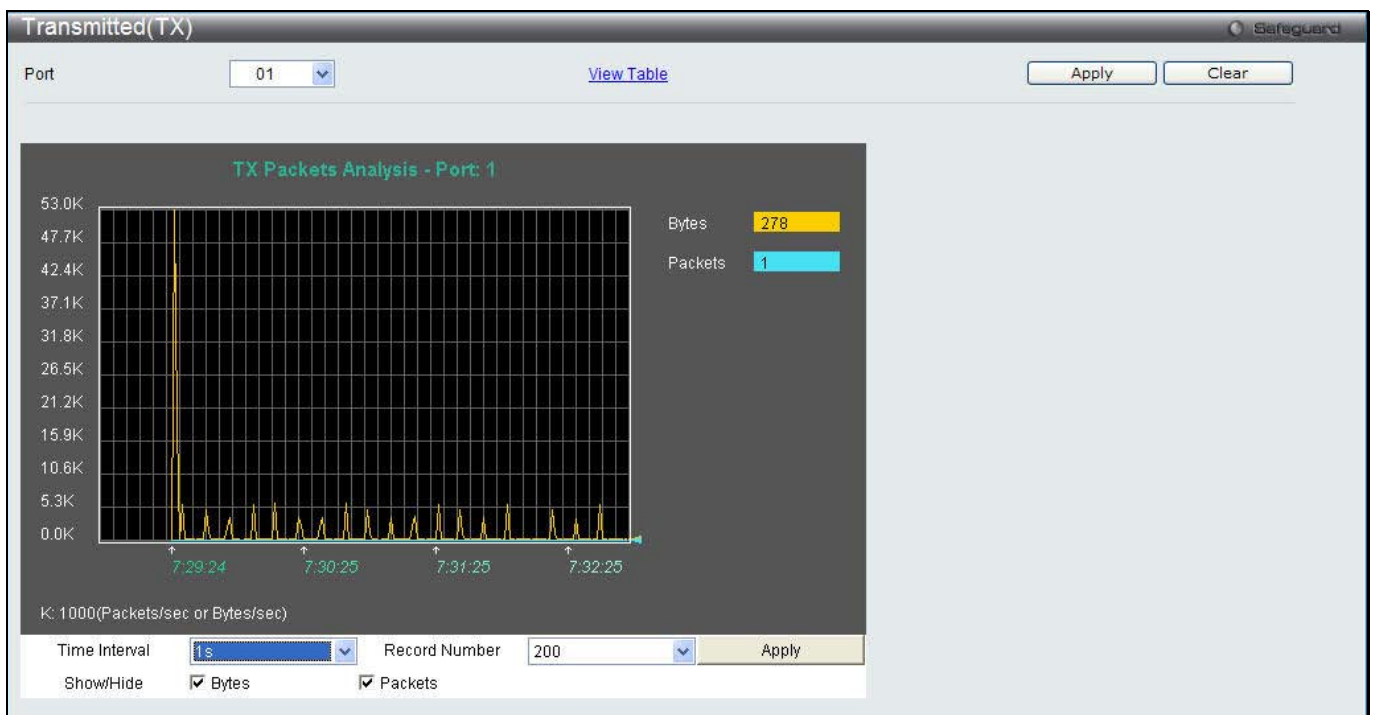


Figure 14-8 Transmitted (TX) window (for Bytes and Packets)

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-9 TX Packets Analysis window (table for Bytes and Packets)

The fields that can be configured or displayed 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 <i>1s</i> and <i>60s</i> , where "s" stands for seconds. The default value is one second.
Record Number	Select number of times the Switch will be polled between <i>20</i> and <i>200</i> . The default value is <i>200</i> .
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 drop-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:

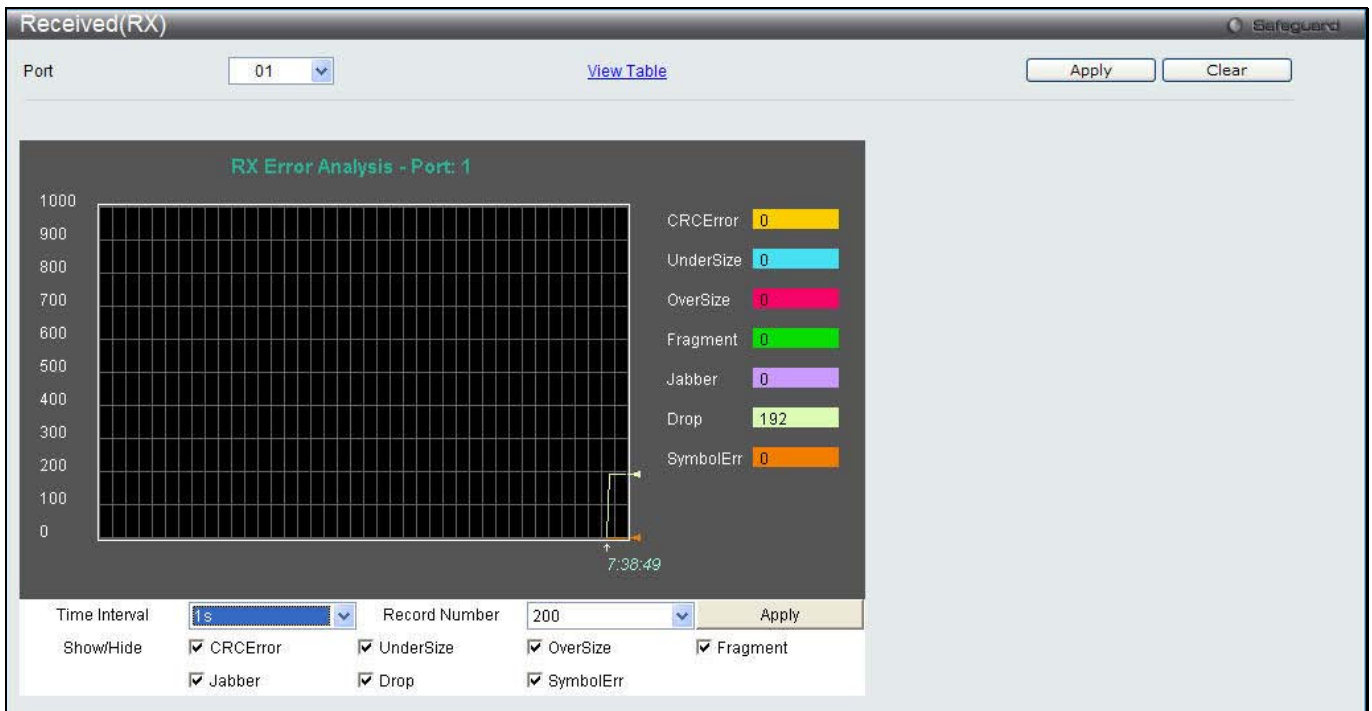


Figure 14-10 Received (RX) window (for errors)

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-11 RX Error Analysis window (table)

The fields that can be configured or displayed 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.
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 drop-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:

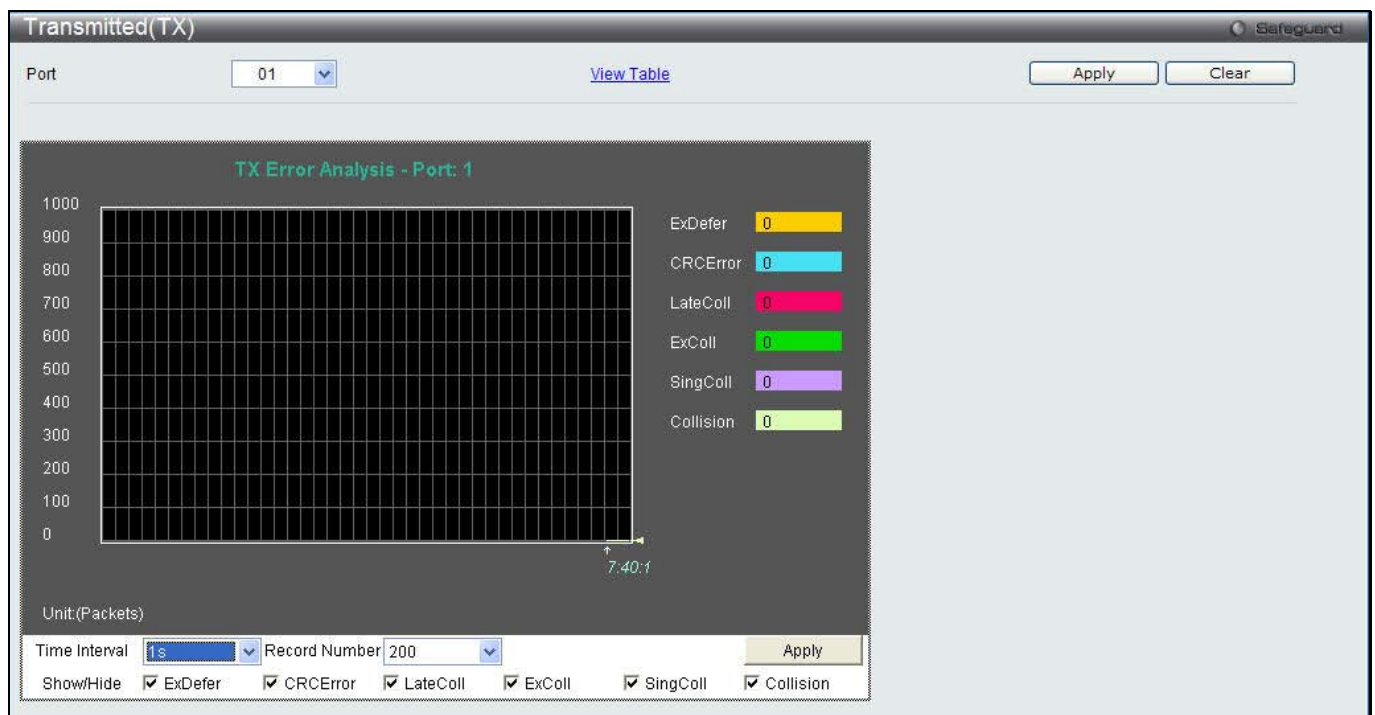


Figure 14-12 Transmitted (TX) window (for errors)

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-13 TX Error Analysis window (table)

The fields that can be configured or displayed 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.
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 drop-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:

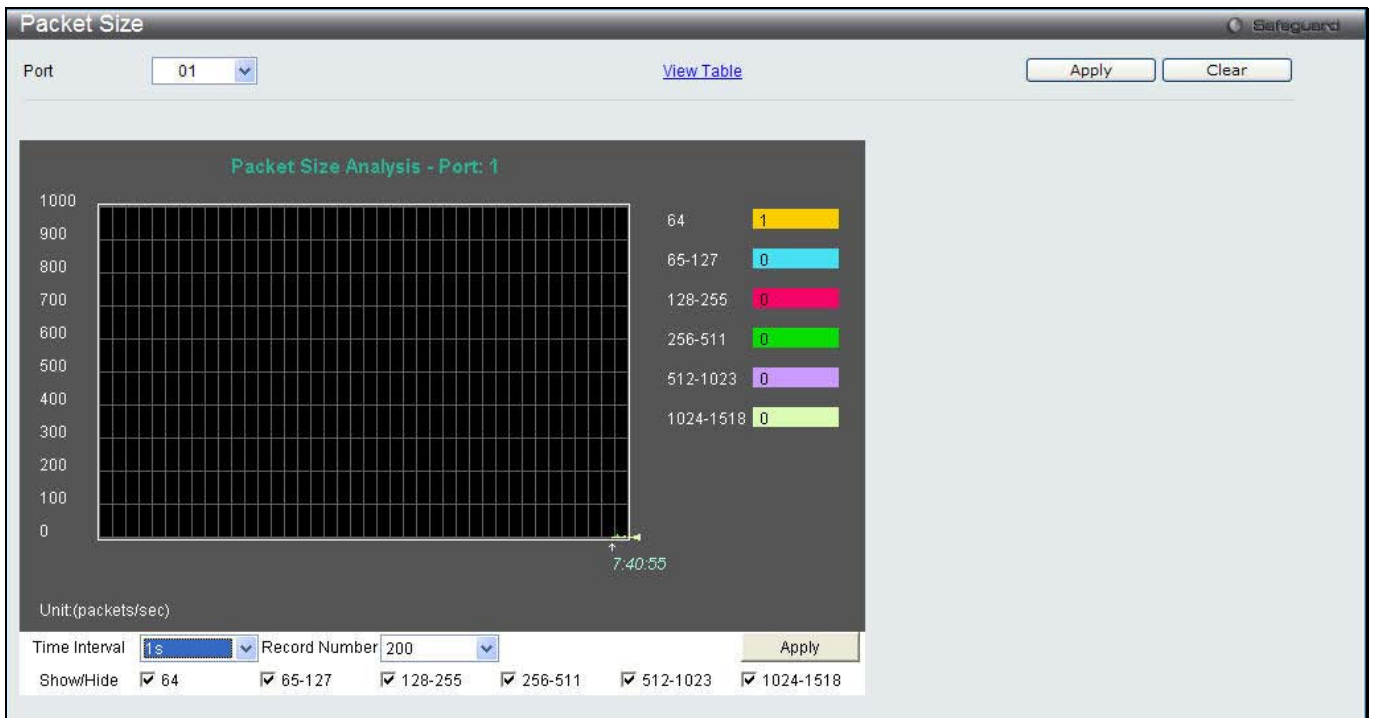


Figure 14-14 Packet Size window

Click the [View Table](#) link to display the information in a table rather than a line graph.



Figure 14-15 RX Size Analysis window (table)

The fields that can be configured or displayed 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.

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.

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 14-16 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.
TX	Click the radio buttons to select whether the port should include outgoing traffic.

RX	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 14-17 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 (1-4094)	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 14-18 RSPAN Settings – Modify window

The fields that can be configured are described below:

Parameter	Description
Source Ports	<p>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.</p> <p>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.</p>
Redirect Port List	<p>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.</p>

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

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

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 14-19 sFlow Global Settings window

The fields that can be configured are described below:

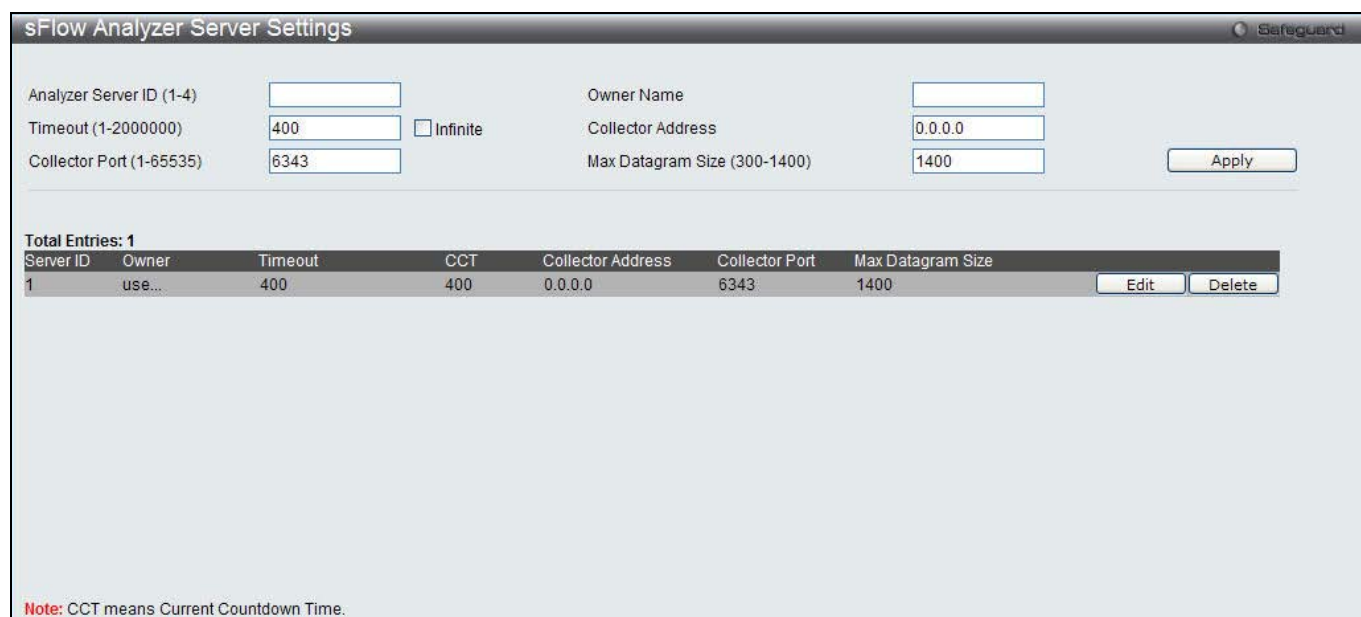
Parameter	Description
sFlow State	Here the user can enable or disable the sFlow feature.

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

sFlow Analyzer Server Settings

The Switch can support 4 different Analyzer Servers at the same time and each sampler or poller can select a collector to send the samples. We 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:



sFlow Analyzer Server Settings

Analyzer Server ID (1-4) Owner Name

Timeout (1-2000000) Infinite Collector Address

Collector Port (1-65535) Max Datagram Size (300-1400)

Total Entries: 1

Server ID	Owner	Timeout	CCT	Collector Address	Collector Port	Max Datagram Size
1	use...	400	400	0.0.0.0	6343	1400

Note: CCT means Current Countdown Time.

Figure 14-20 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. When owner is set or modified, the timeout value will become 400 automatically.
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

On this page the user can 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 14-21 sFlow Flow Sampler Settings window

The fields that can be configured are described below:

Parameter	Description
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. The sampling rate for packet Tx 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

On this page the user can configure the sFlow counter poller parameters. If the user wants to change the analyzer server ID, he needs to delete the counter poller and create a new one.

Figure 14-22 sFlow Counter Poller Settings

The fields that can be configured are described below:

Parameter	Description
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 polling interval.

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:

The screenshot shows the 'Ping Test' window with the following fields and options:

- IPv4 Ping Test:**
 - Target IP Address: [Text Input]
 - Repeat Pinging for: Infinite times, [Text Input] (1-255 times)
 - Timeout: [Text Input] (1-99 sec)
 - Start button
- IPv6 Ping Test:**
 - Target IP Address: [Text Input]
 - Interface Name: [Text Input]
 - Repeat Pinging for: Infinite times, [Text Input] (1-255 times)
 - Size: [Text Input] (1-6000)
 - Timeout: [Text Input] (1-99 sec)
 - Start button

Figure 14-23 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 IPv4 Address	Enter an IP address to be pinged.
Target IPv6 Address (EI Mode Only)	Enter an IPv6 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 (EI Mode Only)	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:

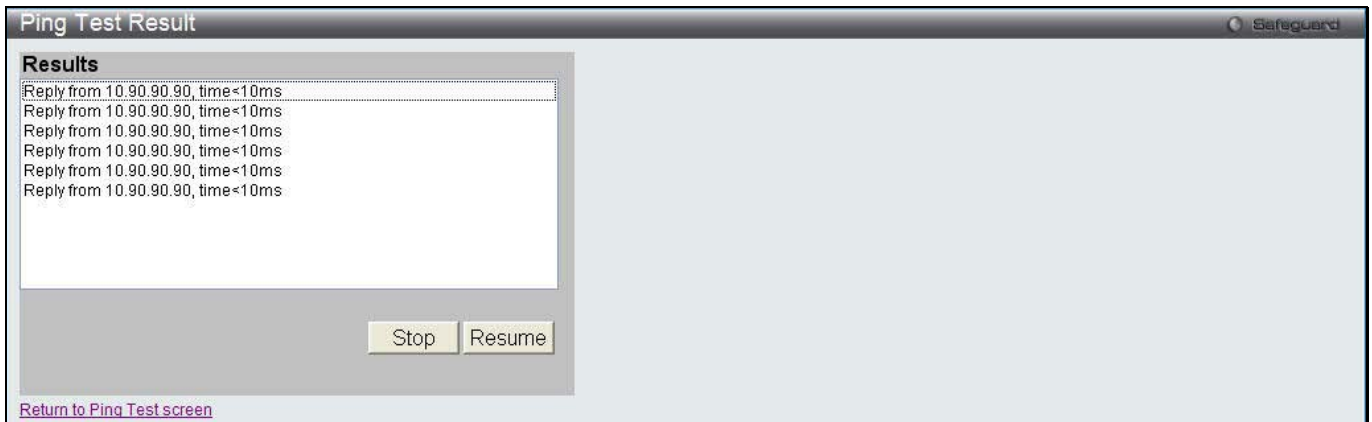


Figure 14-24 Ping Test Result window

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 14-25 Trace Route window

The fields that can be configured are described below:

Parameter	Description
IPv4 Address	IP address of the destination station.
IPv6 Address	IPv6 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:

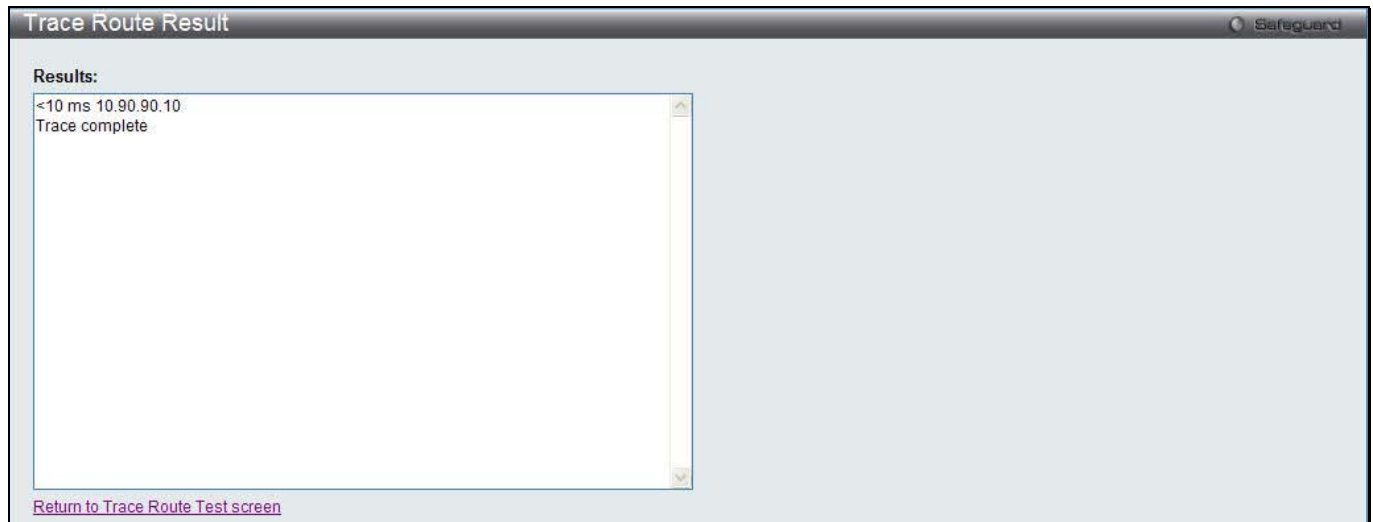


Figure 14-26 Trace Route Result window

Click the **Stop** button to halt the Trace Route.

Click the **Resume** button to resume the Trace Route.

Peripheral

Device Environment

The device environment feature displays the Switch internal temperature status.

To view this window, click **Monitoring > Peripheral > Device Environment** as shown below:

Items	Data
Internal Power	Active
External Power	Fail
Right Fan 1	Speed Low (3000 RPM)
Right Fan 2	Speed Low (3000 RPM)
Right Fan 3	Speed Low (3000 RPM)
Right Fan 4	Speed Low (3000 RPM)
Current Temperature(celsius)	29
Fan High Temperature Threshold (celsius)	40
Fan Low Temperature Threshold (celsius)	35
High Warning Temperature Threshold (celsius)	79
Low Warning Temperature Threshold (celsius)	11

Figure 14-27 Device Environment window

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

Chapter 11 Save and Tools

Section 3 WLAN

This section describes all the available configurations in the WLAN tab.

Chapter 1 Security

Captive Portal (CP)

Captive Portal (CP)

Captive Portal (CP) is the feature that controls the accessibility of both wired and wireless users to the network. The verification can be configured to allow access for guests and authenticated users in this section.



NOTE: The Captive Portal (CP) folder is also accessible from the LAN tab in the navigation window. Any configuration within this folder will be exactly the same as the Captive Portal (CP) folder in the LAN tab.

Global Configuration

This window is used to globally configure the CP settings.

To view this window, click **Security > Captive Portal (CP) > Global Configuration** as shown below:

Figure 1-1 Global Configuration window

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

Parameter	Description
CP Global State	Click the radio buttons to enable or disable the CP global state.
CP Global Operational Status	Display the status of the CP operational status.
CP Global Disable Reason	When captive portal is disabled, the field displays the reason being disabled. Available reasons are: <i>Administrator Disabled</i> , <i>IP Address Not Configured</i> , <i>No IP Routing Interface</i> and <i>Routing Disabled</i> .
Additional HTTP Port (0-65535)	Enter the additional HTTP port number between 0 and 65535, except 80 and 443. 80 is reserved for HTTP default port, and 443 is reserved for HTTPS default port. The default value is 0 which represents that no additional port is used, and the default port (80) is used.
Additional HTTP Secure Port (0-65535)	Enter the additional HTTPS port number between 0 and 65535, except 80 and 443. 80 is reserved for HTTP default port, and 443 is reserved for HTTPS default port. The default value is 0 which represents that no additional port is used, and the default port (443) is used.

Peer Switch Statistics Reporting Interval (15-3600)	When clustering is supported on the switch, enter an interval that the peer switches send its authenticated client statistics to the Cluster Controller periodically. The reporting interval is in the range of 0, 15-3600 seconds. The value 0 means the function is disabled. The default value is 120.
Authentication Timeout (60-600)	Enter a time for authentication. If a CP user does not enter valid credentials within the time, the authentication page needs to be served again in order for the client to gain access to the network. The value is between 60 and 600 seconds.

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

CP Configuration

This window is used to create CP configuration.

To view this window, click **Security > Captive Portal (CP) > CP Configuration** as shown below:

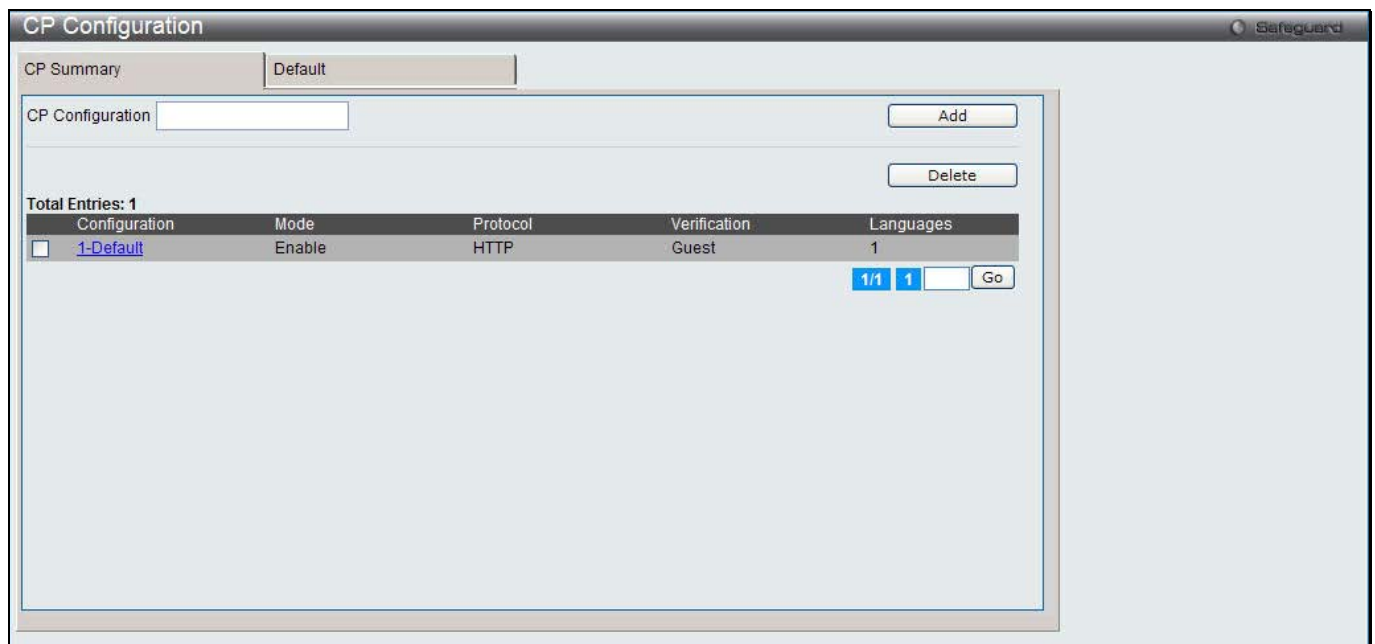


Figure 1-2 CP configuration - CP Summary window

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

Parameter	Description
CP Configuration	Enter a name of CP configuration.
Configuration	Display the captive portal ID and name.
Mode	Display whether the CP is enabled.
Protocol	Display whether the portal uses HTTP or HTTPS.
Verification	Display which type of user verification to perform. <ul style="list-style-type: none"> <i>Guest</i> - The user does not need to be authenticated by a database. <i>Local</i> - The switch uses a local database to authenticated users. <i>RADIUS</i> - The switch uses a database on a remote RADIUS server to authenticate users.
Languages	Display the number of languages that are configured for this captive portal.

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

Tick the check box of the specific entry, and 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.

Click the link under Configuration in the table, or the tab to configure the detail information about CP configuration.

After clicking the link or the tab, the following page will appear:

The screenshot shows the 'CP Configuration' window with the following fields and options:

- Enable Captive Portal:** Radio buttons for Enabled (selected) and Disabled.
- Configuration Name:** Text field containing 'Default'.
- Protocol Mode:** Radio buttons for HTTP (selected) and HTTPS.
- Verification Mode:** Radio buttons for Guest (selected), Local, and RADIUS.
- User Logout Mode:** Radio buttons for Enabled and Disabled (selected).
- Redirect Mode:** Radio buttons for Enabled and Disabled (selected).
- Redirect URL:** Empty text field.
- User Group:** Dropdown menu showing '1-Default' and buttons for Add, Delete, and Modify.
- Timeouts and Rates:** Input fields for Idle Timeout (0-900 secs), Session Timeout (0-86400 secs), Max Up Rate (bytes/sec), Max Down Rate (bytes/sec), Max Receive (bytes), Max Transmit (bytes), and Max Total (bytes), all currently set to 0.
- Language Table:**

Code	Language	...	Clear
en	(English)	...	Clear
		...	Clear
		...	Clear

Figure 1-3 CP Configuration - Edit window

The fields that can be configured are described below:

Parameter	Description
Enable Captive Portal	Click the radio buttons to enable or disable the CP configuration.
Configuration Name	Enter to modify the configuration name.
Protocol Mode	Click the radio buttons to use HTTP or HTTPS as the protocol that CP configuration is used during verification process.
Verification Mode	Click the radio buttons to select the verification mode for the CP to verify clients. <ul style="list-style-type: none"> <i>Guest</i> – The user does not need to be authenticated by a database. <i>Local</i> – The Switch uses a local database to authenticate users. <i>RADIUS</i> – The Switch uses a database on a remote RADIUS server to authenticate users.
User Logout Mode	Click the radio buttons to enable or disable the ability for an authenticated user to de-authenticate from the network.
Redirect Mode	Click the radio buttons to enable or disable the redirect mode for a CP configuration.
Redirect URL	When the Redirect Mode is enabled, enter the URL to which the newly authenticated client is redirected.
Idle Time	Enter the idle time in seconds to allow a user remain idle before automatically being logged out. The value 0 indicates that the timeout is not enforced. The default value is 0.
Session Timeout	Enter the waiting time in seconds before terminating a session. A user is logged out once the session timeout is reached. The value 0 indicates that the timeout is not enforced.
Max Up Rate	Enter the maximum rate, in bytes per second, that a client can transmit data into the network when using the captive portal. The rate is between 0 and 536870911.
Max Down Rate	Enter the maximum rate, in bytes per second, that a client can receive data from the network when using the captive portal. The rate is between 0 and 536870911.
Max Receive	Enter the maximum number of bytes that a client is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.

Max Transmit	Enter the maximum number of bytes that a client is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.
Max Total	Enter the maximum sum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.
User Group	<p>When <i>Local</i> or <i>RADIUS</i> is selected in Verification Mode, a user group needs to be assigned. All users who belong to the group are permitted to access the network through this portal. You may create, delete, or change user groups for all captive portals.</p> <ul style="list-style-type: none"> To assign an existing user group to the CP, select the user group from the drop-down menu. To create a new user group, enter the name in the field and click the Add button. To change the name of an existing user group, select the user group from the drop-down menu, enter the new name in the field and click the Modify button.
Code	Enter the IANA Language Subtag code for the language. All codes are listed in the IANA Language Subtag Registry . If the language is supported by the Switch, this field is filled in automatically when selecting the language.
Language	Click the ... button to select the language to use for CP. Click the Clear button to remove the language from the list.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the language tab to customize the CP web pages. For example, to customize the English version of the captive portal page looks, click the **(English)** tab. The web page shows when a wireless client connects to the access point.

Use the drop-down menu to customize different web pages for the CP web. Select *Global Parameters* from the drop-down menu on the top of the page to see the following page:

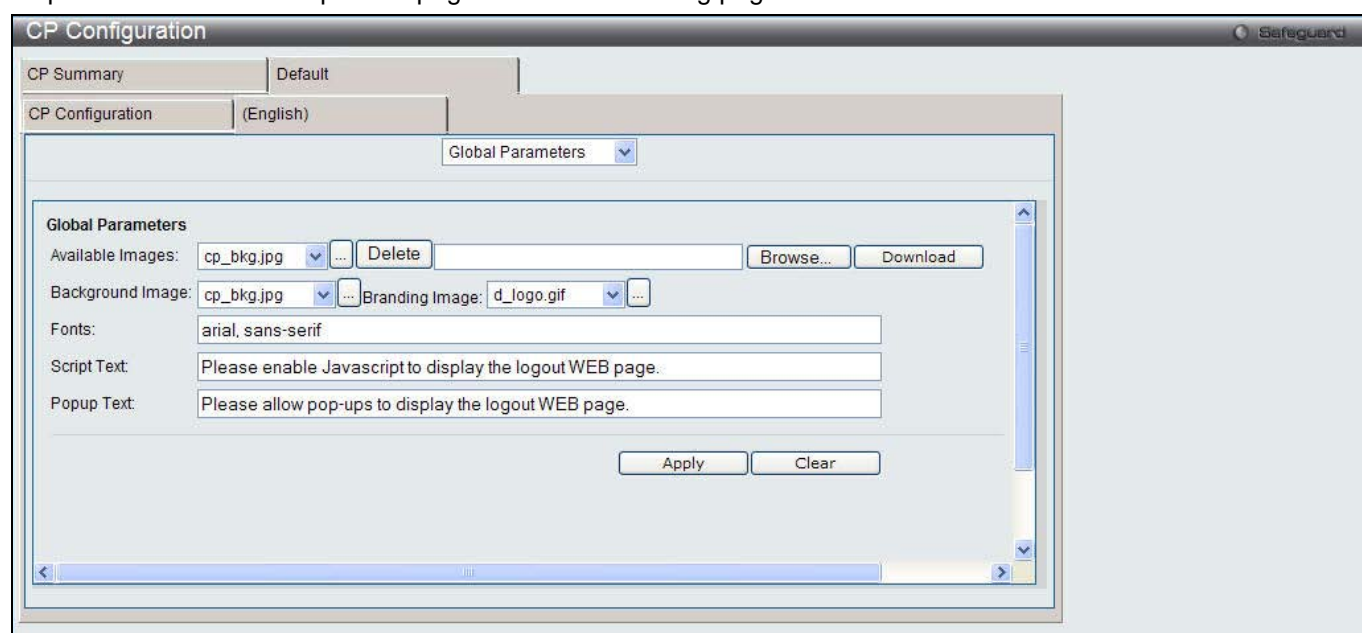


Figure 1-4 CP Configuration – Customize window (Global Parameters)

The fields that can be configured are described below:

Parameter	Description
Available Images	The drop-down menu shows the images that are available to use for the page background, branding and the account image. Click the ... button to view the images. To add a new image, click the Browse button to select the image on the local system, and click the Download to download the image to the Switch. To remove an image from the list, select the file name from the drop-down menu and click the Delete

	button. You can only delete images that you download.
Background Image	Use the drop-down menu to select the name of the image to display as the page background. Alternatively, click the ... button to display the available images. Click the image to select it. To specify that no background image is to be used, select <i>(No Selection)</i> from the drop-down menu.
Branding Image	Use the drop-down menu to select the name of the image file to display on the top left corner of the page. This image is used for branding purposes, such as the company logo. Alternatively, Click the ... button to display the available images. Click the image to select it. To specify that no branding image is to be used, select <i>(No Selection)</i> from the drop-down menu.
Fonts	Enter the name of the font that is used for the CP web pages.
Script Text	Enter the information to indicate that users must enable JavaScript to display the logout web page. This field is only applicable when the User Logout Mode is enabled.
Popup Text	Enter the information to indicate that users must allow pop-up windows to display the logout web page. This field is only applicable when the User Logout Mode is enabled.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Select *Authentication Page* from the drop-down menu on the top of the page to see the following page:

Figure 1-5 CP Configuration – Customize window (Authentication Page)

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

Parameter	Description
Background Image	Display the name of the current background image on the Authentication Page.
Branding Image	Display the name of the current branding image on the Authentication Page.
Browser Title	Enter the text to display on the client's web browser title bar or tab.
Page Title	Enter the text to use as the page title.
Colors	Specify the colors of different areas on the CP page. Enter the color codes in the fields or click the ... button to select a color.
Account Image	Use the drop-down menu to select an image to display on the CP web page above the login field. Alternatively, click the ... button to display the available images. Click the image to select it.
Account Title	Enter the text to instruct users to authenticate.

User Label	Enter the text to display next to the user name text box.
Password Label	Enter the text to display next to the password text box.
Button Label	Enter the text to display on the button for users to click and connect to the network.
Acceptance Use Policy Text Box	Enter the text to display in the Acceptance Use Policy text box. The acceptance use policy instructs users about the conditions under which they are allowed to access the network.
Acceptance Use Policy Check Box	Enter the text to display next to the check box to indicate that the user has to accept the terms of use.
Instructional Text	Enter the detailed information to instruct users to authenticate. This text appears under the button.
Denied message	Enter the message to display when the user does not provide valid authentication information.
Resource Message	Enter the message to display when the system has rejected authentication due to system resource limitations.
Timeout Message	Enter the message to display when the system has rejected authentication because the authentication transaction took too long.
Busy Message	Enter the message to display when the CP is processing the authentication request.
No Accept Message	Enter the message to display when the user did not tick the Acceptance Use Policy check box.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Welcome Page* from the drop-down menu on the top of the page to see the following page:

The screenshot shows the 'CP Configuration' web interface. At the top, there are tabs for 'CP Summary' and 'Default'. Below that, there are tabs for 'CP Configuration' and '(English)'. A dropdown menu is set to 'Welcome Page'. The main configuration area is titled 'Welcome Page' and contains four input fields: 'Branding Image' with the value 'd_logo.gif', 'Browser Title' with the value 'Captive Portal', 'Title' with the value 'Congratulations!', and 'Text' with the value 'You are now authorized and connected to the network.'. At the bottom of the configuration area, there are three buttons: 'Apply', 'Clear', and 'Preview'.

Figure 1-6 CP Configuration – Customize window (Welcome Page)

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

Parameter	Description
Branding Image	Display the name of the current branding image on the Welcome Page.
Browser Title	Display the text to display on the client's web browser title bar or tab.
Title	Enter the title to greet the user after successfully connecting to the network.

Text	Enter the optional text to further identify the network to be access by the CP user.
-------------	--

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Logout Page* from the drop-down menu on the top of the page to see the following page:

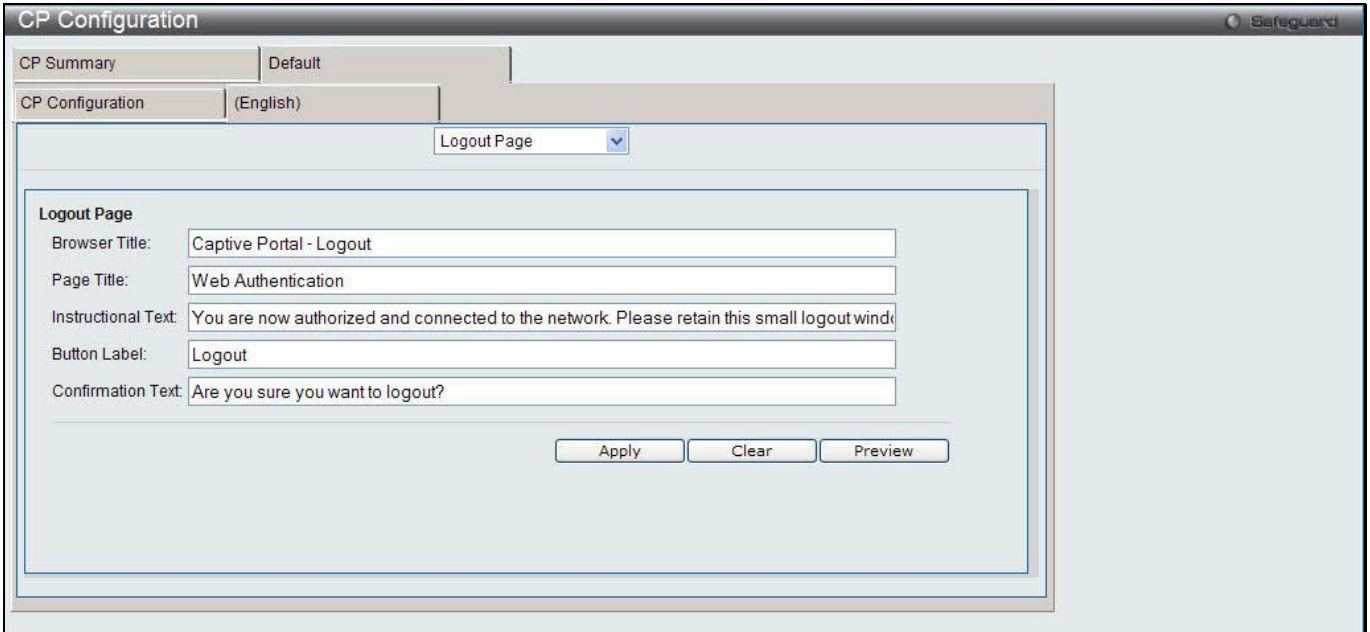


Figure 1-7 CP Configuration – Customize window (Logout Page)

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

Parameter	Description
Browser Title	Enter the text to display on the title bar of the Logout page.
Page Title	Enter the text to use as the page title.
Instruction Text	Enter the detailed information to confirm that the user has been authenticated and instructs the user how to de-authenticate.
Button Label	Enter the text to display on the button to de-authenticate.
Confirmation Text	Enter the message to confirm the de-authentication process.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Select *Logout Success Page* from the drop-down menu on the top of the page to see the following page:

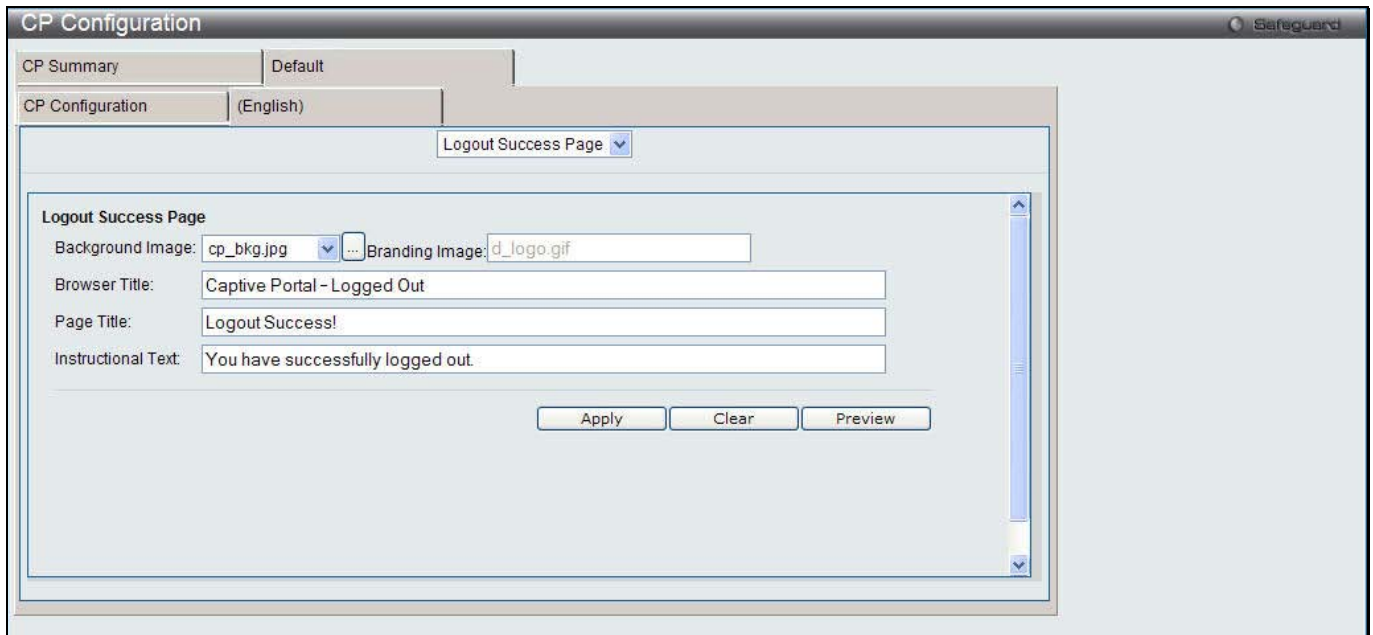


Figure 1-8 CP Configuration – Customize window (Logout Success Page)

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

Parameter	Description
Background Image	Display the name of the current background image on the Logout Success Page.
Branding Image	Display the name of the current branding image on the Logout Success Page.
Browser Title	Enter the text to display on the title bar of the Logout Success page.
Page Title	Enter the text to use as the page title.
Instructional Text	Enter the message to confirm that the user has been de-authenticated.

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

Click the **Clear** button to wipe all the configurations and set back to the default settings.

Click the **Preview** button to view the result of the web page.

Local User

This window is used to create, modify or delete authorized users to the local database.

To view this window, click **Security > Captive Portal (CP) > Local User** as shown below:

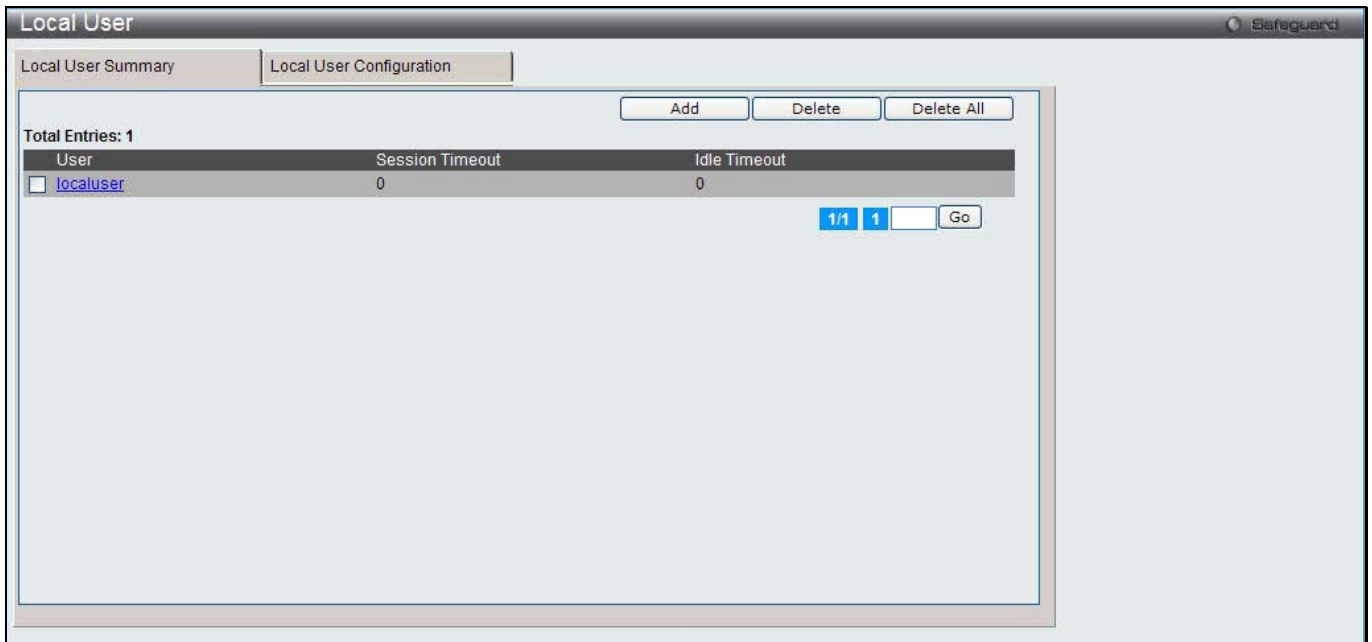


Figure 1-9 Local User - Summary window

Click the **Add** button to create a new user to the local database.

Tick the corresponding check box, and click the **Delete** button to remove the specific entry.

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

Click the specific User hyperlink to modify the information.

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

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

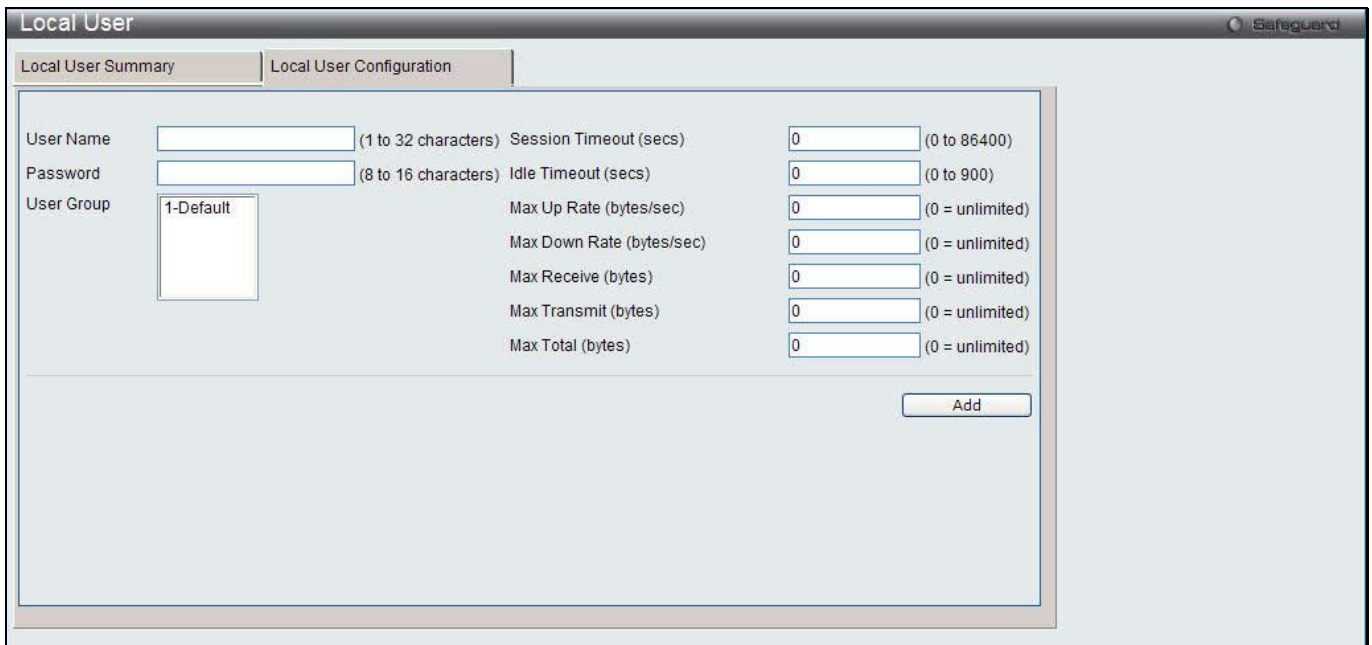


Figure 1-10 Local User - Configuration window (Add)

The fields that can be configured are described below:

Parameter	Description
User Name	Enter the name of the user.
Password	Enter a password for the user.

User Group	Assign the user to at least one User Group. To assign the user to more than one group, press the Ctrl key and click each group.
Session Timeout (secs)	Enter the time in seconds that allows the user to remain connected to the network. Once the Session Timeout value is reached, the user is logged out automatically.
Idle Timeout (secs)	Enter the time in seconds that allows the user to remain idle before the Switch automatically logs the user out.
Max Up Rate (bytes/sec)	Enter the maximum transmitting speed, in bytes per second, when using the captive portal.
Max Down Rate (bytes/sec)	Enter the maximum receiving speed, in bytes per second, when using the captive portal.
Max Receive (bytes)	Enter the maximum number of bytes that the user is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.
Max Transmit (bytes)	Enter the maximum number of bytes that the user is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.
Max Total (bytes)	Enter the maximum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.

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

After clicking the specific User hyperlink, the following page will appear:

The screenshot shows the 'Local User Configuration' window with the following fields and values:

Field	Value	Range/Options
User Name	localuser	
Password	••••••	(8 to 16 characters)
User Group	1-Default	
Session Timeout (secs)	0	(0 to 86400)
Idle Timeout (secs)	0	(0 to 900)
Max Up Rate (bytes/sec)	0	(0 = unlimited)
Max Down Rate (bytes/sec)	0	(0 = unlimited)
Max Receive (bytes)	0	(0 = unlimited)
Max Transmit (bytes)	0	(0 = unlimited)
Max Total (bytes)	0	(0 = unlimited)

Buttons: Apply, Delete

Figure 1-11 Local User - Configuration window (Edit)

The fields that can be configured are described below:

Parameter	Description
Password	Enter a password for the user.
User Group	Assign the user to at least one User Group. To assign the user to more than one group, press the Ctrl key and click each group.
Session Timeout (secs)	Enter the time in seconds that allows the user to remain connected to the network. Once the Session Timeout value is reached, the user is logged out automatically.
Idle Timeout (secs)	Enter the time in seconds that allows the user to remain idle before the Switch automatically logs the user out.
Max Up Rate	Enter the maximum transmitting speed, in bytes per second, when using the captive

(bytes/sec)	portal.
Max Down Rate (bytes/sec)	Enter the maximum receiving speed, in bytes per second, when using the captive portal.
Max Receive (bytes)	Enter the maximum number of bytes that the user is allowed to receive when using the captive portal. After this limit has been reached the user will be disconnected.
Max Transmit (bytes)	Enter the maximum number of bytes that the user is allowed to transmit when using the captive portal. After this limit has been reached the user will be disconnected.
Max Total (bytes)	Enter the maximum number of bytes the user is allowed to transmit and receive. After this limit has been reached the user will be disconnected.

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

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

Interface Association

This window is used to associate a configured CP with interfaces. Interfaces could be physical ports or wireless networks (SSID).

To view this window, click **Security > Captive Portal (CP) > Interface Association** as shown below:



Figure 1-12 Interface Association window

The fields that can be configured are described below:

Parameter	Description
CP Configuration	Use the drop-down menu to select a CP to configure.
Associated Interfaces	Display all the interfaces associated with the CP. To select more than one interface, press the Ctrl key and click each interface.
Interface List	Display all the interfaces that is available to choose. To select more than one interface, press the Ctrl key and click each interface.

Click the **Delete** button to remove the selected interface(s) from the Associated Interfaces box.

Click the **Add** button to add the selected interface(s) in the Interface List box to the Associated Interfaces box.

CP Status

This window is used to display the CP status.

To view this window, click **Security > Captive Portal (CP) > CP Status** as shown below:

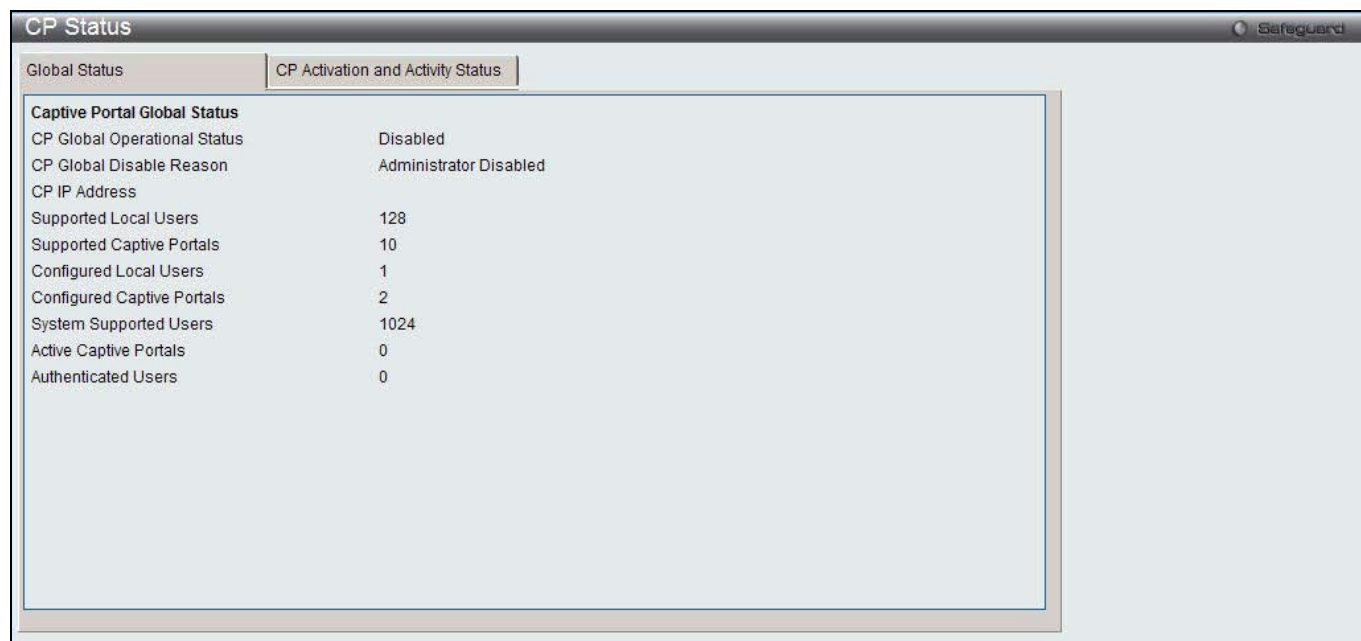


Figure 1-13 CP Global Status window

The fields that can be displayed are described below:

Parameter	Description
CP Global Operational Status	Display the status of the CP operational status.
CP Global Disable Reason	When captive portal is disabled, the field displays the reason being disabled. Available reasons are: <i>Administrator Disabled, IP Address Not Configured, No IP Routing Interface and Routing Disabled.</i>
CP IP Address	Display the captive portal IP address.
Supported Local Users	Display the number of entries that the Local User database supports.
Supported Captive Portals	Display the number of supported captive portals in the system.
Configured Local Users	Display the number of users configured in the system.
Configured Captive Portals	Display the number of captive portals configured on the Switch.
System Supported Users	Display the number of authenticated users that the system can support.
Active Captive Portals	Display the number of captive portal instances that are operationally enabled.
Authenticated Users	Display the number of users currently authenticated to all captive portal instances on the Switch.

After clicking the **CP Activation and Activity Status** tab, the following page will appear:

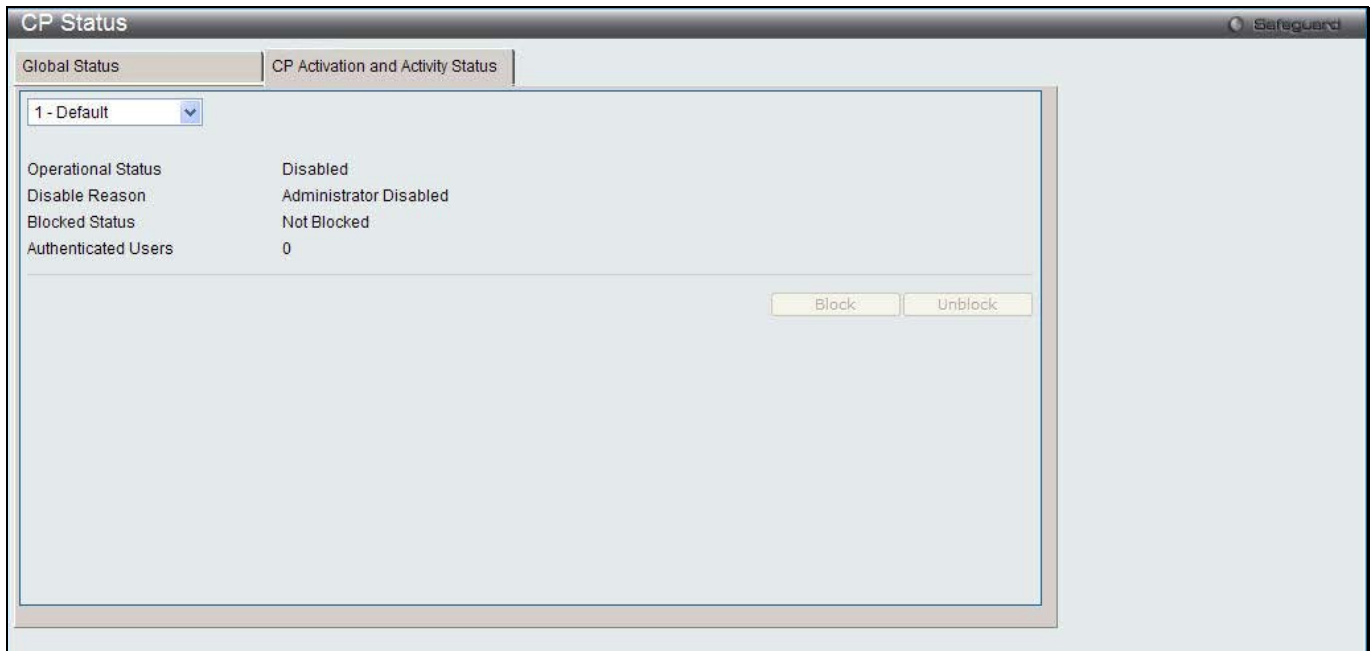


Figure 1-14 CP Activation and Activity Status window

Use the drop-down menu to select a CP to see its activation and activity status. Click **Block** to prevent users from gaining access to the network through the selected captive portal. If the Blocked Status of the selected captive portal is **Blocked**, click **Unblock** to allow access to the network through the captive portal.

Interface Status

This window is used to display the CP interface status.

To view this window, click **Security > Captive Portal (CP) > Interface Status** as shown below:

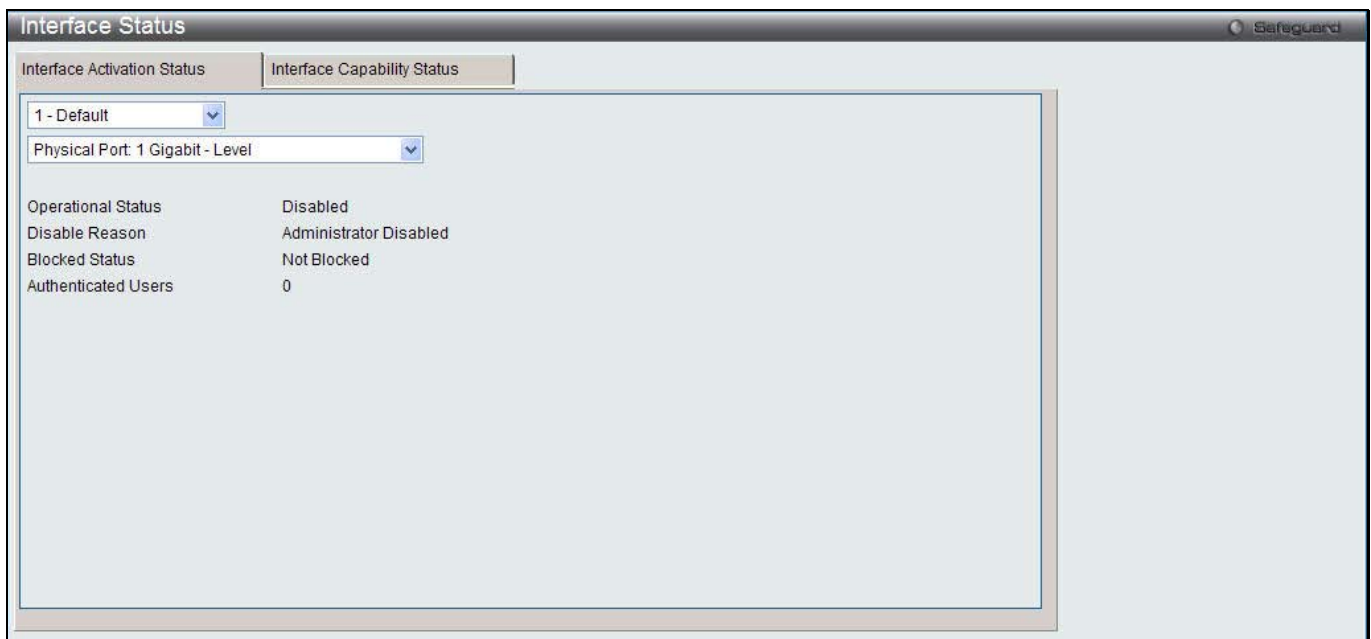


Figure 1-15 Interface Activation Status window

Use the first drop-down menu to select the portal, and the second drop-down menu to select an interface for to view information.

After clicking the **Interface Capability Status** tab, the following page will appear:

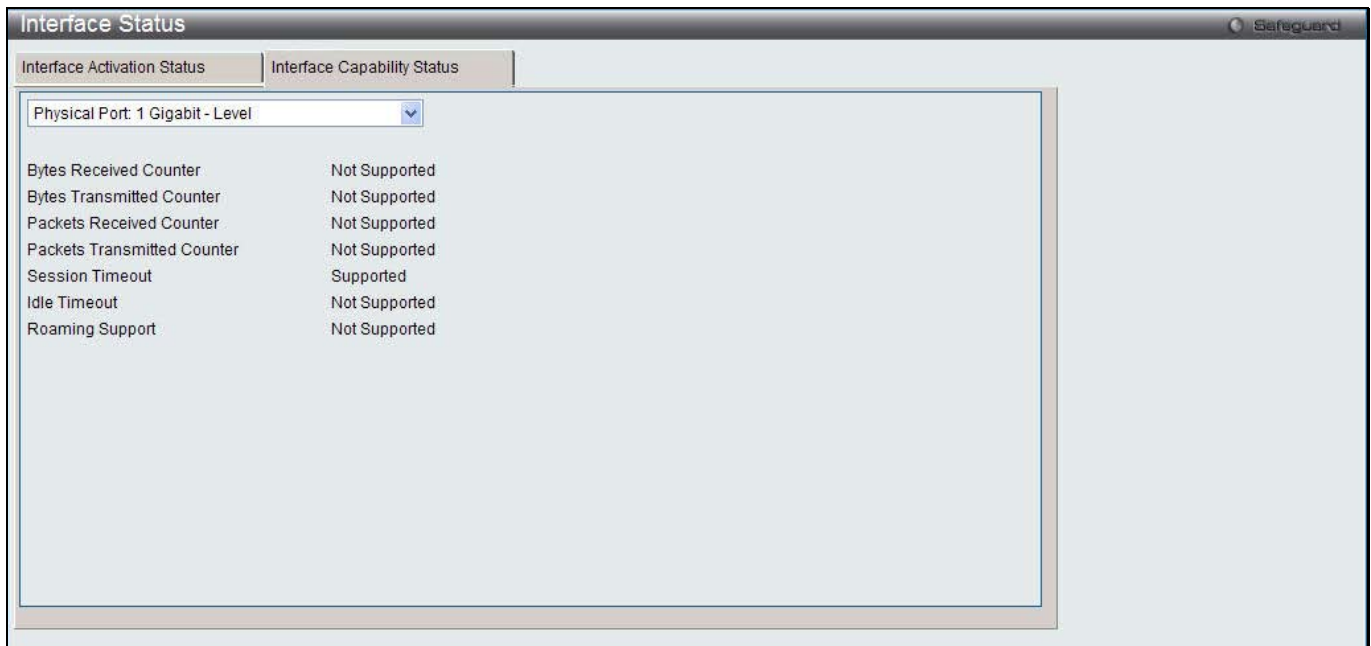


Figure 1-16 Interface Capability Status window

The fields that can be displayed are described below:

Parameter	Description
Bytes Received Counter	Display whether the interface supports displaying the number of bytes received from each client.
Bytes Transmitted Counter	Display whether the interface supports displaying the number of bytes transmitted to each client.
Packets Received Counter	Display whether the interface supports displaying the number of packets received from each client.
Packets Transmitted Counter	Display whether the interface supports displaying the number of packets transmitted to each client.
Session Timeout	Display whether the interface supports client session timeout. This attribute is supported on all interfaces.
Idle Timeout	Display whether the interface supports a timeout when the user does not send or receive any traffic.
Roaming Support	Display whether the interface supports client roaming. Only wireless interfaces support client roaming.

Use the drop-down menu to select an interface to see the detail status.

Client Connection Status

This window is used to display the detail information about the clients that connection to the Switch through CP. To view this window, click **Security > Captive Portal (CP) > Client Connection Status** as shown below:

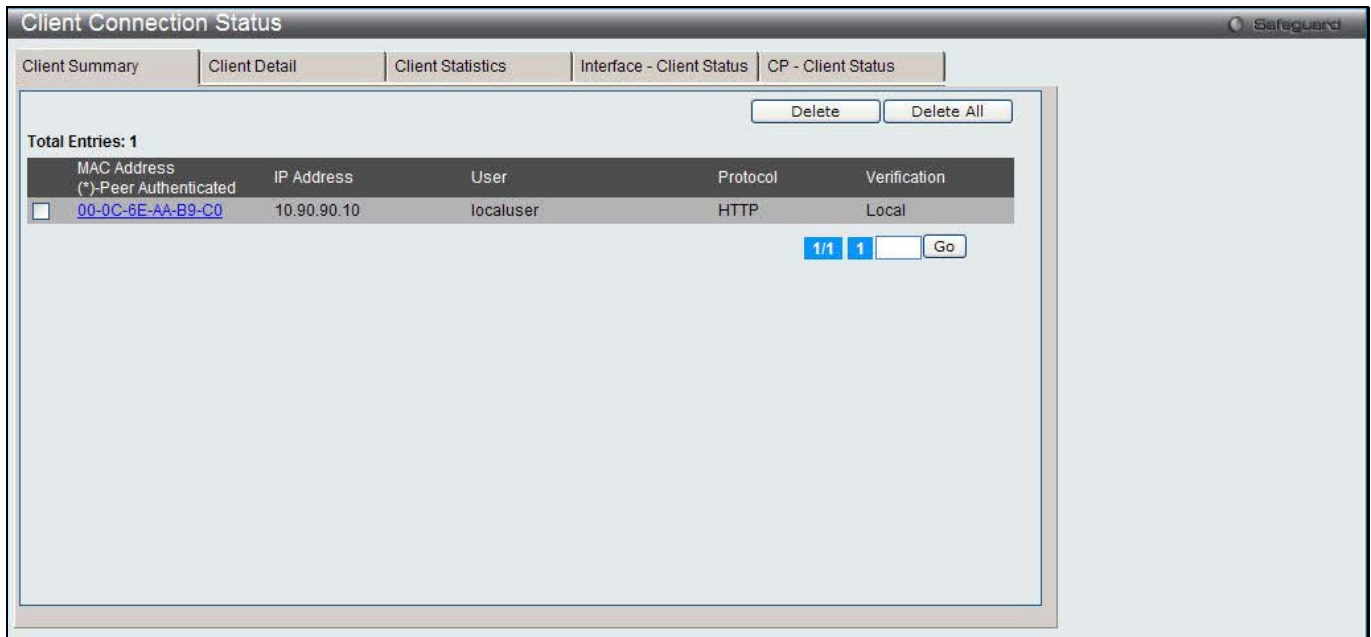


Figure 1-17 Client Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	Display the MAC address of the wireless client (if applicable). If the MAC address is marked with an asterisk (*), the authenticated client is authenticated by a peer switch. In other words, the cluster controller was not the authenticator.
IP Address	Display the IP address of the wireless client (if applicable).
User	Display the user name (or Guest ID) of the connected client.
Protocol	Display the current connection protocol, which is either <i>HTTP</i> or <i>HTTPS</i> .
Verification	Display the current account type, which is <i>Guest</i> , <i>Local</i> , or <i>RADIUS</i> .

To force the captive portal to disconnect an authenticated client, select the corresponding check box next to the client MAC address and click **Delete**.

To disconnect all clients from all captive portals, click **Delete All**.

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

After clicking the **Client Detail** tab, the following page will appear:

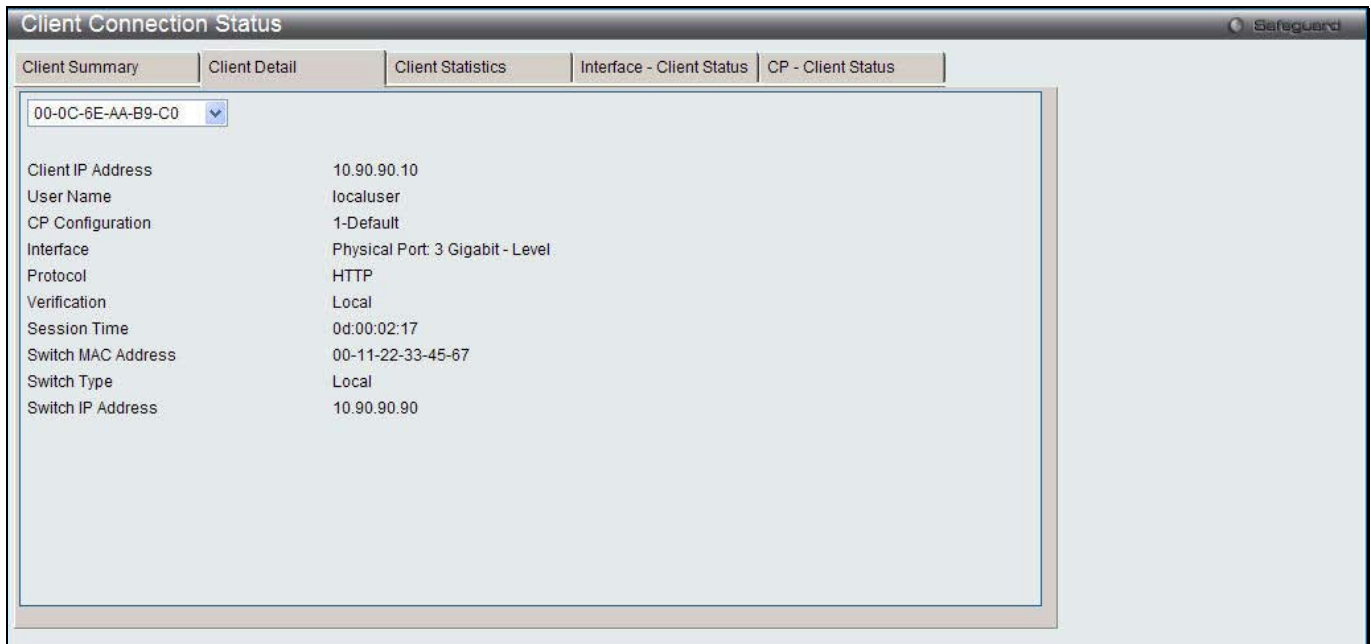


Figure 1-18 Client Connection Status window

The fields that can be displayed are described below:

Parameter	Description
Client IP Address	Display the IP address of the wireless client (if applicable).
User Name	Display the user name (or Guest ID) of the connected client.
CP Configuration	Display the CP configuration the wireless client is using.
Interface	Display the interface the wireless client is using.
Protocol	Display the current connection protocol, which is either <i>HTTP</i> or <i>HTTPS</i> .
Verification	Display the current account type, which is <i>Guest</i> , <i>Local</i> , or <i>RADIUS</i> .
Session Time	Display the amount of time that has passed since the client was authorized.
Switch MAC Address	Display the MAC address of the switch handling authentication for this client. If clustering is supported, this field might display the MAC address of a peer switch in the cluster.
Switch Type	Display whether the switch handling authentication for this client is the local switch or a peer switch in the cluster.
Switch IP Address	Display the IP address of the switch handling authentication for this client. If clustering is supported, this field might display the IP address of a peer switch in the cluster.

Use the drop-down menu to select the MAC address of the associated client to view the detail information.

After clicking the **Client Statistics** tab, the following page will appear:

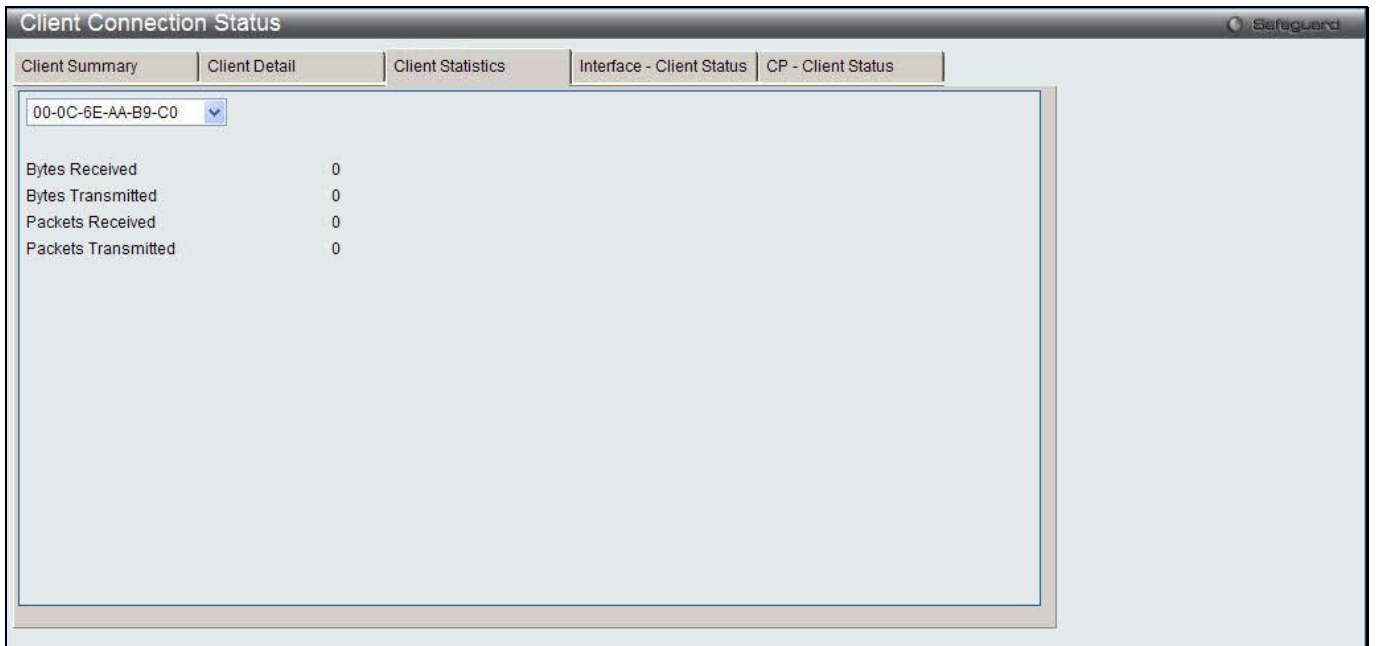


Figure 1-19 Client Statistics window

Use the drop-down menu to select the MAC address of the associated client to view the statistical information.

After clicking the **Interface - Client Status** tab, the following page will appear:

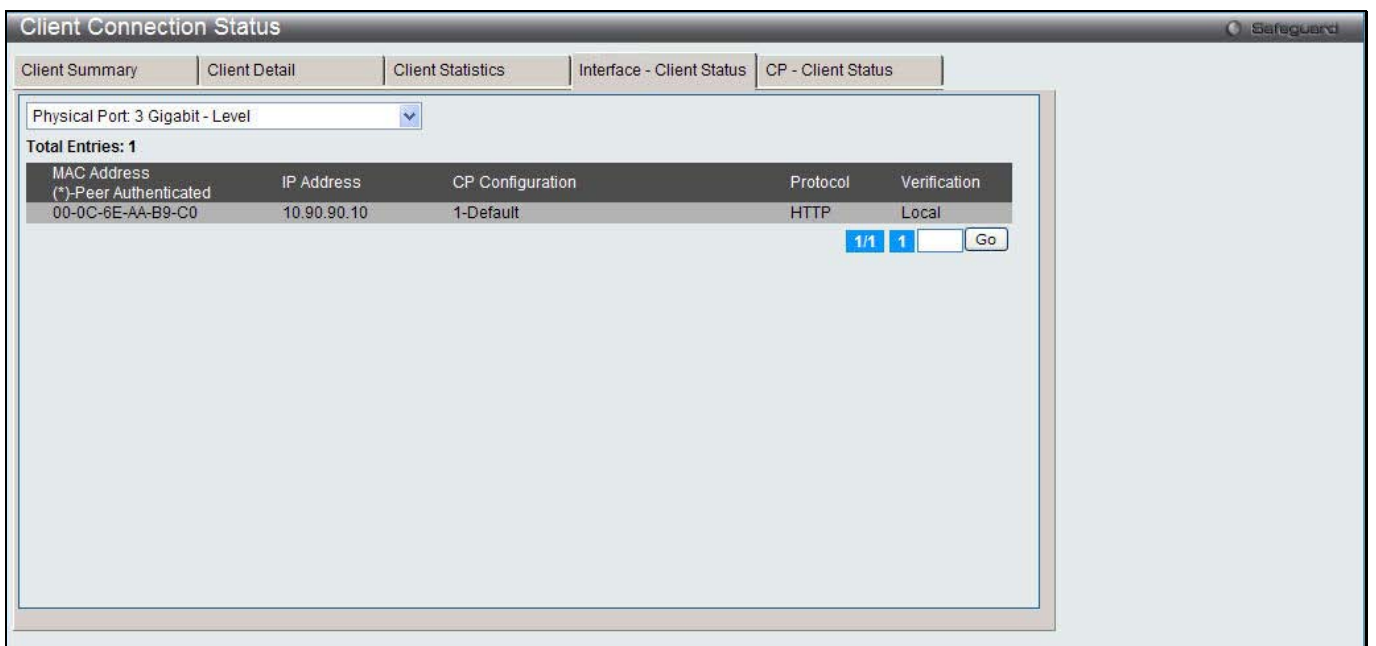


Figure 1-20 Interface - Client Status window

Use the drop-down menu to select an interface to see the information about the clients connected to a CP on this interface.

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

After clicking the **CP - Client Status** tab, the following page will appear:

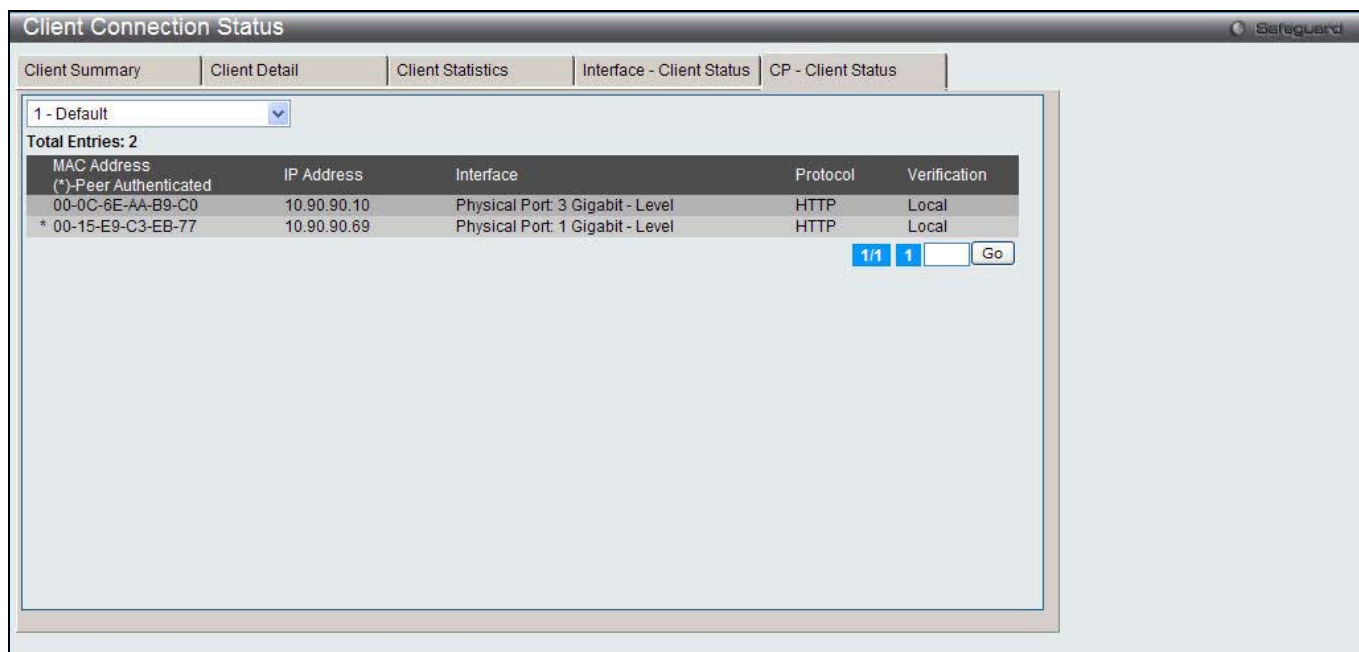


Figure 1-21 CP-Client Status window

Use the drop-down menu to select a CP to see the information of the clients connected to the CP. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

SNMP Trap Configuration

This window is used to configure whether or not SNMP traps are sent from the Captive Portal and to specify captive portal events that will generate a trap.

To view this window, click **Security > Captive Portal (CP) > SNMP Trap Configuration** as shown below:



Figure 1-22 SNMP Trap Configuration window

The fields that can be configured are described below:

Parameter	Description
Client Authentication Failure Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client attempts to authenticate with a captive portal but is unsuccessful.
Client Connection Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client authenticates with and connects to a captive portal.
Client Database Full Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap each time an entry cannot be added to the client database because it is full.
Client Disconnection Traps	Use the drop-down menu to enable or disable the SNMP agent sending a trap when a client disconnects from a captive portal.

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

Chapter 2 Monitoring

Global
Peer Switch
Access Point
Client
QoS

Global

The Unified Switch periodically collects information from the APs it manages and from associated peer switches. This window is used to show status and statistics about the switch and all of the objects associated with it.

To view this window, click **Monitoring > Global** as shown below:

Global		Switch Status	IP Discovery	Configuration Received	AP Hardware Capability
WLAN Switch Operational Status	Enabled	IP Address	10.90.90.90		
Module Version	4.0.0.1	Peer Switches	1		
Cluster Controller	Yes	Cluster Controller IP Address	10.90.90.90		
Total Access Points	2	Managed Access Points	2		
Standalone Access Points	0	Rogue Access Points	0		
Discovered Access Points	0	Connection Failed Access Points	0		
Authentication Failed Access Points	0	Unknown Access Points	22		
Rogue AP Mitigation Limit	16	Rogue AP Mitigation Count	0		
Maximum Managed APs in Peer Group	48	WLAN Utilization	4%		
Total Clients	0	Authenticated Clients	0		
802.11a Clients	0	802.11b/g Clients	0		
802.11n Clients	0	Maximum Associated Clients	2048		
Detected Clients	26	Maximum Detected Clients	4096		
Maximum Pre-authentication History Entries	500	Total Pre-authentication History Entries	0		
Maximum Roam History Entries	500	Total Roam History Entries	0		
AP Provisioning Count	2	Maximum AP Provisioning Entries	96		

Figure 2-1 Global window

The fields that can be displayed are described below:

Parameter	Description
WLAN Switch Operational Status	This status field displays the operational status of the WLAN Switch. The WLAN Switch may be configured as enabled, but is operationally disabled due to configuration dependencies. If the operational status is disabled, the reason will be displayed in the following status field. The WLAN Switch is composed of multiple components, and each component in the system must acknowledge an enable or disable of the WLAN Switch. During a transition the operational status might temporarily show a pending status.
IP Address	IP address of the switch.
Module Version	Display WLAN version.
Peer Switches	Number of peer WLAN switches detected on the network.
Cluster Controller	Indicate whether this switch is the Cluster Controller for the cluster. Among a group of peer switches, one of the switches is automatically elected or configured to be the Cluster Controller. The Cluster Controller gathers status and statistics about all APs and clients in the peer group. NOTE: Only the Cluster Controller switch can display managed APs, clients, statistics, and RF Scan databases for the whole cluster. The switches that

	are not Cluster Controllers can display information only about locally attached devices.
Cluster Controller IP Address	The IP address of the peer switch that is the Cluster Controller.
Total Access Points	Total number of Managed APs in the database. This value is always equal to the sum of Managed Access Points, Connection Failed Access Points, and Discovered Access Points.
Managed Access Points	Number of APs in the managed AP database that are authenticated, configured, and have an active connection with the Unified Switch.
Standalone Access Points	Number of trusted APs in Standalone mode. APs in Standalone mode are not managed by a switch.
Rogue Access Points	Number of Rogue APs currently detected on the WLAN. When an AP performs an RF scan, it might detect access points that have not been validated. It reports these APs as rogues.
Discovered Access Points	APs that have a connection with the switch, but haven't been completely configured. This value includes all managed APs with a Discovered or Authenticated status.
Connection Failed Access Points	Number of APs that were previously authenticated and managed, but currently don't have connection with the Unified Switch.
Authentication Failed Access Points	Number of APs that failed to establish communication with the Unified Switch.
Unknown Access Points	Number of Unknown APs currently detected on the WLAN. If an AP configured to be managed by the Unified Switch is detected through an RF scan at any time that it is not actively managed it is classified as an Unknown AP.
Rogue AP Mitigation Limit	Maximum number of APs for which the system can send de-authentication frames.
Rogue AP Mitigation Count	Number of APs to which the wireless system is currently sending de-authentication messages to mitigate against rogue APs. A value of 0 indicates that mitigation is not in progress.
Maximum Managed APs in Peer Group	Maximum number of access points that can be managed by the cluster.
WLAN Utilization	Total network utilization across all APs managed by this switch. This is based on global statistics.
Total Clients	Total number of clients in the database. This total includes clients with an Associated, Authenticated, or Disassociated status.
Authenticated Clients	Total number of clients in the associated client database with an Authenticated status.
802.11a Clients	Total number of IEEE 802.11a only clients that are authenticated.
802.11b/g Clients	Total number of IEEE 802.11b/g only clients that are authenticated.
802.11n Clients	Total number of clients that are IEEE 802.11n capable and are authenticated. These include IEEE 802.11a/n, IEEE 802.11b/g/n, 5 GHz IEEE 802.11n, 2.4GHz IEEE 802.11n.
Maximum Associated Clients	Maximum number of clients that can associate with the wireless system. This is the maximum number of entries allowed in the Associated Client database.
Detected Clients	Number of wireless clients detected in the WLAN.
Maximum Detected Clients	Maximum number of clients that can be detected by the switch. The number is limited by the size of the Detected Client Database.
Maximum Pre-authentication History Entries	Maximum number of Client Pre-Authentication events that can be recorded by the system.

Total Pre-authentication History Entries	Current number of pre-authentication history entries in use by the system.
Maximum Roam History Entries	Maximum number of entries that can be recorded in the roam history for all detected clients.
Total Roam History Entries	Current number of roam history entries in use by the system.
AP Provisioning Count	Current number of AP provisioning entries configured on the system.
Maximum AP Provisioning Entries	Number of AP provisioning entries that can be stored by the system.
WLAN Bytes Transmitted	Total bytes transmitted across all APs managed by the switch.
WLAN Packets Transmitted	Total packets transmitted across all APs managed by the switch.
WLAN Bytes Received	Total bytes received across all APs managed by the switch.
WLAN Packets Received	Total packets received across all APs managed by the switch.
WLAN Bytes Transmit Dropped	Total bytes transmitted across all APs managed by the switch that were dropped.
WLAN Packets Transmit Dropped	Total packets transmitted across all APs managed by the switch that were dropped.
WLAN Bytes Received Dropped	Total bytes received across all APs managed by the switch that were dropped.
WLAN Packets Receive Dropped	Total packets received across all APs managed by the switch that were dropped.
Distributed Tunnel Packets Transmitted	Total number of packets sent by all APs via distributed tunnels.
Distributed Tunnel Roamed Clients	Total number of clients that successfully roamed away from Home AP using distributed tunneling.
Distributed Tunnel Clients	Total number of clients that are associated with an AP that are using distributed tunneling.
Distributed Tunnel Client Denials	Total number of clients for which the system was unable to set up a distributed tunnel when client roamed.

After clicking the **Switch Status** tab, the following page will appear:

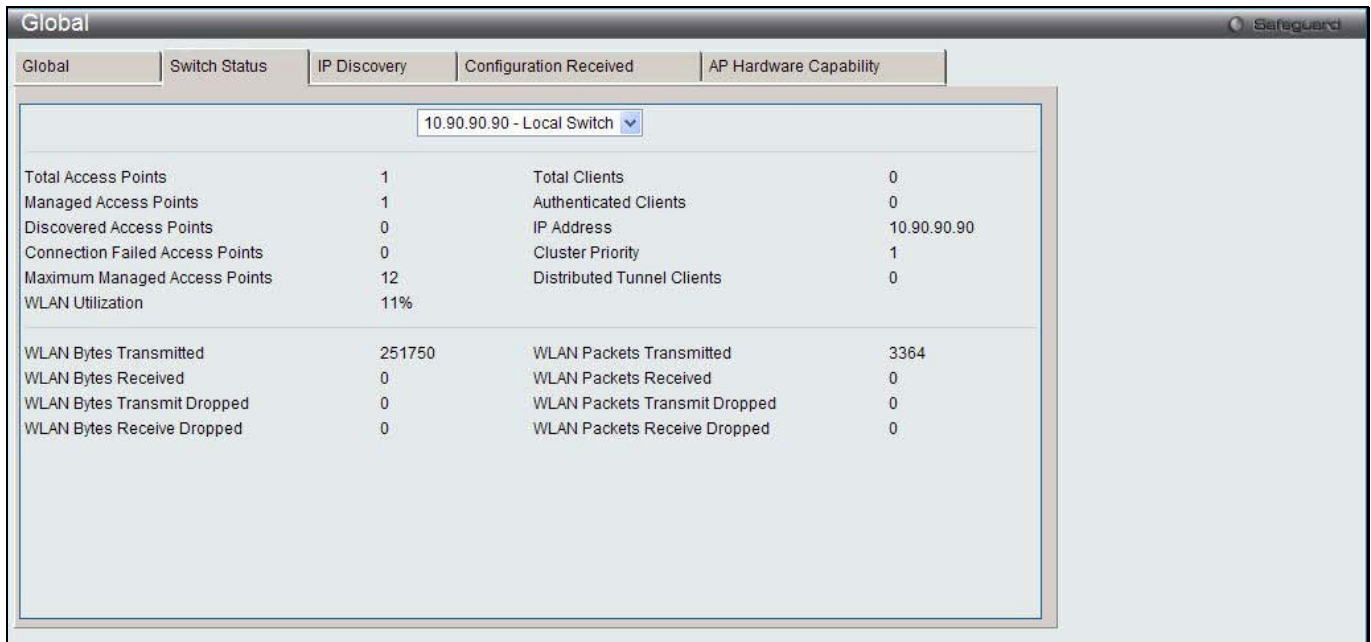


Figure 2-2 Switch Status window

Use the drop-down menu to select a Switch to view the information.

The fields that can be displayed are described below:

Parameter	Description
Total Access Points	Total number of Managed APs in the database. This value is always equal to the sum of Managed Access Points, Connection Failed Access Points, and Discovered Access Points.
Total Clients	Total number of clients in the database. This total includes clients with an Associated, Authenticated, or Disassociated status.
Managed Access Points	Number of APs in the managed AP database that are authenticated, configured, and have an active connection with the wireless switch.
Authenticated Clients	Total number of clients in the associated client database with an Authenticated status.
Discovered Access Points	APs that have a connection with the switch, but haven't been completely configured. This value includes all managed APs with a Discovered or Authenticated status.
IP Address	IP address of the switch.
Connection Failed Access Points	Number of APs that were previously authenticated and managed, but currently don't have connection with the wireless switch.
Cluster Priority	Cluster priority value of the switch. The switch with highest priority in a cluster becomes the Cluster Controller. If the priority is the same, the switch with lowest IP address becomes the Cluster Controller. A priority of 0 means that the switch cannot become the Cluster Controller.
Maximum Managed Access Points	Maximum number of access points that can be managed by the switch.
Distributed Tunnel Clients	Total number of clients that are associated with an AP that are using distributed tunneling.
WLAN Utilization	Total network utilization across all APs managed by this switch. This is based on global statistics.
WLAN Bytes	Total bytes transmitted across all APs managed by the switch.

Transmitted	
WLAN Packets Transmitted	Total packets transmitted across all APs managed by the switch.
WLAN Bytes Received	Total bytes received across all APs managed by the switch.
WLAN Packets Received	Total packets received across all APs managed by the switch.
WLAN Bytes Transmit Dropped	Total bytes transmitted across all APs managed by the switch that were dropped.
WLAN Packets Transmit Dropped	Total packets transmitted across all APs managed by the switch that were dropped.
WLAN Bytes Received Dropped	Total bytes received across all APs managed by the switch that were dropped.
WLAN Packets Receive Dropped	Total packets received across all APs managed by the switch that were dropped.

After clicking the **IP Discovery** tab, the following page will appear:

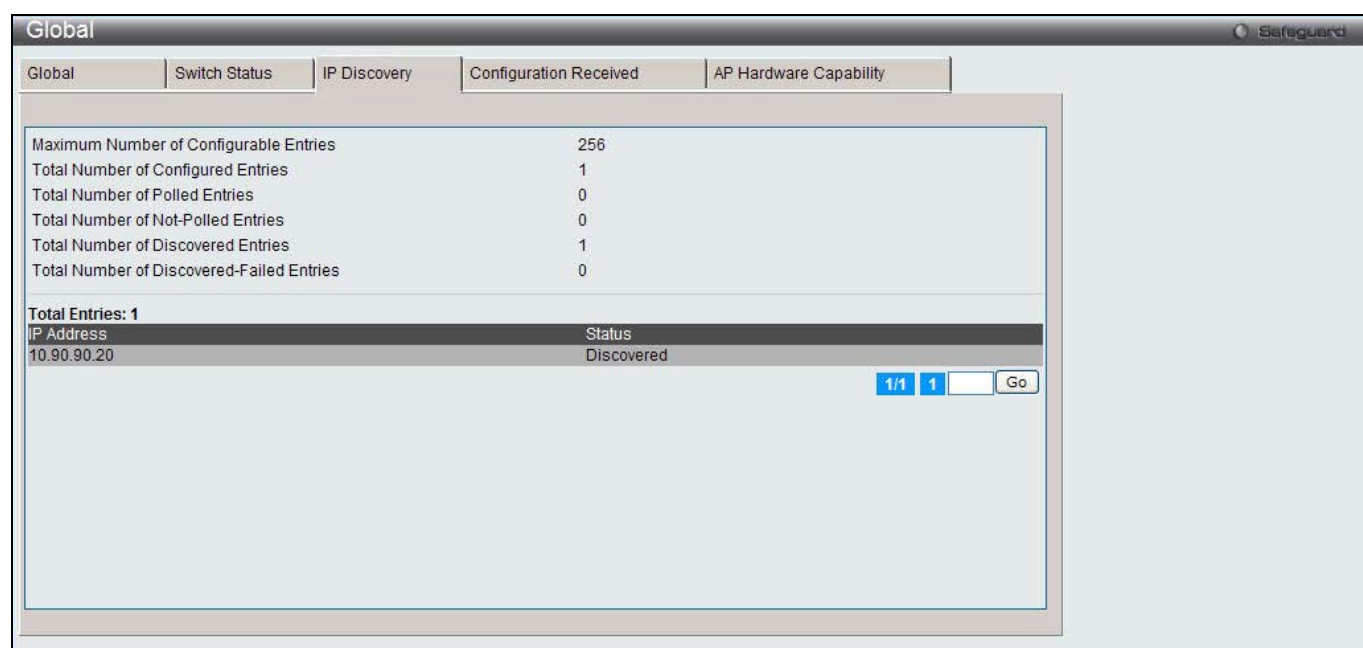


Figure 2-3 IP Discovery window

The fields that can be displayed are described below:

Parameter	Description
Maximum Number of Configurable entries	Display the maximum number of IP addresses that can be configured in the IP Discovery list.
Total Number of Configured Entries	Display the number of IP addresses that have been configured in the IP Discovery list.
Total Number of Polled Entries	Display the amount of the IP addresses in the IP Discovery list the switch has attempted to contact.
Total Number of Not-Polled Entries	Display the amount of the IP addresses in the IP Discovery list the switch has not attempted to contact.
Total Number of Discovered Entries	Display the amount of devices (peer switches or APs) the switch has successfully discovered, authenticated, and validated by polling the IP address configured in the IP Discovery list.

Total Number of Discovered-Filed Entries	Display the amount of devices that have an IP address configured in the IP Discovery list that the switch has attempted to contact and failed to authenticate or validate.
Total Entries	Total number of entries displayed in the table below.
IP Address	Display the IP address of the device configured in the IP Discovery list.
Status	<p>The status is in one of the following states:</p> <ul style="list-style-type: none"> • <i>Not Polled</i> – The switch has not attempted to contact the IP address in the L3/IP Discovery list. • <i>Polled</i> – The switch has attempted to contact the IP address. • <i>Discovered</i> – The switch contacted the peer switch or the AP in the L3/IP Discovery list and has authenticated or validated the device. • <i>Discovered – Failed</i> – The switch contacted the peer switch or the AP with IP address in the L3/IP Discovery list and was unable to authenticate or validate the device. <p>If the device is an access point, an entry appears in the AP failure list with a failure reason.</p>

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

After clicking the **Configuration Received** tab, the following page will appear:

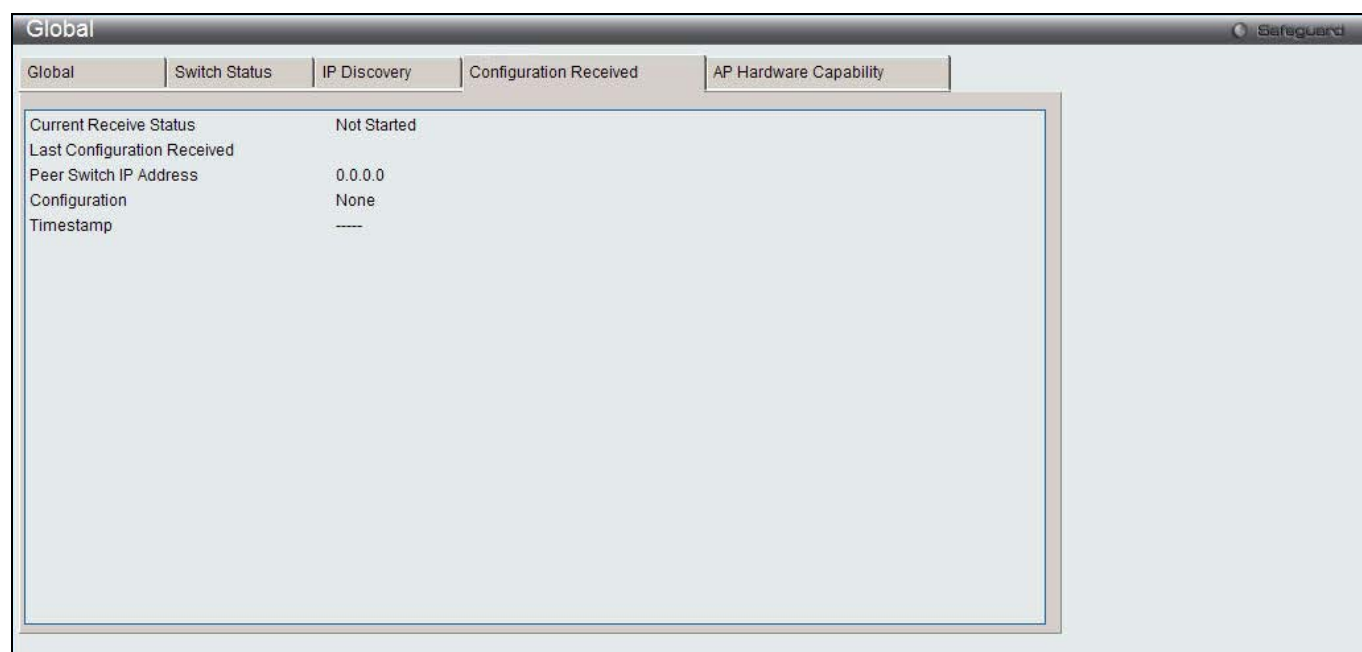


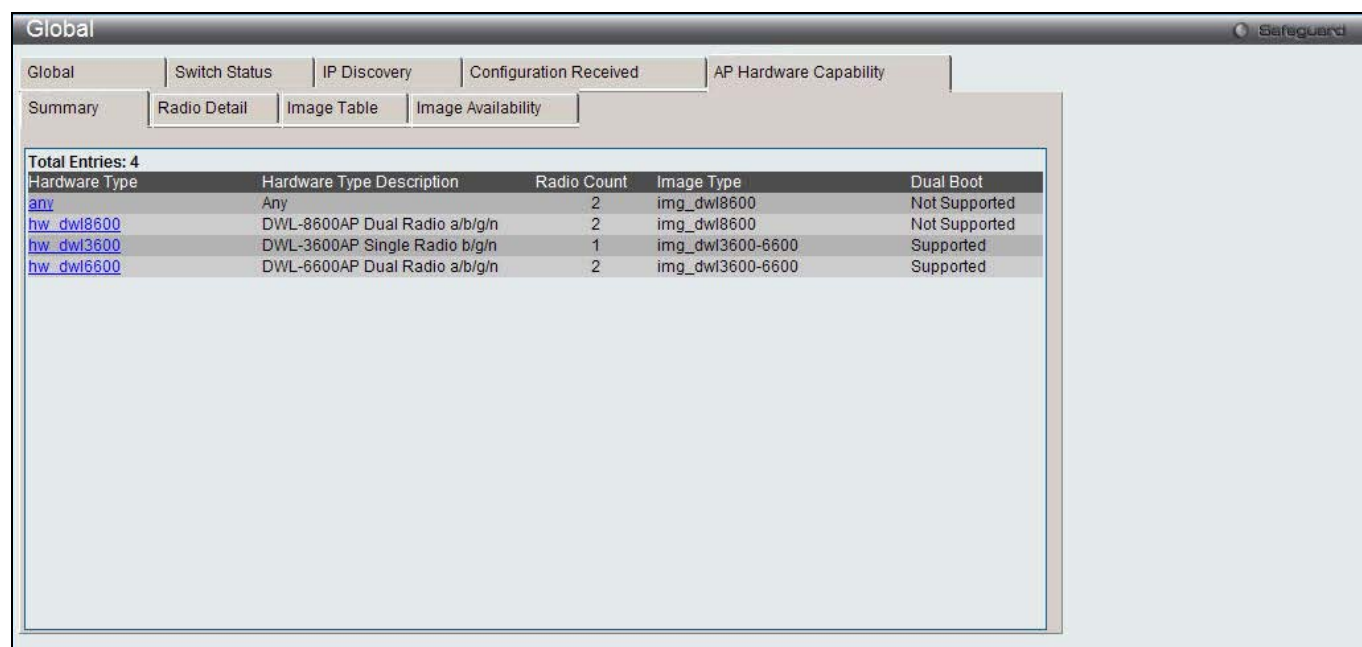
Figure 2-4 Configuration Received window

The fields that can be displayed are described below:

Parameter	Description
Current Receive Status	Display the global status when wireless configuration is received from a peer switch. The possible status values are <i>Not Started</i> , <i>Receiving Configuration</i> , <i>Saving Configuration</i> , <i>Applying AP Profile Configuration</i> , <i>Success</i> , <i>Failure - Invalid Code Version</i> , <i>Failure - Invalid Hardware Version</i> , and <i>Failure - Invalid Configuration</i> .
Peer Switch IP Address	Display the last switch from which this switch received any wireless configuration data.
Configuration	Display which portions of configuration were last received from a peer switch, which can be one or more of the following:

	<ul style="list-style-type: none"> • <i>Global</i> – Receive the basic and advanced global settings. • <i>Discovery</i> – Receive the L2 and L3 discovery information, including the VLAN and IP list. • <i>Channel/Power</i> – Receive the RF management settings. • <i>AP Database</i> – Receive the AP database settings. • <i>AP Profiles</i> – Receive the AP profiles settings. • <i>Known Client</i> – Receive the known client database settings. • <i>Captive Portal</i> – Receive the captive portal information. • <i>RADIUS Client</i> – Receive the client RADIUS information. • <i>QoS ACL</i> – Receive the QoS access control lists settings. • <i>QoS DiffServ</i> – Receive the differentiated classes, services and policies. <p>If the switch has not received any configuration for another switch, the value is None.</p>
Timestamp	Display the last time this switch received any configuration data from a peer switch.

After clicking the **AP Hardware Capability** tab, few more sub-tabs appears. Click the **Summary** tab, and the following page will appear:



Hardware Type	Hardware Type Description	Radio Count	Image Type	Dual Boot
any	Any	2	img_dw18600	Not Supported
hw_dw18600	DWL-8600AP Dual Radio a/b/g/n	2	img_dw18600	Not Supported
hw_dw13600	DWL-3600AP Single Radio b/g/n	1	img_dw13600-6600	Supported
hw_dw16600	DWL-6600AP Dual Radio a/b/g/n	2	img_dw13600-6600	Supported

Figure 2-5 AP Hardware Capability - Summary window

The fields that can be displayed are described below:

Parameter	Description
Total Entries	Total number of entries displayed in the table below.
Hardware Type	Display the AP hardware type.
Hardware Type Description	Display a description of the platform and the supported IEEE 802.11 modes.
Radio Count	Display whether the hardware supports one radio or two radios.
Image Type	Display the type of software the hardware requires.
Dual Boot	Display whether this AP hardware type supports dual boot. On dual boot APs, if the AP code is corrupted during the code upgrade process due to a power failure or unexpected AP rebooting while the AP is writing to NVRAM then the AP is able to come up using the old image.

After clicking the Hardware Type hyperlink or the **Radio Detail** tab under the **AP Hardware Capability** tab, the following page will appear:

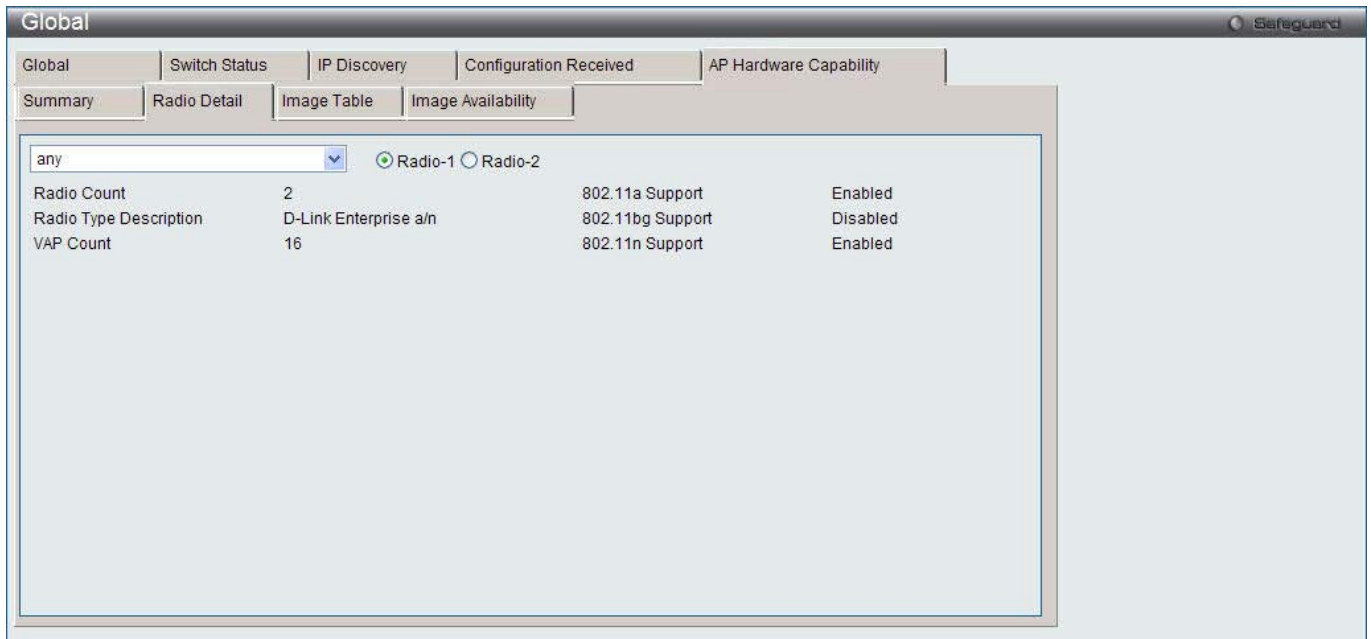


Figure 2-6 AP Hardware Capability - Radio Detail window

Use the drop-down menu to select the hardware type and click the radio buttons to select the radio index.

The fields that can be displayed are described below:

Parameter	Description
Radio Count	Display the number of radios supported on the hardware platform, which is either 1 or 2.
Radio Type Description	Display the type of radio, which might contain information such as the manufacturer name and supported IEEE 802.11 modes.
VAP Count	Display the number of VAPs the radio supports.
802.11a Support	Display whether support for IEEE 802.11a mode is enabled.
802.11bg Support	Display whether support for IEEE 802.11bg mode is enabled.
802.11n Support	Display whether support for IEEE 802.11n mode is enabled.

After clicking the **Image Table** tab under the **AP Hardware Capability** tab, the following page will appear:

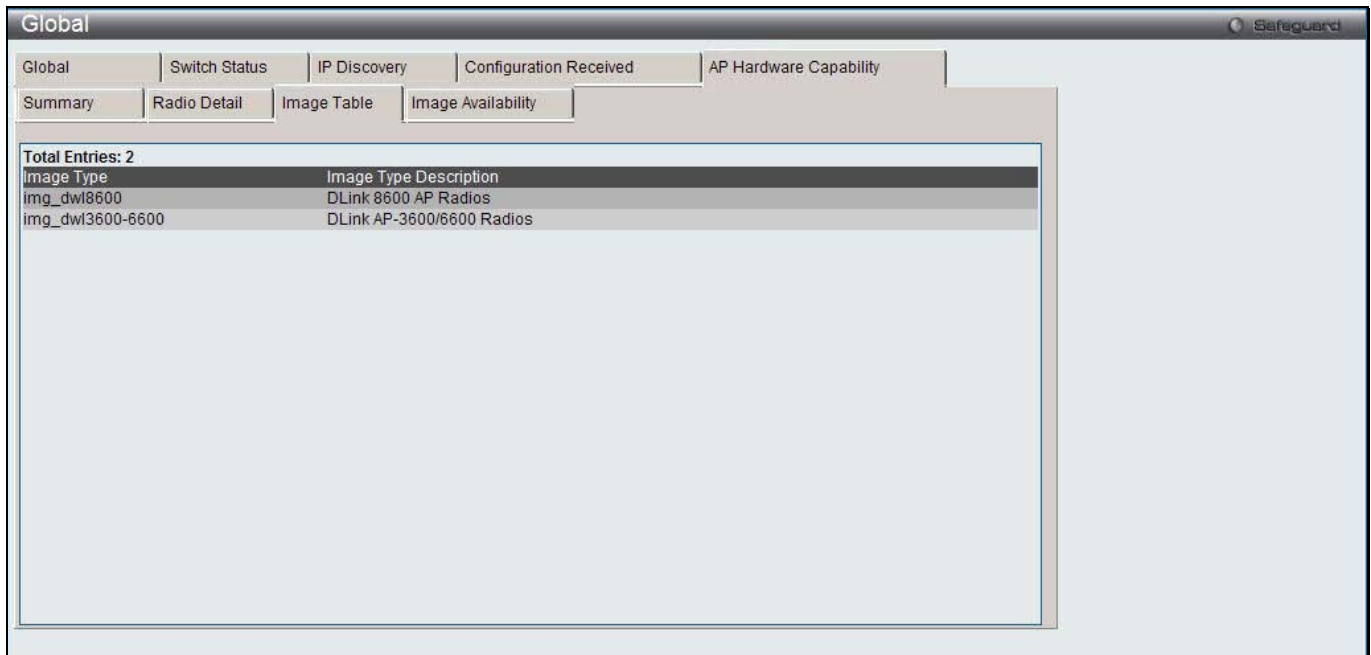


Figure 2-7 AP Hardware Capability - Image Table window

After clicking the **Image Availability** tab under the **AP Hardware Capability** tab, the following page will appear:

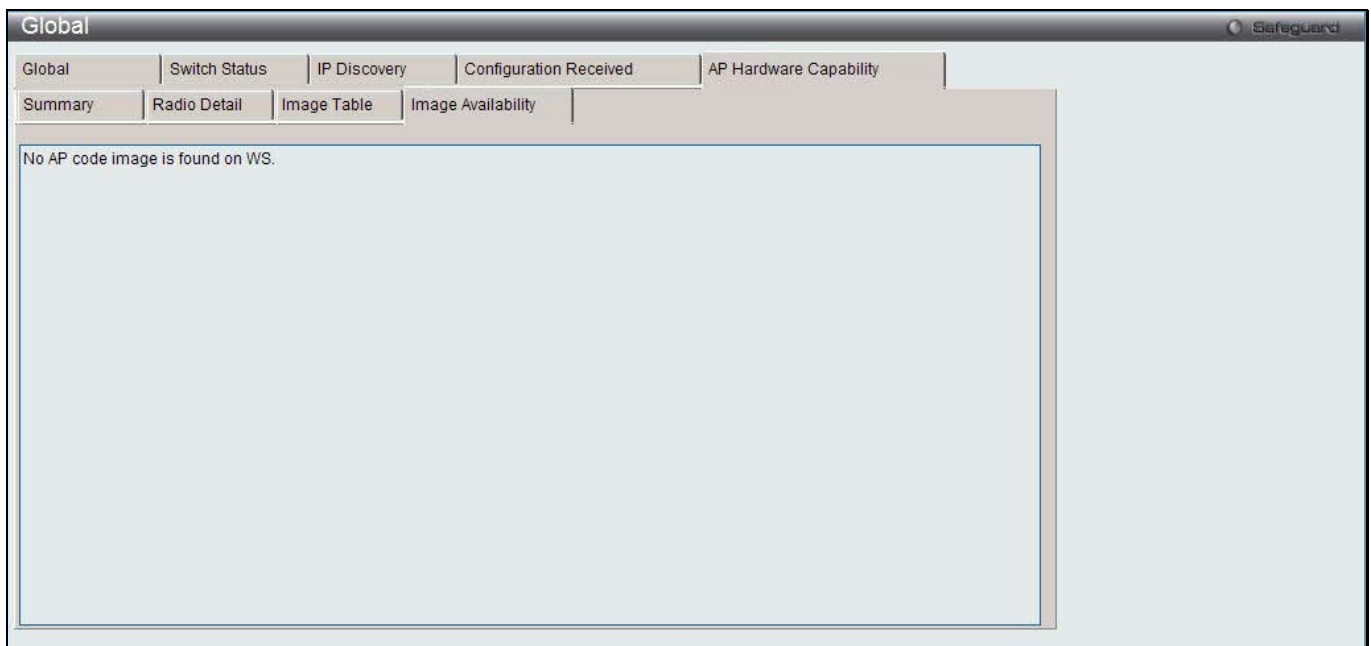


Figure 2-8 AP Hardware Capability - Image Availability window

Peer Switch

This window is used to provide information about other unified wireless switches in the network. Peer wireless switches within the same cluster exchange data about themselves, their managed APs, and clients. The switch maintains a database with this data so you can view information about a peer, such as its IP address and software version. One switch in a cluster is elected as a Cluster Controller. The Cluster Controller collects status and statistics from all the other switches in the cluster, including information about the APs peer switches manage and the clients associated to those APs.

To view this window, click **Monitoring > Peer Switch** as shown below:

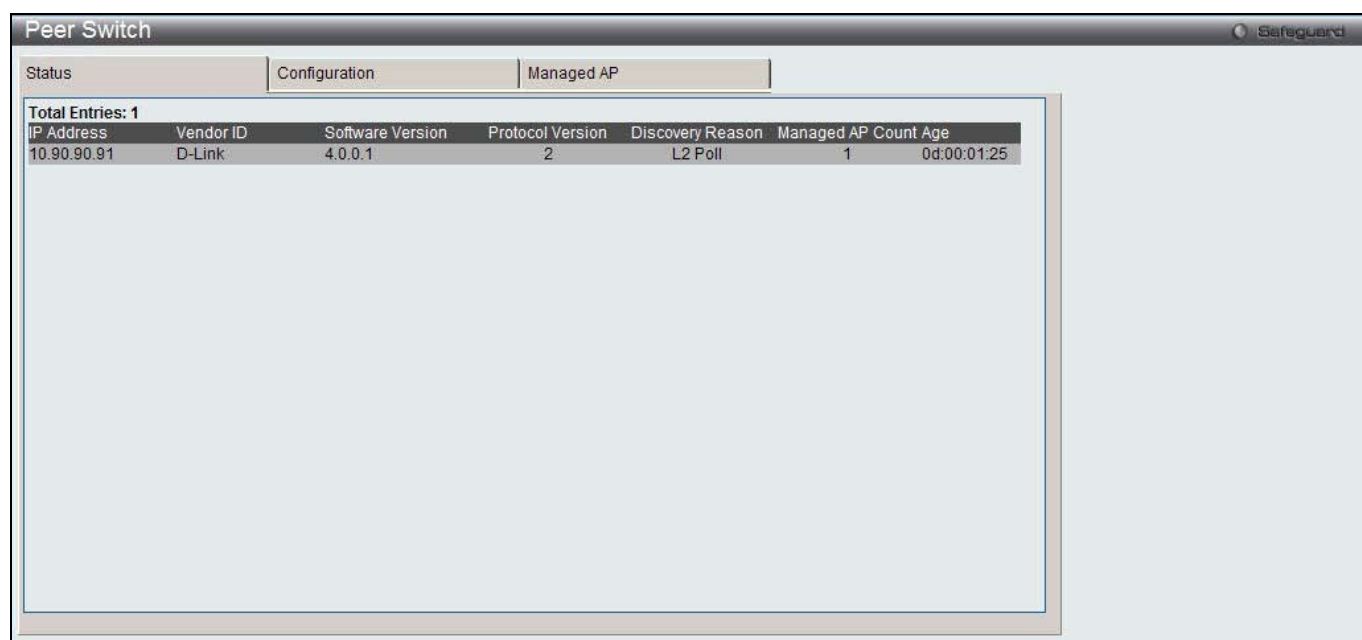


Figure 2-9 Peer Switch – Status window

The fields that can be displayed are described below:

Parameter	Description
Total Entries	Total number of entries displayed in the table below.
IP Address	IP address of the peer wireless switch in the cluster.
Vendor ID	The vendor ID of the peer switch software.
Software Version	The software version for the given peer switch.
Protocol Version	The protocol version supported by the software on the peer switch.
Discovery Reason	The discovery method of the given peer switch, which can be through an L2 Poll or IP Poll.
Managed AP Count	Shows the number of APs that the switch currently manages.
Age	Time since last communication with the switch in Days, Hours, Minutes, and Seconds.

After clicking the **Configuration** tab, the following page will appear:

Peer IP Address	Configuration Switch IP Address	Configuration	Timestamp
10.90.90.91	0.0.0.0	None	---

Figure 2-10 Peer Switch – Configuration window

The fields that can be displayed are described below:

Parameter	Description
Total Entries	Total number of entries displayed in the table below.
Peer IP Address	The IP address of each peer wireless switch in the cluster that received configuration information.
Configuration Switch IP Address	The IP Address of the switch that sent the configuration information.
Configuration	<p>Display which parts of the configuration the switch received from the peer switch. The possible configuration elements can be one or more of the following:</p> <ul style="list-style-type: none"> • <i>Global</i> – Receive the basic and advanced global settings. • <i>Discovery</i> – Receive the L2 and L3 discovery information, including the VLAN and IP list. • <i>Channel/Power</i> – Receive the RF management settings. • <i>AP Database</i> – Receive the AP database settings. • <i>AP Profiles</i> – Receive the AP profiles settings. • <i>Known Client</i> – Receive the known client database settings. • <i>Captive Portal</i> – Receive the captive portal information. • <i>RADIUS Client</i> – Receive the client RADIUS information. • <i>QoS ACL</i> – Receive the QoS access control lists settings. • <i>QoS DiffServ</i> – Receive the differentiated classes, services and policies. <p>If the switch has not received any configuration for another switch, the value is None.</p>
Timestamp	Display when the configuration was applied to the switch. The time is displayed as UTC time and therefore only useful if the administrator has configured each peer switch to use NTP.

After clicking the **Managed AP** tab, the following page will appear:

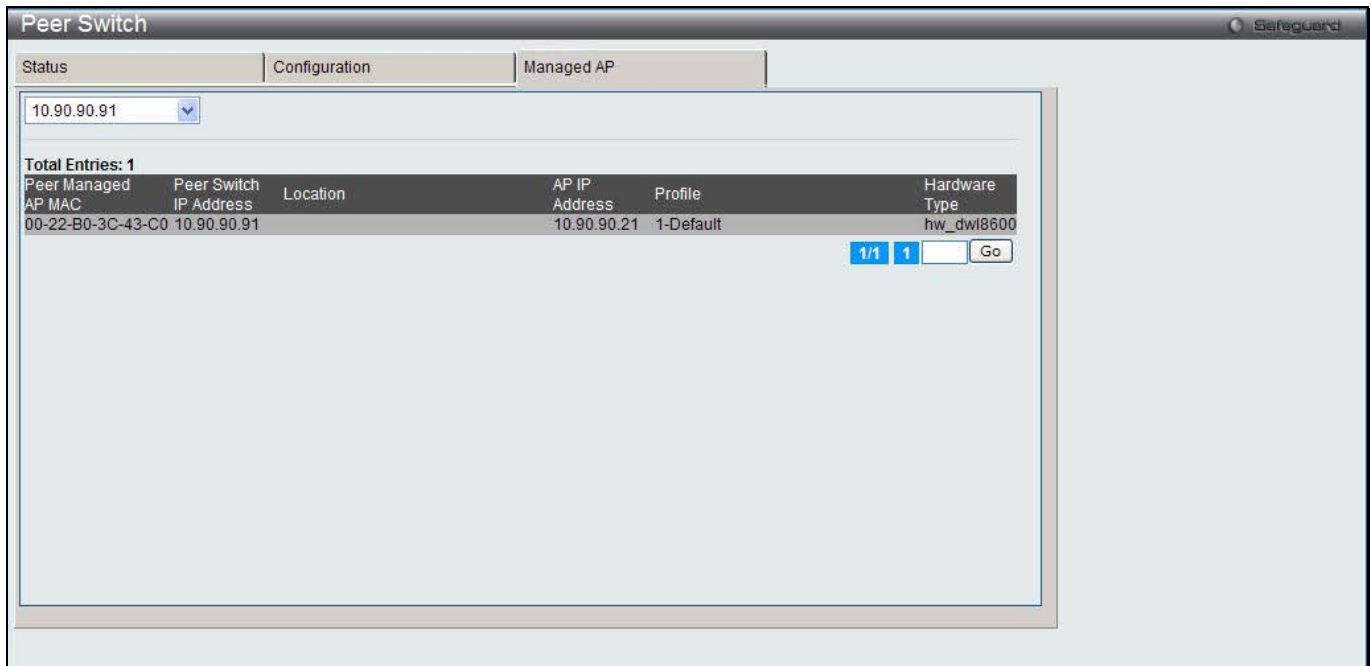


Figure 2-11 Peer Switch – Managed AP window

Use the drop-down menu to select the IP address of a peer switch.

The fields that can be displayed are described below:

Parameter	Description
Total Entries	Total number of entries displayed in the table below.
Peer Managed AP MAC	The MAC address of each AP managed by the peer switch.
Peer Switch IP Address	The IP address of the peer switch that manages the AP.
Location	The descriptive location configured for the managed AP.
AP IP Address	The IP address of the AP.
Profile	The AP profile applied to the AP by the switch.
Hardware Type	The Hardware ID associated with the AP hardware platform.

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

Access Point

All AP Status

This window is used to display summary information about access points that the Switch has discovered or detected.

To view this window, click **Monitoring > Access Point > All AP Status** as shown below:

All AP Status										
Total Entries: 4										
MAC Address	Location	Switch Port	IP Address	Software Version	Age	Status	Profile	Radio	Channel	Authenticated Clients
<input checked="" type="checkbox"/> 00-22-B0-3C-43-C0		Unknown	10.90.90.21	4.0.0.1	0d:00:00:04	Managed	1-Default	1 - 802.11a/n 2 - 802.11b/g/n	157 11	0 0
<input checked="" type="checkbox"/> 00-22-B0-3C-DD-C0		1	10.90.90.20	4.0.0.1	0d:00:00:03	Managed	1-Default	1 - 802.11a/n 2 - 802.11b/g/n	157 1	0 0
<input type="checkbox"/> 00-20-B0-11-BB-A9	N/A	N/A	N/A	N/A	0d:00:03:23	Rogue	N/A	802.11b/g	11	N/A
<input type="checkbox"/> 00-22-B0-3C-E4-90	N/A	N/A	N/A	N/A	0d:00:23:44	Rogue	N/A	802.11b/g	5	N/A

Figure 2-12 All AP Status window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	Display the MAC address of the access point.
Location	A location description for the AP. This is the value configured in the valid AP database (either locally or on the RADIUS server).
Switch Port	The physical port (in the slot/port format) on the switch that the AP is connected to either directly or indirectly in the same L3 domain. If the AP is beyond the L3 network boundary, then 'Unknown' is displayed.
IP Address	The network address of the access point.
Software Version	Display the version of D-Link Access Point software that the AP is running.
Age	Display how much time has passed since the AP was last detected and the information was last updated.
Status	Display the access point status. <ul style="list-style-type: none"> <i>Managed</i> - The AP profile configuration has been applied to the AP and it's operating in managed mode. <i>No Database Entry</i> - The MAC address of the AP does not appear in the local or RADIUS Valid AP database. <i>Authentication (Failed AP)</i> - The AP failed to be authenticated by the Unified Switch or RADIUS server. <i>Failed</i> - The Unified Switch lost contact with the AP; a failed entry will remain in the managed AP database unless you remove it. Note that a managed AP will temporarily show a failed status during a reset. <i>Rogue</i> - The AP has not attempted to contact the switch, and the MAC address of the AP is not in the Valid AP database.
Profile	The AP profile configuration currently applied to the managed AP. The profile is assigned to the AP in the valid AP database. NOTE: Once an AP is discovered and managed by the Unified Switch, if the profile is changed in the valid AP database (either locally or on the RADIUS server) the AP is automatically reset when a new profile is assigned.
Radio	Display the wireless radio mode the AP is using.
Channel	Display the operating channel for the radio.
Authenticated Clients	Display the number of wireless clients that are associated and authenticated with the access point per radio.

Click the **Delete All** button to remove all entries from the list except Managed Access Points.

Tick the corresponding check box and click the **Manage** button to configure an Authentication Failed AP to be managed by the Switch the next time it is discovered.

Tick the corresponding check box and click the **Acknowledge** button to identify an AP as an Acknowledged Rogue. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

Managed AP Status

This window is used to display a variety of information about each AP that the Switch manages. This window contains two main tabs, **Status** and **Statistics**. The **Status** tab provides configuration and association information about managed APs and their neighbors. The **Statistics** tab displays information about the number of packets and bytes transmitted and received on various interfaces.

To view this window, click **Monitoring > Access Point > Managed AP Status** as shown below:

Figure 2-13 Managed AP Status - Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the Unified Switch- managed AP. If the MAC address of the AP is followed by an asterisk (*), it is managed by a peer switch.
Location	A location description for the AP. This is the value configured in the valid AP database (either locally or on the RADIUS server).
IP Address	The network IP address of the managed AP.
Profile	The AP profile configuration currently applied to the managed AP. The profile is assigned to the AP in the valid AP database. NOTE: Once an AP is discovered and managed by the Unified Switch, if the profile is changed in the valid AP database (either locally or on the RADIUS server) the AP must be reset to configure with the new profile.
Software Version	The software version the AP is currently running.
Status	The current managed state of the AP. The possible values are: <ul style="list-style-type: none"> <i>Discovered</i> - The AP is discovered by the switch, but is not yet authenticated. <i>Authenticated</i> - The AP has been validated and authenticated (if authentication is enabled), but it is not configured. <i>Managed</i> - The AP profile configuration has been applied to the AP and it's operating in managed mode. <i>Failed</i> - The Unified Switch lost contact with the AP, a failed entry will remain in the managed AP database unless you remove it. Note that a managed AP will temporarily show a failed status during a reset. NOTE: When management connectivity is lost for a managed AP, then both radios of the AP are turned down. All the clients associated with the AP get disassociated. The radios become operational if and when that AP is managed again by a switch.

Configuration Status	This status indicates if the AP is configured successfully with the assigned profile. The status is one of the following: <ul style="list-style-type: none"> • <i>Not Configured</i> - The profile has not been sent to the AP yet, the AP may be discovered but not yet authenticated. • <i>In Progress</i> - The switch is currently sending the AP profile configuration packet to the AP. • <i>Success</i> - The entire profile has been sent to the AP and there were no configuration errors. • <i>Partial Success</i> - The entire profile has been sent to the AP and there were configuration errors (for example, some configuration parameters were not accepted), but the AP is operational. • <i>Failure</i> - The profile has been sent to the AP and there were configuration errors, the AP is not operational.
Age	Time since last communication between the Unified Switch and the AP.

Click the MAC Address hyperlink to see the detail of the AP.

Tick the corresponding check box, and click the **Delete** button to remove the specific entry.

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

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

After clicking the **Detail** tab under the **Status** tab, the following page will appear:

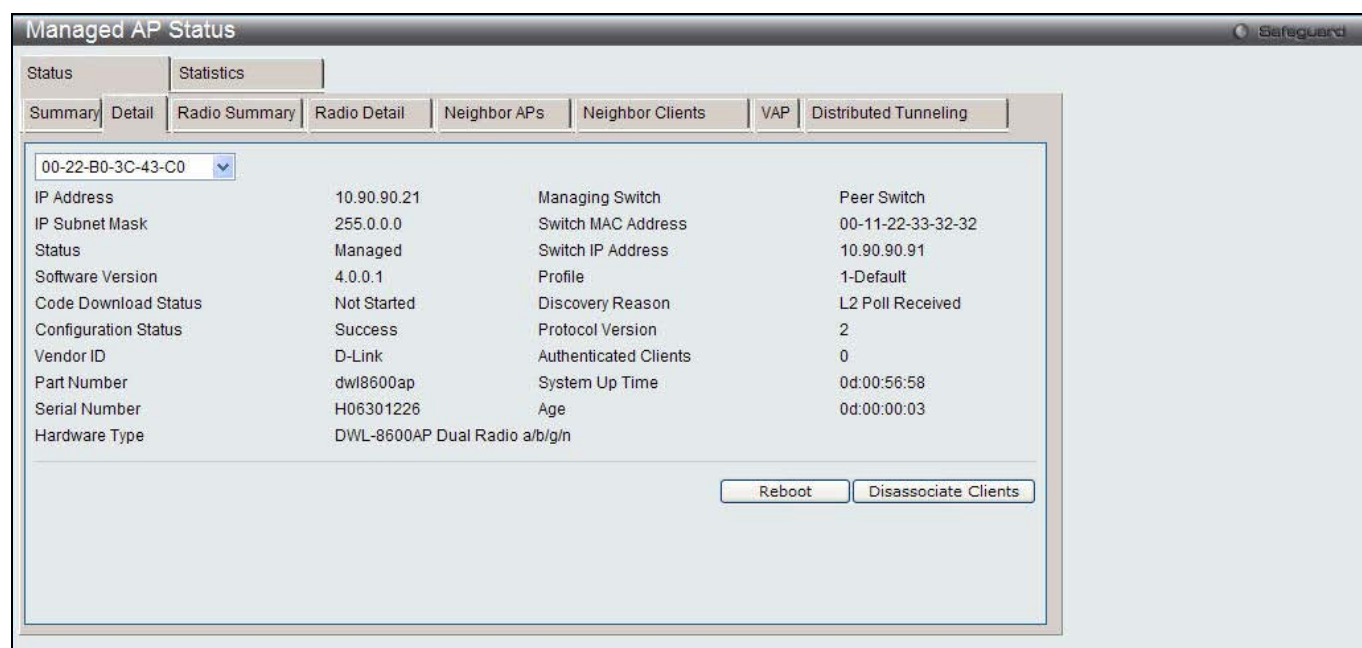


Figure 2-14 Managed AP Status - Detail window

Use the drop-down menu to select the MAC address of the AP to see the detail information.

The fields that can be displayed are described below:

Parameter	Description
IP Address	The IP address of the managed AP.
IP subnet Mask	The subnet mask of the managed AP
Status	The current managed state of the AP. The possible values are: <ul style="list-style-type: none"> • <i>Discovered</i> - The AP is discovered and by the switch, but is not yet authenticated. • <i>Authenticated</i> - The AP has been validated and authenticated (if authentication

	<p>is enabled), but it is not configured.</p> <ul style="list-style-type: none"> • <i>Managed</i> - The AP profile configuration has been applied to the AP and it's operating in managed mode. • <i>Failed</i> - The Unified Switch lost contact with the AP, a failed entry will remain in the managed AP database unless you remove it. Note that a managed AP will temporarily show a failed status during a reset. <p>NOTE: When management connectivity is lost for a managed AP, then both radios of the AP are turned down. All the clients associated with the AP get disassociated. The radios become operational if and when that AP is managed again by a switch.</p>
Software Version	Display the version of software on the AP. This is learned from the AP during discovery.
Code Download Status	<p>The current status of a code download request for this AP. The possible values are:</p> <ul style="list-style-type: none"> • <i>Not Started</i> - No download has begun. • <i>Requested</i> - A download is planned for this AP, but the AP is not in the current download group, so it hasn't been told to start the download yet. • <i>Code-Transfer-In-Progress</i> - The AP has been told to download the code. • <i>Failure</i> - The AP reported a failing code download. • <i>Aborted</i> - The download was aborted before the AP loaded code from the TFTP server. • <i>Waiting-For-APs-To-Download</i> - A download finished on this AP, and it is waiting for other APs to finish download. Reset command is not sent to the AP in this state. • <i>NVRAM-Update-In-Progress</i> - Download completed successfully. The reset command sent to the AP. • <i>Timed-Out</i> - The AP did not reconnect to the Unified Switch in the fixed time interval.
Configuration Status	<p>Display whether the AP is configured successfully with the assigned profile. The status is one of the following:</p> <ul style="list-style-type: none"> • <i>Not Configured</i> - The profile has not been sent to the AP yet, the AP may be discovered but not yet authenticated. • <i>In Progress</i> - The switch is currently sending the AP profile configuration packet to the AP. • <i>Success</i> - The entire profile has been sent to the AP and there were no configuration errors. • <i>Partial Success</i> - The entire profile has been sent to the AP and there were configuration errors, but the AP is operational. • <i>Failure</i> - The profile has been sent to the AP and there were configuration errors, the AP is not operational.
Vendor ID	Vendor of the AP software, this is learned from the AP during discovery.
Part Number	Hardware part number for the AP, which is learned from the AP during discovery.
Hardware Type	Hardware platform for the AP, which is learned from the AP during discovery.
Managing Switch	Display whether the AP is managed by the local switch or a peer switch.
Switch MAC Address	The MAC address of the switch that is managing the AP.
Switch IP Address	The IP address of the switch that is managing the AP.
Profile	<p>The AP profile configuration currently applied to the managed AP, the profile is assigned to the AP in the valid AP database.</p> <p>NOTE: Once an AP is discovered and managed by the Unified Switch, if the profile is changed in the valid AP database (either locally or on the RADIUS server) the AP must be reset to configure with the new profile.</p>
Discovery Reason	This status value indicates how the managed AP was discovered, the status is one of the following values:

	<ul style="list-style-type: none"> • <i>IP Poll Received</i> - The AP was discovered via an IP poll from the Unified Switch, its IP address is configured in the IP polling list. • <i>Peer Redirect</i> - The AP was discovered through a peer switch redirect, the AP tried to associate with another peer switch and learned the current Unified Switch IP address from the peer (peer learned Unified Switch IP address in RADIUS server response when validating the AP). • <i>Switch IP Configured</i> - The managed AP is configured with the Unified Switch IP address. • <i>Switch IP DHCP</i> - The managed AP learned the current DWL-8600AP IP address through DHCP option 43. • <i>L2 Poll Received</i> - The AP was discovered through the D-Link Wireless Device Discovery protocol.
Protocol Version	The protocol version supported by the software on the AP, which is learned from the AP during discovery.
Authenticated Clients	Total number of clients currently associated to the AP that have been authenticated. This is the sum of all authenticated clients for all the VAPs enabled on the AP.
System Up Time	Time in seconds since last power-on reset of the managed AP.
Age	Time since last communication between the Unified Switch and the AP.

Click the **Reboot** button to restart the managed AP.

Click the **Disassociate Clients** to disconnect all the associated clients from the AP.

After clicking the **Radio Summary** tab under the **Status** tab, the following page will appear:

MAC Address (*)-Peer Managed	Location	Radio	Channel	Transmit Power	Authenticated Clients
00-22-B0-3C-43-C0		1 - 802.11a/n	36	100	0
		2 - 802.11b/g/n	11	100	0
00-22-B0-3C-DD-C0		1 - 802.11a/n	36	100	0
		2 - 802.11b/g/n	1	100	0

Figure 2-15 Managed AP Status – Radio Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the Unified Switch managed AP. If the MAC address of the AP is followed by an asterisk (*), it is managed by a peer switch.
Location	A location description for the AP, this is the value configured in the valid AP database (either locally or on the RADIUS server).
Radio	Display the radio interface.

Channel	The current operating channel for the radio.
Transmit Power	The current transmit power for the radio.
Authenticated Clients	Total count of clients authenticated by the AP on the physical radio. This is a sum of all the clients authenticated by each VAP enabled on the radio.

Click the MAC Address or Radio hyperlinks to see the detail information about the radio.

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

After clicking the **Radio Detail** tab under the **Status** tab, the following page will appear:

Supported Channel	Radar Detection Required	Radar Detected	Time Since Radar Last Detected
36	No	No	0d:00:00:00
40	No	No	0d:00:00:00
44	No	No	0d:00:00:00
48	No	No	0d:00:00:00
149	No	No	0d:00:00:00
153	No	No	0d:00:00:00
157	No	No	0d:00:00:00
161	No	No	0d:00:00:00
165	No	No	0d:00:00:00

Figure 2-16 Managed AP Status – Radio Detail window

Use the drop-down menu to select the MAC address of the AP and click the radio type to see the detail information.

The fields that can be displayed are described below:

Parameter	Description
Supported Channels	The list of eligible channels the AP reported to the switch for channel assignment. The list is based on country code, hardware capabilities, and any configured channel limitations.
Channel	The current operating channel for the radio.
Channel Bandwidth	Display whether the channel bandwidth is 20 MHz or 40 MHz.
Fixed Channel Indicator	This flag indicates if a fixed channel is configured and assigned to the radio, a fixed channel can be configured in the valid AP database (locally or on a RADIUS server).
Manual Channel Adjustment Status	The current state of a manual request to change the channel on this radio. The valid values are: <ul style="list-style-type: none"> <i>Not Started</i> - No request has been made to change the channel. <i>Requested</i> - A channel change has been requested by the user but has not been processed by the switch. <i>In Progress</i> - The switch is processing a channel change request for this radio. <i>Success</i> - A channel change request is complete. <i>Failure</i> - A channel change request failed.
WLAN Utilization	Total network utilization for the physical radio. This value is based on radio

	statistics.
Authenticated Clients	Total count of clients authenticated with the AP on the physical radio. This is a sum of all the clients authenticated with the AP for each VAP enabled on the radio.
Transmit Power	The current transmit power for the radio.
Fixed Power Indicator	This flag indicates if a fixed power setting is configured and assigned to the radio, a fixed transmit power can be configured in the valid AP database (locally or on a RADIUS server).
Manual Power Adjustment Status	Indicates the current state of a manual request to change the power setting on this radio. The valid values are: <ul style="list-style-type: none"> • <i>Not Started</i> - No request has been made to change the power. • <i>Requested</i> - A power adjustment has been requested by the user but has not been processed by the switch. • <i>In Progress</i> - The switch is processing a power adjustment request for this radio. • <i>Success</i> - A power adjustment request is complete. • <i>Failure</i> - A power adjustment request failed.
Total Neighbors	Total number of neighbors (both APs and clients) that can be seen by this radio in its RF area.
Supported Channel	List the radio channel used for transmitting and receiving wireless traffic.
Radar Detection Required	In some regulatory domains, radar detection is required on some channels in the 5-GHz band. If radar detection is required on the channel, the AP uses the 802.11h specification to avoid interference with other wireless devices.
Radar Detected	Display whether another 802.11 device was detected on the channel.
Time Since Radar Last Detected	Display the amount of time that has passed since the device was last detected on the channel.

After clicking the **Neighbor APs** tab under the **Status** tab, the following page will appear:

The screenshot shows the 'Managed AP Status' window with the 'Neighbor APs' tab selected. The interface includes a navigation bar with tabs for 'Status', 'Statistics', 'Summary', 'Detail', 'Radio Summary', 'Radio Detail', 'Neighbor APs', 'Neighbor Clients', 'VAP', and 'Distributed Tunneling'. Below the navigation bar, there is a dropdown menu for selecting an AP's MAC address (currently set to '00-22-B0-3C-43-C0') and radio buttons for selecting a radio (currently '1-802.11a/n' is selected, '2-802.11b/g/n' is unselected). A 'Delete All Neighbors' button is located to the right of the radio selection. The main content area displays a table with the following data:

Neighbor AP MAC	SSID	RSSI	Status	Age
00-22-B0-3C-DD-C0	dlink1	19	Managed	0d:00:07:49

At the bottom of the table, there are pagination controls showing '1/1' and a 'Go' button.

Figure 2-17 Managed AP Status – Neighbor APs window

Use the drop down menu to select AP's MAC address and use the radio button to select a radio to view the neighbor APs detected by using an RF scan on that radio.

The fields that can be displayed are described below:

Parameter	Description
Neighbor AP MAC	The Ethernet MAC address of the neighbor AP network, this could be a physical radio interface or VAP MAC address. For D-Link APs this is always a VAP MAC address. The neighbor AP MAC address may be cross-referenced in the RF Scan status.
SSID	Service Set ID of the neighbor AP network.
RSSI	Received Signal Strength Indication, this is an indicator of the signal strength relative to the neighbor and may give an idea of the neighbor's distance from the managed AP. The range is from 1 to 100, where 1 is the weakest signal strength.
Status	Indicate the managed status of the AP, whether this is a valid AP known to the switch or a Rogue on the network. The valid values are: <ul style="list-style-type: none"> <i>Managed</i> - The neighbor AP is managed by the wireless system. <i>Standalone</i> - The AP is managed in standalone mode and configured as a valid AP entry (local or RADIUS). <i>Rogue</i> - The AP is classified as a threat by one of the threat detection algorithms. <i>Unknown</i> - The AP is detected in the network but is not classified as a threat by the threat detection algorithms.
Age	Indicate the time since this AP was last reported from an RF scan on the radio.

Click the Neighbor AP MAC hyperlink to see the detail information about AP RF Scan Status.

Click the **Delete All Neighbors** to remove all the neighbor entries.

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

After clicking the **Neighbor Clients** tab under the **Status** tab, the following page will appear:

The screenshot displays the 'Managed AP Status' window with the 'Neighbor Clients' tab selected. At the top, there are tabs for 'Status' and 'Statistics'. Below that are sub-tabs: 'Summary', 'Detail', 'Radio Summary', 'Radio Detail', 'Neighbor APs', 'Neighbor Clients', 'VAP', and 'Distributed Tunneling'. A dropdown menu shows the selected AP MAC '00-22-B0-3C-43-C0' and radio buttons for '1-802.11a/n' (selected) and '2-802.11b/g/n'. A 'Delete All Neighbors' button is visible. The main area contains a table with the following data:

Neighbor Client MAC	RSSI	Channel	Discovery Reason	Age
00-15-E9-C3-EB-77	23	36	Assoc Managed AP, RF	0d:00:00:25

At the bottom right of the table area, there is a pagination control showing '1/1' and a 'Go' button.

Figure 2-18 Managed AP Status – Neighbor Clients window

Use the drop down menu to select AP's MAC address and use the radio button to select a radio to view the neighbor clients detected via an RF scan on that radio.

The fields that can be displayed are described below:

Parameter	Description
-----------	-------------

Neighbor Client MAC	The Ethernet address of client station.
RSSI	Received Signal Strength Indication, this is an indicator of the signal strength relative to the neighbor and may give an idea of the neighbor's distance from the managed AP. The range is from 1 to 100, where 1 is the weakest signal strength.
Channel	The managed AP channel the client frame was received on, which may be different than the operating channel for this radio.
Discovery Reason	Indicate one or more discovery methods for the neighbor client. One or more of the following values may be displayed: <ul style="list-style-type: none"> • <i>RF</i> - The client was reported from an RF scan on the radio. Note that client stations are difficult to detect via RF scan, the other methods are more common for client neighbor detection. • <i>Probe Request</i> - The managed AP received a probe request from the client. • <i>Associated to Managed AP</i> - This neighbor client is associated to another managed AP. • <i>Associated to this AP</i> - The client is associated to this managed AP on the displayed radio. • <i>Associated to Peer AP</i> - The client is associated to an AP managed by a peer switch. • <i>Ad Hoc Rogue</i> - The client was detected as part of an Ad Hoc network.
Age	Indicate the time since this client was last reported from an RF scan on the radio.

Click the Neighbor Client MAC hyperlink to see the detail information about Detected Clients.

Click the **Delete All Neighbors** to remove all the neighbor entries.

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

After clicking the **VAP** tab under the **Status** tab, the following page will appear:

Managed AP Status

Status | Statistics

Summary | Detail | Radio Summary | Radio Detail | Neighbor APs | Neighbor Clients | VAP | Distributed Tunneling

00-22-B0-3C-43-C0 | 1-802.11a/n | 2-802.11b/g/n

VAP ID	VAP Mode	BSSID	SSID	Client Authentications
0	Enabled	00-22-B0-3C-43-C0	DWS-3160	0
1	Disabled	00-22-B0-3C-43-C1	dlink2	0
2	Disabled	00-22-B0-3C-43-C2	dlink3	0
3	Disabled	00-22-B0-3C-43-C3	dlink4	0
4	Disabled	00-22-B0-3C-43-C4	dlink5	0
5	Disabled	00-22-B0-3C-43-C5	dlink6	0
6	Disabled	00-22-B0-3C-43-C6	dlink7	0
7	Disabled	00-22-B0-3C-43-C7	dlink8	0
8	Disabled	00-22-B0-3C-43-C8	dlink9	0
9	Disabled	00-22-B0-3C-43-C9	dlink10	0
10	Disabled	00-22-B0-3C-43-CA	dlink11	0
11	Disabled	00-22-B0-3C-43-CB	dlink12	0
12	Disabled	00-22-B0-3C-43-CC	dlink13	0
13	Disabled	00-22-B0-3C-43-CD	dlink14	0
14	Disabled	00-22-B0-3C-43-CE	dlink15	0
15	Disabled	00-22-B0-3C-43-CF	dlink16	0

Figure 2-19 Managed AP Status – VAP window

Use the drop down menu to select AP's MAC address and use the radio button to select a radio to view the details about VAPs on that radio.

After clicking the **Distributed Tunneling** tab under the **Status** tab, the following page will appear:

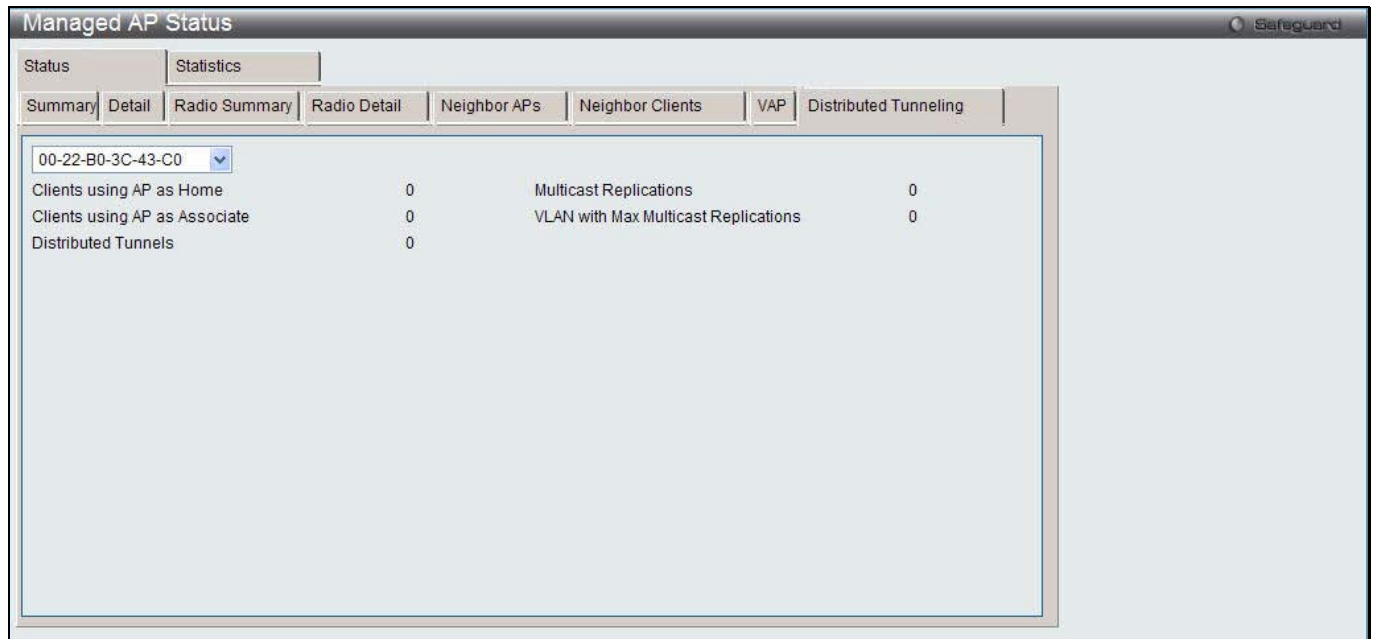


Figure 2-20 Managed AP Status – Distributed Tunneling window

Use the drop down menu to select AP's MAC address to view the distributed tunneling information.

The fields that can be displayed are described below:

Parameter	Description
Clients using AP as Home	Number of clients that roamed away from this AP using distributed tunneling mode and are tunneling data back to this AP.
Clients using AP as Associate	Number of clients that roamed to this AP using distributed tunneling mode and are tunneling data to the Home AP.
Distributed Tunnels	Number of APs to which this AP has a distributed L2 tunnel. The AP may be acting as Home AP or Association AP for clients using the tunnel.
Multicast Replications	Maximum number of tunnels on the Home AP that are members of the same VLAN.
VLAN with Max Multicast Replications	The VLAN ID that is currently replicated the most number of times by the AP for sending multicasts into distributed tunnels.

After clicking the **WLAN Summary** tab under the **Statistics** tab, the following page will appear:

The screenshot shows the 'Managed AP Status' window with the 'Statistics' tab selected. Under 'Statistics', the 'WLAN Summary' sub-tab is active. It displays a table with 2 total entries. The table has columns for MAC Address, Packets Received, Bytes Received, Packets Transmitted, and Bytes Transmitted. The first entry has a MAC Address of 00-22-B0-3C-43-C0, 0 packets received, 0 bytes received, 5174 packets transmitted, and 604998 bytes transmitted. The second entry has a MAC Address of 00-22-B0-3C-DD-C0, 0 packets received, 0 bytes received, 1442 packets transmitted, and 139834 bytes transmitted. A pagination control shows '1/1' and a 'Go' button.

MAC Address	Packets Received	Bytes Received	Packets Transmitted	Bytes Transmitted
00-22-B0-3C-43-C0	0	0	5174	604998
00-22-B0-3C-DD-C0	0	0	1442	139834

Figure 2-21 Managed AP Statistics – WLAN Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the Unified Switch-managed AP.
Packets Received	Total packets received by the AP on the wireless network.
Bytes Received	Total bytes received by the AP on the wireless network.
Packets Transmitted	Total packets transmitted by the AP on the wireless network.
Bytes Transmitted	Total bytes transmitted by the AP on the wireless network.

Click the MAC Address hyperlink to view detailed statistics about the AP.

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

After clicking the **Ethernet Summary** tab under the **Statistics** tab, the following page will appear:

The screenshot shows the 'Managed AP Status' window with the 'Statistics' tab selected. Under 'Statistics', the 'Ethernet Summary' sub-tab is active. It displays a table with 2 total entries. The table has columns for MAC Address, Packets Received, Bytes Received, Packets Transmitted, and Bytes Transmitted. The first entry has a MAC Address of 00-22-B0-3C-43-C0, 2253 packets received, 307534 bytes received, 4698 packets transmitted, and 2548538 bytes transmitted. The second entry has a MAC Address of 00-22-B0-3C-DD-C0, 677 packets received, 76184 bytes received, 1589 packets transmitted, and 804705 bytes transmitted. A pagination control shows '1/1' and a 'Go' button.

MAC Address	Packets Received	Bytes Received	Packets Transmitted	Bytes Transmitted
00-22-B0-3C-43-C0	2253	307534	4698	2548538
00-22-B0-3C-DD-C0	677	76184	1589	804705

Figure 2-22 Managed AP Statistics – Ethernet Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the Unified Switch-managed AP.
Packets Received	Total packets received by the AP on the wired network.
Bytes Received	Total bytes received by the AP on the wired network.
Packets Transmitted	Total packets transmitted by the AP on the wired network.
Bytes Transmitted	Total bytes transmitted by the AP on the wired network.

Click the MAC Address hyperlink to view detailed statistics about the AP.

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

After clicking the **Detail** tab under the **Statistics** tab, the following page will appear:

The screenshot shows the 'Managed AP Status' window with the 'Statistics' tab selected. Under 'Statistics', the 'Detail' sub-tab is active. A drop-down menu shows the MAC address '00-22-B0-3C-43-C0'. Below the menu is a table of statistics:

WLAN Packets Received	0	WLAN Bytes Received	0
WLAN Packets Transmitted	5200	WLAN Bytes Transmitted	606700
WLAN Packets Receive Dropped	0	WLAN Bytes Receive Dropped	0
WLAN Packets Transmit Dropped	0	WLAN Bytes Transmit Dropped	0
Ethernet Packets Received	2258	Ethernet Bytes Received	307892
Ethernet Packets Transmitted	4712	Ethernet Bytes Transmitted	2556988
Multicast Packets Received	317	Total Receive Errors	0
Total Transmit Errors	0	ARP Reqs Converted from Bcast to Ucast	0
Filtered ARP Reqs	0	Broadcasted ARP Requests	0

Figure 2-23 Managed AP Statistics – Detail window

Use the drop-down menu to view statistics for a specific AP that the Switch manages.

The fields that can be displayed are described below:

Parameter	Description
WLAN Packets Received	Total packets received by the AP on the wireless network.
WLAN Bytes Received	Total bytes received by the AP on the wireless network.
WLAN Packets Transmitted	Total packets transmitted by the AP on the wireless network.
WLAN Bytes Transmitted	Total bytes transmitted by the AP on the wireless network.
WLAN Packets Received Dropped	Number of packets received by the AP on the wireless network that were dropped.
WLAN Bytes Received Dropped	Number of bytes received by the AP on the wireless network that were dropped.
WLAN Packets Transmit Dropped	Number of packets transmitted by the AP on the wireless network that were dropped.
WLAN Bytes Transmit Dropped	Number of bytes transmitted by the AP on the wireless network that were dropped.

Ethernet Packets Received	Total packets received by the AP on the wired network.
Ethernet Bytes Received	Total bytes received by the AP on the wired network.
Ethernet Packets Transmitted	Total packets transmitted by the AP on the wired network.
Ethernet Bytes Transmitted	Total bytes transmitted by the AP on the wired network.
Multicast Packets Received	Total multicast packets received by the AP on the wired network.
Total Receive Errors	Total receive errors detected by the AP on the wired network.
Total Transmit Errors	Total transmit errors detected by the AP on the wired network.
ARP Reqs Converted from Bcast to Ucast	Number of ARP requests that the AP converted from a broadcast packet to a unicast packet before sending to the wireless link.
Filtered ARP Reqs	Number of ARP requests that AP was able to drop instead of sending on the wireless link.
Broadcasted ARP Requests	The number of ARP requests sent as broadcasts on the VAPs. This counter does not include WDS links. The same ARP frame may be counted multiple times when it is broadcasted on multiple VAPs. The counter is available even when ARP suppression is disabled.

After clicking the **Radio** tab under the **Statistics** tab, the following page will appear:

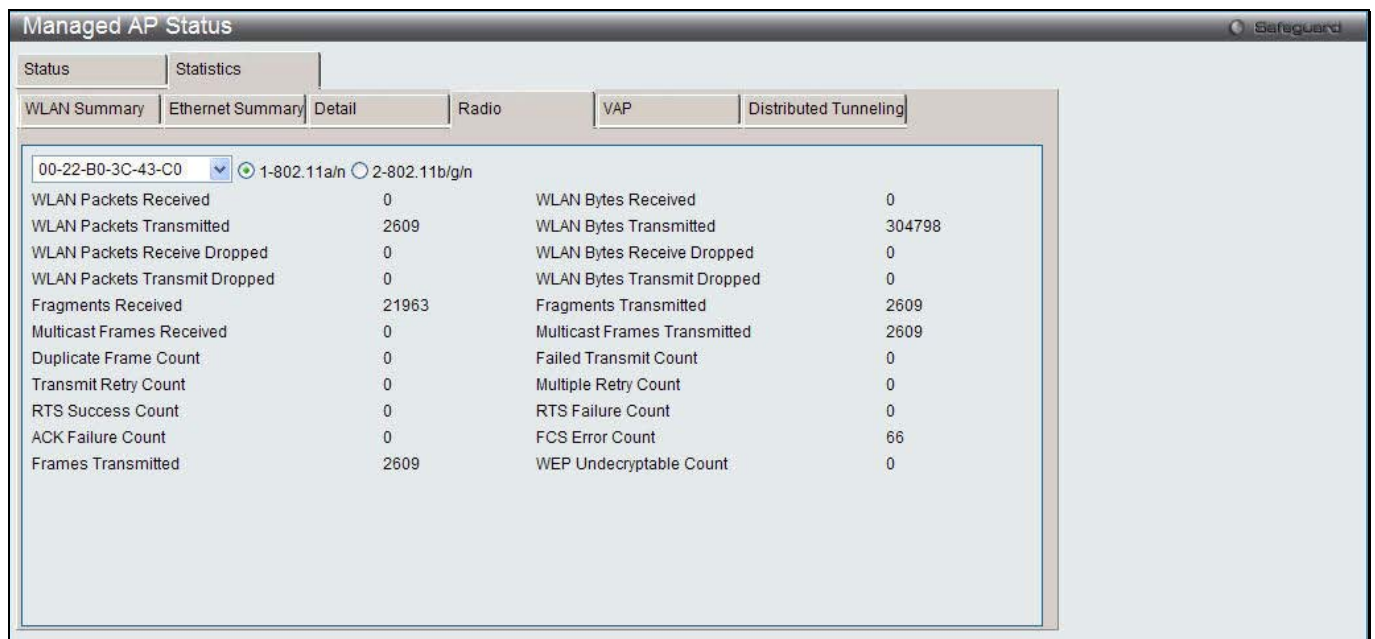


Figure 2-24 Managed AP Statistics – Radio window

Use the drop down menu to select AP’s MAC address and click the radio button to select a radio to view the detailed information about the packets and bytes transmitted and received on the radio (wireless) interface of a particular access point managed by the Switch.

The fields that can be displayed are described below:

Parameter	Description
WLAN Packets Received	Total packets received by the AP on this radio interface.
WLAN Bytes Received	Total bytes received by the AP on this radio interface.
WLAN Packets Transmitted	Total packets transmitted by the AP on this radio interface.
WLAN Bytes Transmitted	Total bytes transmitted by the AP on this radio interface.

WLAN Packets Received Dropped	Number of packets received by the AP on this radio interface that were dropped.
WLAN Bytes Received Dropped	Number of bytes received by the AP on this radio interface that were dropped.
WLAN Packets Transmit Dropped	Number of packets transmitted by the AP on this radio interface that were dropped.
WLAN Bytes Transmit Dropped	Number of bytes transmitted by the AP on this radio interface that were dropped.
Fragments Received	Count of successfully received MPDU frames of type data or management.
Fragments Transmitted	Number of transmitted MPDU with an individual address or an MPDU with a multicast address of type Data or Management.
Multicast Frames Received	Count of MSDU frames received with the multicast bit set in the destination MAC address.
Multicast Frames Transmitted	Count of successfully transmitted MSDU frames where the multicast bit is set in the destination MAC address.
Duplicate Frame Count	Number of times a frame is received and the Sequence Control field indicates is a duplicate.
Failed Transmit Count	Number of times a MSDU is not transmitted successfully due to transmit attempts exceeding either the short retry limit or the long retry limit.
Transmit Retry Count	Number of times a MSDU is successfully transmitted after one or more retries.
Multiple Retry Count	Number of times a MSDU is successfully transmitted after more than one retry.
RTS Success Count	Count of CTS frames received in response to an RTS frame.
RTS Failure Count	Count of CTS frames not received in response to an RTS frame.
ACK Failure Count	Count of ACK frames not received when expected.
FCS Error Count	Count of FCS errors detected in a received MPDU frame.
Frames Transmitted	Count of each successfully transmitted MSDU.
WEP Undecryptable Count	Count of encrypted frames received and the key configuration of the transmitter indicates that the frame should not have been encrypted or that frame was discarded due to the receiving station not implementing the privacy option.

After clicking the **VAP** tab under the **Statistics** tab, the following page will appear:

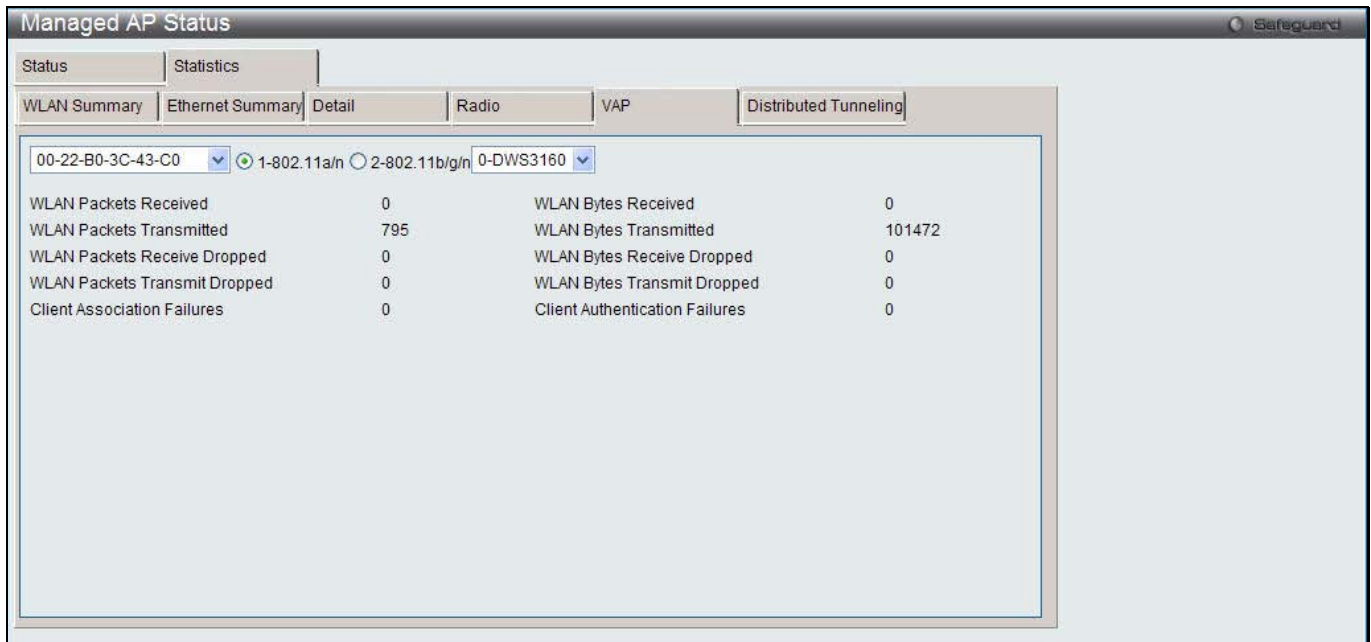


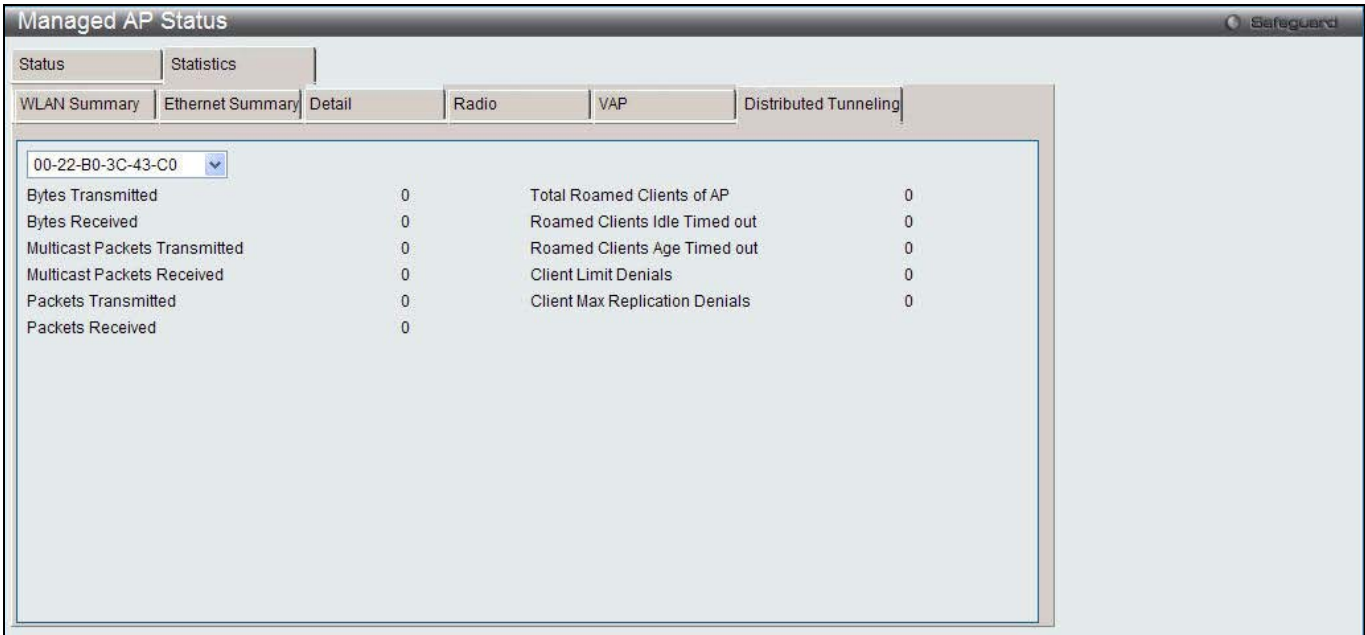
Figure 2-25 Managed AP Statistics – VAP window

Use the drop down menu to select AP's MAC address and VAP's ID, and click the radio button to select a radio to view the information about the client failures and number of packets and bytes transmitted and received on each VAP on specified radio for a particular access point managed by the Switch.

The fields that can be displayed are described below:

Parameter	Description
WLAN Packets Received	Total packets received by the AP on this VAP.
WLAN Bytes Received	Total bytes received by the AP on this VAP.
WLAN Packets Transmitted	Total packets transmitted by the AP on this VAP.
WLAN Bytes Transmitted	Total bytes transmitted by the AP on this VAP.
WLAN Packets Received Dropped	Number of packets received by the AP on this VAP that were dropped.
WLAN Bytes Received Dropped	Number of bytes received by the AP on this VAP that were dropped.
WLAN Packets Transmit Dropped	Number of packets transmitted by the AP on this VAP that were dropped.
WLAN Bytes Transmit Dropped	Number of bytes transmitted by the AP on this VAP that were dropped.
Client Association Failures	Number of clients that have been denied association to the VAP.
Client Authentication Failures	Number of clients that have failed authentication to the VAP.

After clicking the **Distributed Tunneling** tab under the **Statistics** tab, the following page will appear:



The screenshot shows the 'Managed AP Status' window with the 'Distributed Tunneling' tab selected. A dropdown menu at the top left shows the MAC address '00-22-B0-3C-43-C0'. Below it, a table displays statistics for this AP:

Bytes Transmitted	0	Total Roamed Clients of AP	0
Bytes Received	0	Roamed Clients Idle Timed out	0
Multicast Packets Transmitted	0	Roamed Clients Age Timed out	0
Multicast Packets Received	0	Client Limit Denials	0
Packets Transmitted	0	Client Max Replication Denials	0
Packets Received	0		

Figure 2-26 Managed AP Statistics – Distributed Tunneling window

Use the drop down menu to select AP's MAC address to view information about the number of packets and bytes transmitted and received by clients that use L2 distributed tunnels on an access point managed by the switch.

AP Authentication Failure Status

This window is used to display the AP that is failed to associate to the Switch.

To view this window, click **Monitoring > Access Point > AP Authentication Failure Status** as shown below:



The screenshot shows the 'AP Authentication Failure Status' window. It displays a table with one entry:

MAC Address (*)-Peer Reported	IP Address	Last Failure Type	Age
<input type="checkbox"/> 00-22-B0-3C-43-C0	10.90.90.21	No Database Entry	0d:00:00:08

Buttons for 'Delete All' and 'Manage' are visible at the top right. At the bottom right, there is a pagination control showing '1/1' and a 'Go' button.

Figure 2-27 AP Authentication Failure Status window

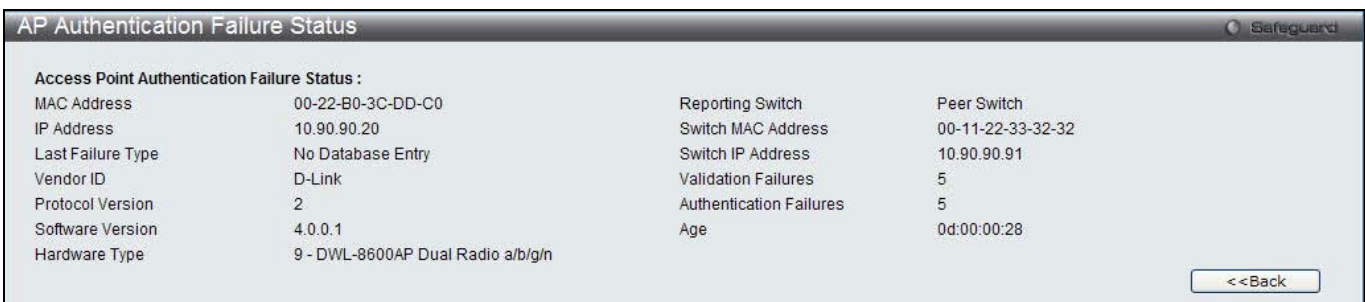
Click the **Delete All** button to remove all entries.

Tick the corresponding check box and click the **Manage** button to associate the AP with the Switch.

Click the MAC Address hyperlink to see the detail information.

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

After clicking the MAC Address hyperlink, the following page will appear:



The screenshot shows the 'AP Authentication Failure Status - Detail' window. It displays the following information:

Access Point Authentication Failure Status :			
MAC Address	00-22-B0-3C-DD-C0	Reporting Switch	Peer Switch
IP Address	10.90.90.20	Switch MAC Address	00-11-22-33-32-32
Last Failure Type	No Database Entry	Switch IP Address	10.90.90.91
Vendor ID	D-Link	Validation Failures	5
Protocol Version	2	Authentication Failures	5
Software Version	4.0.0.1	Age	0d:00:00:28
Hardware Type	9 - DWL-8600AP Dual Radio a/b/g/n		

A '<<Back' button is located at the bottom right.

Figure 2-28 AP Authentication Failure Status – Detail window

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

AP RF Scan Status

This window is used to display the information about all APs detected via RF scan, including those reported as Rogues.

To view this window, click **Monitoring > Access Point > AP RF Scan Status** as shown below:

The screenshot shows the 'AP RF Scan Status' window with a 'Safeguard' icon in the top right. Below the title bar are four buttons: 'Delete All', 'Manage', 'Acknowledge', and 'Acknowledge All Rogues'. The main content area displays 'Total Entries: 1' and a table with the following data:

MAC Address	SSID	Physical Mode	Channel	Status	Age
<input type="checkbox"/> 00-22-B0-3C-DD-C0	DWS3160	802.11a/n	36	Managed	0d:02:26:08

At the bottom right of the table area, there is a pagination control showing '1/1' and a 'Go' button.

Figure 2-29 AP RF Scan Status window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet MAC address of the detected AP. This could be a physical radio interface or VAP MAC. For D-Link APs this is always a VAP MAC address.
SSID	Service Set ID of the network, which is broadcast in the detected beacon frame.
Physical Mode	Display the 802.11 mode being used on the AP.
Channel	Transmit channel of the AP.
Status	Indicate the managed status of the AP, whether this is a valid AP known to the switch or a Rogue on the network. The valid values are: <ul style="list-style-type: none"> • <i>Managed</i> - The neighbor AP is managed by the wireless system. • <i>Standalone</i> - The AP is managed in standalone mode and configured as a valid AP entry (local or RADIUS). • <i>Rogue</i> - The AP is classified as a threat by one of the threat detection algorithms. • <i>Unknown</i> - The AP is detected in the network but is not classified as a threat by the threat detection algorithms.
Age	Time since this AP was last detected in an RF scan.

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

Tick the specific check box and click the **Manage** button to configure a Rogue AP to be managed by the switch the next time it is discovered.

Tick the specific check box and click the **Acknowledge** button to clear the rogue status of an AP in the RF Scan database.

Click the **Acknowledge All Rogues** button to acknowledge all APs with a Rogue status.

Click the MAC Address hyperlink to see more information about the detected AP.

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

After clicking the MAC Address hyperlink, the following page will appear:

AP RF Scan Status			
AP RF Scan Status		WIDS AP Rogue Classification	
MAC address	00-22-B0-3C-43-C0	BSSID	00-22-B0-3C-43-C0
SSID	DWS3160	Physical Mode	802.11a/n
Channel	44	Security Mode	WEP
Status	Managed	802.11n Mode	Supported
Initial Status	Unknown	Beacon Interval	100msecs
Transmit Rate	60Mbps	Highest Supported Rate	300Mbps
WIDS Rogue AP Mitigation	Not Required	Peer Managed AP	None
Age	0d:00:08:26	Ad hoc Network	Not Ad hoc
Discovered Age	0d:00:09:26	OUI Description	D-Link Corporation

Figure 2-30 AP RF Scan Status – Detail window

The fields that can be displayed are described below:

Parameter	Description
MAC address	The Ethernet MAC address of the detected AP. This could be a physical radio interface or VAP MAC. For D-Link APs this is always a VAP MAC address.
SSID	Service Set ID of the network, which is broadcast in the detected beacon frame.
Channel	Transmit channel of the AP.
Status	Indicate the managed status of the AP, whether this is a valid AP known to the switch or a Rogue on the network. The valid values are: <ul style="list-style-type: none"> <i>Managed</i> - The neighbor AP is managed by the wireless system. <i>Standalone</i> - The AP is managed in standalone mode and configured as a valid AP entry (local or RADIUS). <i>Rogue</i> - The AP is classified as a threat by one of the threat detection algorithms. <i>Unknown</i> - The AP is detected in the network but is not classified as a threat by the threat detection algorithms.
Initial Status	If the AP is not rogue, the initial status is equal to Status (Managed, Standalone, or Unknown). For rogue APs, the initial status is the classification prior to this AP becoming rogue.
Transmit Rate	Display the rate at which the AP is currently transmitting data.
WIDS Rogue AP Mitigation	Status indicating whether rogue AP mitigation is in progress for this AP. If mitigation is not in progress then this field displays the reason, which can be one of the following: <ul style="list-style-type: none"> Not Required (AP is not rogue) Already mitigating too many APs. AP is operating on an illegal channel. AP is spoofing valid managed AP MAC address. AP is Ad hoc.
Age	Time since this AP was last detected in an RF scan.
Discovered Age	Time since this AP was first detected in an RF scan.
BSSID	Basic Service Set Identifier advertised by the AP in the beacon frames.

Physical Mode	Display the 802.11 mode being used on the AP.
Security Mode	Security mode used by the AP.
802.11n Mode	Display whether this AP supports IEEE 802.11n mode.
Beacon Interval	Beacon interval for the neighbor AP network.
Highest Supported Rate	Highest supported rate advertised by this AP in the beacon frames. The rate is represented in increments of 1 Mbps.
Peer Managed AP	Display whether this AP is managed by a switch in the cluster.
Ad hoc Network	Display whether the beacon frame was received from an ad hoc network.
OUI Description	Display the manufacturer of the AP or wireless client adapter based on the information in the OUI database on the switch.

After clicking the **AP Triangulation Status** tab, the following page will appear:

Figure 2-31 AP RF Scan Status – AP Triangulation Status window

The fields that can be displayed are described below:

Parameter	Description
Detected AP MAC Address	The Ethernet MAC address of the detected AP. This could be a physical radio interface or VAP MAC. For D-Link APs this is always a VAP MAC address.
Sentry	Display whether the AP that detected the entry is in sentry or non-sentry mode.
MAC Address	Display the MAC address of the AP that detected the RF Scan entry. The address links to the Valid AP database.
Radio	Display the radio on the AP that detected the RF Scan entry.
RSSI(%)	Display the received signal strength indicator in terms of percentage for the non-sentry AP. The range is from 0 to 100%. A value of 0 indicates the AP is not detected.
Signal Strength(dBm)	Received signal strength for the non-sentry AP. The range is from -127 dBm to 127 dBm, but most values are expected to range from -95 dBm to -10 dBm.
Noise Level(dBm)	Noise reported on the channel by the non-sentry AP.
Age	Time since this AP was last detected in an RF scan.

After clicking the **WIDS AP Rogue Classification** tab, the following page will appear:

The screenshot shows the 'AP RF Scan Status' window with the 'WIDS AP Rogue Classification' tab selected. The summary information is as follows:

- MAC Address: 00-22-B0-3C-43-C0
- Status: Managed

Total Entries: 10

Test Description	Condition Detected	Reporting MAC Address	Radio	Test Config	Test Result	Time Since First Report	Time Since Last Report
Administrator configured rogue AP	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Managed SSID from an unknown AP	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Managed SSID from a fake managed AP	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
AP without an SSID	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Fake managed AP on an invalid channel	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Managed SSID detected with incorrect security	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Invalid SSID from a managed AP	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
AP is operating on an illegal channel	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Standalone AP with unexpected configuration	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00
Unmanaged AP detected on wired network	False	00-22-B0-3C-43-C0	0	Enabled		0d:00:00:00d:00:00:00	0d:00:00:00d:00:00:00

Figure 2-32 AP RF Scan Status – WIDS AP Rogue Classification window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The MAC address of the detected AP. This could be a physical radio interface or VAP MAC. For D-Link APs this is always a VAP MAC address.
Status	Display the managed status of the AP, whether this is a valid AP known to the Switch or a Rogue on the network. The valid values are: <ul style="list-style-type: none"> • <i>Managed</i> - The neighbor AP is managed by the wireless system. • <i>Standalone</i> - The AP is managed in standalone mode and configured as a valid AP entry (local or RADIUS). • <i>Rogue</i> - The AP is classified as a threat by one of the threat detection algorithms. • <i>Unknown</i> - The AP is detected in the network but is not classified as a threat by the threat detection algorithms.
Test Description	Display the tests that were performed, which includes the following: <ul style="list-style-type: none"> • Administrator-Configured rogue AP • Managed SSID received from an unknown AP • Managed SSID from a fake managed AP • Fake managed AP on an invalid channel • AP without an SSID • Managed SSID detected with incorrect security configuration • Invalid SSID received from managed AP. • AP is operating on an illegal channel • Standalone AP is operating with unexpected configuration. • Unmanaged AP detected on wired network.
Condition Detected	Display whether the result of the test was true or false.
Reporting MAC Address	Display the MAC address of the AP that reported the test results.
Radio	Display which physical radio on the reporting AP was responsible for the test results.

Test Config	Display whether this test is configured to report rogues. Each test can be globally enabled or disabled to report a positive result as a rogue.
Test Result	Display whether this test reported the device as rogue. In some cases the test may report a positive result, be enabled, but not report the device as rogue because the device is allowed to operate in this mode.
Time Since First Report	Time stamp indicating how long ago this test first detected the condition.
Time Since Last Report	Time stamp indicating how long ago this test last detected the condition.

AP De-Authentication Attack Status

This window is used to display the information about rogue APs that the Cluster Controller has attacked by using the de-authentication attack feature. The wireless switch can protect against rogue APs by sending de-authentication messages to the rogue AP. The de-authentication attack feature must be globally enabled in order for the wireless system to do this function. Make sure that no legitimate APs are classified as rogues before enabling the attack feature. This feature is disabled by default.

The wireless system can conduct the de-authentication attack against 16 APs at the same time. The intent of this attack is to serve as a temporary measure until the rogue AP is located and disabled.

To view this window, click **Monitoring > Access Point > AP De-Authentication Attack Status** as shown below:

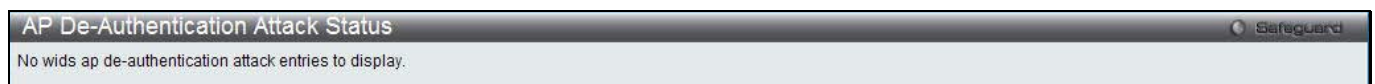


Figure 2-33 AP De-Authentication Attack Status window

The fields that can be displayed are described below:

Parameter	Description
BSSD	Display the BSSID of the AP against which the attack is launched. The BSSID is a MAC address.
Channel	Display the channel on which the rogue AP is operating.
Time Since Attack Started	Display the amount of time that has passed since the attack started on the AP.
RF Scan Report Age	Display the amount of time that has passed since the RF Scan reported this AP.

Client

Associated Clients

This window is used to view a variety of information about the wireless clients that are associated with the APs the switch manages.

To view this window, click **Monitoring > Client > Associated Clients** as shown below:

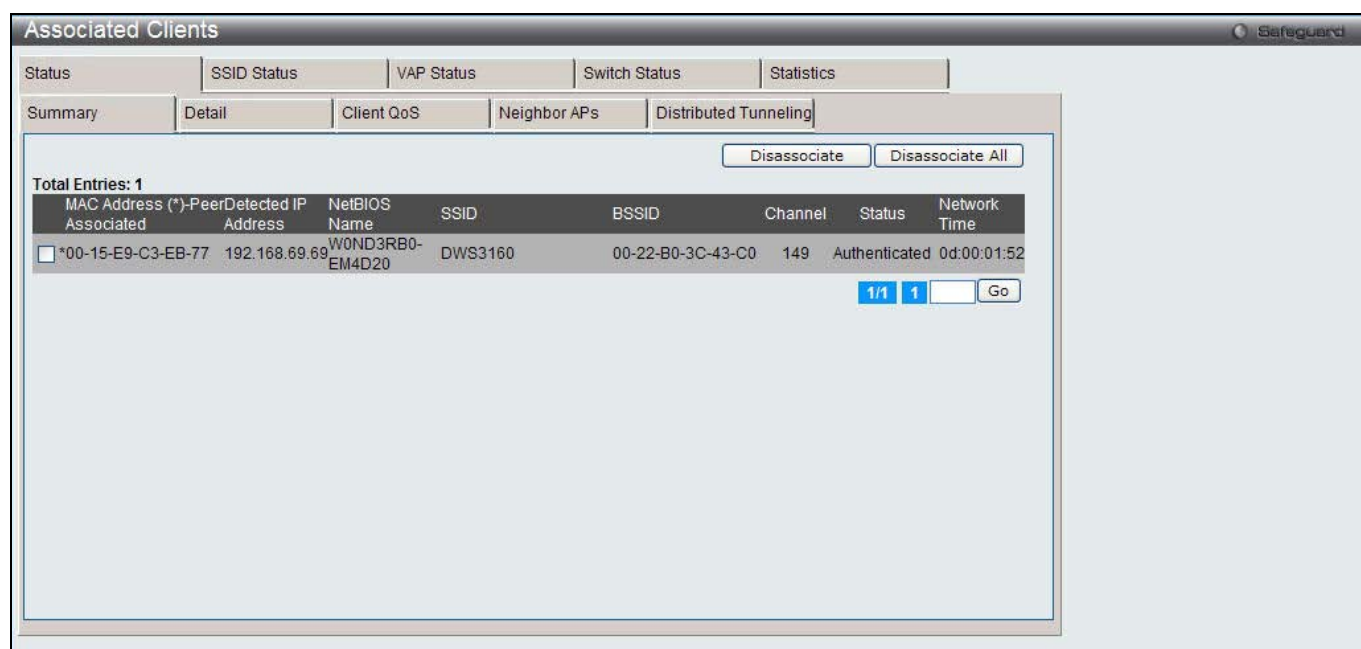


Figure 2-34 Associated Clients Status - Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the client station. If the MAC address is followed by an asterisk (*), the client is associated with an AP managed by a peer switch.
Detected IP Address	Display the IPv4 address of the client.
NetBIOS Name	The NetBIOS name of the wireless client. For Microsoft Windows hosts, the NetBIOS name is typically the same as, or based on the host name of the client.
SSID	The network on which the client is connected.
BSSID	The Ethernet MAC address for the managed AP VAP where this client is associated.
Channel	The operating channel for the client association.
Status	Display whether or not the client has associated and/or authenticated. The valid values are: <ul style="list-style-type: none"> <i>Associated</i> - The client is current associated to the managed AP. <i>Authenticated</i> - The client is currently associated and authenticated to the managed AP. <i>Disassociated</i> - The client has disassociated from the managed AP, if the client does not roam to another managed AP within the client roam timeout, it will be deleted.
Network Time	Display the amount of time that has passed since this client first authenticated with the network.

Tick the specific check box and click the **Disassociate** button to disassociate the client from the managed AP.

Click the **Disassociate All** button to disassociate all clients from the managed AP.

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

After clicking the **Detail** tab under the **Status** tab, the following page will appear:

The screenshot shows the 'Associated Clients' web UI. At the top, there are tabs for 'Status', 'SSID Status', 'VAP Status', 'Switch Status', and 'Statistics'. Below these are sub-tabs for 'Summary', 'Detail', 'Client QoS', 'Neighbor APs', and 'Distributed Tunneling'. The 'Detail' tab is selected, and a dropdown menu shows the client MAC address '00-15-E9-C3-EB-77'. The main area displays a table of client details:

SSID	DWS3160	Associating Switch	Peer Switch
BSSID	00-22-B0-3C-43-C0	Switch MAC Address	00-11-22-33-32-32
AP MAC Address	00-22-B0-3C-43-C0	Switch IP Address	10.90.90.91
Status	Authenticated	Location	
Channel	149	Radio	1
User Name		VLAN	1
Inactive Period	0d:00:00:00	Transmit Data Rate	54 Mbps
Age	0d:00:00:03	Network Time	0d:00:02:42
Dot11n Capable	No	STBC Capable	No
NetBIOS Name	W0ND3R80-EM4D20	Detected IP Address	10.90.90.68
Tunnel IP Address	----		

A 'Disassociate' button is located at the bottom right of the detail window.

Figure 2-35 Associated Clients Status - Detail window

The fields that can be displayed are described below:

Parameter	Description
SSID	Display the network on which the client is connected.
BSSID	Display the Ethernet MAC address for the managed AP VAP where this client is associated.
AP MAC Address	Display the base AP Ethernet MAC address for the managed AP.
Status	Display whether or not the client has associated and/or authenticated. The valid values are: <ul style="list-style-type: none"> <i>Associated</i> -The client is current associated to the managed AP. <i>Authenticated</i> - The client is currently associated and authenticated to the managed AP. <i>Disassociated</i> -The client has disassociated from the managed AP, if the client does not roam to another managed AP within the client roam timeout, it will be deleted.
Channel	Display the operating channel for the client association.
User Name	Display the user name of client that have authenticated via 802.1X. Clients on networks with other security modes will not have a user name.
Inactive Period	Display the amount of time since data packets were last received from the client.
Age	Display the amount of time that has passed since the switch received new status or statistics updates for this client.
Dot11n Capable	Display whether the associated client supports the IEEE 802.11n standard.
NetBIOS Name	Display the NetBIOS name of the wireless client. For Microsoft Windows hosts, the NetBIOS name is typically the same as, or based on the host name.
Tunnel IP Address	This field displays "----" for all non-tunneled clients. For a tunneled client, this is the assigned tunnel IP address.
Associating Switch	Display whether the AP that the wireless client is associated to is managed by the local switch or a peer switch.
Switch MAC Address	Display the MAC address of the switch that manages the AP to which the wireless client is associated.
Switch IP Address	Display the IP address of the switch that manages the AP to which the wireless client

	is associated.
Location	The descriptive location configured for the managed AP.
Radio	Display the managed AP radio interface the client is associated to and its configured mode.
VLAN	If the client is on a VAP using VLAN data forwarding mode, the current assigned VLAN is displayed.
Transmit Data Rate	Display the rate at which the client station is currently transmitting data.
Network Time	Display the amount of time that has passed since this client first authenticated with the network.
STBC Capable	Display the Space Time Block Code (STBC) mode of the client.
Detected IP Address	Display the IPv4 address of the client.

Click the drop-down menu to select a MAC address of the client to view detailed status information about the client and its association with the access point.

Click the **Disassociate** to disassociate the client from the managed AP.

After clicking the **Client QoS** tab under the **Status** tab, the following page will appear:

Figure 2-36 Associated Clients Status - Client QoS window

Click the drop-down menu to select the MAC address of the client with the information to view.

The fields that can be displayed are described below:

Parameter	Description
Actual / RADIUS	Click the Actual radio button to display either the actual status parameters configured on the AP. Click the RADIUS radio button to display any client QoS parameters that were obtained for the client from a RADIUS server when using 802.1X authentication.
Client QoS Operational Status	Display whether QoS is enforced for the client.
Bandwidth Limit Down	Display the maximum rate at which the client receives traffic from the AP in bits per second. The rate shown in this field is the configured value rounded down to the nearest 64

	kbps. A value of 0 means no bandwidth limiting is in effect in this direction.
Bandwidth Limit Up	Display the maximum rate at which the client transmits traffic to the AP in bits per second. The rate shown in this field is the configured value rounded down to the nearest 64 kbps. A value of 0 means no bandwidth limiting is in effect in this direction.
Access Control Down	Display which ACL, if any, is applied to traffic from the AP to the client.
Access Control Up	Display which ACL, if any, is applied to traffic from the client to the AP.
Diffserv Policy Down	Display which DiffServ policy, if any, is applied to traffic from the AP to the client.
Diffserv Policy Up	Display which DiffServ policy, if any, is applied to traffic from the client to the AP.

After clicking the **Neighbors APs** tab under the **Status** tab, the following page will appear:

Figure 2-37 Associated Clients Status - Neighbor APs window

Click the drop-down menu to select the MAC address of the client with the information to view.

The fields that can be displayed are described below:

Parameter	Description
AP MAC Address	The base Ethernet address of the Unified Switch managed AP.
Location	The configured descriptive location for the managed AP.
Radio	The radio interface and its configured mode that detected this client as a neighbor.
Discovery Reason	Indicates one or more discovery methods for the neighbor client. One or more of the following values may be displayed: <ul style="list-style-type: none"> <i>RF</i> - The client was reported from an RF scan on the radio. Note that client stations are difficult to detect via RF scan, the other methods are more common for client neighbor detection. <i>Probe Request</i> - The managed AP received a probe request from the client. <i>Associated to Managed AP</i> - This neighbor client is associated to another managed AP. <i>Associated to this AP</i> - The client is associated to this managed AP on the displayed radio. <i>Associated to Peer AP</i> - The client is associated to an AP managed by a peer

switch.

- *Ad Hoc Rogue* - The client was detected as part of an ad hoc network with this AP.

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

After clicking the **Distributed Tunneling** tab under the **Status** tab, the following page will appear:

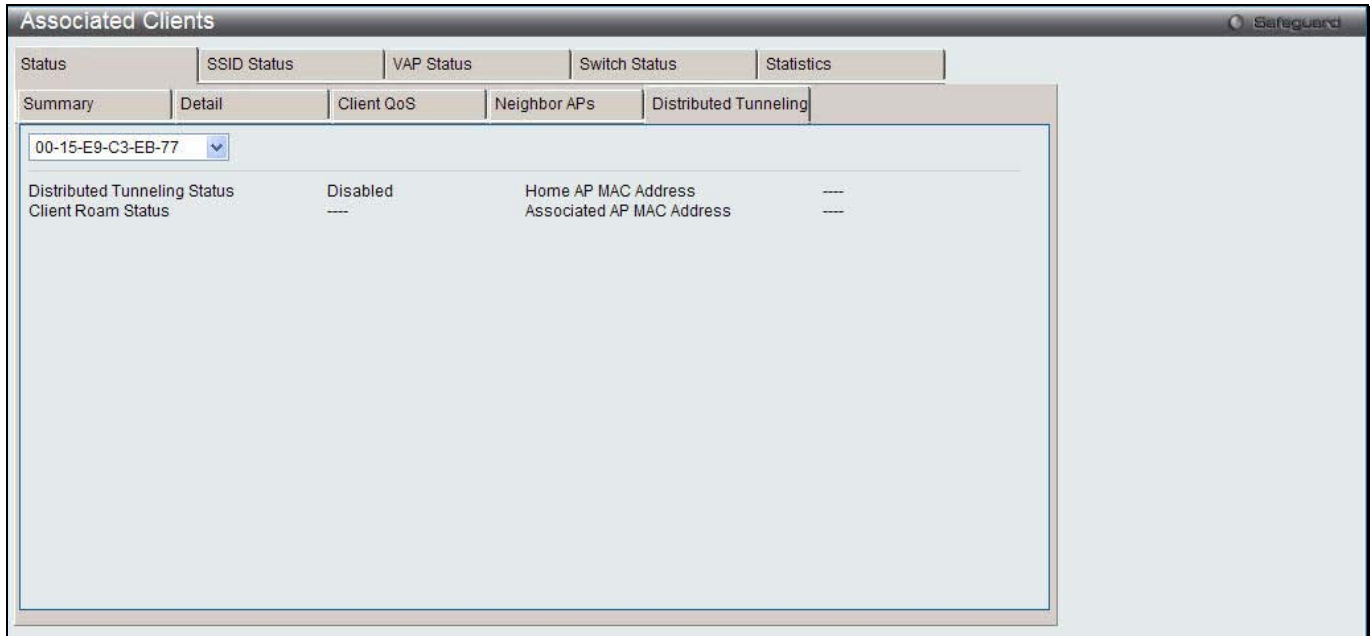


Figure 2-38 Associated Clients Status - Distributed Tunneling window

Click the drop-down menu to select the MAC address of the client with the information to view.

The fields that can be displayed are described below:

Parameter	Description
Distributed Tunneling Status	Display whether this client is associated with a network that supports L2 distributed tunneling.
Client Roam Status	Display whether the client is on the Home AP or has roamed to another AP and is using a tunnel. The field can display one of the following values: <ul style="list-style-type: none"> • <i>Home</i> - Client is not using a tunnel. • <i>Roaming</i> - Client is using a tunnel.
Home AP MAC Address	Display the MAC Address of the Home AP for the client. The value is meaningful only for clients that are associated with networks enabled for distributed tunneling.
Associated AP MAC Address	Display the MAC Address of the AP to which the client roamed via the distributed tunneling protocol.

After clicking the **SSID Status** tab, the following page will appear:

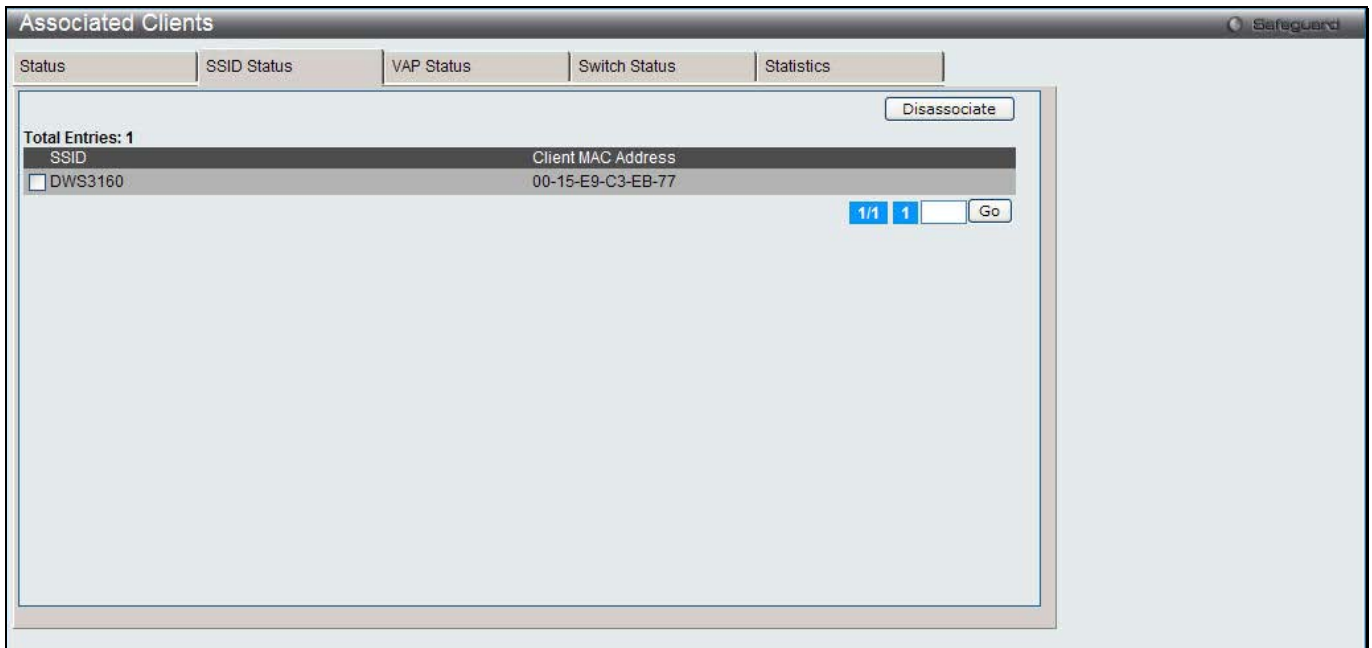


Figure 2-39 Associated Clients SSID Status window

The fields that can be displayed are described below:

Parameter	Description
SSID	The network on which the client is connected.
Client MAC Address	The Ethernet address of the client station.

Tick the specific check box and click the **Disassociate** button to disassociate the client from the managed AP. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **VAP Status** tab, the following page will appear:

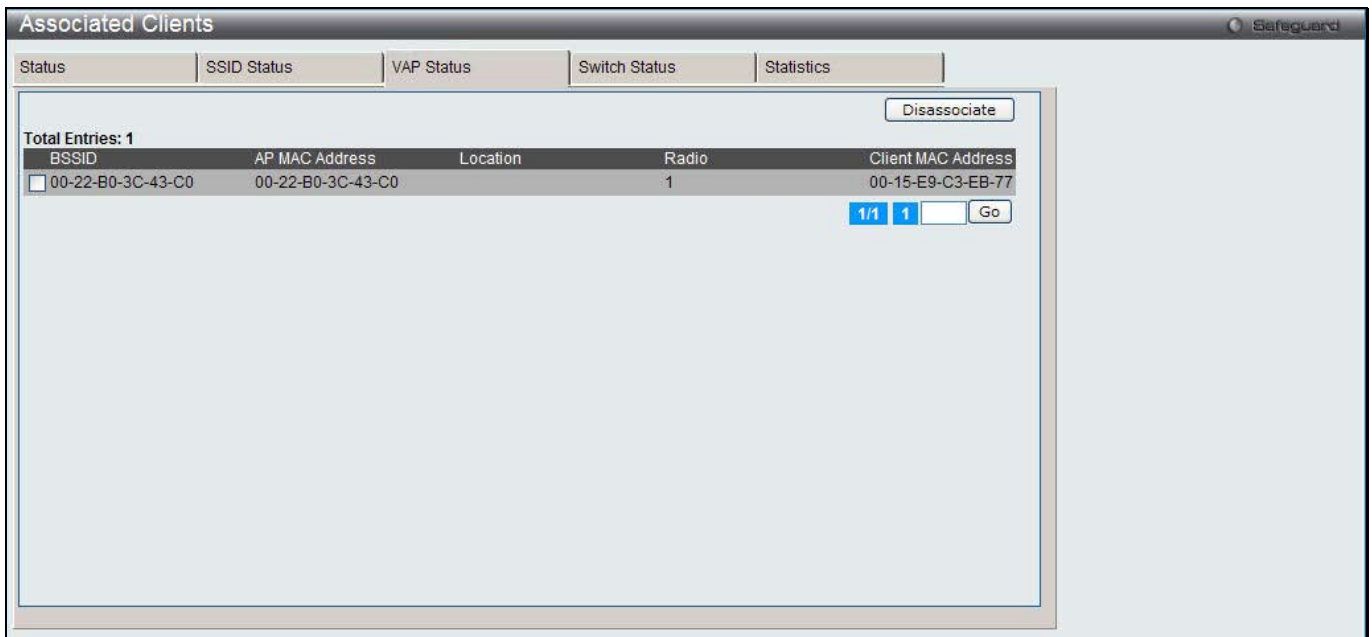


Figure 2-40 Associated Clients VAP Status window

The fields that can be displayed are described below:

Parameter	Description
-----------	-------------

BSSID	The Ethernet MAC address for the managed AP VAP where this client is associated.
AP MAC Address	The base AP Ethernet MAC address for the managed AP.
Location	The descriptive location configured for the managed AP.
Radio	Display the managed AP radio interface the client is associated to and its configured mode.
Client MAC Address	The Ethernet address of the client station.

Tick the specific check box and click the **Disassociate** button to disassociate the client from the managed AP. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Switch Status** tab, the following page will appear:

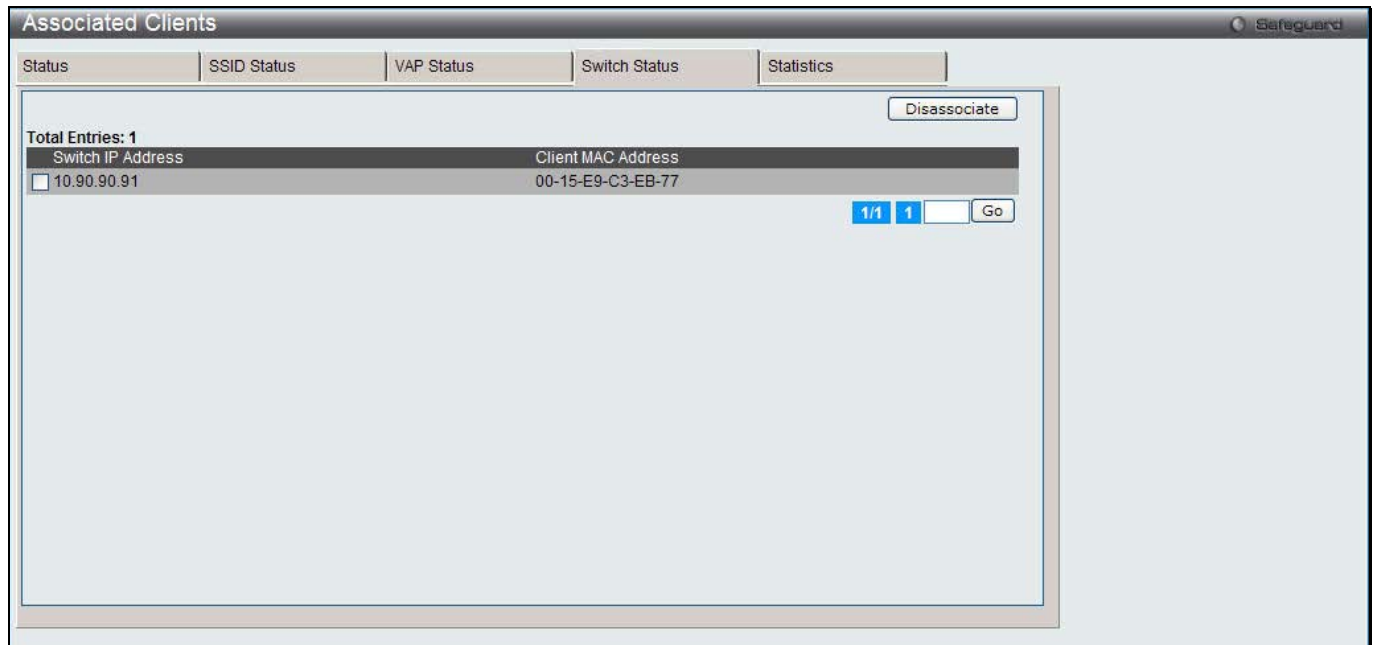


Figure 2-41 Associated Clients Switch Status window

The fields that can be displayed are described below:

Parameter	Description
Switch IP Address	The IP address of the switch that manages the AP to which the client is associated.
Client MAC Address	The MAC address of the associated client.

Tick the specific check box and click the **Disassociate** button to disassociate the client from the managed AP. Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the **Statistics** tab, the following page will appear:

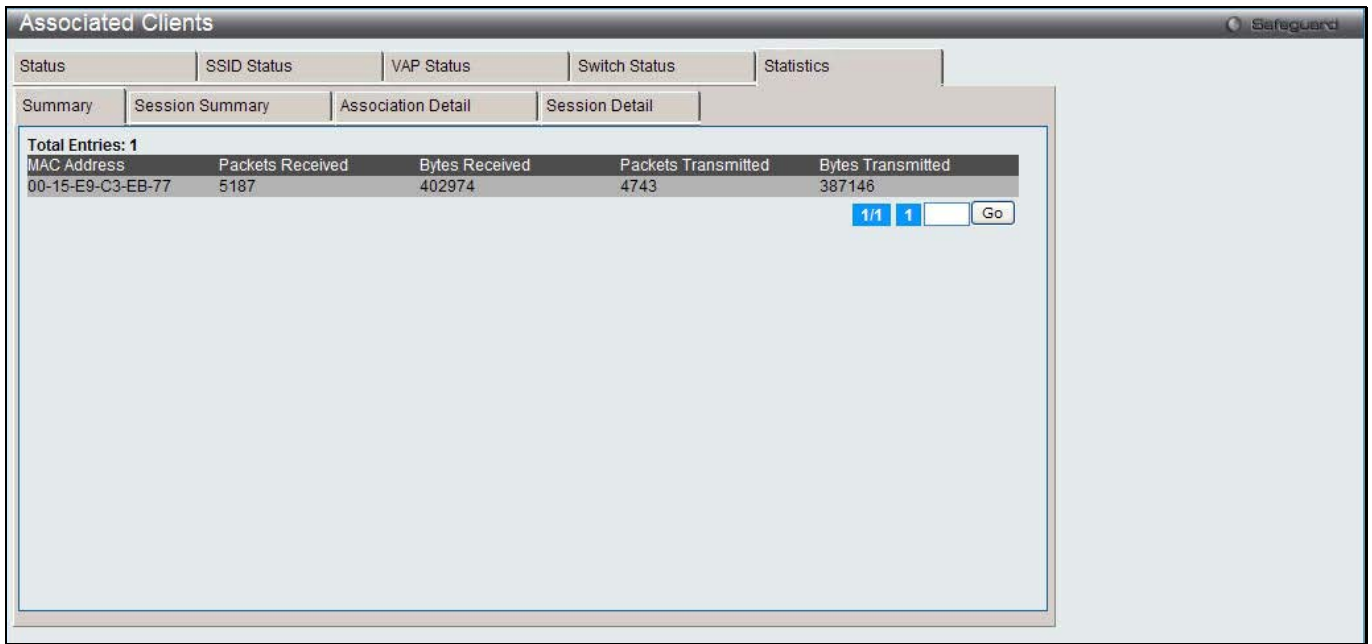


Figure 2-42 Associated Clients Statistics - Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the client station.
Packets Received	Packets received from the client station.
Bytes Received	Bytes received from the client station.
Packets Transmitted	Packets transmitted to the client station.
Bytes Transmitted	Bytes transmitted to the client station.

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

After clicking the **Session Summary** tab under the **Statistics** tab, the following page will appear:

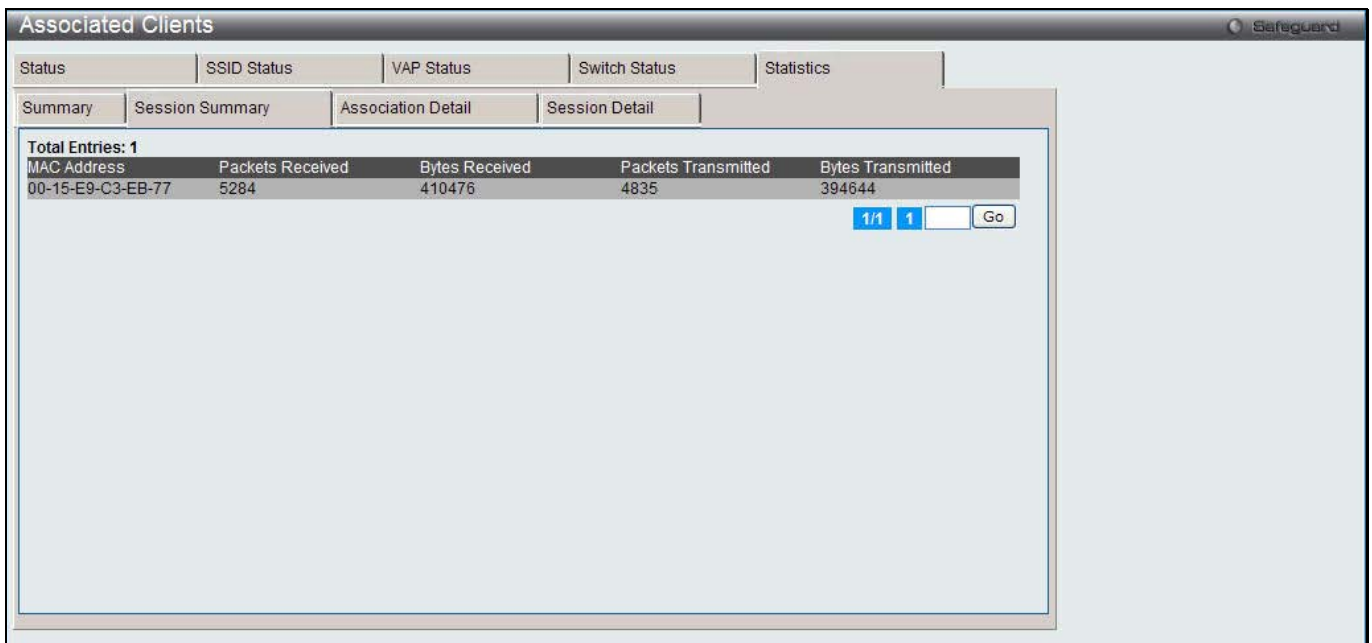


Figure 2-43 Associated Clients Statistics - Session Summary window

If the client roams from one AP to another AP but remains connected to the same network, the session continues and the session statistics continue to accumulate. If the client closes the wireless connection or roams out of the range of an AP managed by the switch, the session ends.

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the client station.
Packets Received	Packets received from the client station.
Bytes Received	Total bytes received from the client station.
Packets Transmitted	Total packets transmitted to the client station.
Bytes Transmitted	Total bytes transmitted to the client station.

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

After clicking the **Association Detail** tab under the **Statistics** tab, the following page will appear:

This page is used to display information about the traffic that a wireless client receives and transmits while it is associated with a single AP. Each client is identified by its MAC address.

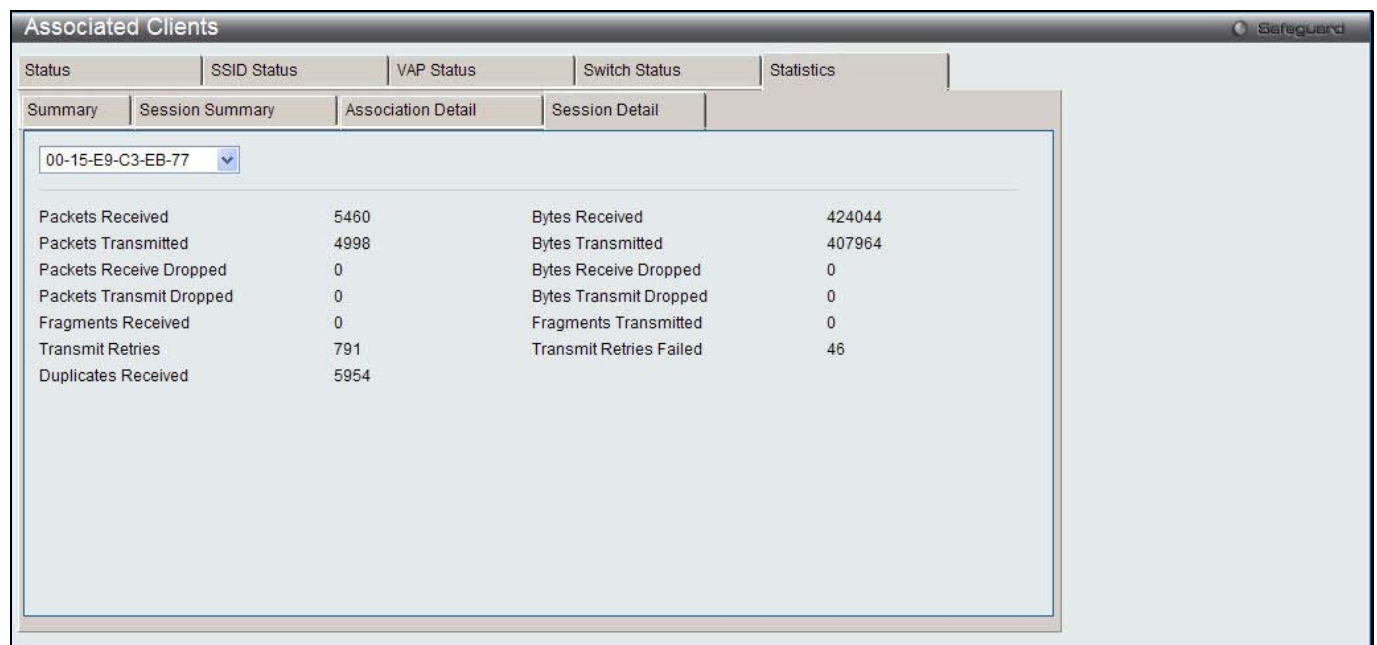


Figure 2-44 Associated Clients Statistics - Association Detail window

Click the drop-down menu to select the MAC address of the client with the information to view.

The fields that can be displayed are described below:

Parameter	Description
Packets Received	Total packets received from the client station.
Bytes Received	Total bytes received from the client station.
Packets Transmitted	Total packets transmitted to the client station.
Bytes Transmitted	Total bytes transmitted to the client station.
Packets Receive Dropped	Number of packets received from the client station that were dropped.
Bytes Received Dropped	Number of bytes received from the client station that were dropped.
Packets Transmit Dropped	Number of packets transmitted to the client station that were dropped.

Bytes Transmit Dropped	Number of bytes transmitted to the client station that were dropped.
Fragments Received	Total fragmented packets received from the client station.
Fragments Transmitted	Total fragmented packets transmitted to the client station.
Transmit Retries	Number of times transmits to client station succeeded after one or more retries.
Transmit Retries Failed	Number of times transmits to client station failed after one or more retries.
Duplicates Received	Total duplicate packets received from the client station.

After clicking the **Session Detail** tab under the **Statistics** tab, the following page will appear:

This page is used to display information about the traffic that a wireless client receives and transmits while it is connected to the same WLAN network shared by APs that the switch manages. Each client is identified by its MAC address

The screenshot shows the 'Associated Clients' window with the 'Session Detail' tab selected. A drop-down menu is set to '00-15-E9-C3-EB-77'. The statistics are as follows:

Parameter	Value	Parameter	Value
Packets Received	5460	Bytes Received	424044
Packets Transmitted	4998	Bytes Transmitted	407964
Packets Receive Dropped	0	Bytes Receive Dropped	0
Packets Transmit Dropped	0	Bytes Transmit Dropped	0
Fragments Received	0	Fragments Transmitted	0
Transmit Retries	791	Transmit Retries Failed	46
Duplicates Received	5954		

Figure 2-45 Associated Clients Statistics - Session Detail window

Click the drop-down menu to select the MAC address of the client with the information to view.

The fields that can be displayed are described below:

Parameter	Description
Packets Received	Total packets received from the client station.
Bytes Received	Total bytes received from the client station.
Packets Transmitted	Total packets transmitted to the client station.
Bytes Transmitted	Total bytes transmitted to the client station.
Packets Receive Dropped	Number of packets received from the client station that were dropped.
Bytes Received Dropped	Number of bytes received from the client station that were dropped.
Packets Transmit Dropped	Number of packets transmitted to the client station that were dropped.
Bytes Transmit Dropped	Number of bytes transmitted to the client station that were dropped.
Fragments Received	Total fragmented packets received from the client station.
Fragments Transmitted	Total fragmented packets transmitted to the client station.
Transmit Retries	Number of times transmits to client station succeeded after one or more retries.
Transmit Retries Failed	Number of times transmits to client station failed after one or more retries.

Duplicates Received

Total duplicate packets received from the client station.

Detected Clients

This window is used to display the information about clients that have authenticated with an AP as well as information about clients that disassociate and are no longer connected to the system.

To view this window, click **Monitoring > Client > Detected Clients** as shown below:

MAC Address	Client Name	Client Status	Age	Create Time
00-05-5D-55-94-A0		Detected	0d:00:22:55	0d:00:22:55
00-13-46-FD-9C-B5		Detected	0d:00:01:09	0d:00:23:55
00-15-E9-C3-EB-77		Detected	0d:00:00:01	0d:00:14:56
00-15-F2-4D-9A-28		Detected	0d:00:01:38	0d:00:22:25
00-17-9A-D1-66-A5		Detected	0d:00:00:01	0d:00:26:26
00-1B-11-B5-89-B8		Detected	0d:00:14:55	0d:00:17:55
00-1D-6A-12-0F-C1		Detected	0d:00:00:08	0d:00:23:55
00-1D-6A-12-0F-C7		Detected	0d:00:02:08	0d:00:05:08
00-1D-D9-46-5C-AC		Detected	0d:00:06:55	0d:00:15:55
00-22-FA-5C-9D-70		Detected	0d:00:10:25	0d:00:11:26

Figure 2-46 Detected Client Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the client.
Client Name	Display the name of the client, if available, from the Known Client database. If the client is not in the database, the field is blank.
Client Status	Display the client status, which can be one of the following: <ul style="list-style-type: none"> <i>Authenticated</i> - The wireless client is authenticated with the wireless system. <i>Detected</i> - The wireless client is detected by the wireless system but is not a security threat. <i>Black-Listed</i> - The client with this MAC address is specifically denied access via MAC Authentication. <i>Rogue</i> - The client is classified as a threat by one of the threat detection algorithms.
Age	Time since any event has been received for this client that updated the detected client database entry.
Create Time	Time since this entry was first added to the Detected Clients database.

Click the specific MAC address hyperlink to see more information about the client.

Tick the specific check box and click the **Delete** button to remove the entry.

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

Click the **Acknowledge All Rogues** button to clear the rogue status of all clients.

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

After clicking the MAC address hyperlink, the following page will appear:

Detected Clients					
Detected Client Summary		Pre-Authentication History Summary		Roam History Summary	
Detected Client Status		WIDS Client Rogue Classification		Pre-Auth History	
		Triangulation		Roam History	
MAC address	00-13-46-FD-9C-B5	Auth Msgs Recorded	0		
Client Status	Detected	Auth Collection Interval	0d:00:00:31		
Authentication Status	Not Authenticated	Highest Auth Msgs	0		
Threat Detection	Detected	De-Auth Msgs Recorded	0		
Threat Mitigation Status	Not Done	De-Auth Collection Interval	0d:00:00:31		
Time Since Entry Last Updated	0d:00:01:28	Highest De-Auth Msgs	0		
Time Since Entry Create	0d:00:15:29	Authentication Failures	0		
Client Name		Probes Detected	4		
RSSI	2	Broadcast BSSID Probes	2		
Signal	-89	Broadcast SSID Probes	2		
Noise	-91	Specific BSSID Probes	0		
Probe Req Recorded	0	Specific SSID Probes	0		
Probe Collection Interval	0d:00:00:31	Last Non-Broadcast BSSID	00-00-00-00-00-00		
Highest Probes Detected	2	Last Non-Broadcast SSID			
Channel	6	Threat Mitigation Sent	0d:00:00:00		
OUI Description	D-Link Corporation				

Figure 2-47 Detected Client Summary –Detected Client Status window

The fields that can be displayed are described below:

Parameter	Description
MAC address	The Ethernet address of the client.
Client Status	Display the client status, which can be one of the following: <ul style="list-style-type: none"> <i>Authenticated</i> - Client is Authenticated with the system and is not Rogue. <i>Detected</i> - Client is detected, not Authenticated, not rogue, and is not found in the Known Clients Database. <i>Known</i> - Client is detected and found in the Known Clients Database, but is not authenticated. <i>Black-Listed</i> - Client tried to associate with the system, but was rejected due to MAC authentication. <i>Rogue</i> - Client failed of the enabled threat tests.
Authentication Status	Display whether this client is authenticated. NOTE: The Client Status can be Rogue, but the authentication status can still be Authenticated.
Threat Detection	Display whether one of the threat detection tests has been triggered for this client. If the test is disabled, the client will not be marked as a rogue, but you can still investigate why the threat was triggered.
Threat Mitigation Status	Display whether threat mitigation has been done for this client.
Time Since Entry Last Updated	Display the amount of time that has passed since any event has been received for this client that updated the detected client database entry.
Time Since entry Create	Display the amount of time that has passed since this entry was first added to the detected clients database.
Client Name	Display the name of the client, if available, from the Known Client Database. If the client is not in the database, the field is blank.
RSSI	If the client is authenticated with the managed AP, this field displays the last RSSI value reported by the AP with which the client is authenticated. The RSSI is a percentage from 1 to 100%. A value of 0 means the AP is not detected.
Signal	Last signal strength reported by the managed AP with which the client is

	authenticated. The possible range is from -128 to 128 dBm.
Noise	Last channel noise reported by the managed AP with which the client is authenticated. The possible range is from -128 to 128 dBm.
Probe Req Recorded	Number of probe requests recorded so far during the probe collection interval.
Probe Collection Interval	Display the amount of time spent in each probe collection period. The probe collection helps the switch decide whether the client is a threat.
Highest Probes Detected	Display the largest number of probes that the switch detected during a probe collection interval.
Channel	Display the channel that the client is using.
OUI Description	Display the organization unique identifier for the wireless client.
Auth Msgs Recorded	Display the number of IEEE 802.11 Authentication messages recorded so far during the authentication collection interval.
Auth Collection Interval	Display the amount of time spent in each authentication collection period. The authentication collection helps the switch decide whether the client is a threat.
Highest Auth Msgs	Display the largest number of authentication messages that the switch detected during an authentication collection interval.
De-Auth Msgs Recorded	Display the number of IEEE 802.11 De-Authentication messages recorded so far during the de-authentication collection interval.
De-Auth Collection Interval	Display the amount of time spent in each de-authentication collection period. The de-authentication collection helps the switch decide whether the client is a threat.
Highest De-Auth msgs	Display the largest number of de-authentication messages that the switch detected during a de-authentication collection interval.
Authentication Failures	Display the number of 802.1X Authentication failures detected for this client.
Probes Detected	Display the number of probes detected in the last RF Scan.
Broadcast BSSID Probes	Display the number of probes to broadcast BSSID in the last RF Scan.
Broadcast SSID Probes	Display the number of probes to broadcast SSID in the last RF Scan.
Specific BSSID Probes	Display the number of probes to a specific BSSID in the last RF Scan.
Specific SSID Probes	Display the number of probes to a specific SSID in the last RF Scan.
Last Non-Broadcast BSSID	Display the last non-broadcast BSSID detected in the RF Scan, which is a MAC address.
Last Non-Broadcast SSID	Display the name of the last non-broadcast SSID detected in the RF Scan.
Threat Mitigation Sent	Display whether threat mitigation has been done for this client.

Click the **Acknowledge Rogue** button to clear the rogue status of the client.

After clicking the **WIDS Client Rogue Classification** tab under the **Detected Client Summary** tab, the following page will appear:

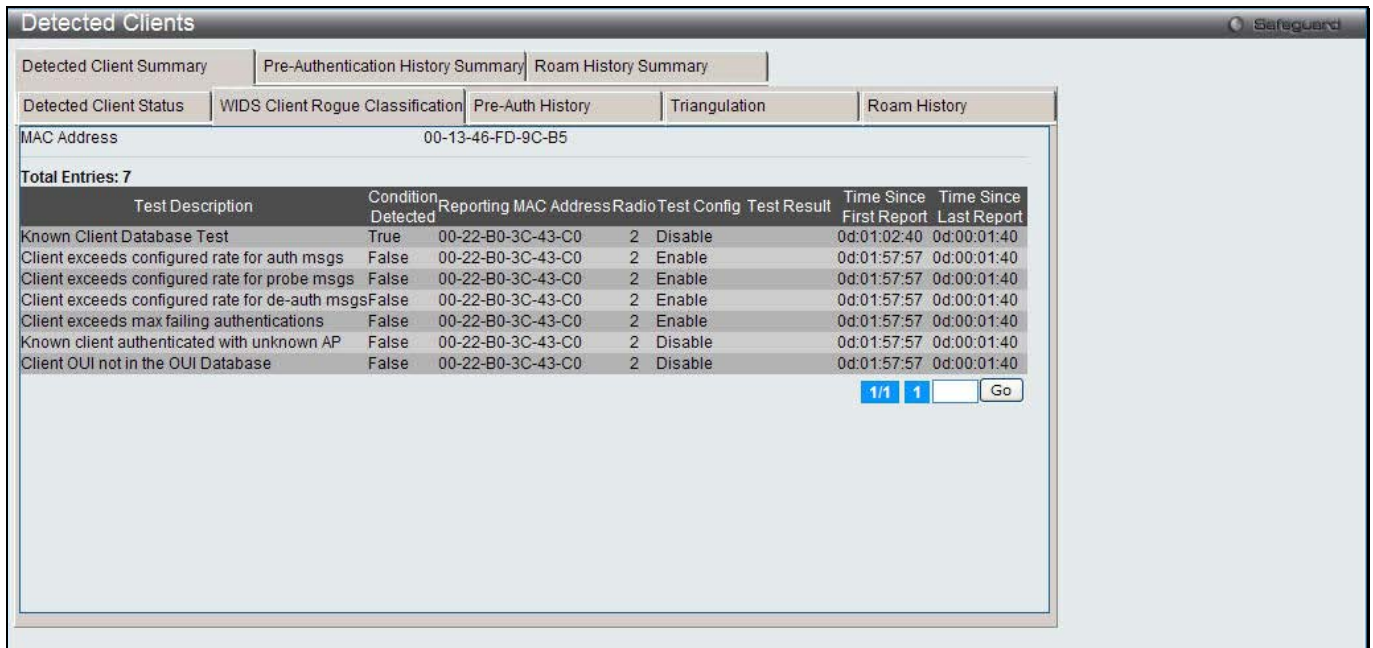


Figure 2-48 Detected Client Summary –WIDS Client Rogue Classification window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet MAC address of the detected wireless client.
Test Description	Display the tests that were performed, which includes the following: <ul style="list-style-type: none"> • Known Clients database Test • Client exceeds configured rate for auth msgs • Client exceeds configured reate for probe msgs • Client exceeds configured rate for de-auth msgs • Client exceeds max failing authentications • Known client authenticated with unknown AP • Client OUI not in the OUI Database
Condition Detection	Display whether the result of the test was true or false.
Reporting MAC Address	Display the MAC address of the AP that reported the test results.
Radio	Display which physical radio on the reporting AP was responsible for the test results.
Test Config	Display whether this test is configured to report rogues. Each test can be globally enabled or disabled to report a positive result as a rogue.
Test Result	Display whether this test reported the device as rogue. In some cases the test may report a positive result, be enabled, but not report the device as rogue because the device is allowed to operate in this mode.
Time Since First Report	Time stamp indicating how long ago this test first detected the condition.
Time Since Last Report	Time stamp indicating how long ago this test last detected the condition.

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

After clicking the **Pre-Auth History** tab under the **Detected Client Summary** tab, the following page will appear:

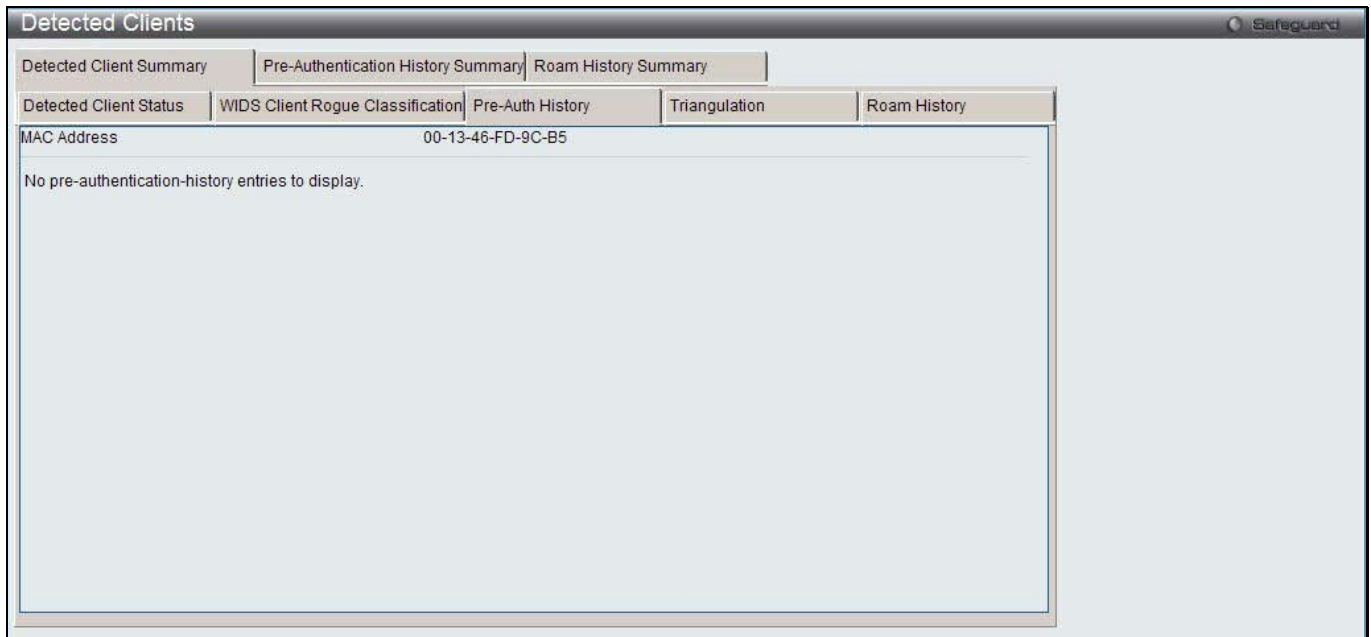


Figure 2-49 Detected Client Summary –Pre-Auth History window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	MAC address of the client.
AP MAC Address	MAC Address of the managed AP to which the client has pre-authenticated.
Radio Interface Number	Radio number to which the client is authenticated, which is either Radio 1 or Radio 2.
VAP MAC Address	VAP MAC address to which the client roamed.
SSID	SSID Name used by the VAP.
Age	Time since the history entry was added.
User Name	Display the user name of client that authenticated via 802.1X.
Pre-Authentication Status	Display whether the client successfully authenticated and shows a status of Success or Failure.

After clicking the **Triangulation** tab under the **Detected Client Summary** tab, the following page will appear:

Figure 2-50 Detected Client Summary –Triangulation window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	MAC address of the client.
AP Function	Identifies whether the radio that detected the client is in sentry or non-sentry mode. <ul style="list-style-type: none"> <i>Non-Sentry</i> - The radio that detected the client is not configured in sentry mode. This means the radio can accept connections from wireless clients and send and receive traffic. <i>Sentry</i> - The radio that detected the client is configured in sentry mode. Networks that deploy sentry APs or radios can detect devices on the network quicker and perform more thorough security analysis.
AP MAC Address	MAC Address of the managed AP that detected the client.
Radio	Radio number to which the client is authenticated, which is either Radio 1 or Radio 2.
RSSI (%)	Received signal strength indicator in terms of percentage for the non-sentry AP. The range is from 0 to 100, where the maximum value is 100. A value of 0 indicates that the client is not detected.
Signal (dBm)	Received signal strength in dBm. The possible range is -127 to 127. However, realistically, this value is expected to range from -95 to -10.
Noise (dBm)	Noise reported on the channel by the non-sentry AP. The possible range is -127 to 127.
Age	Time since this AP detected the signal.

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

After clicking the **Roam History** tab under the **Detected Client Summary** tab, the following page will appear:

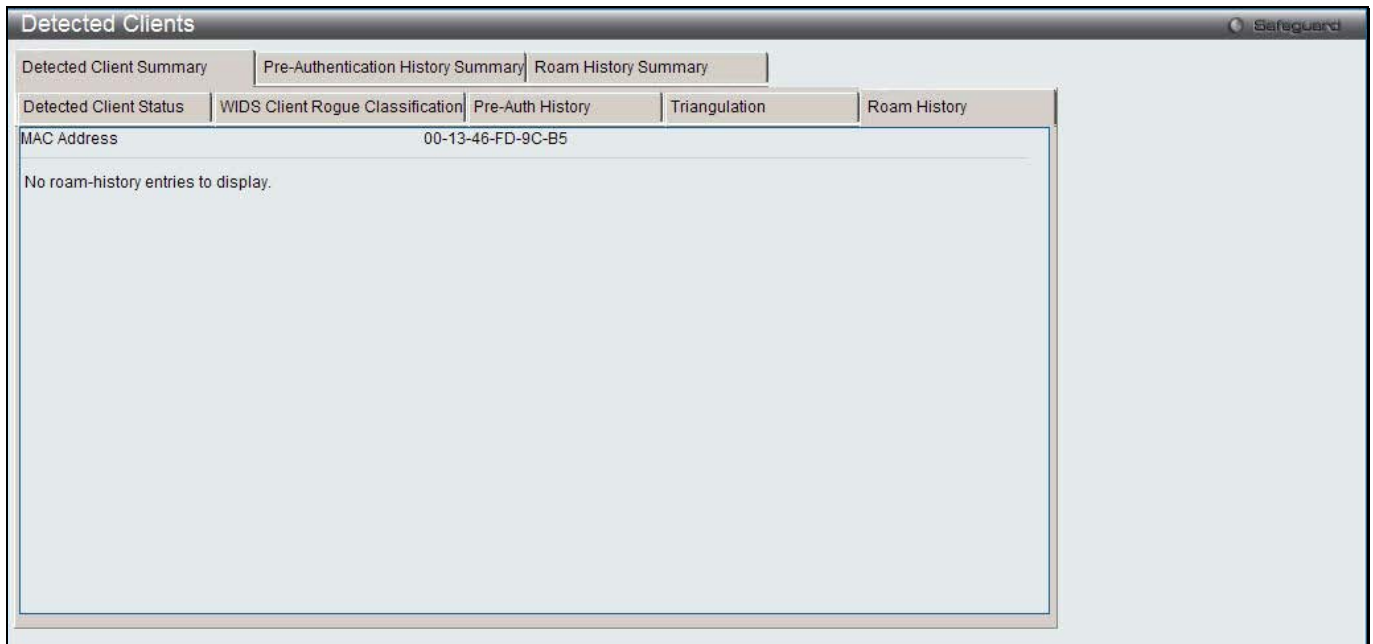


Figure 2-51 Detected Client Summary –Roam History window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	MAC address of the detected client.
AP MAC Address	MAC Address of the managed AP to which the client authenticated.
Radio Interface Number	Radio Number to which the client is authenticated.
VAP MAC Address	VAP MAC address to which the client roamed.
SSID	SSID Name used by the VAP.
New Authentication	A flag indicating whether the history entry represents a new authentication or a roam event.
Age	Time since the history entry was added.

After clicking the **Pre-Authentication History Summary** tab, the following page will appear:

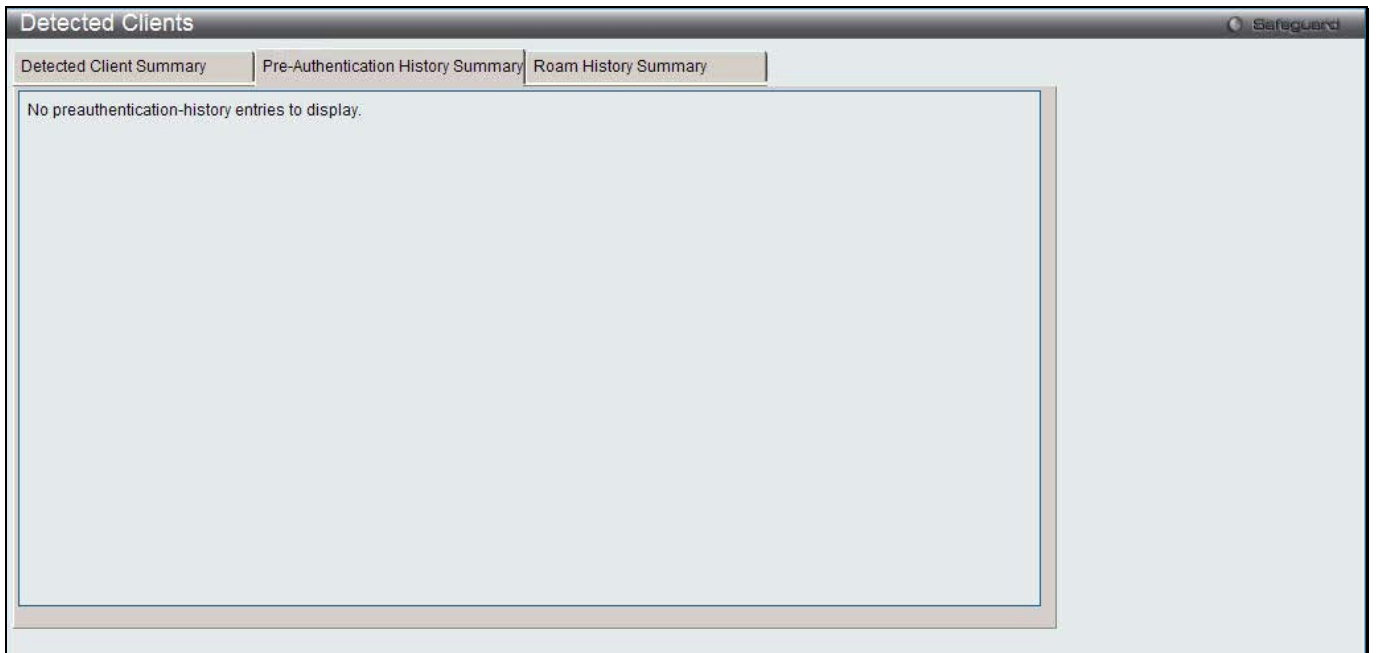


Figure 2-52 Detected Client Pre-Authentication History Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	MAC address of the detected client.
AP MAC Address	MAC Address of the managed AP to which the client has pre-authenticated. This field can show a history of up to ten pre-authentications for each client.

After clicking the **Roam History Summary** tab, the following page will appear:

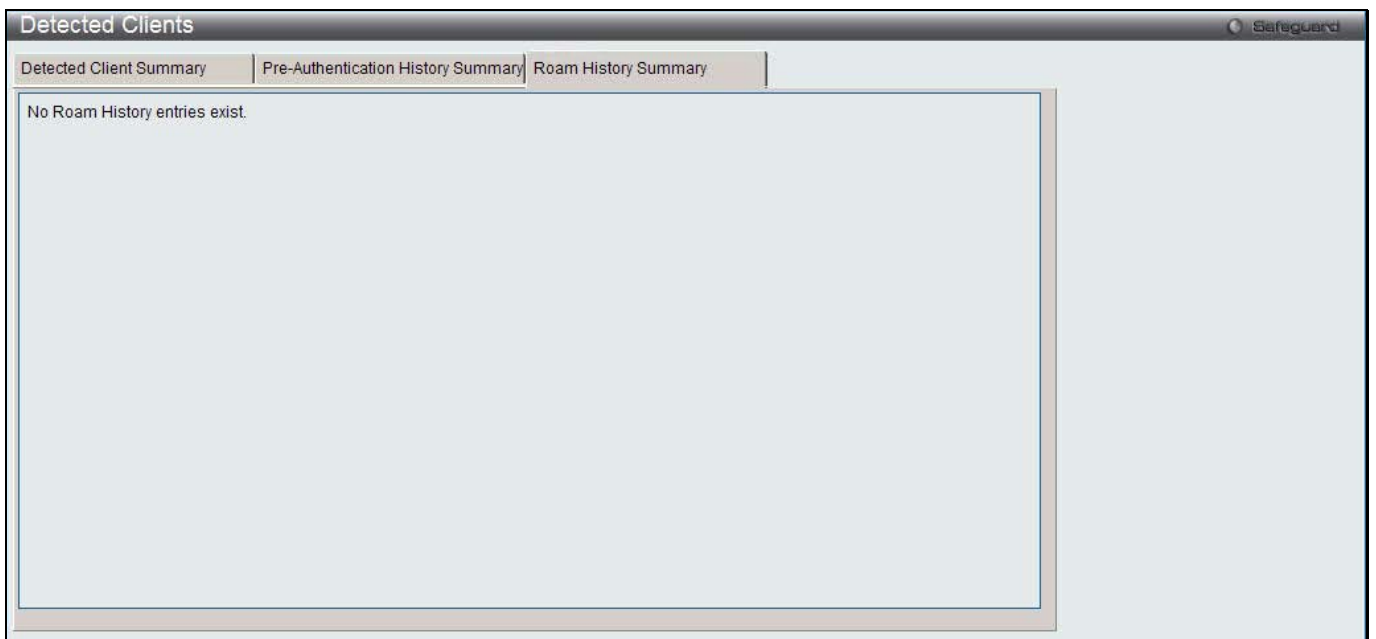


Figure 2-53 Detected Client Roam History Summary window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	MAC address of the detected client.

AP MAC Address	MAC Address of the managed AP to which the client authenticated. This field can show the MAC address of the last ten APs to which the client has roamed and authenticated.
-----------------------	--

Ad Hoc Clients

This window is used to display the ad hoc clients. An ad hoc client is a wireless client that gains access to the WLAN through a wireless client that is associated with an access point. The ad hoc client does not communicate directly with the AP. Ad hoc networks are a particular concern because they consume RF bandwidth and can present a security risk.

To view this window, click **Monitoring > Client > Ad Hoc Clients** as shown below:



Figure 2-54 Ad Hoc Clients window

The fields that can be displayed are described below:

Parameter	Description
MAC Address	The Ethernet address of the client. If the Detection Mode is <i>Beacon</i> , the client is represented as an AP in the RF Scan database and the Neighbor APs list. If the Detection Mode is <i>Data</i> , the client information is in the Neighbor Clients list.
AP MAC Address	The base Ethernet MAC Address of the managed AP which detected the client.
Location	The configured descriptive location for the managed AP.
Radio	The radio interface and its configured mode that detected the ad hoc device.
Detection Mode	The mechanism of detecting this Ad Hoc device. The possible values are <i>Beacon</i> or <i>Data</i> .
Age	Time since last detection of the ad hoc network.

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

Tick the specific check box and click the **Allow MAC** button to add the MAC address, which default action is allow, to the Known Clients window and allow the client to access the WLAN.

Tick the specific check box and click the **Deny MAC** button to add the MAC address, which default action is deny, to the Known Clients window and block an ad hoc client from WLAN access.

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

QoS

Access Control Lists

IP Access Control Lists

This window is used to display the IP access control lists (ACL).

To view this window, click **Monitoring > QoS > Access Control Lists > IP Access Control Lists** as shown below:

Table	Current Number / Maximum Number
ACL	4 / 100

Type Select: ALL

Total Entries: 3

IP ACL ID (Name)	Type	Rules Count	Rules ID
1	Standard	1	1
100	Extended	1	1
ACLName	Named	1	1

1/1 1 Go

Figure 2-55 IP Access Control Lists window

Use the **Type Select** drop-down menu to display various types of IP ACL.

Click the Rules ID hyperlink to see the detail information about the rule.

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

After clicking the Rules ID hyperlink, one of the following pages will appear:

IP ACL ID	1
Rule ID	1
Action	Deny
Match Every	False
Source IP Address	10.1.1.1
Source IP Mask	255.0.0.0

<< Back

Figure 2-56 IP Access Control Lists - Rule ID window (Standard IP ACL)

The fields that can be displayed are described below:

Parameter	Description
IP ACL ID	The ID of the IP ACL.
Rule ID	The number identifier for each rule that is defined for the IP ACL.
Action	The action associated with each rule. Available values are <i>Permit</i> and <i>Deny</i> .
Match Every	Display whether this access list applies to every packet. Available values are <i>True</i> and <i>False</i> .
Source IP Address	The source IP address for this rule.
Source IP Mask	The source IP Mask for this rule.

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

IP Access Control Lists

IP ACL Name: 100
Rule ID: 1

Action: Deny
Match Every: False

Protocol:
Source IP Address:
Source IP Mask:
Source L4 Port:
Destination IP Address:
Destination IP Mask:
Destination L4 Port:
Service Type:

<<Back

Figure 2-57 IP Access Control Lists - Rule ID window (Extended IP ACL)

The fields that can be displayed are described below:

Parameter	Description
IP ACL Name	The ID of the IP ACL.
Rule ID	The number identifier for each rule that is defined for the IP ACL.
Action	The action associated with each rule. Available values are <i>Permit</i> and <i>Deny</i> .
Match Every	Display whether this access list applies to every packet. Available values are <i>True</i> and <i>False</i> .
Protocol	The protocol to filter for this rule.
Source IP Address	The source IP address for this rule.
Source IP Mask	The source IP Mask for this rule.
Source L4 Port	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination IP Mask	The destination IP Mask for this rule.
Destination L4 Port	The destination port for this rule.
Service Type	Display one of the three Match conditions, <i>IP DSCP</i> , <i>IP Precedence</i> or <i>IP ToS</i> , for the extended IP ACL rule.

Click the <<Back button to return to the previous window.

IP Access Control Lists

IP ACL Name: ACLName
Rule ID: 1

Action: Deny
Match Every: False

Protocol:
Source IP Address:
Source IP Mask:
Source L4 Port:
Destination IP Address:
Destination IP Mask:
Destination L4 Port:
Service Type:

<<Back

Figure 2-58 IP Access Control Lists - Rule ID window (Named IP ACL)

The fields that can be displayed are described below:

Parameter	Description
IP ACL Name	The name of the IP ACL.
Rule ID	The number identifier for each rule that is defined for the IP ACL.
Action	The action associated with each rule. Available values are <i>Permit</i> and <i>Deny</i> .
Match Every	Display whether this access list applies to every packet. Available values are <i>True</i> and <i>False</i> .
Protocol	The protocol to filter for this rule.
Source IP Address	The source IP address for this rule.
Source IP Mask	The source IP Mask for this rule.
Source L4 Port	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination L4 Port	The destination IP Mask for this rule.
Service Type	Display one of the three Match conditions, <i>IP DSCP</i> , <i>IP Precedence</i> or <i>IP ToS</i> , for the extended IP ACL rule.

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

IPv6 Access Control Lists

This window is used to display the IPv6 access control lists.

To view this window, click **Monitoring > QoS > Access Control Lists > IPv6 Access Control Lists** as shown below:

Table		Current Number / Maximum Number
ACL		3 / 100
Total Entries: 1		
IPv6 ACL Name	Rules Count	Rules ID
IPv6ACL	1	1

1/1 1 Go

Figure 2-59 IPv6 Access Control Lists window

Click the Rules ID hyperlink to see the detail information about the rule.

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

After clicking the Rules ID hyperlink, the following page will appear:

IPv6 ACL Name	IPv6
Rule ID	1
Action	Deny
Match Every	False
Protocol	
Source Prefix	Source Prefix Length
Source L4 Port	
Destination Prefix	Destination Prefix Length
Destination L4 Port	
Flow Label	
IP DSCP Service	

<<Back

Figure 2-60 IPv6 Access Control Lists - Rule ID window

The fields that can be displayed are described below:

Parameter	Description
IPv6 ACL Name	IPv6 ACL identifier.
Rule ID	The ordered rule number identifier defined within the IPv6 ACL.
Action	The action associated with each rule. Available values are <i>Permit</i> and <i>Deny</i> .
Match Every	Display whether this access list applies to every packet. Available values are <i>True</i> and <i>False</i> .
Protocol	The protocol to filter for this rule.
Source Prefix	The source IPv6 address for this rule.
Source L4 Port	The source port for this rule.
Destination Prefix	The destination IPv6 address for this rule.
Destination L4 Port	The destination port for this rule.
Flow Label	The value of IPv6 flow label.
IP DSCP Service	The DSCP keyword value.

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

MAC Access Control Lists

This window is used to display the MAC access control lists.

To view this window, click **Monitoring > QoS > Access Control Lists > MAC Access Control Lists** as shown below:

The screenshot shows a web interface window titled "MAC Access Control Lists" with a "Safeguard" logo in the top right. Below the title bar, there is a table header "Table" and "Current Number / Maximum Number" with the value "3 / 100". Below this, it says "Total Entries: 1". A table with three columns: "MAC ACL Name", "Rules Count", and "Rules ID" is shown. The first row contains "MACACL", "1", and "1". At the bottom right, there are navigation controls: "1/1", "1", and a "Go" button.

Table	Current Number / Maximum Number
ACL	3 / 100

Total Entries: 1

MAC ACL Name	Rules Count	Rules ID
MACACL	1	1

Figure 2-61 MAC Access Control Lists window

Click the Rules ID hyperlink to see the detail information about the rule.

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

After clicking the Rules ID hyperlink, the following page will appear:

The screenshot shows a web interface window titled "MAC Access Control Lists" with a "Safeguard" logo in the top right. The main content area displays the following configuration details for rule 1:

MAC ACL Name	MACACL
Rule ID	1
Action	Deny
Match Every	False
CoS	
Destination MAC	Destination MAC Mask
Ethertype Key	
Source MAC	Source MAC Mask
VLAN	

At the bottom right, there is a "<< Back" button.

Figure 2-62 MAC Access Control Lists - Rule ID window

The fields that can be displayed are described below:

Parameter	Description
MAC ACL Name	MAC ACL identifier.
Rule ID	The ordered rule number identifier defined within the MAC ACL.
Action	The action associated with each rule. Available values are <i>Permit</i> and <i>Deny</i> .
Match Every	Display whether this access list applies to every packet. Available values are <i>True</i> and <i>False</i> .
CoS	The 802.1p user priority for this rule.
Destination MAC	The destination MAC address for this rule.
Destination MAC Mask	The destination MAC mask specifies which bits in the destination MAC address to compare against an Ethernet frame.
Ethertype Key	The Ethertype keyword or custom value for this rule.
Source MAC	The source MAC address for this rule.
Source MAC Mask	The source MAC mask specifies which bits in the source MAC address to compare against an Ethernet frame.
VLAN	The VLAN identifier value for this rule.

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

Differentiated Services

Class Summary

This window is use to display the differentiated service class.

To view this window, click **Monitoring > QoS > Differentiated Services > Class Summary** as shown below:

Class Summary		
Class Name	Class Type	Reference Class
123	All (IPv6)	
ip	All (IPv4)	

1/1 1 Go

Figure 2-63 Class Summary window

The fields that can be displayed are described below:

Parameter	Description
Class Name	The name of this class.
Class Type	A class type of <i>All</i> means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
Reference Class	The name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

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

Policy Summary

This window is use to display the differentiated service policy.

To view this window, click **Monitoring > QoS > Differentiated Services > Policy Summary** as shown below:

Policy Name	Policy Type	Member Classes
policy	In	123

Figure 2-64 Policy Summary window

The fields that can be displayed are described below:

Parameter	Description
Policy Name	The name of this policy.
Policy Type	The policy type.
Member Classes	List of all class names associated with this policy.

Click the Member Classes hyperlink to see the detail information about the matched class.

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

After clicking the Member Classes hyperlink, the following page will appear:

Class Name	123
Class Type	All
Class Layer 3 Protocol	IPv6

Match Criteria	Values
Any	
Flow Label	130

Figure 2-65 Policy Summary - Class Configuration window

The fields that can be displayed are described below:

Parameter	Description
Class Name	The name of this class.
Class Type	A class type of <i>All</i> means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
Class Layer 3 Protocol	The Layer 3 protocol for this class. Possible values are IPv4 and IPv6.
Match Criteria	The Match Criteria fields are only displayed if they have been configured. They are displayed in the order entered by the user. The fields are evaluated in accordance with the class type. The possible Match Criteria fields are: <i>Destination IP Address, Destination Layer 4 Port, Destination MAC Address, Ethertype, Source MAC Address, VLAN, Class of Service, Any, IP DSCP, IP Precedence, IP TOS, Protocol Keyword, Reference Class, Source IP Address, and Source Layer 4 Port.</i>
Values	The values of the Match Criteria.

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

Policy Attribute Summary

This window is use to display the differentiated service policy attribute.

To view this window, click **Monitoring > QoS > Differentiated Services > Policy Attribute Summary** as shown below:

Policy Attribute Summary				
Policy Name	Policy Type	Class Name	Attribute	Attribute Details
policy	In	123	None	Best Effort will be used

1/1 1 Go

Figure 2-66 Policy Attribute Summary window

The fields that can be displayed are described below:

Parameter	Description
Policy Name	The name of this policy.
Policy Type	The policy type.
Class Name	The name of this class.
Attribute	Display the attributes attached to the policy class instances.
Attribute Details	Display the configured values of the attached attributes.

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

Chapter 3 Administration

Basic Setup
AP Management
Advanced Configuration

Basic Setup

This window is used to configure the wireless basic setup.

To view this window, click **Administration > Basic Setup** as shown below:

Figure 3-1 Basic Setup Global window

The fields that can be configured are described below:

Parameter	Description
Enable WLAN Switch	Click to enable or disable the WLAN switching functionality.
Auto IP Assign Mode	Click to enable or disable the wireless switch to automatically assign itself an IP address.
Switch Static IP Address	If the Auto IP Assign Mode is disabled, a static IP address of the Switch must be manually assigned.
AP Validation Method	Click the Local radio button to use the entries added in the Valid AP tab for AP validation. Click the RADIUS radio button to use the database in an external RADIUS server for AP validation.
Require Authentication Passphrase	Tick the check box to require APs to be authenticated with passphrase by the Local or RADIUS database before they can associate with the Switch.
Require Accounting	Tick the check box to enable RADIUS accounting for wireless clients.
Country Code	Use the drop-down menu to select the country code that represents the country where your switch and APs operate.

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

Click the **Exchange Certificate** button to request a X.509 certificate from the cluster controller.

Click the **Certificate Generate** button to generate the X.509 certificate and RSA key on the Switch.

After clicking the **Discovery** tab, the following page will appear:

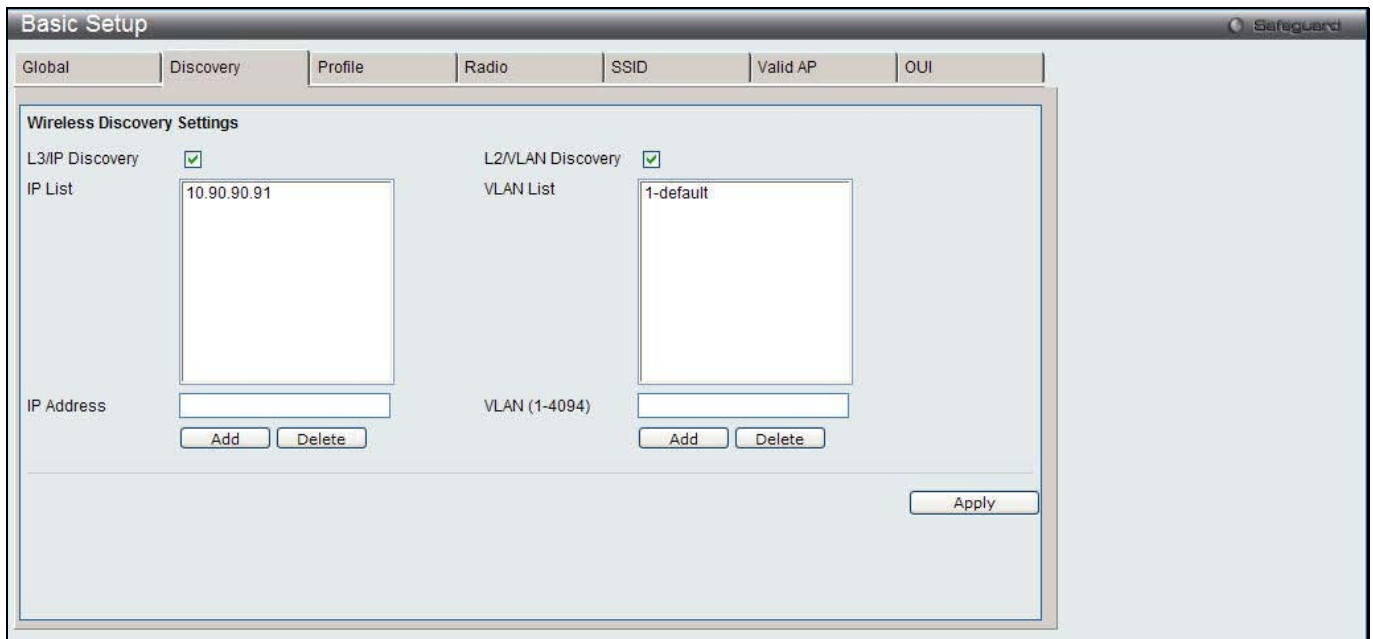


Figure 3-2 Basic Setup Discovery window

The fields that can be configured are described below:

Parameter	Description
L3/IP Discovery	Tick the check box to enable IP-based discovery of access points and peer wireless switches. Deselect the check box to disable it.
IP List	Display the list of IP addresses configured for discovery. Select one or more entries and click the Delete button to remove entries from the list.
IP Address	Enter an IP address to add the IP address to the IP List. The maximum entries to be entered is 256.
L2/VLAN Discovery	Tick the check box to enable L2/VLAN discovery. Deselect the check box to disable it. The maximum entries to be entered is 16.
VLAN List	Display the list of VLAN for discovery.
VLAN (1-4094)	Enter the VLAN ID to add the VLAN to the VLAN List.

Enter the information in **IP Address** or **VLAN** and click the corresponding **Add** button to add the entry to the list. Select one or more entries in the IP List or VLAN List and click the corresponding **Delete** button to remove entries from the list.

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

After clicking the **Profile** tab, the following page will appear:

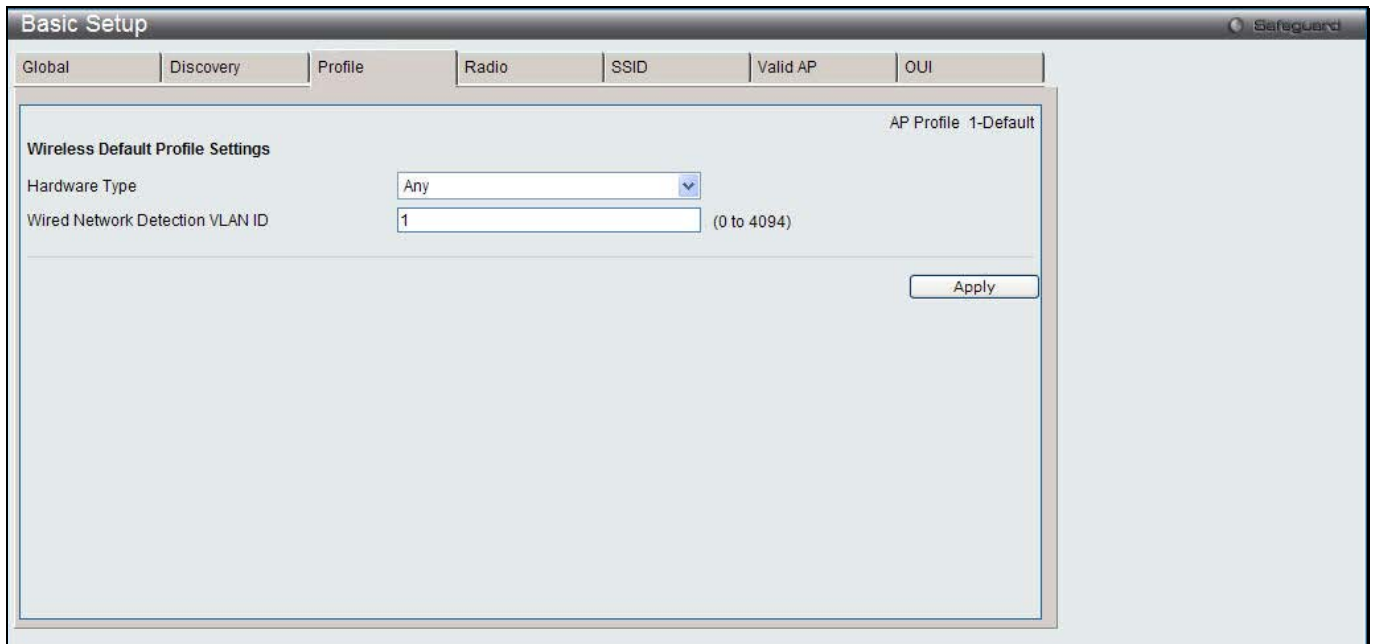


Figure 3-3 Basic Setup Profile window

The fields that can be configured are described below:

Parameter	Description
Hardware Type	Use the drop-down menu to select the hardware type for the APs that use this profile.
Wired Network Detection VLAN ID	Enter the VLAN ID that the Switch uses to send tracer packets to detect APs connected to the wired network. The tracer packets help the switch identify unauthorized APs that do not belong to the D-Link Unified Access System but are connected to the wired network.

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

After clicking the **Radio** tab, the following page will appear:

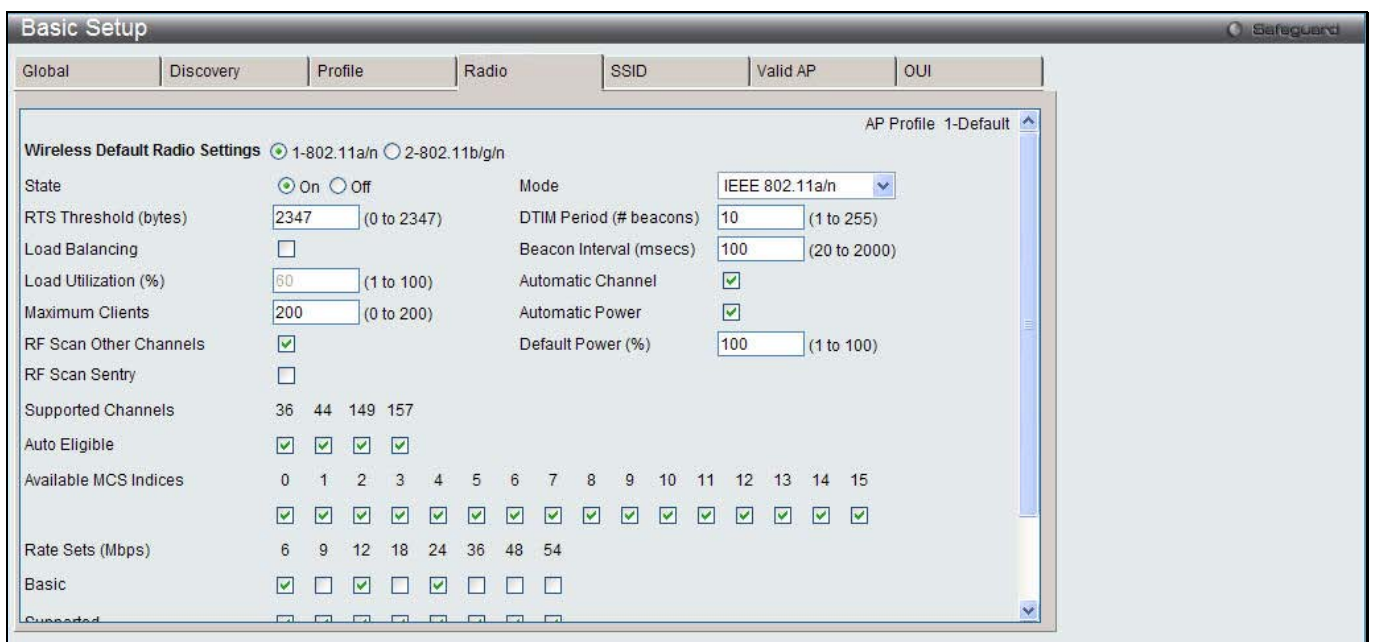


Figure 3-4 Basic Setup Radio window

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

Parameter	Description
Wireless Default Radio Settings	Click the radio button to select the radio between 802.11a/n and 802.11b/g/n.
State	Click to have the radio On or Off.
Mode	Use the drop-down menu to select the Physical Layer standard the radio uses. When 1-802.11a/n is selected in Wireless Default Radio Settings, available options are IEEE 802.11a, IEEE 802.11a/n and 5GHzIEEE 802.11n. When 2-802.11b/g/n is selected in Wireless Default Radio Settings, available options are IEEE 802.11b/g, IEEE 802.11b/g/n and 2.4GHzIEEE 802.11n.
RTS Threshold (bytes)	Specify a Request to Send (RTS) Threshold value between 0 and 2347. The RTS threshold indicates the number of octets in an MPDU, below which an RTS/CTS handshake is not performed. Changing the RTS threshold can help control traffic flow through the AP, especially one with a lot of clients. If you specify a low threshold value, RTS packets will be sent more frequently. This will consume more bandwidth and reduce the throughput of the packet. On the other hand, sending more RTS packets can help the network recover from interference or collisions which might occur on a busy network, or on a network experiencing electromagnetic interference.
DTIM Period (# beacons)	Specify the Delivery Traffic Information Map (DTIM) period that the clients served by this access point should check for buffered data still on the AP awaiting pickup. The DTIM message is an element included in some Beacon frames. It indicates which client stations, currently sleeping in low-power mode, have data buffered on the access point awaiting pick-up. The DTIM period you specify indicates how often the clients served by this access point should check for buffered data still on the AP awaiting pickup. Specify a DTIM period within the given range (1-255). The measurement is in beacons. For example, if you set this field to 1, clients will check for buffered data on the AP at every beacon. If you set this field to 10, clients will check on every 10th beacon.
Beacon Interval (msecs)	Specify the interval of beacon frames transmitted by an access point to announce the existence of the wireless network. The default behavior is to send a beacon frame once every 100 milliseconds (or 10 per second). The Beacon Interval value is set in milliseconds. Enter a value from 20 to 2000.
Load Balancing	Tick the check box to enable load balancing. When enabled, you can control the amount of traffic that is allowed on the AP.
Local Utilization (%)	Enter a threshold for the percentage of network bandwidth utilization allowed on the radio. Once the level is reached, the AP stops accepting new client associations.
Maximum Clients	Specify the maximum number of stations allowed to associate with this access point.
Automatic Channel	Tick the check box to make the radio of APs assigned to this profile eligible for auto-channel selection.
Automatic Power	Tick the check box to automatically adjust the RF signal to broadcast at the right distance.
Default Power (%)	Enter a percentage of the maximum transmission power for the RF signal. When the Automatic Power check box is selected, an initial default RF signal power setting is used. Alternatively, a fixed RF signal power setting is used. The automatic RF signal power algorithm will not reduce the RF signal power below the number you set in this field. By default, the value is 100%.
RF Scan Other Channels	Tick the check box to allow the radio periodically moves away from the operational channel to scan other channels.
RF Scan Sentry	Tick the check box to allow the radio to operate in sentry mode.
Supported Channels	Display the channels supported for the radio mode. The available channels vary based on the selected Country Code in the Basic Setup Global window.
Auto Eligible	Tick the check boxes beneath each channel to include the channel in the automatic

	channel assignment process.
Available MSC Indices	Tick the check boxes to add MCS Index when operating in 802.11n mode.
Rate Sets (Mbps)	Display the transmission rate sets.
Basic	Tick the check boxes to indicate the data rates that all stations associating with the AP must support.
Supported	Tick the check boxes to indicate rates that the access point supports. The AP automatically chooses the most efficient rate based on factors like error rates and distance of client stations from the AP.

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

Click the **Clear** button to discard the changes made and return to the default settings.

After clicking the **SSID** tab, the following page will appear:

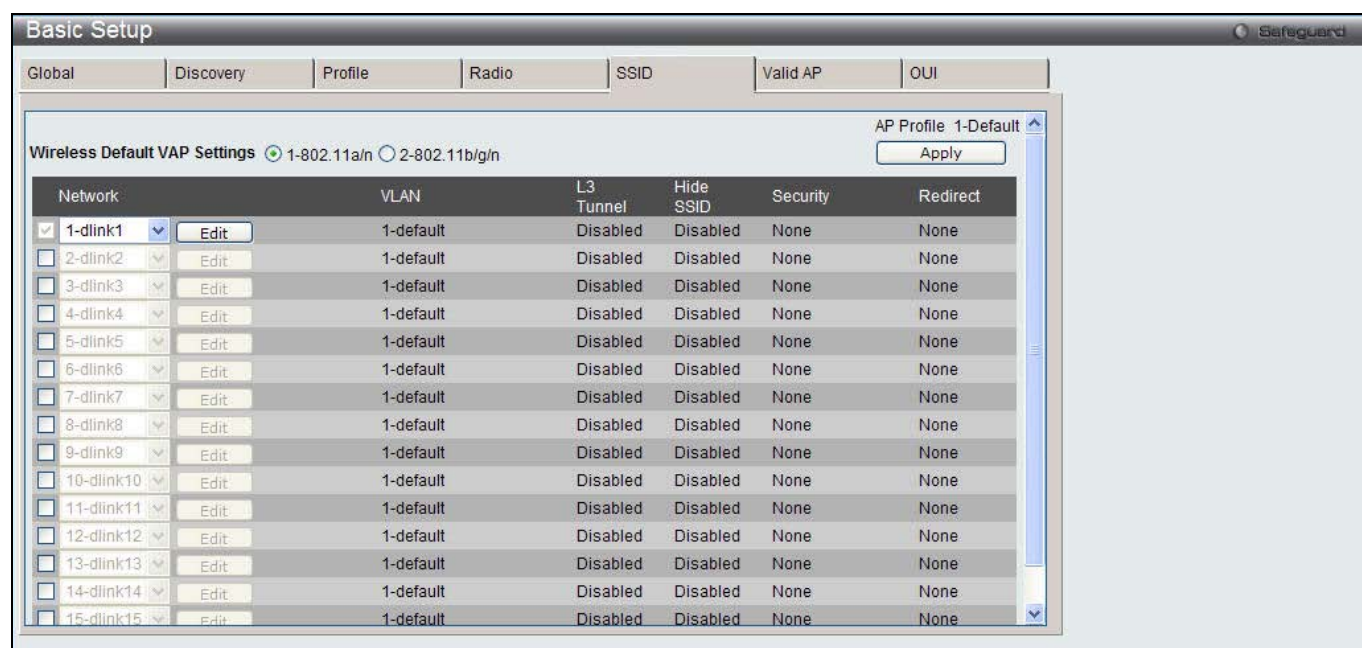


Figure 3-5 Basic Setup SSID window

The fields that can be configured are described below:

Parameter	Description
Wireless Default VAP Settings	Click to select the radio to configure the settings for before enabling the VAP.
Network	Tick the check box to enable the corresponding VAP on the selected radio. Use the drop-down menu to select the network to assign to the VAP.

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

Click the **Edit** button to modify settings for the corresponding network.

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

The screenshot shows the 'Basic Setup SSID - Edit window' with the following configuration details:

- Wireless Network Configuration**
- SSID: DWS3160
- Hide SSID:
- Deny Broadcast:
- VLAN: 1 (1 to 4094)
- MAC Authentication: Local RADIUS Disable
- Redirect: None HTTP
- Redirect URL: (empty text box)
- Wireless ARP Suppression Mode: Disable
- L2 Distributed Tunneling Mode: Disable
- L3 Tunnel: Disable
- L3 Tunnel Status: None
- L3 Tunnel Subnet: 0.0.0.0
- L3 Tunnel Mask: 255.255.255.0
- RADIUS Use Network Configuration: Enable

Figure 3-6 Basic Setup SSID – Edit window

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

Parameter	Description
SSID	Enter Service Set Identifier (SSID) of the network, which is an alphanumeric key that uniquely identifies a wireless local area network.
Hide SSID	Tick the check box to hide the SSID broadcast to discourage stations from automatically discovering the access point.
Deny Broadcast	Tick the check box to prohibit the AP from responding to client probe requests
VLAN	Enter a VLAN ID.
MAC Authentication	Click Local or RADIUS to enable MAC Authentication. The MAC address of the client must be configured at the local switch or the external RADIUS server.
Redirect	Select the HTTP radio button to redirect wireless clients to a custom Web page.
Redirect URL	Enter the URL where all initial HTTP accesses should be redirected to. This text box is accessible only when HTTP is selected as the redirect type.
Wireless ARP Suppression Mode	Use the drop-down menu to enable or disable the APs to reduce the number of broadcasted ARP requests on the wireless interfaces. Reducing broadcasts helps conserve power on the wireless clients. The wireless clients that use power-save mode must wake up and use more power when they detect broadcast frames. NOTE: Enabling this feature slightly degrades AP packet forwarding performance due to extra packet filtering to find DHCP packets and extra processing for ARP request and reply packets. Networks that do not use IPv4 should not enable this feature.
L2 Distributed Tunneling Mode	The distributed L2 tunneling mode supports L3 roaming for wireless clients without forwarding any data traffic to the Unified Switch. Use the drop-down menu to enable or disable the mode. L2 tunneling is recommended when the Unified Switch does not support hardware forwarding acceleration or hardware-based L2 tunnels. NOTE: <ol style="list-style-type: none"> When there is only one switch managing all APs and that switch goes down, all APs shut down their radios and the tunnel is terminated. After the switch recovers and the AP becomes managed again, the client that was previously tunneling traffic will re-associate and obtain an IP address on the network where its currently located. This IP address will be different from the IP address it was using when it was tunneling, and the traffic will not be tunneled.

	<ol style="list-style-type: none"> 2. If the network has peer switches and the tunnel is established between the APs managed by the peer switches then, when a switch managing the home AP fails, the switch managing the association AP detects the failure and terminates the tunnel. At this point the client is disassociated. When the client re-associates it obtains a new IP address. 3. If the switch managing the association AP fails, then the scenario is the same as in item 1 above. The AP takes down all radios and the clients disassociate. 		
L3 Tunnel	<p>The L3 Tunnel feature allows mobile stations to maintain their IP connections while roaming from one access point to another access point even when these access points are attached to different IP subnets.</p> <p>NOTE: When L3 tunneling is enabled the VLAN ID is not used. In fact, the switch puts the management VLAN ID, if any, on the tunneled packets.</p> <p>NOTE: If the wireless network topology changes (for example, a Unified Switch reboots) while the L3 tunneling feature is in use, you should perform an ARP refresh on wired clients to speed up the process of re-establishing connectivity to the tunneled network.</p>		
L3 Tunnel Status	Display the status of L3 tunnel.		
L3 Tunnel Subnet	Enter the subnet of L3 tunnel. The network IP address you enter in this field must be in the same subnet as a routing interface for the WLAN on the Switch.		
L3 Tunnel Mask	Enter the subnet mask for the network IP address on the L3 Tunnel subnet.		
RADIUS Use Network Configuration	This parameter is used to control whether the VAP uses the network or global RADIUS Accounting settings. Select Enable to use RADIUS accounting settings defined on the Wireless Network Configuration page. Select Disable to use RADIUS accounting settings defined on the Wireless Global Configuration page.		
RADIUS Accounting	Tick the check box to enable RADIUS accounting for wireless clients.		
Security Option	Select the security mechanism of the wireless connection to protect the network.		
	<table border="1"> <tr> <td>None</td> <td>Select this for not having any security of the network, and no further options are configurable on the AP.</td> </tr> </table>	None	Select this for not having any security of the network, and no further options are configurable on the AP.
None	Select this for not having any security of the network, and no further options are configurable on the AP.		

	WEP	<p>Wired Equivalent Privacy (WEP) is a data encryption protocol for 802.11 wireless networks. If this security mechanism is selected, all wireless clients and access points on the network are configured with a 64-bit or 128-bit Shared Key for data encryption. Select WEP to see the following options.</p> <p>Static WEP – Select Static WEP to configure the static key management. The following options will display:</p> <ul style="list-style-type: none">• Authentication – Tick the check boxes to select the authentication type. Available options are Open System and Shared Key.• WEP Key Type – Click the radio buttons to select the key type. Available options are ASCII and HEX. ASCII key includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. HEX key includes digits 0 to 9 and the letters A to F.• WEP Key Length (bits) – Click the radio button to select the key length in 64 bits or 128 bits.• WEP Keys – Click the radio button to select the specific transfer key. Enter up to 4 WEP keys in the text fields. The length of keys depends on the WEP Key Type and WEP Key Length configured earlier. <p>WEP IEEE802.1X – Select WEP IEEE802.1X to see the following options:</p> <ul style="list-style-type: none">• Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP.• Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.
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	WPA/WPA2	<p>WPA and WPA2 are Wi-Fi Alliance IEEE 802.11i standards, which include AES-CCMP and TKIP mechanisms. Select WPA/WPA2 to see the following options.</p> <p>WPA Personal – Select this to configure static key management.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • WPA Key Type – The key type is ASCII, which includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • WPA Key – The WPA Key is the shared secret key for WPA Personal. Enter a string between 8 and 63 characters. Acceptable characters include upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP. <p>WPA Enterprise – Select this and the AP uses the global RADIUS server or the specified RADIUS server for the wireless network.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • Pre-Authentication – Tick the Pre-Authentication check box to allow WPA2 wireless clients sending preauthentication packets. The pre-authentication information is relayed from the access point. The client is currently using to the target access point. Enabling this feature can help speed up authentication for roaming clients who connect to multiple access points. Only clients that connect by using WPA2 can use this feature. It is not supported by the original WPA. • Pre-Authentication Limit – Enter the number of pre-authentications that can be in progress simultaneously on an AP. The limit prevents too much load on the RADIUS server. This does not prevent the preauthentication from being attempted again when the load is lighter. A value of 0 represents no limit. • Key Caching Hold Time – Enter the amount of minutes a PMK will be held by the AP. This applies to Pairwise Master Keys (PMKs) generated by RADIUS, those that come from pre-authentication, and those that are forwarded to the AP. Note that this time limit can be overridden by RADIUS if the RADIUS server returns a longer time in the Session-Timeout attribute for a particular user. The valid values of this are from 1–1440 minutes. If you do not enter a value, APs will not forward the PMK for the wireless client to other APs in case the client roams to another AP. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast (group) key is changed for clients associated to this VAP. • Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.
Client QoS	Tick the check box to enable Client QoS operation for wireless clients that	

	associate with the AP using the SSID in the previous field.
Client QoS Bandwidth Limit Down	Enter the maximum allowed transmission rate from the AP to the wireless client in bits per second.
Client QoS Bandwidth Limit Up	Enter the maximum allowed client transmission rate to the AP in bits per second.
Client QoS Access Control Down	Use the drop-down menu to select the name of the access list applied to traffic in the outbound (down) direction.
Client QoS Access Control Up	Use the drop-down menu to select the name of the access list applied to traffic in the inbound (up) direction.
Client QoS Diffserv Policy Down	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the outbound (down) direction.
Client QoS Diffserv Policy Up	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the inbound (up) direction.

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

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

Click the **Clear** button to discard the changes made and return to the default settings.

After clicking the **Valid AP** tab, the following page will appear:

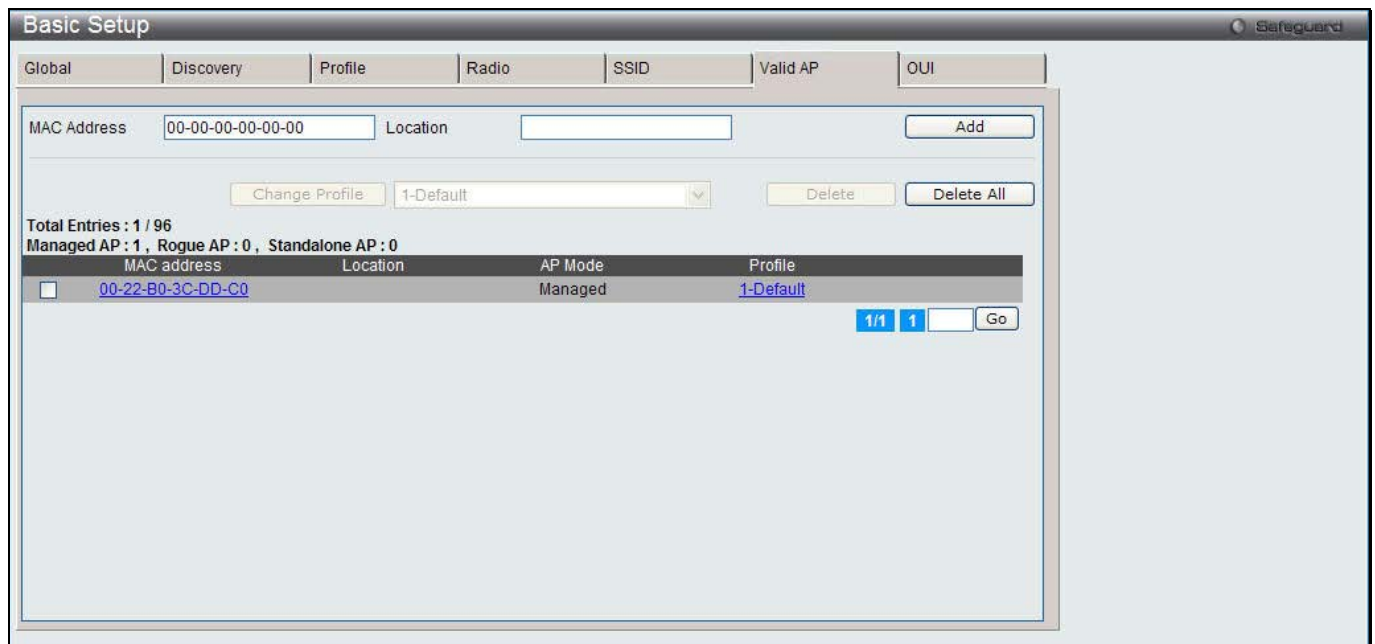


Figure 3-7 Basic Setup Valid AP window

The fields that can be configured are described below:

Parameter	Description
MAC Address	Enter the MAC address of the AP.
Location	Enter a location to help identify the AP.

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

Tick one or more MAC addresses, select an AP profile from the drop-down menu and click the **Change Profile** button to change the profile assigned to the selected AP or APs.

Tick one or more MAC addresses and click the **Delete** button to remove the entry.

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

Click the MAC Address hyperlink to see more Valid AP configuration.

Click the Profile hyperlink to go to the AP Profiles window.

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

After clicking the MAC Address hyperlink, the following page will appear:

Figure 3-8 Basic Setup Valid AP – Valid Access Point Configuration window

The fields that can be configured are described below:

Parameter	Description
MAC Address	Use the drop-down menu to select the MAC address of the AP.
AP Mode	Use the drop-down menu to select one of the three AP modes.
	<p>Managed</p> <p>Select this to have the AP being part of the D-Link Unified Switch, and it can be managed by the Unified Switch. When Managed is selected, the following options appear at the bottom half of the page:</p> <p>Authentication Password – Tick the Edit check box and enter the password for the AP to authenticate itself with the switch upon discovery.</p> <p>Profile - Use the drop-down menu to select an AP profile to assign to the AP.</p> <p>Channel - Use the drop-down menu to select the portion of the radio spectrum that the radio uses for transmitting and receiving. Select Auto to automatically scan for the available RF signal to use.</p> <p>Power - Enter a number in percentage to set the power level which affects how far an AP broadcasts its RF signal.</p>

	<p>Standalone</p>	<p>Select this to have the AP acting as an individual access point in the network. When Standalone is selected, the following options appear at the bottom half of the page:</p> <p>Expected SSID - Enter the SSID that identifies the wireless network on the standalone AP.</p> <p>Expected Channel – Use the drop-down menu to select the channel that the standalone AP uses. If the AP is configured to automatically select a channel, or if you do not want to specify a channel, select <i>Any</i>.</p> <p>Expected Security Mode – Select the option to specify the type of security the AP uses:</p> <ul style="list-style-type: none"> • Any - Any security mode. • Open - No security. • WEP - Static WEP or WEP 802.1X. • WPA/WAP2 - WPA and/or WPA2 (Personal or Enterprise). <p>Expected Wired Network Mode - If the standalone AP is allowed on the wired network, select Allowed. If the AP is not permitted on the wired network, select Not Allowed.</p>
	<p>Rogue</p>	<p>Select this if you wish to be notified (through an SNMP trap, if enabled) when this AP is detected in the network.</p>
<p>Location</p>	<p>Enter a location to help identify the AP.</p>	

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

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

After clicking the **OUI** tab, the following page will appear:

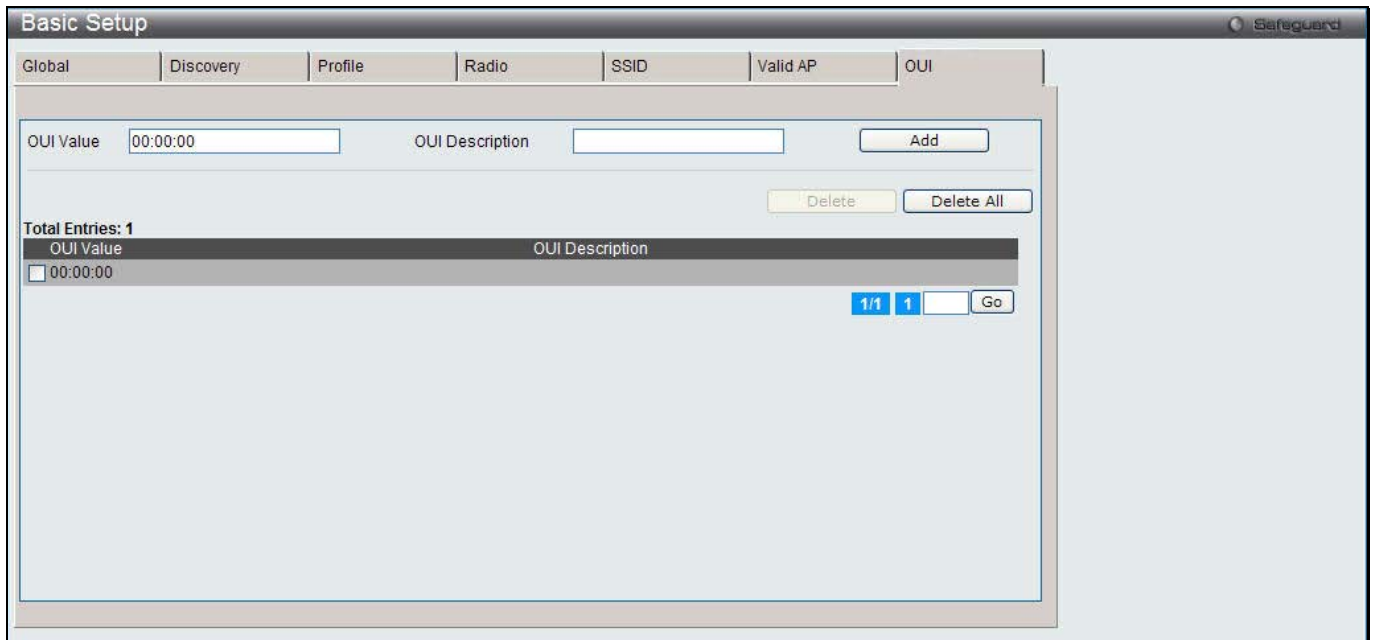


Figure 3-9 Basic Setup OUI window

The fields that can be configured are described below:

Parameter	Description
<p>OUI Value</p>	<p>Enter the OUI that represents the company ID in the format XX:XX:XX where XX is a hexadecimal number between 00 and FF. The first three bytes of the MAC address represents the company ID assignment.</p>

OUI Description

Enter the organization name associated with the OUI.

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

Tick one or more OUI Values and click the **Delete** button to remove the entry.

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

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

AP Management

AP Reboot

This window is used to reboot one or all APs from the Unified Switch.

To view this window, click **Administration > AP Management > AP Reboot** as shown below:



Figure 3-10 AP Reboot window

Tick to select one or more MAC address and click the **Reboot** button to restart the specified AP or APs.

Click the **Reboot All** button to restart all APs.

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

RF Management

This window is used to configure the radio frequency.

To view this window, click **Administration > AP Management > RF Management** as shown below:

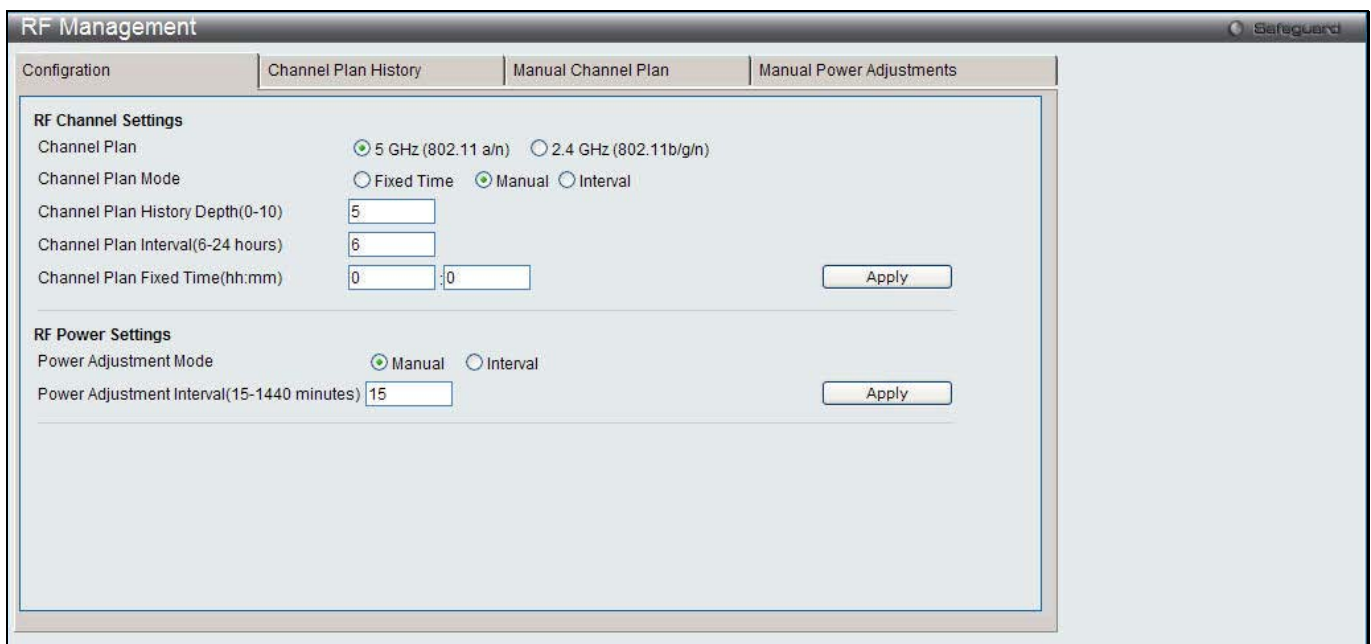


Figure 3-11 RF Management Configuration window

The fields that can be configured are described below:

Parameter	Description
Channel Plan	The 2.4 GHz (802.11b/g/n) and 5 GHz (802.11 a/n) frequencies use different channel plans. Click the radio button to select the frequency.
Channel Plan Mode	Click to select channel assignment mode. The default is Manual . Fixed Time – Select this to specify the time for the channel plan and channel assignment. Manual – Select this to manually run the channel plan algorithm and apply the channel plan to the APs. Interval – Select this to have the switch periodically calculating and applying the channel plan.
Channel Plan History Depth (0-10)	Enter the number of channel plan history iterations. The default value is 5. The channel plan history lists the channels the switch assigns each of the APs it manages after a channel plan is applied. Entries are added to the history regardless of interval, time, or channel plan mode. The number you specify in this field controls the number of iterations of the channel assignment. NOTE: The APs changed in previous iterations cannot be assigned new channels in the next iteration. This history prevents the same APs from being changed time after time. The default value is 5.
Channel Plan Interval (6-24 Hours)	If Interval is selected in Channel Plan Mode , enter an interval, between 6 and 24 hours, at which the channel plan calculation and assignment occurs. The default value is 6.
Channel Plan Fixed Time (hh:mm)	If Fixed Time is selected in Channel Plan Mode , enter a fix time at which the channel plan calculation and assignment occurs. The channel plan calculation will occur once every 24 hours at the entered time.
Power Adjustment Mode	Click Manual or Interval to manually or periodically adjust the power of the AP radio frequency transmission. The default is Manual . <ul style="list-style-type: none"> • Manual - The proposed power adjustments are run manually from the Manual Power Adjustments page. • Interval - The switch periodically calculates the power adjustments and applies the power for all APs. The interval period begins when you click Submit.
Power Adjustment Interval (15-1440 minutes)	Enter the interval to determine how often the switch runs the power adjustment algorithm. The value takes effect when Interval is selected in Power Adjustment Mode . The default value is 15.

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

After clicking the **Channel Plan History** tab, the following page will appear:

Figure 3-12 RF Management Channel Plan History window

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

Parameter	Description
5 GHz (802.11 a/n) / 2.4 GHz (802.11 b/g/n)	The 5 GHz and 2.4 GHz radios use different channel plans, so the switch tracks the channel history separately for each radio. The channel information that displays is only for the selected radio.
Operational Status	Display whether the switch is using the automatic channel adjustment algorithm on the AP radios.
Last Iteration	Display the most recent iteration of channel plan adjustments. The APs that received a channel adjustment in previous iterations cannot be assigned new channels in the next iteration to prevent the same APs from being changed time after time. Click the AP Management > RF Management > Configuration tab to set the history depth to control the maximum number of iterations stored and displayed in the channel plan history.
Last Algorithm Time	Display the date and time when the channel plan algorithm last ran. NOTE: To set the system time on the Switch, you must use SNTP, which is disabled by default. From the Web interface, you configure the SNTP settings in the LAN > Network Application > SNTP folder.
AP MAC Address	The Ethernet address of the Unified Wireless Switch managed AP. If the MAC address of the AP is followed by an asterisk (*), it is managed by a peer switch.
Location	A location description for the AP, this is the value configured in the valid AP database (either locally or on the RADIUS server).
Radio	Indicate the radio interface and configured mode of the radio, if the radio is disabled the radio mode will be displayed as Off instead of showing the configured mode.
Iteration	Display the iteration of channel plan adjustments.
Channel	If radio is operational, the current operating channel for the radio.

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



NOTE: The channel will fail to be applied to an AP if one of the following conditions exist:

- The AP has failed.
- The radio on the AP has been disabled through a profile update.

- The channel is not valid for the radio mode.
- The AP has been rebooted since the channel plan was computed and acquires a static channel that has been set statically via local database.
- The channel has been set manually through the advanced page.
- The auto-channel mode has been disabled in the profile for this AP.

After clicking the **Manual Channel Plan** tab, the following page will appear:

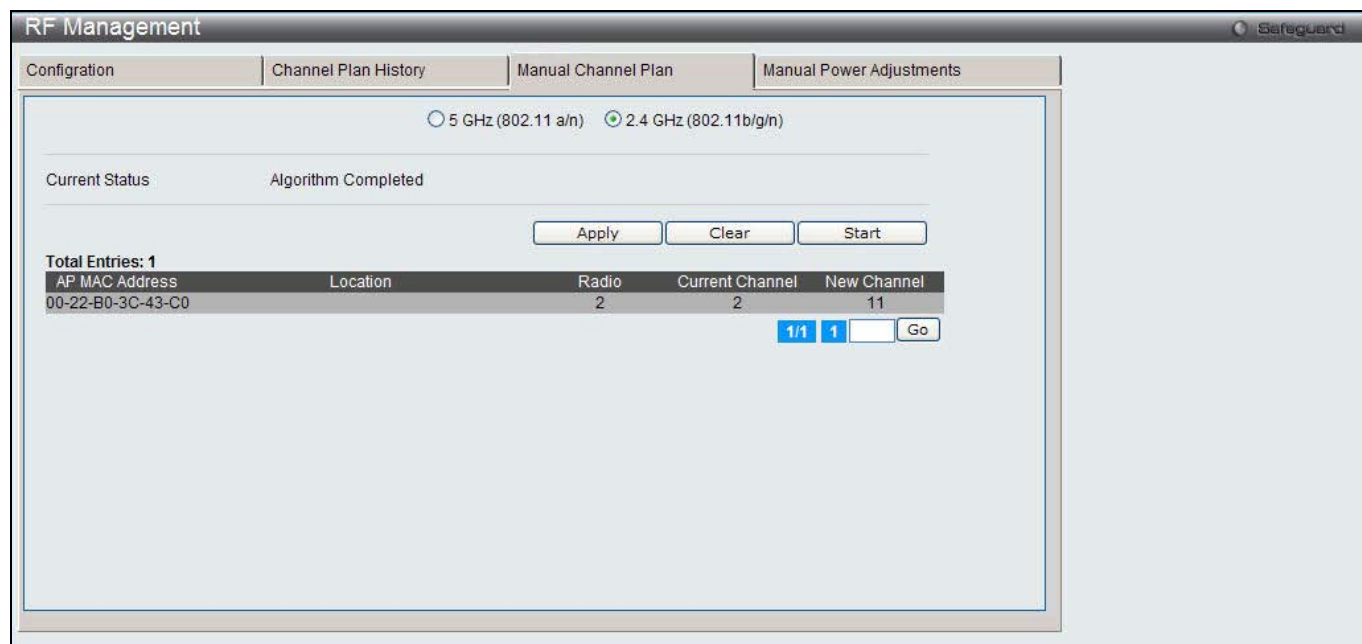


Figure 3-13 RF Management Manual Channel Plan window

The fields that can be displayed are described below:

Parameter	Description
5 GHz (802.11 a/n) / 2.4 GHz (802.11 b/g/n)	The 5 GHz and 2.4 GHz radios use different channel plans, so the switch tracks the channel history separately for each radio. The channel information that displays is only for the selected radio.
Current Status	Display one of the following status: <ul style="list-style-type: none"> • <i>None</i> - The channel plan algorithm has not been manually run since the last switch reboot. • <i>Algorithm In Progress</i> - The channel plan algorithm is running. • <i>Algorithm Complete</i> - The channel plan algorithm has finished running. • <i>Apply In Progress</i> - The switch is applying the proposed channel plan and adjusting the channel on the APs listed in the table. • <i>Apply Complete</i> - The algorithm and channel adjustment are complete.
AP MAC Address	The Ethernet address of the Unified Wireless Switch managed AP. If the MAC address of the AP is followed by an asterisk (*), it is managed by a peer switch.
Location	A location description for the AP, this is the value configured in the valid AP database (either locally or on the RADIUS server).
Radio	Display the radio interface and configured mode of the radio, if the radio is disabled the radio mode will be displayed as Off instead of showing the configured mode.
Current Channel	Display the current operating channel for the AP that the algorithm recommends for new channel assignments.
New Channel	Display the proposed operating channel for the AP.

Click the radio buttons to select the radio frequency in order to see its channel plan.

Click the **Apply** button to accept the proposed channel change.

Click the **Clear** button to remove the entries.

Click the **Start** button to manually run the channel plan adjustment feature.

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

After clicking the **Manual Power Adjustments** tab, the following page will appear:

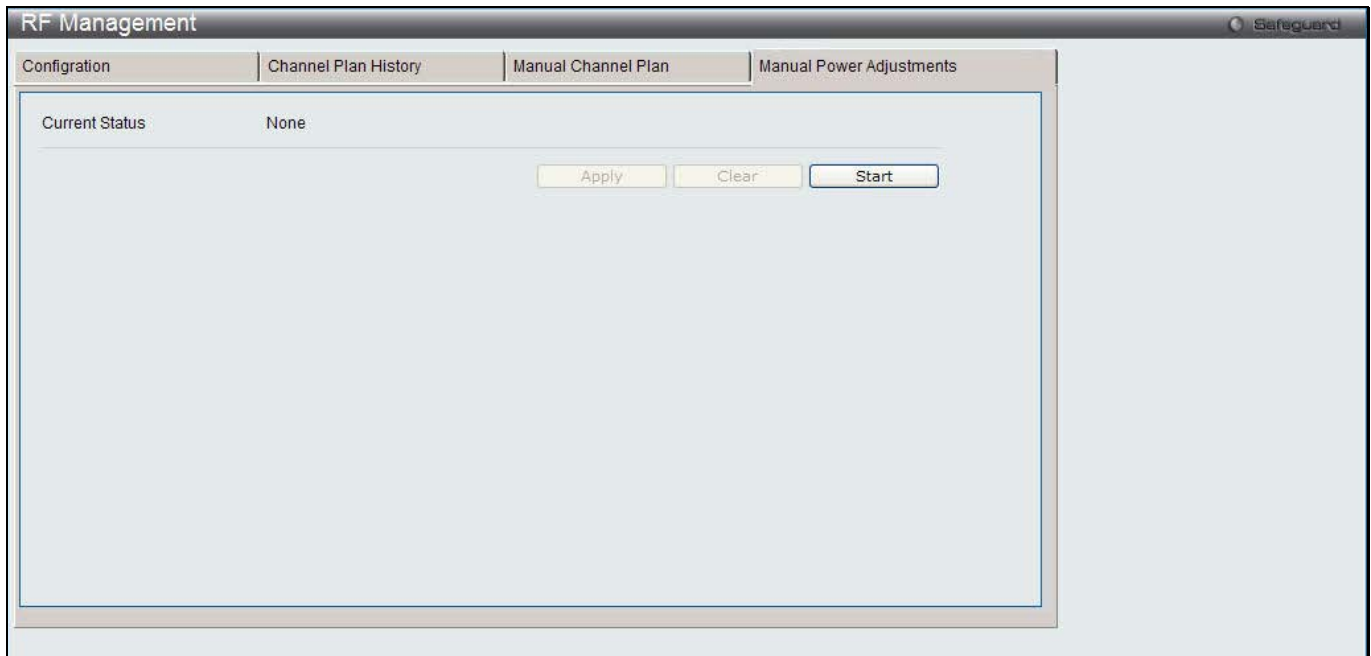


Figure 3-14 RF Management Manual Power Adjustments window

The fields that can be displayed are described below:

Parameter	Description
Current Status	Display the Current Status of the plan. <ul style="list-style-type: none"> • <i>None</i> - The power adjustment algorithm has not been manually run since the last switch reboot. • <i>Algorithm In Progress</i> - The power adjustment algorithm is running. • <i>Algorithm Complete</i> - The power adjustment algorithm has finished running. • <i>Apply In Progress</i> - The switch is adjusting the power levels that the APs use. • <i>Apply Complete</i> - The algorithm and power adjustment are complete.
AP MAC Address	Display the AP MAC address.
Location	Display the location of the AP, which is set in the Valid AP database.
Radio	Display the radio.
Current Power	Display the current power level for the AP.
New Power	Display the proposed power level for the AP.

Click the **Apply** button to accept the proposed power.

Click the **Clear** button to remove the entries.

Click the **Start** button to manually run the power adjustment feature.

Software Download

This window is used to upgrade software on the APs that the Switch manages. The Cluster Controller can update code on APs managed by peer wireless switches.

To view this window, click **Administration > AP Management > Software Download** as shown below:

Figure 3-15 AP Software Download window

The fields that can be configured are described below:

Parameter	Description
Server Address	Enter the IP address of the host where the upgrade file is located.
File Path	Enter the file path on the TFTP server where the software is located. NOTE: This field requires to type a forward slash (/) when specifying the file path, for example “/<filepath>”.
File Name	Enter the name of the upgrade file.
Group Size	Enter a number to limit the number of APs to be upgraded at a time.
Image Download Type	Use the drop-down menu to select the type of the image to be downloaded.
Managed AP	Display all the managed APs. To upgrade all managed APs, select All from the list. To upgrade a specific AP, select the AP from the list. To upgrade multiple APs, hold the CTRL key and select the multiple APs.

Click the **Apply** button to start the process.



NOTE: This may take about twelve minutes for the upgrade process to complete for an AP. After the process is complete, the AP will restart automatically and become managed AP again.

After clicking the **AP Image Management** tab, the following page will appear:

This page is used to a file download process to the wireless switch while the file is a specified AP code image.

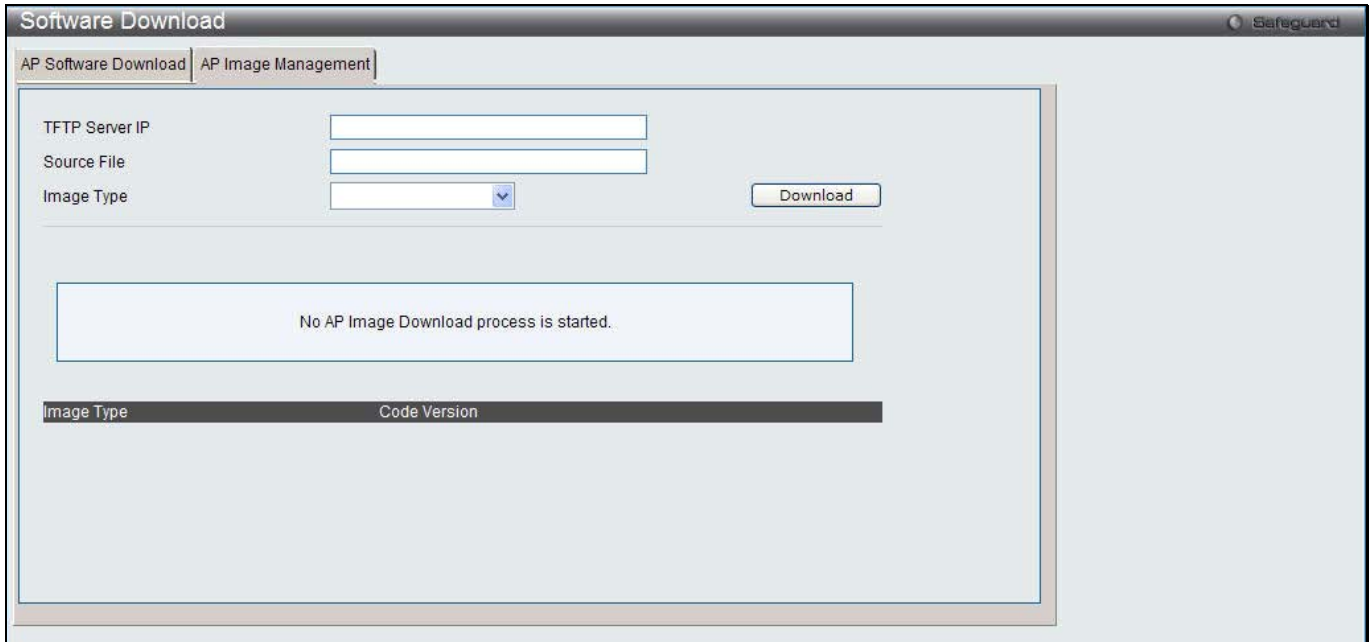


Figure 3-16 AP Image Management window

The fields that can be configured are described below:

Parameter	Description
TFTP Server IP	Enter the IP address of the TFTP server.
Source File	Enter the file name.
Image Type	Use the drop-down menu to select the type of the image to be downloaded.

Click the **Download** button to initiate the file download process to the wireless switch.

Advanced Settings

This window is used to configure the remote Telnet access, and radio frequency channel and power.

To view this window, click **Administration > AP Management > Advanced Settings** as shown below:



Figure 3-17 Advanced Settings window

Click the hyperlinks under Debug, Channel or Power to configure the detail information.

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

After clicking the Debug hyperlink, the following page will appear:

Figure 3-18 Advanced Settings – Debug window

The fields that can be configured are described below:

Parameter	Description
Password	Enter the admin password for the AP.
Confirm Password	Retype the password to confirm.
Enable Debug	Click to enable or disable debugging.

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

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

After clicking the Channel or Power hyperlink, the following page will appear:

Figure 3-19 Advanced Settings – Channel/Power window

The fields that can be configured are described below:

Parameter	Description
Channel	Use the drop-down menu to define the portion of the radio spectrum that the radio uses for transmitting and receiving.
Power	Enter a number in percentage to set the power level which affects how far an AP broadcasts its RF signal.

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

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

AP Provisioning

This window is used to configure access point provisioning.

To view this window, click **Administration > AP Management > AP Provisioning** as shown below:

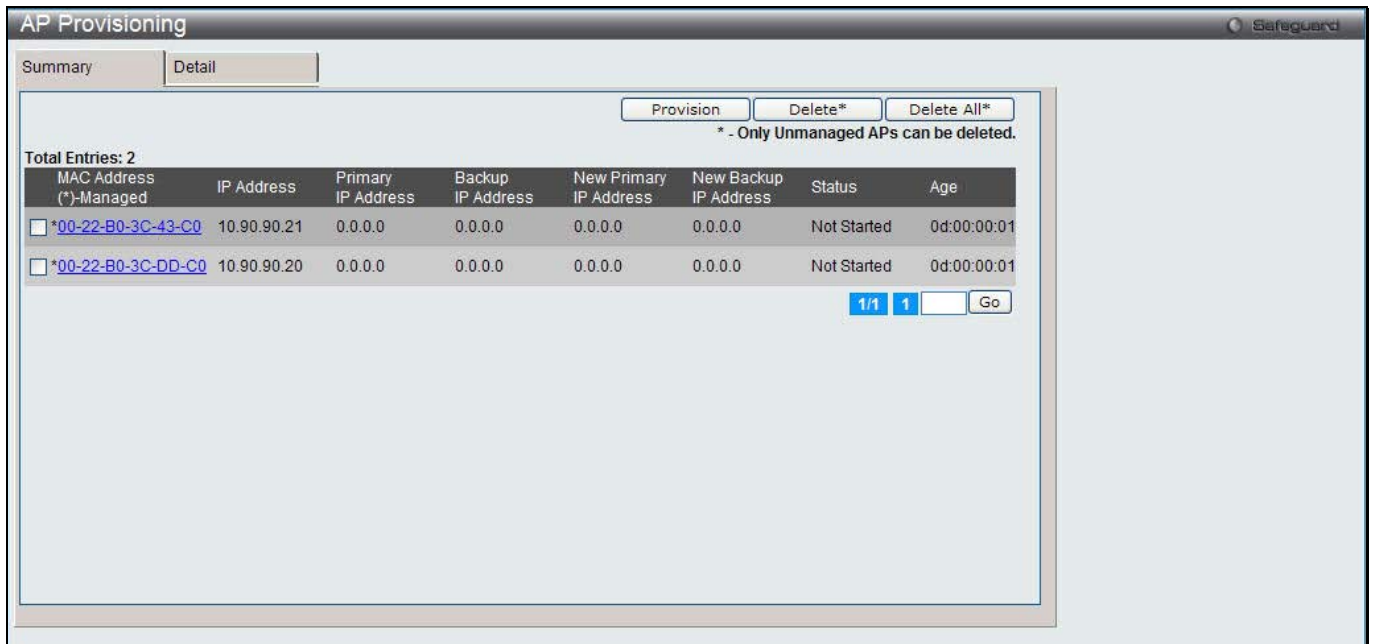


Figure 3-20 AP Provisioning window

- Tick the specific MAC Address and click the **Provision** button to perform provisioning.
- Tick the specific MAC Address and click the **Delete** button to remove the entry.
- Click the **Delete All** button to remove the unmanaged APs.
- Click the MAC Address hyperlink or click the **Detail** tab to see more information.
- Enter a page number and click the **Go** button to navigate to a specific page when multiple pages exist.

After clicking the MAC Address hyperlink or the **Detail** tab, the following page will appear:

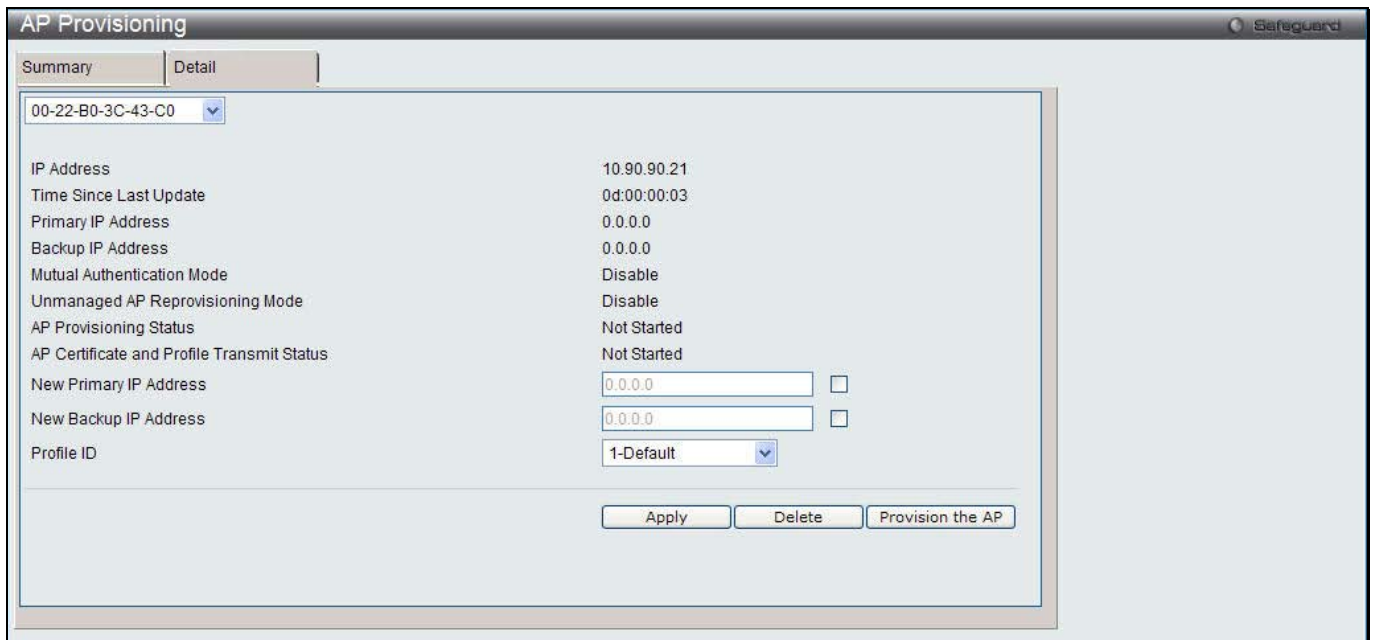


Figure 3-21 AP Provisioning Detail window

The fields that can be configured are described below:

Parameter	Description
MAC Address	Use the drop down menu to select the MAC address of the AP.
New Primary IP	Tick the check box and enter the IP address of the primary switch that the AP to be

Address	provisioned.
New Backup IP Address	Tick the check box and enter IP address of the backup switch that the AP to be provisioned.
Profile ID	Use the drop-down menu to select the profile ID to be used when provisioning.

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

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

Click the **Provision the AP** button to perform provisioning.

Advanced Configuration

Global

This window is used to configure wireless advanced settings.

To view this window, click **Administration > Advanced Configuration > Global** as shown below:

Parameter	Value	Range
Peer Group ID	1	(1 to 255)
Client Roam Timeout (secs)	30	(1 to 120)
Ad Hoc Client Status Timeout (hours)	24	(0 to 168)
AP Failure Status Timeout (hours)	24	(0 to 168)
MAC Authentication Mode	white-list	
RF Scan Status Timeout (hours)	24	(0 to 168)
Detected Clients Status Timeout (hours)	24	(0 to 168)
AP Provisioning Database Age Time(hours)	72	(0 to 240)
Tunnel IP MTU Size	1500	
Cluster Priority	1	(0 to 255, 0 - Disable)
AP Client QoS	Disable	
AP Auto Upgrade Mode	Disable	
Base IP Port	57775	(1 to 65000)

Figure 3-22 Global General window

The fields that can be configured are described below:

Parameter	Description
Peer Group ID	Enter a peer group ID to configure wireless switches as peers. Peer switches share some information about APs and allow L3 roaming among them.
Client Roam Timeout (secs)	Enter a time in second to determine how long to keep an entry in the Associated Client Status list after a client has disassociated.
Ad Hoc Client Status Timeout (hours)	Enter a time in hour to determine how long to keep an entry in the Ad Hoc Client Status list.
AP Failure Status Timeout (hours)	Enter a time in hour to determine how long to keep an entry in the AP Authentication Failure Status list.
MAC Authentication Mode	Select the global action to take on wireless clients in the white-list or black-list . white-list – Specify that any wireless clients with MAC addresses, specified in the Known Client database and not explicitly denied access, are granted access. If the MAC address is not in the database then the access to the client is denied. black-list - Select this option to specify that any wireless clients with MAC

	addresses, specified in the Known Client database and not explicitly granted access, are denied access. If the MAC address is not in the database then the access to the client is granted.
RF Scan Status Timeout (hours)	Enter a time in hour to determine how long to keep an entry in the RF Scan Status list.
Detected Clients Status Timeout (hours)	Enter a time in hour to determine how long to keep an entry in the Detected Client Status list.
AP Provisioning Database Age Time (hours)	Enter a time in hour to determine how long to keep an entry in the AP provisioning database.
Tunnel IP MTU Size	<p>Select the maximum size of an IP packet handled by the network. The MTU is enforced only on tunneled VAPs. When IP packets are tunneled between the APs and the Unified Switch, the packet size is increased by 20 bytes during transit. This means that clients, configured for 1500 byte, its IP MTU size may exceed the maximum MTU size of existing network infrastructure which is set up to switch and route 1518 (1522-tagged) byte frames. If the tunnel IP MTU size is increased, the physical MTU of the ports on which the traffic flows must also be increased.</p> <p>NOTE: If any of the following conditions are true, there is no need to increase the tunnel IP MTU size:</p> <ul style="list-style-type: none"> • The wireless network does not use L3 tunneling. • The tunneling mode is used only for voice traffic, which typically has small packets. • The tunneling mode is used only for TCP based protocols, such as HTTP. This is because the AP automatically reduces the maximum segment size for all TCP connections to fit within the tunnel.
Cluster Priority	Specify the priority of this switch for the Cluster Controller election. The switch with highest priority in a cluster becomes the Cluster Controller. If the priorities are the same among all switches, the switch with lowest IP address becomes the Cluster Controller. A priority of 0 means that the switch cannot become the Cluster Controller. The highest possible priority is 255.
AP Client QoS	Use the drop-down menu to enable or disable the client QoS feature.
AP Auto Upgrade Mode	Use the drop-down menu to enable or disable the AP auto upgrade mode
Basic IP Port	Enter the IP control data communication port.

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

After clicking the **SNMP Traps** tab, the following page will appear:

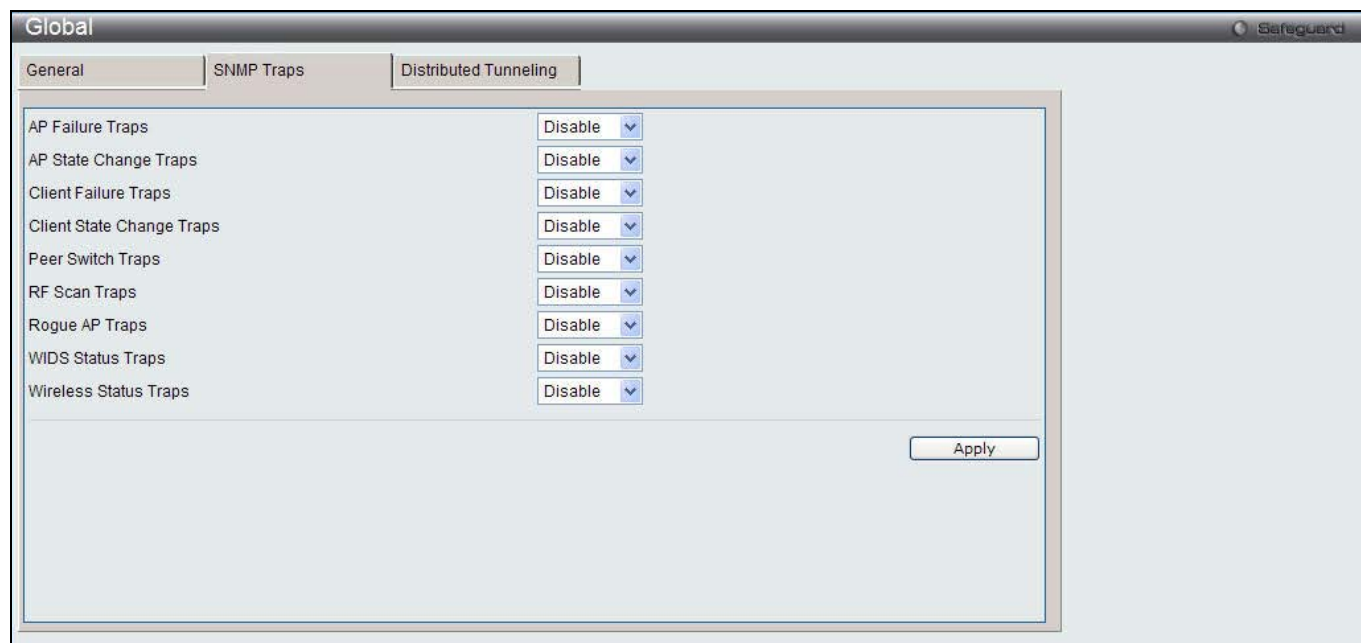


Figure 3-23 Global SNMP Traps window

The fields that can be configured are described below:

Parameter	Description
AP Failure Traps	Select Enable to allow the SNMP agent sending a trap if an AP fails to associate or authenticate with the switch.
AP State Change Traps	Select Enable to allow the SNMP agent sending a trap, when managed AP is discovered, managed AP is failed, managed AP unknown protocol is discovered and managed AP load balancing utilization is exceeded.
Client Failure Traps	Select Enable to allow the SNMP agent sending a trap if a wireless client fails to associate or authenticate with an AP that is managed by the switch.
Client State Change Traps	Select Enable to allow the SNMP agent sending a trap when the wireless client association, disassociation, or roam is detected.
Peer Switch Traps	Select Enable to allow the SNMP agent sending a trap when the peer switch is discovered or failed, peer switch unknown protocol is discovered, or configuration command is received from peer switch.
RF Scan Traps	Select Enable to allow the SNMP agent sending a trap when the RF scan detects a new AP, wireless client, or ad-hoc client.
Rogue AP Traps	Select Enable to allow the SNMP agent sending a trap when the switch discovers a rogue AP.
WIDS Status Traps	Select Enable to allow the SNMP agent sending a trap when the switch has become Cluster Controller, a rogue client is detected, rogue clients still exist after rogue detected trap interval, or the maximum number of managed APs in the peer group is exceeded.
Wireless Status Traps	Select Enable to allow the SNMP agent sending a trap if the operational status of the Unified Switch changes, the Channel Algorithm or the Power Algorithm is complete, or any of the following databases or lists has reached the maximum number of entries: Managed AP database, AP Neighbor List, Client Neighbor List, AP Authentication Failure List, RF Scan AP List, Client Association Database, Ad Hoc Clients List and Detected Clients List.

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

After clicking the **Distributed Tunneling** tab, the following page will appear:

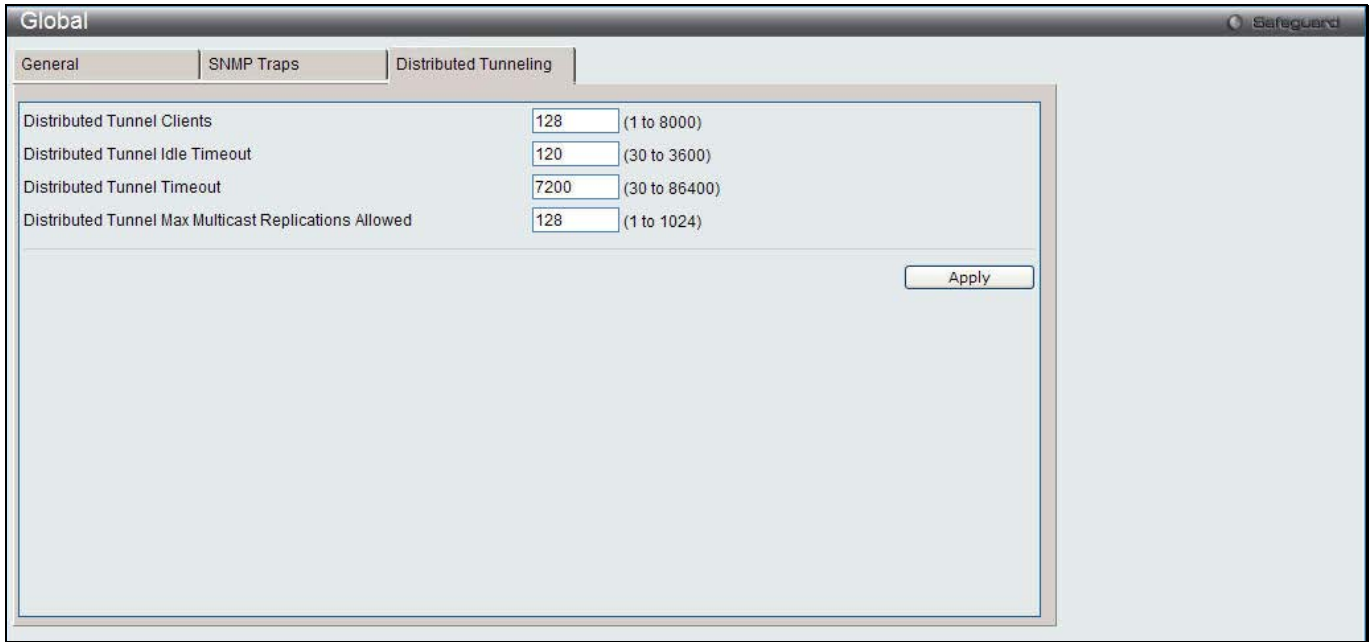


Figure 3-24 Global Distributed Tunneling window

The fields that can be configured are described below:

Parameter	Description
Distributed Tunnel Clients	Enter the maximum number of distributed tunneling clients that can roam away from the Home AP at the same time.
Distributed Tunnel Idle Timeout	Enter the time in seconds of no activity by the client before the tunnel to that client is terminated, and the client is forced to change its IP address.
Distributed Tunnel Timeout	Enter the time in seconds before the tunnel to the roamed client is terminated, and the client is forced to change its IP address.
Distributed Tunnel Max Multicast Replications Allowed	Enter the maximum number of tunnels to which a multicast frame is copied on the Home AP.

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

Networks

This window is used to display all the wireless networks configured on the switch.

To view this window, click **Administration > Advanced Configuration > Networks** as shown below:



Figure 3-25 Networks window

The fields that can be configured are described below:

Parameter	Description
Network Name	Enter the SSID.

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

Tick the check box of a specific SSID and click the **Delete** button to remove the entry.

Click the **Refresh** button to update the information.

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

After clicking the ID or SSID hyperlink, the following page will appear:

Figure 3-26 Networks – Edit window

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

Parameter	Description
SSID	Enter Service Set Identifier (SSID) of the network, which is an alphanumeric key that uniquely identifies a wireless local area network.
Hide SSID	Tick the check box to hide the SSID broadcast to discourage stations from automatically discovering the access point.
Deny Broadcast	Tick the check box to prohibit the AP from responding to client probe requests
VLAN	Enter a VLAN ID.
MAC Authentication	Click Local or RADIUS to enable MAC Authentication. The MAC address of the client must be configured at the local switch or the external RADIUS server.
Redirect	Select the HTTP radio button to redirect wireless clients to a custom Web page.

Redirect URL	Enter the URL where all initial HTTP accesses should be redirected to. This text box is accessible only when HTTP is selected as the redirect type.		
Wireless ARP Suppression Mode	Use the drop-down menu to enable or disable the APs to reduce the number of broadcasted ARP requests on the wireless interfaces. Reducing broadcasts helps conserve power on the wireless clients. The wireless clients that use power-save mode must wake up and use more power when they detect broadcast frames. NOTE: Enabling this feature slightly degrades AP packet forwarding performance due to extra packet filtering to find DHCP packets and extra processing for ARP request and reply packets. Networks that do not use IPv4 should not enable this feature.		
L2 Distributed Tunneling Mode	The distributed L2 tunneling mode supports L3 roaming for wireless clients without forwarding any data traffic to the Unified Switch. Use the drop-down menu to enable or disable the mode. L2 tunneling is recommended when the Unified Switch does not support hardware forwarding acceleration or hardware-based L2 tunnels. NOTE: <ol style="list-style-type: none"> When there is only one switch managing all APs and that switch goes down, all APs shut down their radios and the tunnel is terminated. After the switch recovers and the AP becomes managed again, the client that was previously tunneling traffic will re-associate and obtain an IP address on the network where its currently located. This IP address will be different from the IP address it was using when it was tunneling, and the traffic will not be tunneled. If the network has peer switches and the tunnel is established between the APs managed by the peer switches then, when a switch managing the home AP fails, the switch managing the association AP detects the failure and terminates the tunnel. At this point the client is disassociated. When the client re-associates it obtains a new IP address. If the switch managing the association AP fails, then the scenario is the same as in item 1 above. The AP takes down all radios and the clients disassociate. 		
L3 Tunnel	The L3 Tunnel feature allows mobile stations to maintain their IP connections while roaming from one access point to another access point even when these access points are attached to different IP subnets. NOTE: When L3 tunneling is enabled the VLAN ID is not used. In fact, the switch puts the management VLAN ID, if any, on the tunneled packets. NOTE: If the wireless network topology changes (for example, a Unified Switch reboots) while the L3 tunneling feature is in use, you should perform an ARP refresh on wired clients to speed up the process of re-establishing connectivity to the tunneled network.		
L3 Tunnel Status	Display the status of L3 tunnel.		
L3 Tunnel Subnet	Enter the subnet of L3 tunnel. The network IP address you enter in this field must be in the same subnet as a routing interface for the WLAN on the Switch.		
L3 Tunnel Mask	Enter the subnet mask for the network IP address on the L3 Tunnel subnet.		
RADIUS Use Network Configuration	This parameter is used to control whether the VAP uses the network or global RADIUS Accounting settings. Select Enable to use RADIUS accounting settings defined on the Wireless Network Configuration page. Select Disable to use RADIUS accounting settings defined on the Wireless Global Configuration page.		
RADIUS Accounting	Tick the check box to enable RADIUS accounting for wireless clients.		
Security Option	Select the security mechanism of the wireless connection to protect the network. <table border="1"> <tr> <td>None</td> <td>Select this for not having any security of the network, and no further options are configurable on the AP.</td> </tr> </table>	None	Select this for not having any security of the network, and no further options are configurable on the AP.
None	Select this for not having any security of the network, and no further options are configurable on the AP.		

	WEP	<p>Wired Equivalent Privacy (WEP) is a data encryption protocol for 802.11 wireless networks. If this security mechanism is selected, all wireless clients and access points on the network are configured with a 64-bit or 128-bit Shared Key for data encryption. Select WEP to see the following options.</p> <p>Static WEP – Select Static WEP to configure the static key management. The following options will display:</p> <ul style="list-style-type: none"> • Authentication – Tick the check boxes to select the authentication type. Available options are Open System and Shared Key. • WEP Key Type – Click the radio buttons to select the key type. Available options are ASCII and HEX. ASCII key includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. HEX key includes digits 0 to 9 and the letters A to F. • WEP Key Length (bits) – Click the radio button to select the key length in 64 bits or 128 bits. • WEP Keys – Click the radio button to select the specific transfer key. Enter up to 4 WEP keys in the text fields. The length of keys depends on the WEP Key Type and WEP Key Length configured earlier. <p>WEP IEEE802.1X – Select WEP IEEE802.1X to see the following options:</p> <ul style="list-style-type: none"> • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP. • Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.
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	WPA/WPA2	<p>WPA and WPA2 are Wi-Fi Alliance IEEE 802.11i standards, which include AES-CCMP and TKIP mechanisms. Select WPA/WPA2 to see the following options.</p> <p>WPA Personal – Select this to configure static key management.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • WPA Key Type – The key type is ASCII, which includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • WPA Key – The WPA Key is the shared secret key for WPA Personal. Enter a string between 8 and 63 characters. Acceptable characters include upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP. <p>WPA Enterprise – Select this and the AP uses the global RADIUS server or the specified RADIUS server for the wireless network.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • Pre-Authentication – Tick the Pre-Authentication check box to allow WPA2 wireless clients sending preauthentication packets. The pre-authentication information is relayed from the access point. The client is currently using to the target access point. Enabling this feature can help speed up authentication for roaming clients who connect to multiple access points. Only clients that connect by using WPA2 can use this feature. It is not supported by the original WPA. • Pre-Authentication Limit – Enter the number of pre-authentications that can be in progress simultaneously on an AP. The limit prevents too much load on the RADIUS server. This does not prevent the preauthentication from being attempted again when the load is lighter. A value of 0 represents no limit. • Key Caching Hold Time – Enter the amount of minutes a PMK will be held by the AP. This applies to Pairwise Master Keys (PMKs) generated by RADIUS, those that come from pre-authentication, and those that are forwarded to the AP. Note that this time limit can be overridden by RADIUS if the RADIUS server returns a longer time in the Session-Timeout attribute for a particular user. The valid values of this are from 1–1440 minutes. If you do not enter a value, APs will not forward the PMK for the wireless client to other APs in case the client roams to another AP. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast (group) key is changed for clients associated to this VAP. • Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.
Client QoS	Tick the check box to enable Client QoS operation for wireless clients that	

	associate with the AP using the SSID in the previous field.
Client QoS Bandwidth Limit Down	Enter the maximum allowed transmission rate from the AP to the wireless client in bits per second.
Client QoS Bandwidth Limit Up	Enter the maximum allowed client transmission rate to the AP in bits per second.
Client QoS Access Control Down	Use the drop-down menu to select the name of the access list applied to traffic in the outbound (down) direction.
Client QoS Access Control Up	Use the drop-down menu to select the name of the access list applied to traffic in the inbound (up) direction.
Client QoS Diffserv Policy Down	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the outbound (down) direction.
Client QoS Diffserv Policy Up	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the inbound (up) direction.

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

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

Click the **Clear** button to discard the changes made and return to the default settings.

AP Profiles

This window is used to create, configure, delete AP profiles. AP profiles are like templates, and once you create an AP profile, you can apply that profile to any AP that the Unified Switch manages.

To view this window, click **Administration > Advanced Configuration > AP Profiles** as shown below:

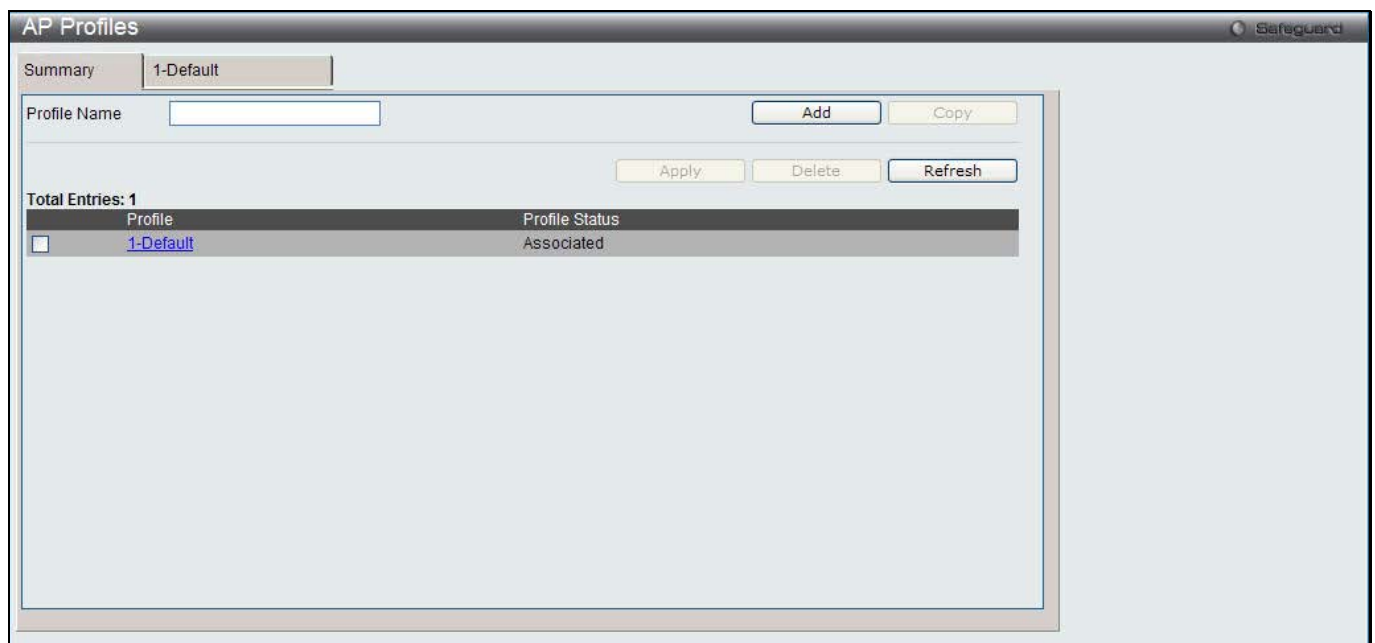


Figure 3-27 AP Profile Summary window

The fields that can be configured are described below:

Parameter	Description
Profile Name	Enter a profile name.

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

Tick the check box of a specific profile and click the **Copy** button to copy the settings of the existing profile to a new profile.

Tick the check box of a specific profile and click the **Apply** button to apply the profile changes to all access points that use the profile.

Tick the check box of a specific profile and click the **Delete** button to remove the entry.
 Click the **Refresh** button to update the information.
 Click the Profile hyperlink to see more information.

After clicking the Profile hyperlink or the tab with profile name, the following page will appear:

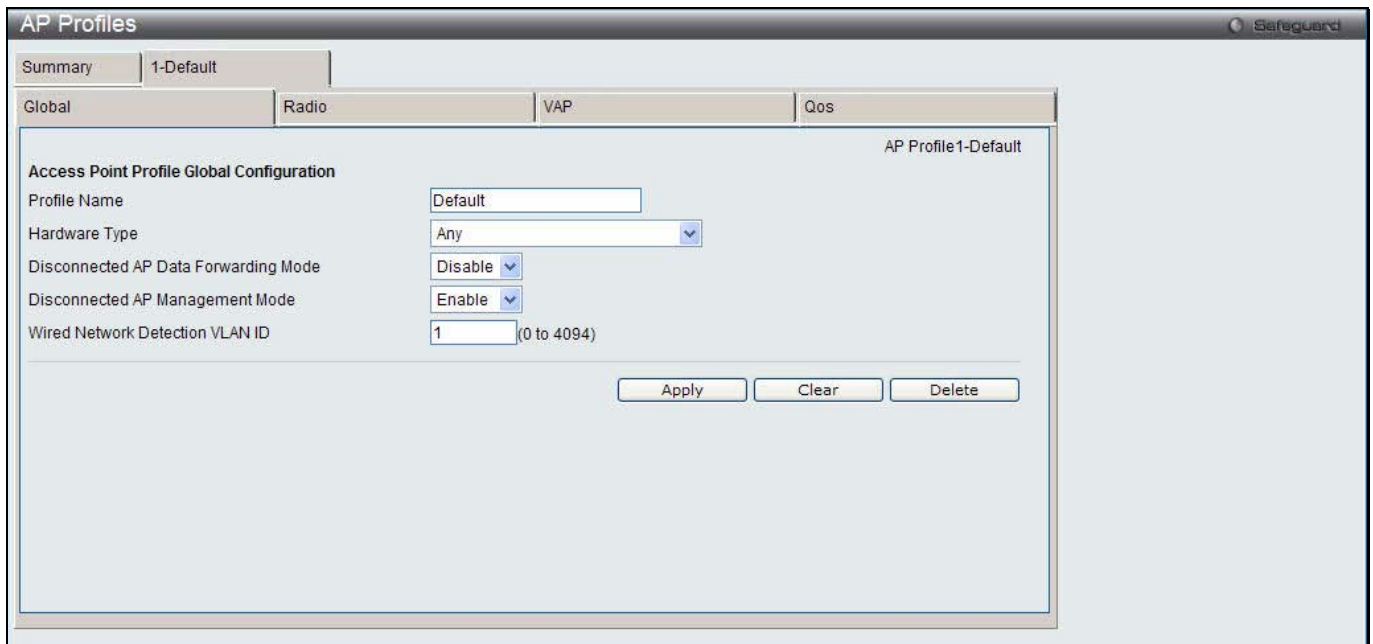


Figure 3-28 AP Profile Configuration – Global window

The fields that can be configured are described below:

Parameter	Description
Profile Name	Enter the Access Point profile name.
Hardware Type	Use the drop-down menu to select the hardware type for the APs that use this profile.
Disconnected AP Data Forwarding Mode	Select to enable or disable disconnected AP data forwarding mode. If the mode is enabled, the managed AP allows clients that are already associated with to continue forwarding traffic when the AP loses connection with the Wireless Switch.
Disconnected AP Management Mode	Select to enable or disable disconnected AP management mode. If the mode is enabled, the managed AP enables stand-alone management functionality when it loses connection with the wireless switch.
Wired Network Detection VLAN ID	Enter the VLAN ID that the Switch uses to send tracer packets to detect APs connected to the wired network. The tracer packets help the switch identify unauthorized APs that do not belong to the D-Link Unified Access System but are connected to the wired network.

Click the **Apply** button to accept the changes made.
 Click the **Clear** button to discard the changes made and return to the default settings.
 Click the **Delete** button to remove the entry.

After clicking the **Radio** tab under the Profile Name tab, the following page will appear:

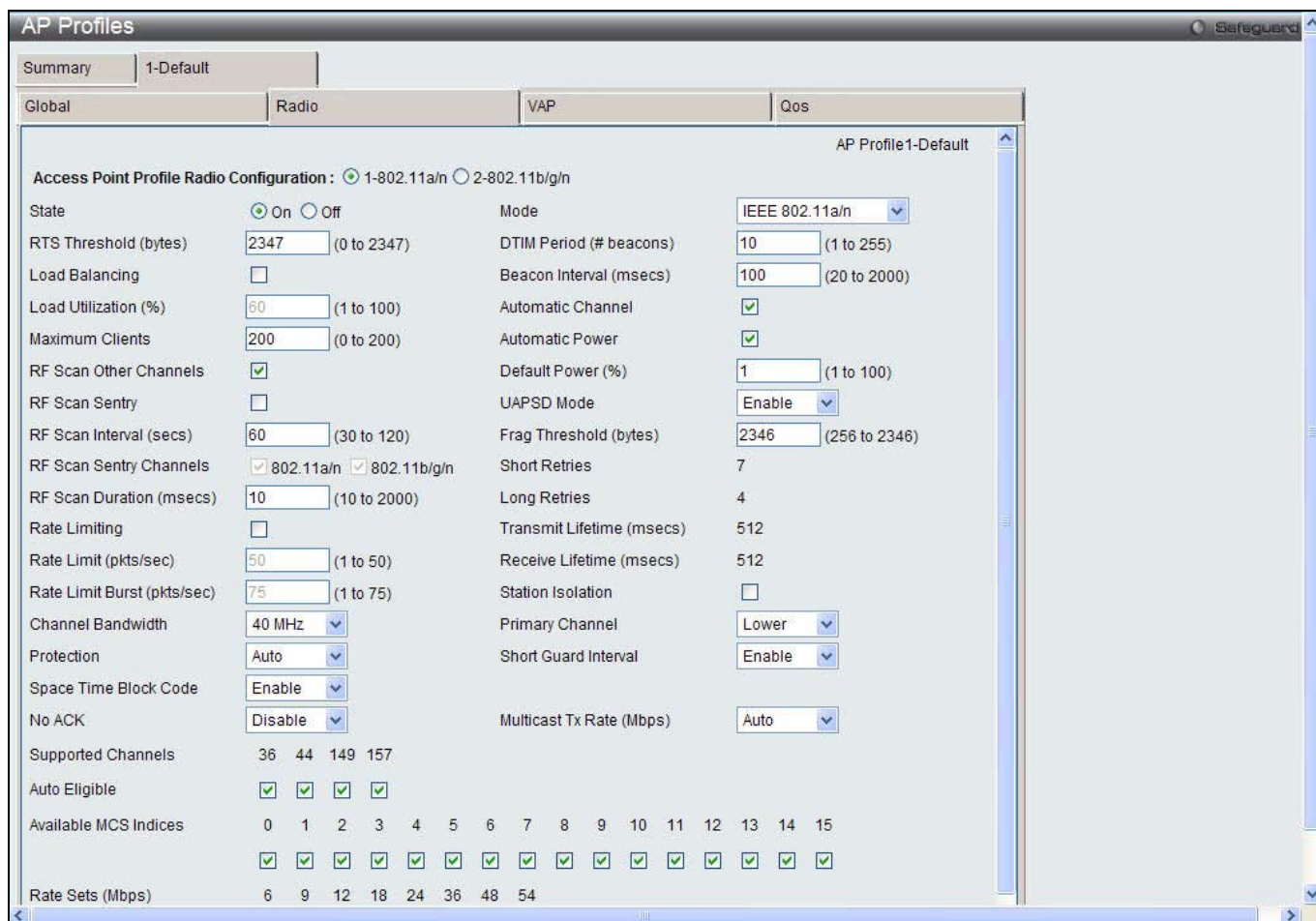


Figure 3-29 AP Profile Configuration – Radio window

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

Parameter	Description
Access Point Profile Radio Configuration	Click the radio button to select the radio between 802.11a/n and 802.11b/g/n.
State	Click to have the radio On or Off.
Mode	Use the drop-down menu to select the Physical Layer standard the radio uses. When 1-802.11a/n is selected in Wireless Default Radio Settings, available options are IEEE 802.11a, IEEE 802.11a/n and 5GHzIEEE 802.11n. When 2-802.11b/g/n is selected in Wireless Default Radio Settings, available options are IEEE 802.11b/g, IEEE 802.11b/g/n and 2.4GHzIEEE 802.11n.
RTS Threshold (bytes)	Specify a Request to Send (RTS) Threshold value between 0 and 2347. The RTS threshold indicates the number of octets in an MPDU, below which an RTS/CTS handshake is not performed. Changing the RTS threshold can help control traffic flow through the AP, especially one with a lot of clients. If you specify a low threshold value, RTS packets will be sent more frequently. This will consume more bandwidth and reduce the throughput of the packet. On the other hand, sending more RTS packets can help the network recover from interference or collisions which might occur on a busy network, or on a network experiencing electromagnetic interference.
DTIM Period (# beacons)	Specify the Delivery Traffic Information Map (DTIM) period that the clients served by this access point should check for buffered data still on the AP awaiting pickup. The DTIM message is an element included in some Beacon frames. It indicates which client stations, currently sleeping in low-power mode, have data buffered on the access point awaiting pick-up. The DTIM period you specify indicates how often the clients served by this access point should check for buffered data still on the AP

	awaiting pickup. Specify a DTIM period within the given range (1-255). The measurement is in beacons. For example, if you set this field to 1, clients will check for buffered data on the AP at every beacon. If you set this field to 10, clients will check on every 10th beacon.
Beacon Interval (msecs)	Specify the interval of beacon frames transmitted by an access point to announce the existence of the wireless network. The default behavior is to send a beacon frame once every 100 milliseconds (or 10 per second). The Beacon Interval value is set in milliseconds. Enter a value from 20 to 2000.
Load Balancing	Tick the check box to enable load balancing. When enabled, you can control the amount of traffic that is allowed on the AP.
Local Utilization (%)	Enter a threshold for the percentage of network bandwidth utilization allowed on the radio. Once the level is reached, the AP stops accepting new client associations.
Maximum Clients	Specify the maximum number of stations allowed to associate with this access point.
Automatic Channel	Tick the check box to make the radio of APs assigned to this profile eligible for auto-channel selection.
Automatic Power	Tick the check box to automatically adjust the RF signal to broadcast at the right distance.
Default Power (%)	Enter a percentage of the maximum transmission power for the RF signal. When the Automatic Power check box is selected, an initial default RF signal power setting is used. Alternatively, a fixed RF signal power setting is used. The automatic RF signal power algorithm will not reduce the RF signal power below the number you set in this field. By default, the value is 100%.
RF Scan Other Channels	Tick the check box to allow the radio periodically moves away from the operational channel to scan other channels.
RF Scan Sentry	Tick the check box to allow the radio to operate in sentry mode.
RF Scan Interval (secs)	Enter the length of time between channel changes during the RF Scan.
RF Scan Sentry Channels	The radio can scan channels in the radio frequency used by the 802.11b/g/n and (2.4 GHz), the 802.11a/n band (5 GHz), or both bands. Select the channel band for the radio to scan.
RF Scan Duration (msecs)	Enter the amount of time in milliseconds that the radio spends scanning the other channel during an RF scan.
Rate Limiting	Enabling multicast and broadcast rate limiting can improve overall network performance by limiting the number of packets transmitted across the network.
Rate Limit (pkts/sec)	Enter the rate limit to set for multicast and broadcast traffic.
Rate Limit Burst (pkts/sec)	Enter a rate limit burst determines how much traffic bursts can be before all traffic exceeds the rate limit.
Channel Bandwidth	Use the drop-down menu to restrict the use of the channel bandwidth to 20 MHz or 40 MHz.
Protection	Select Auto to guarantee that 802.11 transmissions do not cause interference with legacy stations or applications. Select Off to disable the protection mechanism.
Space Time Block Code	Select Enable to send the same data stream on multiple antennas at the same time.
No ACK	Select Enable to specify that the AP should not acknowledge frames with QoSNoAck as the service class value.
UAPSD Mode	Select Enable to enable Unscheduled Automatic Power Save Delivery (UAPSD), which is a power management method.
Frag Threshold (bytes)	Enter a number to limit the size of packets transmitted over the network. Any packet under the entered size is not fragmented. Entering 2346 means that packets are not fragmented.
Short Retries	Display the maximum number of transmission attempts on frame sizes less than or

	equal to the RTS Threshold.
Long Retries	Display the maximum number of transmission attempts on frame sizes greater than the RTS Threshold.
Transmit Lifetime (msecs)	Display the number of milliseconds to wait before terminating attempts to transmit the MSDU after the initial transmission.
Receive Lifetime (msecs)	Display the number of milliseconds to wait before terminating attempts to reassemble the MMPDU or MSDU after the initial reception of a fragmented MMPDU or MSDU.
Station Isolation	Tick the check box to allow the AP blocking communication between wireless clients.
Primary Channel	Use the drop-down menu to set the Primary Channel as the Upper or Lower 20-MHz channel in the 40-MHz band. This option only available when the Channel Bandwidth is configured as 40MHz .
Short Guard Interval	Select to enable or disable the short guard interval when operating in 802.11n mode.
Multicast Tx Rate (Mbps)	Select the 802.11 rate at which the radio transmits multicast frames.
Supported Channels	Display the channels supported for the radio mode. The available channels vary based on the selected Country Code in the Basic Setup Global window.
Auto Eligible	Tick the check boxes beneath each channel to include the channel in the automatic channel assignment process.
Available MCS Indices	Tick the check boxes to add MCS Index when operating in 802.11n mode.
Rate Sets (Mbps)	Display the transmission rate sets.
Basic	Tick the check boxes to indicate the data rates that all stations associating with the AP must support.
Supported	Tick the check boxes to indicate rates that the access point supports. The AP automatically chooses the most efficient rate based on factors like error rates and distance of client stations from the AP.

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

Click the **Clear** button to discard the changes made and return to the default settings.

After clicking the **VAP** tab under the Profile Name tab, the following page will appear:

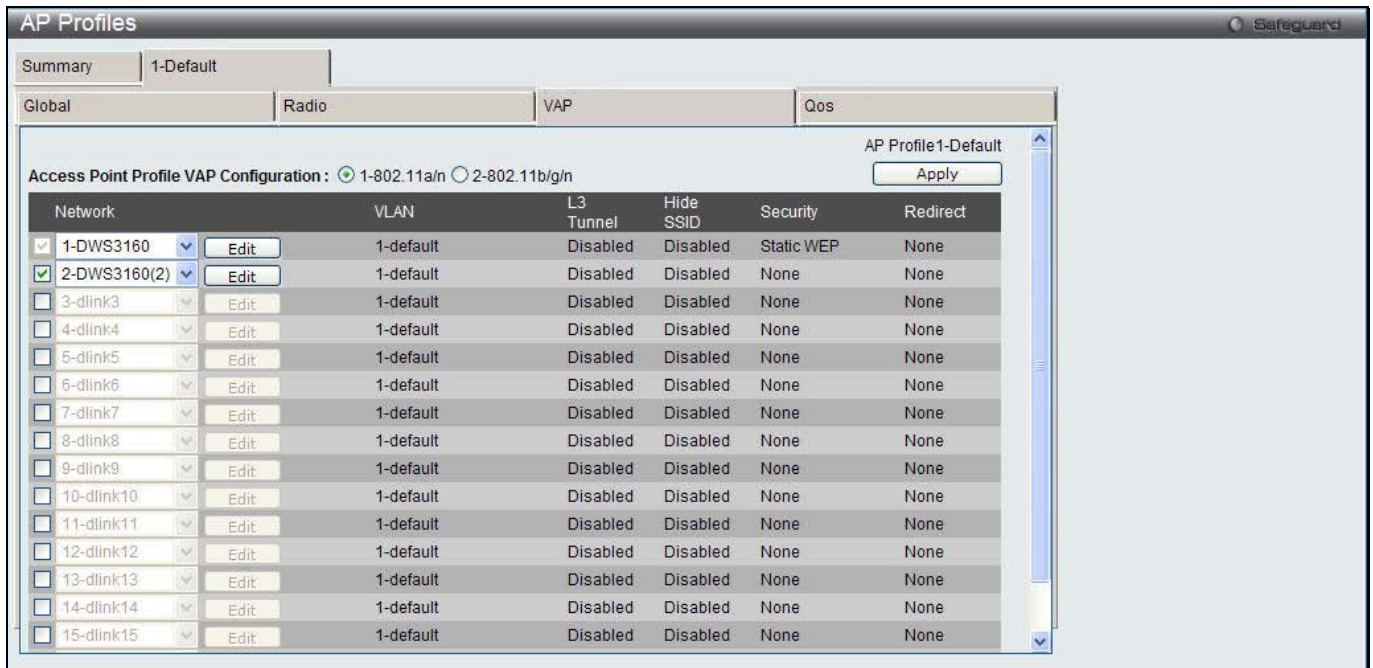


Figure 3-30 AP Profile Configuration – VAP window

The fields that can be configured are described below:

Parameter	Description
Access Point Profile VAP Configuration	Click to select the radio to configure the settings for before enabling the VAP.
Network	Tick the check box to enable the corresponding VAP on the selected radio. Use the drop-down menu to select the network to assign to the VAP.

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

Click the **Edit** button to modify settings for the corresponding network.

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

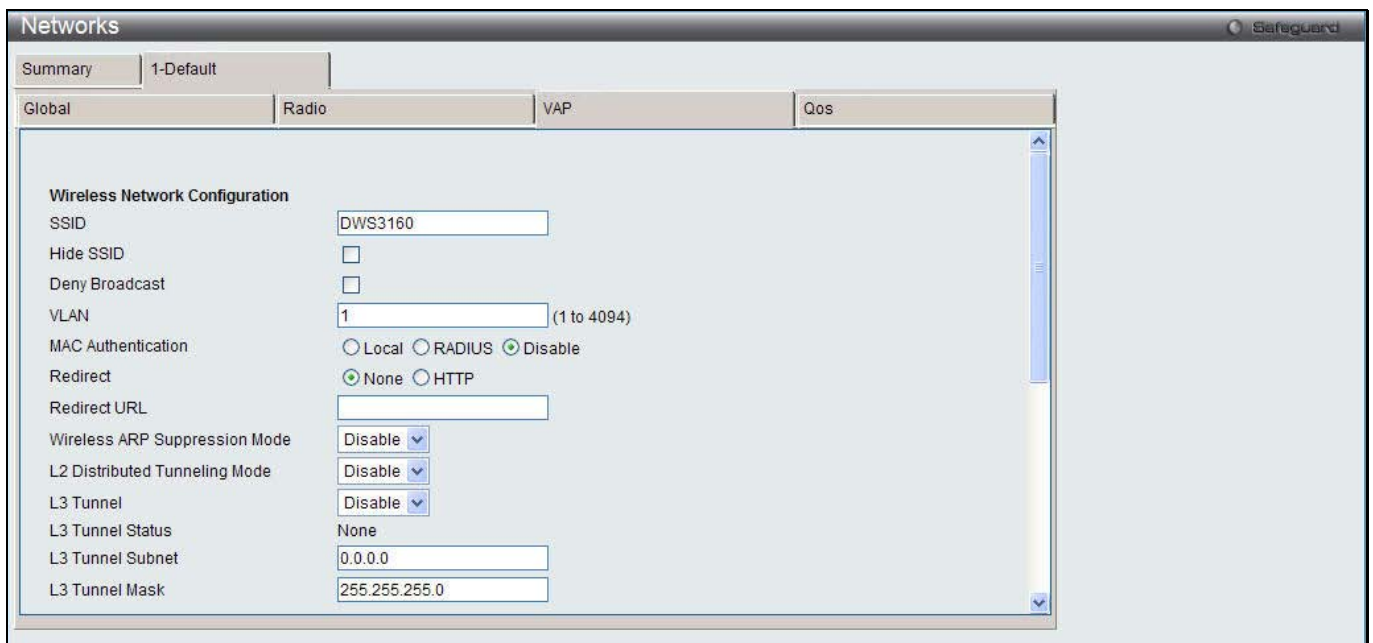


Figure 3-31 AP Profile Configuration – VAP (Edit) window

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

Parameter	Description
SSID	Enter Service Set Identifier (SSID) of the network, which is an alphanumeric key that uniquely identifies a wireless local area network.
Hide SSID	Tick the check box to hide the SSID broadcast to discourage stations from automatically discovering the access point.
Deny Broadcast	Tick the check box to prohibit the AP from responding to client probe requests
VLAN	Enter a VLAN ID.
MAC Authentication	Click Local or RADIUS to enable MAC Authentication. The MAC address of the client must be configured at the local switch or the external RADIUS server.
Redirect	Select the HTTP radio button to redirect wireless clients to a custom Web page.
Redirect URL	Enter the URL where all initial HTTP accesses should be redirected to. This text box is accessible only when HTTP is selected as the redirect type.
Wireless ARP Suppression Mode	Use the drop-down menu to enable or disable the APs to reduce the number of broadcasted ARP requests on the wireless interfaces. Reducing broadcasts helps conserve power on the wireless clients. The wireless clients that use power-save mode must wake up and use more power when they detect broadcast frames. NOTE: Enabling this feature slightly degrades AP packet forwarding performance due to extra packet filtering to find DHCP packets and extra processing for ARP request and reply packets. Networks that do not use IPv4 should not enable this feature.
L2 Distributed Tunneling Mode	The distributed L2 tunneling mode supports L3 roaming for wireless clients without forwarding any data traffic to the Unified Switch. Use the drop-down menu to enable or disable the mode. L2 tunneling is recommended when the Unified Switch does not support hardware forwarding acceleration or hardware-based L2 tunnels. NOTE: <ol style="list-style-type: none"> 1. When there is only one switch managing all APs and that switch goes down, all APs shut down their radios and the tunnel is terminated. After the switch recovers and the AP becomes managed again, the client that was previously tunneling traffic will re-associate and obtain an IP address on the network where its currently located. This IP address will be different from the IP address it was using when it was tunneling, and the traffic will not be tunneled. 2. If the network has peer switches and the tunnel is established between the APs managed by the peer switches then, when a switch managing the home AP fails, the switch managing the association AP detects the failure and terminates the tunnel. At this point the client is disassociated. When the client re-associates it obtains a new IP address. 3. If the switch managing the association AP fails, then the scenario is the same as in item 1 above. The AP takes down all radios and the clients disassociate.
L3 Tunnel	The L3 Tunnel feature allows mobile stations to maintain their IP connections while roaming from one access point to another access point even when these access points are attached to different IP subnets. NOTE: When L3 tunneling is enabled the VLAN ID is not used. In fact, the switch puts the management VLAN ID, if any, on the tunneled packets. NOTE: If the wireless network topology changes (for example, a Unified Switch reboots) while the L3 tunneling feature is in use, you should perform an ARP refresh on wired clients to speed up the process of re-establishing connectivity to the tunneled network.
L3 Tunnel Status	Display the status of L3 tunnel.
L3 Tunnel Subnet	Enter the subnet of L3 tunnel. The network IP address you enter in this field must be in the same subnet as a routing interface for the WLAN on the Switch.

L3 Tunnel Mask	Enter the subnet mask for the network IP address on the L3 Tunnel subnet.	
RADIUS Use Network Configuration	This parameter is used to control whether the VAP uses the network or global RADIUS Accounting settings. Select Enable to use RADIUS accounting settings defined on the Wireless Network Configuration page. Select Disable to use RADIUS accounting settings defined on the Wireless Global Configuration page.	
RADIUS Accounting	Tick the check box to enable RADIUS accounting for wireless clients.	
Security Option	Select the security mechanism of the wireless connection to protect the network.	
	None	Select this for not having any security of the network, and no further options are configurable on the AP.
	WEP	<p>Wired Equivalent Privacy (WEP) is a data encryption protocol for 802.11 wireless networks. If this security mechanism is selected, all wireless clients and access points on the network are configured with a 64-bit or 128-bit Shared Key for data encryption. Select WEP to see the following options.</p> <p>Static WEP – Select Static WEP to configure the static key management. The following options will display:</p> <ul style="list-style-type: none"> • Authentication – Tick the check boxes to select the authentication type. Available options are Open System and Shared Key. • WEP Key Type – Click the radio buttons to select the key type. Available options are ASCII and HEX. ASCII key includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. HEX key includes digits 0 to 9 and the letters A to F. • WEP Key Length (bits) – Click the radio button to select the key length in 64 bits or 128 bits. • WEP Keys – Click the radio button to select the specific transfer key. Enter up to 4 WEP keys in the text fields. The length of keys depends on the WEP Key Type and WEP Key Length configured earlier. <p>WEP IEEE802.1X – Select WEP IEEE802.1X to see the following options:</p> <ul style="list-style-type: none"> • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP. • Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.

	WPA/WPA2	<p>WPA and WPA2 are Wi-Fi Alliance IEEE 802.11i standards, which include AES-CCMP and TKIP mechanisms. Select WPA/WPA2 to see the following options.</p> <p>WPA Personal – Select this to configure static key management.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • WPA Key Type – The key type is ASCII, which includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • WPA Key – The WPA Key is the shared secret key for WPA Personal. Enter a string between 8 and 63 characters. Acceptable characters include upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast key is changed for clients associated to this VAP. <p>WPA Enterprise – Select this and the AP uses the global RADIUS server or the specified RADIUS server for the wireless network.</p> <ul style="list-style-type: none"> • WPA Versions – Tick the check boxes to select the types of client stations to support. Available options are WPA and WPA2. • WPA Ciphers – Tick the check boxes to select the cipher suite to use. Available options are TKIP and CCMP (AES). • Pre-Authentication – Tick the Pre-Authentication check box to allow WPA2 wireless clients sending preauthentication packets. The pre-authentication information is relayed from the access point. The client is currently using to the target access point. Enabling this feature can help speed up authentication for roaming clients who connect to multiple access points. Only clients that connect by using WPA2 can use this feature. It is not supported by the original WPA. • Pre-Authentication Limit – Enter the number of pre-authentications that can be in progress simultaneously on an AP. The limit prevents too much load on the RADIUS server. This does not prevent the preauthentication from being attempted again when the load is lighter. A value of 0 represents no limit. • Key Caching Hold Time – Enter the amount of minutes a PMK will be held by the AP. This applies to Pairwise Master Keys (PMKs) generated by RADIUS, those that come from pre-authentication, and those that are forwarded to the AP. Note that this time limit can be overridden by RADIUS if the RADIUS server returns a longer time in the Session-Timeout attribute for a particular user. The valid values of this are from 1–1440 minutes. If you do not enter a value, APs will not forward the PMK for the wireless client to other APs in case the client roams to another AP. • Bcast Key Refresh Rate – Enter a value to set the interval at which the broadcast (group) key is changed for clients associated to this VAP. • Session Key Refresh Rate – Enter a value to set the interval at which the Unicast session keys is changed.
Client QoS	Tick the check box to enable Client QoS operation for wireless clients that	

	associate with the AP using the SSID in the previous field.
Client QoS Bandwidth Limit Down	Enter the maximum allowed transmission rate from the AP to the wireless client in bits per second.
Client QoS Bandwidth Limit Up	Enter the maximum allowed client transmission rate to the AP in bits per second.
Client QoS Access Control Down	Use the drop-down menu to select the name of the access list applied to traffic in the outbound (down) direction.
Client QoS Access Control Up	Use the drop-down menu to select the name of the access list applied to traffic in the inbound (up) direction.
Client QoS Diffserv Policy Down	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the outbound (down) direction.
Client QoS Diffserv Policy Up	Use the drop-down menu to select the name of the DiffServ policy applied to traffic from the AP in the inbound (up) direction.

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

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

Click the **Clear** button to discard the changes made and return to the default settings.

After clicking the **QoS** tab under the Profile Name tab, the following page will appear:

Figure 3-32 AP Profile Configuration – QoS window

The fields that can be configured are described below:

Parameter	Description
Access Point Profile QoS Configuration	Click the radio button to select the radio between 802.11 a/n and 802.11b/g/n.
Template	Use the drop-down menu to select the QoS template. Available options are <i>Custom</i> , <i>Default</i> and <i>Voice</i> . Select <i>Custom</i> to create your own QoS mechanism.
Queue	Display different types of data transmitted from AP to Station (AP EDCA Parameters) or from Station to AP (Station EDCA Parameters).
AIFS (msecs)	Enter a wait time for data frames.
cwMin (msecs)	Enter the algorithm that determines the initial random backoff wait time (window) for retry of a transmission.

cwMax (msecs)	Enter the upper limit, in milliseconds, for the doubling of the random backoff value.
Max. Burst (usecs)	Enter a value in milliseconds to specify the Maximum Burst Length allowed for packet bursts on the wireless network.
TXOP Limit (32 usec units)	Enter the interval of time for a WMM client station to initiate transmissions on the wireless network.
WMM Mode	Tick to enable the WMM mode.

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

Peer Switch

This window is used to send a variety of configuration information from one switch to all other switches. In addition to keeping the switches synchronized, this function allows you to manage all wireless switches in the cluster from one switch.

To view this window, click **Administration > Advanced Configuration > Peer Switch** as shown below:

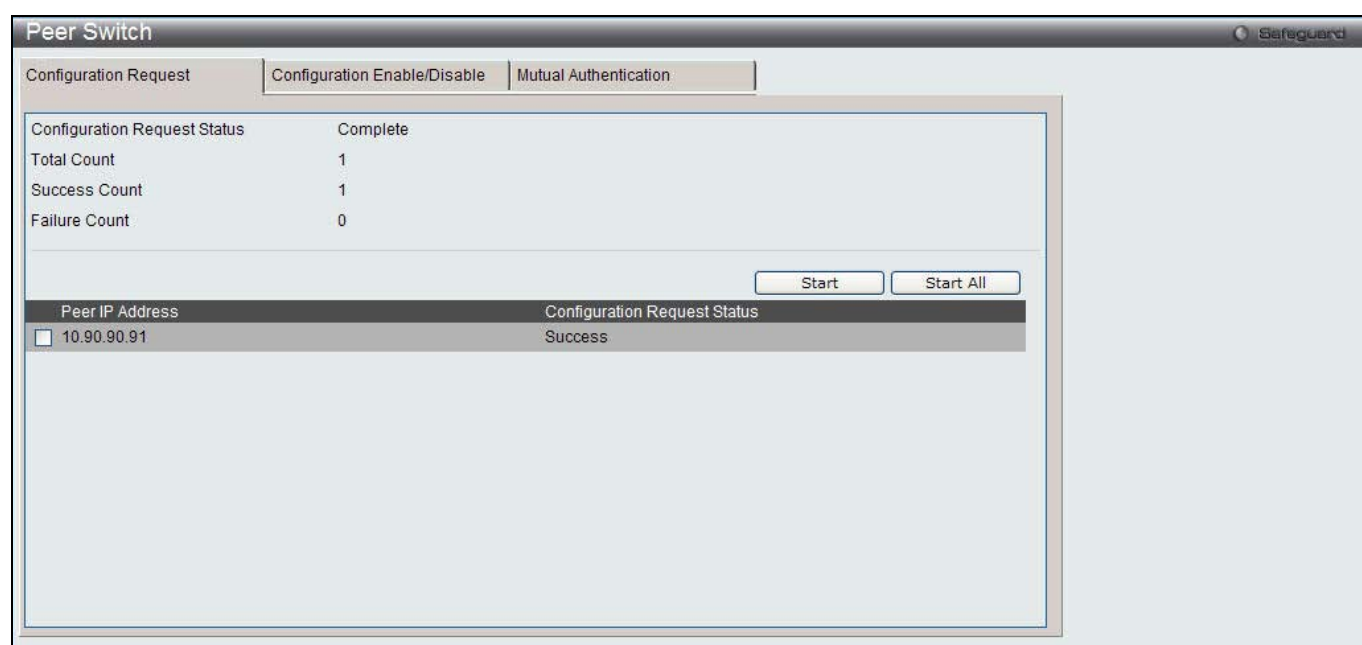


Figure 3-33 Peer Switch Configuration Request window

The fields that can be displayed are described below:

Parameter	Description
Configuration Request Status	Indicates the global status for a configuration push operation to one or more peer switches. The status can be <i>Not Started</i> , <i>Receiving Configuration</i> , <i>Saving Configuration</i> , <i>Success</i> , <i>Failure-Invalid Code Version</i> , <i>Failure-Invalid Hardware Version</i> , and <i>Failure-Invalid Configuration</i> .
Total Count	Display the number of peer switches included at the time a configuration download request is started, the value is 1 if a download request is for a single switch.
Success Count	Display the total number of peer switches that have successfully completed a configuration download.
Failure Count	Display the total number of peer switches that have failed to complete a configuration download.
Peer IP Address	Lists the IP address of each switch in the cluster and indicates the configuration request status of that switch.

Tick the specific check box and click the **Start** button to initiate a configuration update on a specific peer switch. Click the **Start All** button to update all peer switches.

After clicking the **Configuration Enable/Disable** tab, the following page will appear:

The screenshot shows a web interface window titled "Peer Switch" with a "Safeguard" logo in the top right. It has three tabs: "Configuration Request", "Configuration Enable/Disable" (which is selected), and "Mutual Authentication". The main content area is a list of configuration parameters, each with a dropdown menu. The parameters and their current values are: Global (Enabled), Discovery (Disabled), Channel/Power (Enabled), AP Database (Enabled), AP Profiles (Enabled), Known Client (Enabled), Captive Portal (Enabled), RADIUS Client (Enabled), QoS ACL (Enabled), and QoS DiffServ (Enabled). An "Apply" button is located at the bottom right of the configuration area.

Figure 3-34 Peer Switch Configuration Enable/Disable window

The fields that can be configured are described below:

Parameter	Description
Global	Select Enabled to include the basic and advanced global settings in the configuration that the switch pushes to its peers.
Discovery	Select Enabled to include the L2 and L3 discovery information, including the VLAN list and IP list, in the configuration that the switch pushes to its peers.
Channel/Power	Select Enabled to include the RF management information in the configuration that the switch pushes to its peers.
AP Database	Select Enabled to include the AP Database in the configuration that the switch pushes to its peers.
AP Profile	Select Enabled to include all AP profiles in the configuration that the switch pushes to its peers.
Known Client	Select Enabled to include the Known Client Database in the configuration that the switch pushes to its peers.
Captive Portal	Select Enabled to include the Captive Portal information in the configuration that the switch pushes to its peers.
RADIUS Client	Select Enabled to include the Client RADIUS information in the configuration that the switch pushes to its peers.
QoS ACL	Select Enabled to include the QoS ACLs in the configuration that the switch pushes to its peers.
QoS DiffServ	Select Enabled to include the Diffserv classes, services, and policies in the configuration that the switch pushes to its peers.

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

After clicking the **Mutual Authentication** tab, the following page will appear:

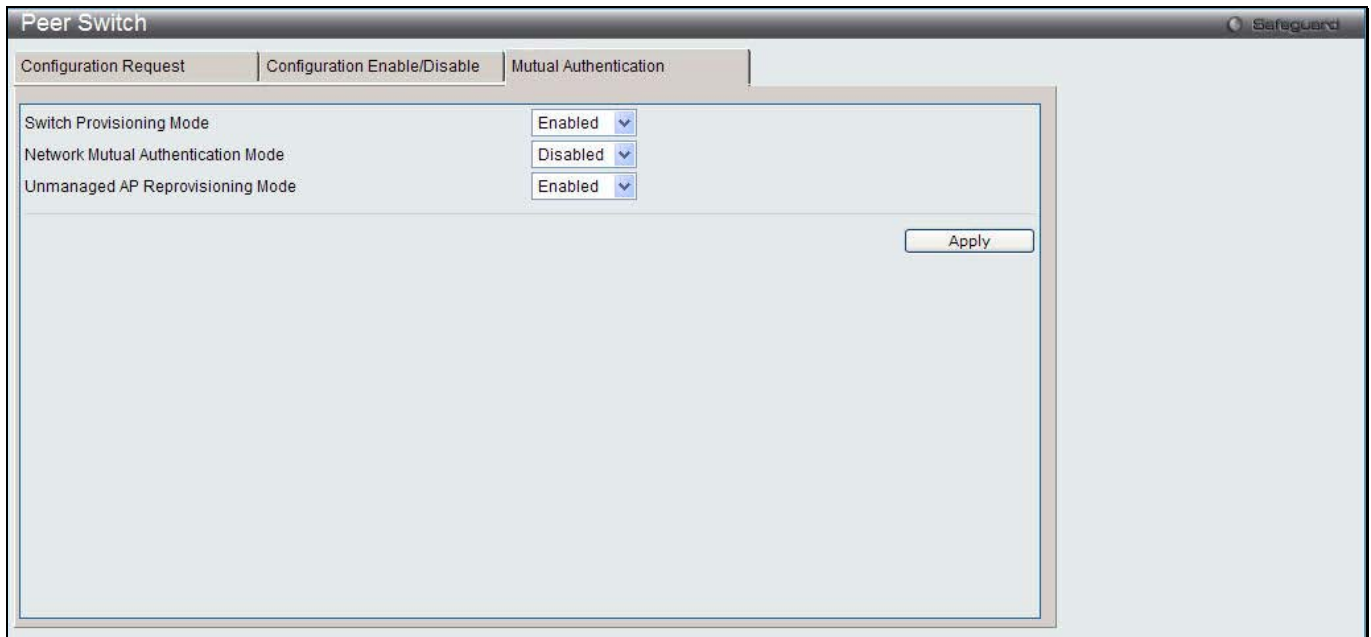


Figure 3-35 Peer Switch Mutual Authentication window

The fields that can be configured are described below:

Parameter	Description
Switch Provisioning Mode	Select Enabled to enable switch provisioning mode.
Network Mutual Authentication Mode	Select Enabled to enable mutual authentication for all network.
Unmanaged AP Reprovisioning Mode	Select Enabled to enable re-provisioning an unmanaged AP.

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

WIDS Security

The D-Link Unified Switch Wireless Intrusion Detection System (WIDS) can help detect intrusion attempts into the wireless network and take automatic actions to protect the network.

To view this window, click **Administration > Advanced Configuration > WIDS Security** as shown below:

Figure 3-36 WIDS Security AP Configuration window

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

Parameter	Description
Administrator configured rogue AP	If the source MAC address is in the valid-AP database on the switch or on the RADIUS server and the AP type is marked as Rogue, then the AP state is Rogue.
Managed SSID from an unknown AP	Select Enabled to check whether an unknown AP is using the managed network SSID. A hacker may set up an AP with managed SSID to fool users into associating with the AP and revealing password and other secure information. Administrators with large networks who are using multiple clusters should either use different network names in each cluster or disable this test. Otherwise, if an AP in the first cluster detects APs in the second cluster transmitting the same SSID as APs in the first cluster then these APs are reported as rogues.
Managed SSID from a fake managed AP	A hacker may set up an AP with the same MAC address as one of the managed APs and configure it to send one of the managed SSIDs. This test checks for a vendor field in the beacons which is always transmitted by managed APs. If the vendor field is not present, then the AP is identified as a fake AP.
AP without an SSID	SSID is an optional field in beacon frames. To avoid detection a hacker may set up an AP with the managed network SSID, but disable SSID transmission in the beacon frames. The AP would still send probe responses to clients that send probe requests for the managed SSID fooling the clients into associating with the hacker's AP. This test detects and flags APs that transmit beacons without the SSID field. The test is automatically disabled if any of the radios in the profiles are configured not to send SSID field, which is not recommended because it does not provide any real security and disables this test.
Fake managed AP on an invalid channel	Select Enabled to detect rogue APs that transmit beacons from the source MAC address of one of the managed APs, but on different channel from which the AP is supposed to be operating.
Managed SSID detected with incorrect security	During RF Scan, the AP examines beacon frames received from other APs and determines whether the detected AP is advertising an open network, WEP, or WPA. If the SSID reported in the RF Scan is one of the managed networks and its configured security not match the detected security then this test marks the AP as rogue.
Invalid SSID from a managed AP	Select Enabled to check whether a known managed AP is sending an unexpected SSID. The SSID reported in the RF Scan is compared to the list of all configured SSIDs that are used by the profile assigned to the managed AP. If the detected SSID doesn't match any configured SSID then the AP is marked as rogue.

AP is operating on an illegal channel	Select Enabled to detect hackers or incorrectly configured devices that are operating on channels that are not legal in the country where the wireless system is set up. NOTE: In order for the wireless system to detect this threat, the wireless network must contain one or more radios that operate in sentry mode.
Standalone AP with unexpected configuration	If the AP is classified as a known standalone AP, the switch checks whether the AP is operating with the expected configuration parameters. You configure the expected parameters for the standalone AP in the local or RADIUS Valid AP database.
Unmanaged AP detected on wired network	Select Enabled to check whether the AP is detected on the wired network. If the AP state is Unknown, then the test changes the AP state to Rogue. The flag indicating whether AP is detected on the wired network is reported as part of the RF Scan report. If AP is managed and is detected on the network then the switch simply reports this fact and doesn't change the AP state to Rogue. In order for the wireless system to detect this threat, the wireless network must contain one or more radios that operate in sentry mode.
Rogue Detected Trap Interval(60-3600 seconds or 0 is disable)	Enter the interval, in seconds, between transmissions of the SNMP trap telling the administrator that rogue APs are present in the RF Scan database. Enter 0 to disable the function.
Wired Network Detection Interval(1-3600 seconds or 0 is disable)	Enter the number of seconds that the AP waits before starting a new wired network detection cycle. Enter 0 to disable the function.
AP De-authentication Attach	Select to enable or disable the AP de-authentication attack. The wireless switch can protect against rogue APs by sending de-authentication messages to the rogue AP. The de-authentication attack feature must be globally enabled in order for the wireless system to do this function. Make sure that no legitimate APs are classified as rogues before enabling the attack feature. This feature is disabled by default.

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

After clicking the **Client Configuration** tab, the following page will appear:

The screenshot shows the 'WIDS Security' window with the 'Client Configuration' tab selected. The configuration items are as follows:

Parameter	Value
Not Present in OUI Database Test	Disabled
Not Present in Known Client Database Test	Disabled
Configured Authentication Rate Test	Enabled
Configured Probe Requests Rate Test	Enabled
Configured De-Authentication Requests Rate Test	Enabled
Maximum Authentication Failures Test	Enabled
Authentication with Unknown AP Test	Disabled
Client Threat Mitigation	Disabled
Known Client Database Lookup Method	Local
Rogue Detected Trap Interval (60-3600 seconds or 0 is disable)	300
De-Authentication Requests Threshold Interval (1-3600 seconds)	60
De-Authentication Requests Threshold Value (1-99999)	10
Authentication Requests Threshold Interval (1-3600 seconds)	60
Authentication Requests Threshold Value (1-99999)	10
Probe Requests Threshold Interval (1-3600 seconds)	60

Figure 3-37 WIDS Security Client Configuration window

The fields that can be configured are described below:

Parameter	Description
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Not Present in OUI Database Test	Select Enabled to check whether a client is present in the OUI DB Test.
Not Present in Known Client Database Test	Select Enabled to check whether the client, which is identified by its MAC address, is listed in the Known Client Database and is allowed access to the AP either through the Authentication Action of Grant or through the White List global action. If the client is in the Known Client Database and has an action of Deny, or if the action is Global Action and it is globally set to Black List, the client fails this test.
Configured Authentication Rate Test	Select Enabled to check whether the client has exceeded the configured rate for transmitting 802.11 authentication requests.
Configured Probe Requests Rate Test	Select Enabled to check whether the client has exceeded the configured rate for transmitting probe requests.
Configured De-Authentication Request Rate Test	Select Enabled to check whether the client has exceeded the configured rate for transmitting de-authentication requests.
Maximum Authentication Failures Test	Select Enabled to check whether the client has exceeded the maximum number of failed authentications.
Authentication with Unknown AP Test	Select Enabled to check whether a client in the Known Client database is authenticated with an unknown AP.
Client Thread Mitigation	Select Enabled to send de-authentication messages to clients that are in the Known Clients database but are associated with unknown APs. Authentication with Unknown AP Test must also be enabled in order for the mitigation to take place. Select Disabled to allow clients in the Known Clients database to remain authenticated with an unknown AP.
Known Client Database Lookup Method	Specify whether the Switch should use the Local or RADIUS database for the lookups in the Known Client database when detecting a client on the network.
Rogue Detected Trap Interval (60-3600 seconds or 0 is disable)	Enter the interval, in seconds, between transmissions of the SNMP trap telling the administrator that rogue APs are present in the RF Scan database. Enter 0 to disable the function.
De-Authentication Requests Threshold Interval (1-3600 seconds)	Enter the number of seconds an AP should spend counting the de-authentication messages sent by wireless clients.
De-Authentication Requests Threshold Value (1-99999)	Enter a threshold value. When the Switch receives more messages than the specified value during the threshold interval, the test triggers.
Authentication Requests Threshold Interval (1-3600 seconds)	Enter the number of seconds an AP should spend counting the authentication messages sent by wireless clients.
Authentication Requests Threshold Value (1-99999)	Enter a threshold value. When the Switch receives more messages than the specified value during the threshold interval, the test triggers.
Probe Requests Threshold Interval (1-3600 seconds)	Enter the number of seconds an AP should spend counting the probe messages sent by wireless clients.
Probe Requests Threshold Value (1-99999)	Enter the number of probe requests a wireless client is allowed to send during the threshold interval before the event is reported as a threat.
Authentication Failure Threshold Value (1-99999)	Enter the number of 802.1X authentication failures a client is allowed to have before the event is reported as a threat.

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

Clients

Known Clients

This window is used to display the wireless clients currently in the Known Client Database.

To view this window, click **Administration > Advanced Configuration > Clients > Known Clients** as shown below:

The screenshot shows the 'Known Clients' window with a 'Safeguard' logo in the top right. At the top, there is a 'MAC Address' input field containing '00-00-00-00-00-00' and an 'Add' button. Below this are 'Delete' and 'Delete All' buttons. A section labeled 'Total Entries: 1' contains a table with the following data:

MAC Address	Name	Authentication Action
00-22-B0-3C-43-C0		global-action

At the bottom right of the table, there are navigation controls: '1/1', a left arrow, a right arrow, and a 'Go' button.

Figure 3-38 Known Clients window

The fields that can be configured are described below:

Parameter	Description
MAC Address	Enter the MAC address of a client.

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

Tick the specific MAC Address and click the **Delete** button to remove the entry.

Click the **Delete All** button to remove all clients from the list.

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

After clicking the **Add** button or the MAC Address hyperlink, the following page will appear:

The screenshot shows the 'Known Clients' window with a 'Safeguard' logo in the top right. The title is 'Known Client Configuration'. It contains three fields: 'MAC Address' with a drop-down menu showing '00-22-B0-3C-43-C0', 'Name' with an empty text input, and 'Authentication Action' with three radio buttons: 'Global Action' (selected), 'Grant', and 'Deny'. An 'Apply' button is located at the bottom right.

Figure 3-39 Known Clients – Add window

The fields that can be configured are described below:

Parameter	Description
MAC Address	Use the drop-down menu to select the MAC address of the client.
Name	Enter a descriptive name for the client.
Authentication Action	Specify the action to take on a wireless client when MAC authentication is enabled on the network. Global Action – Use the MAC Authentication Mode configured in the Advanced Configuration > Global window to determine how to handle the client. Grant – Allow the client with the specified MAC address to access the network. Deny – Prohibit the client with the specified MAC address from accessing the network.

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

Switch Provisioning

This window is used to configure switch provisioning.

To view this window, click **Administration > Advanced Configuration > Switch Provisioning** as shown below:

Figure 3-40 Switch Certificate Request window

The fields that can be configured are described below:

Parameter	Description
Switch IP Address	Enter the IP address of the peer switch.

Click the **Start** button to perform switch certificate request.

After clicking the **Switch Provisioning** tab, the following page will appear:

Figure 3-41 Switch Provisioning window

The fields that can be configured are described below:

Parameter	Description
Switch IP Address	Enter the IP address of the peer switch.

Click the **Start** button to perform switch provisioning.

Chapter 4 QoS

Access Control Lists Differentiated Services

Access Control Lists

IP Access Control Lists

IP access control lists (ACL) allow network managers to define classification actions and rules for wireless networks.

To view this window, click **QoS > Access Control Lists > IP Access Control Lists** as shown below:

Figure 4-1 IP Access Control Lists window

The fields that can be configured are described below:

Parameter	Description
IP ACL	Use the drop-down menu to select the IP ACL type, <i>Standard IP ACL</i> , <i>Extended IP ACL</i> , or <i>Named IP ACL</i> .
IP ACL ID/Name	Enter the ID or name of the IP ACL.
Type Select	Use the drop-down menu to select the IP ACL type to see the information shown in the table below.

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

Click the **Rename ACL** button to change the name of the specific ACL.

Click the **Add / Delete Rules** to configure the ACL rules.

Click the **Delete ACL** to remove the entry from the list.

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

After clicking the **Rename ACL** button, the following page will appear:

Figure 4-2 IP Access Control Lists – Rename window

The fields that can be configured are described below:

Parameter	Description
New IP ACL Name	Enter a new name of IP ACL.

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

Click the **Cancel** button to discard the configuration.

After clicking the **Add / Delete Rules** button or the specific IP ACL ID (Name) hyperlink, the following page will appear:

The screenshot shows the 'IP Access Control Lists' window. At the top, there are buttons for 'Add Rule', '<<Back', 'Delete', and 'Refresh'. Below these is a table with the following data:

Rule ID	Action	Match Every
1	Deny	False

At the bottom right, there is a 'Go' button with a page number '1/1' and a '1' in a box.

Figure 4-3 IP Access Control Lists – Add / Delete Rules window

Click the **Add Rule** button to create a new rule.

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

Tick the check box and click the **Delete** button to remove the specific rule.

Click the **Refresh** button to update the list.

Click the Rule ID hyperlink or the **Edit** button to modify the specific rule.

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

With different types of IP ACL, the rule settings vary.

After clicking the **Add Rule** button to add a rule for Standard IP ACL, the following page appears:

The screenshot shows the 'IP Access Control Lists' window with the 'Add Rule (Standard IP ACL)' form. The fields are:

- IP ACL Name: 1
- Rule ID: (1-12)
- Action: Deny (dropdown)
- Match Every: False (dropdown)
- Source IP Address:
- Source IP Mask:

At the bottom right, there are buttons for 'Create Rule' and 'Cancel'.

Figure 4-4 IP Access Control Lists – Add Rule (Standard IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Rule ID	Enter an ID for the rule.
Action	Use the drop-down menu to select the ACL forwarding action when a packet matches the rule's criteria.
Match Every	Use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Source IP Address	Enter an IP address and a packet's source IP address must match the address

	entered.
Source IP Mask	Enter the source IP mask.

Click the **Create Rule** button to add a new rule.

Click the **Cancel** button to discard the configuration.

After clicking the **Add Rule** button to add a rule for Extended IP ACL, the following page appears:

Figure 4-5 IP Access Control Lists – Add Rule (Extended IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Rule ID	Enter an ID for the rule.
Action	Use the drop-down menu to select the ACL forwarding action when a packet matches the rule's criteria.
Match Every	Use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.
Source IP Address	Enter an IP address and a packet's source IP address must match the address entered.
Source IP Mask	Enter the source IP mask.
Source L4 Port	Use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination IP Address	Enter an IP address and a packet's destination IP address must match the address entered.
Destination IP Mask	Enter the destination IP mask.
Destination L4 Port	Use the drop-down menu to select L4 keyword of destination ports to match a packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Service Type	Select one of the following three Match conditions for the extended IP ACL rule.

IP DSCP – Select one of the DSCP keyword values from the **IP DSCP** drop-down menu. When selecting **Other**, the **IP DSCP Value** field appears. Enter a value in the field.

IP Precedence – Enter a value between 0 and 7 in the **IP Precedence** field.

IP ToS – Enter a value as a hexadecimal number from 00 to FF in the **IP ToS Bits** and **IP ToS Mask** field.

Click the **Create Rule** button to add a new rule.

Click the **Cancel** button to discard the configuration.

When clicking the **Add Rule** button to add a rule for Named IP ACL, the following page appears:

Figure 4-6 IP Access Control Lists – Add Rule (Named IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Rule ID	Enter an ID for the rule.
Action	Use the drop-down menu to select the ACL forwarding action when a packet matches the rule's criteria.
Match Every	Use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.
Source IP Address	Enter an IP address and a packet's source IP address must match the address entered.
Source IP Mask	Enter the source IP mask.
Source L4 Port	Use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination IP Address	Enter an IP address and a packet's destination IP address must match the address entered.
Destination IP Mask	Enter the destination IP mask.
Destination L4 Port	Use the drop-down menu to select L4 keyword of destination ports to match a

	packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Service Type	Select one of the following three Match conditions for the extended IP ACL rule. <i>IP DSCP</i> – Select one of the DSCP keyword values from the IP DSCP drop-down menu. When selecting Other , the IP DSCP Value field appears. Enter a value in the field. <i>IP Precedence</i> – Enter a value between 0 and 7 in the IP Precedence field. <i>IP ToS</i> – Enter a value as a hexadecimal number from 00 to FF in the IP ToS Bits and IP ToS Mask field.

Click the **Create Rule** button to add a new rule.

Click the **Cancel** button to discard the configuration.

After clicking the Rule ID hyperlink or the **Edit** button to modify a rule for Standard IP ACL, the following page appears:

Figure 4-7 IP Access Control Lists – Edit Rule (Standard IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Action	Tick the check box and use the drop-down menu to select the ACL forwarding action.
Match Every	Tick the check box and use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Source IP Address	Tick the check box and enter an IP address and a packet's source IP address must match the address entered.
Source IP Mask	Enter the source IP mask, when the Source IP Address check box is selected.

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

Click the **Cancel** button to discard the configuration.

After clicking the Rule ID hyperlink or the **Edit** button to modify a rule for Extended IP ACL, the following page appears:

Config	Item	Value	Item	Value
<input type="checkbox"/>	Action	Deny		
<input type="checkbox"/>	Match Every	False		
<input type="checkbox"/>	Protocol	IP		
<input type="checkbox"/>	Source IP Address	10.1.1.1		
	Source IP Mask	255.0.0.0		
<input type="checkbox"/>	Source L4 Port			
<input type="checkbox"/>	Destination IP Address			
	Destination IP Mask			
<input type="checkbox"/>	Destination L4 Port			
<input type="checkbox"/>	Service Type			

Figure 4-8 IP Access Control Lists – Edit Rule (Extended IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Action	Tick the check box and use the drop-down menu to select the ACL forwarding action.
Match Every	Tick the check box and use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Tick the check box and use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.
Source IP Address	Tick the check box and enter an IP address and a packet's source IP address must match the address entered.
Source IP Mask	Enter the source IP mask, when the Source IP Address check box is selected.
Source L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination IP Address	Tick the check box and enter an IP address and a packet's destination IP address must match the address entered.
Destination IP Mask	Enter the destination IP mask, when the Destination IP Address check box is selected.
Destination L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of destination ports to match a packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Service Type	Tick the check box and select one of the following three Match conditions for the extended IP ACL rule. <i>IP DSCP</i> – Select one of the DSCP keyword values from the IP DSCP drop-down menu. When selecting Other , the IP DSCP Value field appears. Enter a value in the field. <i>IP Precedence</i> – Enter a value between 0 and 7 in the IP Precedence field. <i>IP ToS</i> – Enter a value as a hexadecimal number from 00 to FF in the IP ToS Bits and IP ToS Mask field.

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

Click the **Cancel** button to discard the configuration.

After clicking the Rule ID hyperlink or the **Edit** button to modify a rule for Named IP ACL, the following page appears:

Figure 4-9 IP Access Control Lists – Edit Rule (Named IP ACL) window

The fields that can be configured are described below:

Parameter	Description
Action	Tick the check box and use the drop-down menu to select the ACL forwarding action.
Match Every	Tick the check box and use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IP ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Tick the check box and use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.
Source IP Address	Tick the check box and enter an IP address and a packet's source IP address must match the address entered.
Source IP Mask	Enter the source IP mask, when the Source IP Address check box is selected.
Source L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination IP Address	Tick the check box and enter an IP address and a packet's destination IP address must match the address entered.
Destination IP Mask	Enter the destination IP mask, when the Destination IP Address check box is selected.
Destination L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of destination ports to match a packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Service Type	Tick the check box and select one of the following three Match conditions for the

	<p>extended IP ACL rule.</p> <p><i>IP DSCP</i> – Select one of the DSCP keyword values from the IP DSCP drop-down menu. When selecting Other, the IP DSCP Value field appears. Enter a value in the field.</p> <p><i>IP Precedence</i> – Enter a value between 0 and 7 in the IP Precedence field.</p> <p><i>IP ToS</i> – Enter a value as a hexadecimal number from 00 to FF in the IP ToS Bits and IP ToS Mask field.</p>
--	---

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

Click the **Cancel** button to discard the configuration.

IPv6 Access Control Lists

This window is used to configure IPv6 Access Control Lists.

To view this window, click **QoS > Access Control Lists > IPv6 Access Control Lists** as shown below:

Figure 4-10 IPv6 Access Control Lists window

The fields that can be configured are described below:

Parameter	Description
IPv6 ACL Name	Enter the ID or name of the IPv6 ACL.

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

Click the **Rename ACL** button to change the name of the specific ACL.

Click the **Add / Delete Rules** to configure the ACL rules.

Click the **Delete ACL** to remove the entry from the list.

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

After clicking the **Rename ACL** button, the following page will appear:

Figure 4-11 IPv6 Access Control Lists – Rename window

The fields that can be configured are described below:

Parameter	Description
New IPv6 ACL Name	Enter a new name of IPv6 ACL.

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

Click the **Cancel** button to discard the configuration.

After clicking the **Add / Delete Rules** button or the specific IPv6 ACL Name hyperlink, the following page will appear:

Figure 4-12 IPv6 Access Control Lists – Add / Delete Rules window

Click the **Add Rule** button to create a new rule.

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

Tick the check box and click the **Delete** button to remove the specific rule.

Click the **Refresh** button to update the list.

Click the Rule ID hyperlink or the **Edit** button to modify the specific rule.

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 appears:

Figure 4-13 IPv6 Access Control Lists – Add Rule window

The fields that can be configured are described below:

Parameter	Description
Rule ID	Enter an ID for the rule.
Action	Use the drop-down menu to select the ACL forwarding action when a packet matches the rule's criteria.
Match Every	Use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IPv6 ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.

Source Prefix	Enter an IPv6 prefix and a packet's source IPv6 prefix must match the address entered.
Source Prefix Mask	Enter the source IPv6 mask.
Source L4 Port	Use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination Prefix	Enter an IPv6 prefix and a packet's destination port IPv6 prefix must match the address entered.
Destination Prefix Mask	Enter the destination IPv6 mask.
Destination L4 Port	Use the drop-down menu to select L4 keyword of destination ports to match a packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Flow Label	Enter a value of IPv6 flow label.
IP DSCP Service	Select one of the DSCP keyword values from the IP DSCP drop-down menu. When selecting Other , the IP DSCP Value field appears. Enter a value in the field.

Click the **Create Rule** button to add a new rule.

Click the **Cancel** button to discard the configuration.

After clicking the Rule ID hyperlink or the **Edit** button, the following page appears:

Figure 4-14 IPv6 Access Control Lists – Edit Rule window

The fields that can be configured are described below:

Parameter	Description
Action	Tick the check box and use the drop-down menu to select the ACL forwarding action.
Match Every	Tick the check box and use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected IPv6 ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
Protocol	Tick the check box and use the drop-down menu to select a packet's IP protocol to match condition for the selected IP ACL rule. When selecting Other , the Protocol Value field appears. Enter a value in the field.

Source Prefix	Tick the check box and enter an IPv6 prefix and a packet's source IPv6 prefix must match the address entered.
Source Prefix Mask	Enter the source IPv6 mask, when the Source Prefix check box is selected.
Source L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of source ports to match a packet's TCP/UDP source port. When selecting Other , the Source Port Value field appears. Enter a value in the field.
Destination Prefix	Tick the check box and enter an IPv6 prefix and a packet's destination IPv6 prefix must match the address entered.
Destination Prefix Mask	Enter the destination IPv6 mask, when the Destination Prefix check box is selected.
Destination L4 Port	Tick the check box and use the drop-down menu to select L4 keyword of destination ports to match a packet's TCP/UDP destination port. When selecting Other , Destination Port Value appears. Enter a value in the field.
Flow Label	Tick the check box and enter a value of IPv6 flow label.
IP DSCP Service	Tick the check box and select one of the DSCP keyword values from the IP DSCP drop-down menu. When selecting Other , the IP DSCP Value field appears. Enter a value in the field.

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

Click the **Cancel** button to discard the configuration.

MAC Access Control Lists

This window is used to configure MAC access control lists.

To view this window, click **QoS > Access Control Lists > MAC Access Control Lists** as shown below:

Figure 4-15 MAC Access Control Lists window

The fields that can be configured are described below:

Parameter	Description
MAC ACL Name	Enter the ID or name of the MAC ACL.

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

Click the **Rename ACL** button to change the name of the specific ACL.

Click the **Add / Delete Rules** to configure the ACL rules.

Click the **Delete ACL** to remove the entry from the list.

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

After clicking the **Rename ACL** button, the following page will appear:

Figure 4-16 MAC Access Control Lists – Rename window

The fields that can be configured are described below:

Parameter	Description
New MAC ACL Name	Enter a new name of MAC ACL.

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

Click the **Cancel** button to discard the configuration.

After clicking the **Add / Delete Rules** button or the specific MAC ACL Name hyperlink, the following page will appear:



Figure 4-17 MAC Access Control Lists – Add / Delete Rules window

Click the **Add Rule** button to create a new rule.

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

Tick the check box and click the **Delete** button to remove the specific rule.

Click the **Refresh** button to update the list.

Click the Rule ID hyperlink or the **Edit** button to modify the specific rule.

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 appears:

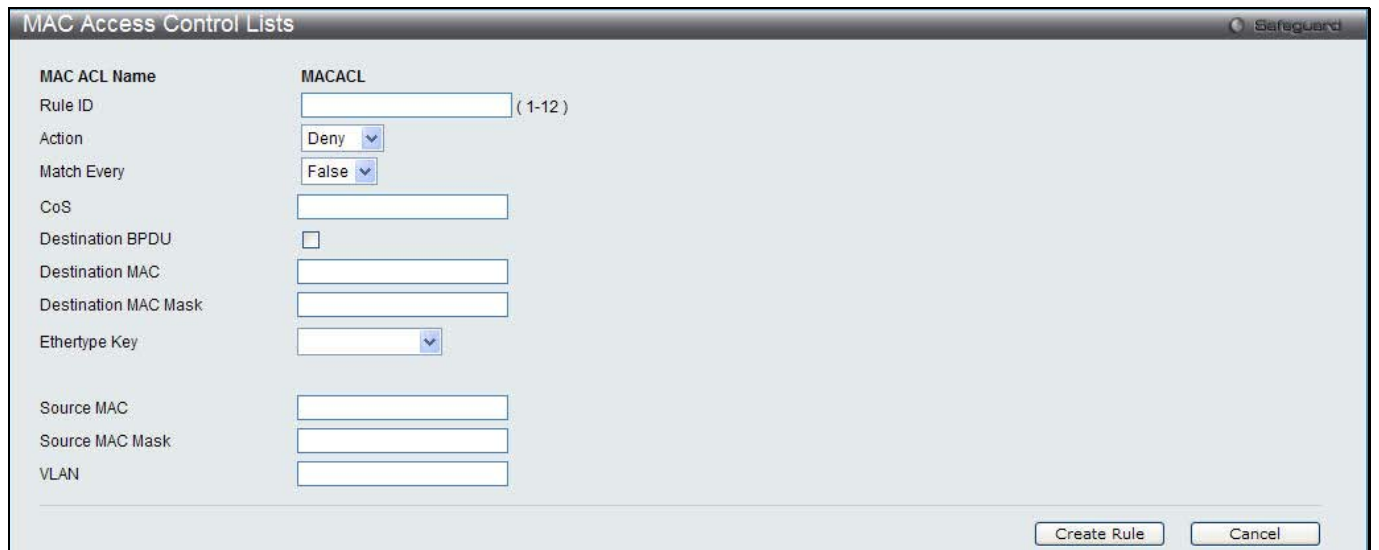


Figure 4-18 MAC Access Control Lists – Add Rule window

The fields that can be configured are described below:

Parameter	Description
Rule ID	Enter an ID for the rule.
Action	Use the drop-down menu to select the ACL forwarding action when a packet

	matches the rule's criteria.
Match Every	Use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected MAC ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.
CoS	Enter the 802.1p user priority to compare against an Ethernet frame.
Destination BPDU	Tick the check box to use multicast address 01:80:C2:00:00:00 as destination MAC and mask is FF:FF:FF:00:00:00.
Destination MAC	Enter a MAC address and an Ethernet frame's destination MAC address must match the address.
Destination MAC Mask	Enter the mask of the destination MAC.
Ethertype Key	Use the drop-down menu to select EtherType. A packet's EtherType must match the selected EtherType. When selecting User Value, the Ethertype Value field appears. Enter a custom value in the field.
Source MAC	Enter a MAC address and an Ethernet frame's source MAC address must match the address.
Source MAC Mask	Enter the mask of the source MAC.
VLAN	Enter an ID of the VLAN. A packet's VLAN ID Must match the entered ID.

Click the **Create Rule** button to add a new rule.

Click the **Cancel** button to discard the configuration.

After clicking the Rule ID hyperlink or the **Edit** button, the following page appears:

MAC ACL Name	Rule ID	MACACL
		1

Config	Item	Value
<input type="checkbox"/>	Action	Deny
<input type="checkbox"/>	Match Every	False
<input type="checkbox"/>	CoS	
<input type="checkbox"/>	Destination MAC	
<input type="checkbox"/>	Destination MAC Mask	
<input type="checkbox"/>	Ethertype Key	
<input type="checkbox"/>	Source MAC	
<input type="checkbox"/>	Source MAC Mask	
<input type="checkbox"/>	VLAN	

Apply Cancel

Figure 4-19 MAC Access Control Lists – Edit Rule window

The fields that can be configured are described below:

Parameter	Description
Action	Tick the check box and use the drop-down menu to select the ACL forwarding action.
Match Every	Tick the check box and use the drop-down menu to select <i>True</i> or <i>False</i> . <i>True</i> means that all packets will match the selected MAC ACL and Rule, and will be either permitted or denied. When <i>True</i> is selected, the option of configuring other match criteria will not be offered since all packets match the rule. To configure specific match criteria for the rule, select <i>False</i> to configure the other match criteria.

CoS	Tick the check box and enter the 802.1p user priority to compare against an Ethernet frame.
Destination BPDU	Tick the check box to use multicast address 01:80:C2:00:00:00 as destination MAC and mask is FF:FF:FF:00:00:00.
Destination MAC	Tick the check box and enter a MAC address and an Ethernet frame's destination MAC address must match the address.
Destination MAC Mask	Enter the mask of the destination MAC, when the Destination MAC check box is selected.
Ethertype Key	Tick the check box and use the drop-down menu to select EtherType. A packet's EtherType must match the selected EtherType. When selecting User Value, the Ethertype Value field appears. Enter a custom value in the field.
Source MAC	Tick the check box and enter a MAC address and an Ethernet frame's source MAC address must match the address.
Source MAC Mask	Enter the mask of the source MAC, when the Source MAC check box is selected.
VLAN	Tick the check box and enter an ID of the VLAN. A packet's VLAN ID Must match the entered ID.

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

Click the **Cancel** button to discard the configuration.

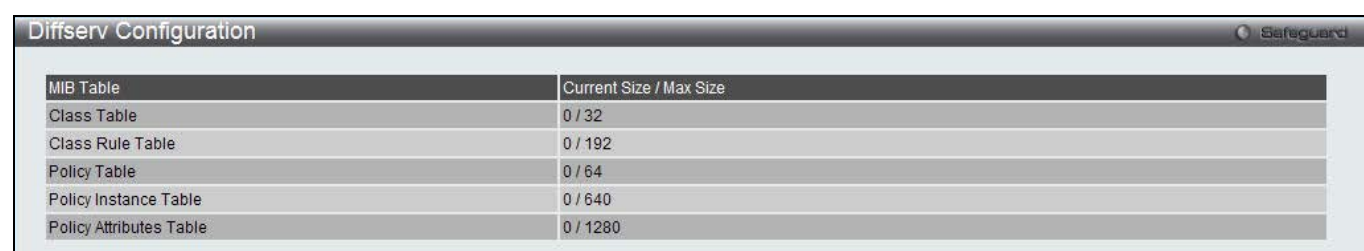
Differentiated Services

The QoS feature contains Differentiated Services (DiffServ) support that allows traffic to be classified into streams and given certain QoS treatment in accordance with defined per-hop behaviors.

Diffserv Configuration

This window is used to display the differentiated services general status information, which includes the current and maximum number of rows in each of the main DiffServ private MIB tables.

To view this window, click **QoS > Differentiated Services > Diffserv Configuration** as shown below:



MIB Table	Current Size / Max Size
Class Table	0 / 32
Class Rule Table	0 / 192
Policy Table	0 / 64
Policy Instance Table	0 / 640
Policy Attributes Table	0 / 1280

Figure 4-20 Diffserv Configuration window

Class Configuration

This window is used to add a new Diffserv class name, or rename or delete an existing class.

To view this window, click **QoS > Differentiated Services > Class Summary** as shown below:

Figure 4-21 Class Configuration window

The fields that can be configured are described below:

Parameter	Description
Class Name	Enter a class name.
Class Type	Select the class type.
Class Layer 3 Protocol	Select the class layer 3 protocol as IPv4 or IPv6.

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

Click the **Edit Class** to configure the entry.

Click the **Rename Class** button to change the name of the specific class.

Click the **Delete Class** to remove the entry from the list.

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

After clicking the **Edit Class** button, the following page appears:

Figure 4-22 Class Configuration – Edit Class window

The fields that can be configured are described below:

Parameter	Description
Class Match Selector	<p>Use the drop-down menu to select match criteria to a specified class. Click the Add Match Criteria button to see the criteria configuration for that class.</p> <p>When Class Layer 3 Protocol is <i>IPv4</i>, the following selections display in the drop-down menu.</p> <p><i>Class of Service</i> – Select this and select a value (between 0 and 7) of Class of Service in the next window.</p> <p><i>Destination IP Address</i> – Select this to enter an IP address and its mask in the next window. A packet's destination IP address must match the address entered.</p> <p><i>Destination Layer4 Port</i> – Select this to choose protocol keyword in the next window. A packet's TCP/UDP destination port must match the selected port. Select Other to enter a user-defined Port ID in the Protocol Value field by which packets are matched to the rule.</p> <p><i>Destination MAC Address</i> – Select this to enter a MAC address and its mask in the next window. A packet's destination MAC address must match the address entered.</p> <p><i>Ethertype</i> – Select this to choose the Ethertype Key in the next window. A frames' Ethertype must match the selected Ethertype. Select User Value to enter a user-defined Ethertype Value in the field.</p>

Any – All packets are considered to match the specified class and no additional input information is needed.

IP DSCP – Select this to choose **IP DSCP Keyword** in the next window. The packet's DSCP must match the selected keyword.

IP Precedence – Select this to choose **Precedence Value** in the next window. The packet's DSCP must match the selected value.

IP TOS – Select this to enter the ToS bits and its mask in the next window. the packet's Type of Service bits in the IP header must match the entered value.

Protocol - Select this to choose a protocol in the next window. A packet's layer 4 protocol must match the selected protocol.

Reference Class – Select to choose a class to start referencing for criteria in the next window.

Source IP Address – Select to enter an IP address and its mask in the next window. A packet's source IP address must match the entered IP address and its mask.

Source Layer4 Port – Select this to choose protocol keyword in the next window. A packet's TCP/UDP source port must match the selected port.

Source MAC Address – Select this to enter a MAC address and its mask in the next window. A packet's source MAC address must match the address entered.

VLAN – Select this to enter a VLAN ID in the next window.

When Class Layer 3 Protocol is *IPv6*, the following selections display in the drop-down menu.

Destination IPv6 Address – Select this to enter an IPv6 prefix and its length in the next window. A packet's destination IPv6 prefix must match the address entered.

Destination Layer4 Port – Select this to choose protocol keyword in the next window. A packet's TCP/UDP destination port must match the selected port.

Any – All packets are considered to match the specified class and no additional input information is needed.

Flow Label – Select this to enter the flow label value in the next window.

IP DSCP – Select this to choose **IP DSCP Keyword** in the next window. The packet's DSCP must match the selected keyword.

Protocol – Select this to choose a protocol in the next window. A packet's layer 4 protocol must match the selected protocol.

Reference Class – Select to choose a class to start referencing for criteria in the next window.

Source IPv6 Address – Select this to enter an IPv6 prefix and its length in the next window. A packet's source port IPv6 prefix must match the address entered.

Source Layer4 Port – Select this to choose protocol keyword in the next window. A packet's TCP/UDP source port must match the selected port.

Click the **Add Match Criteria** to see the criteria configuration for the class.

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

Click the **Cancel** button to discard the configuration.

Policy Configuration

This window is used to associate a collection of classes with one or more policy statements.

To view this window, click **QoS > Differentiated Services > Policy Configuration** as shown below:

Figure 4-23 Policy Configuration window

The fields that can be configured are described below:

Parameter	Description
Policy Name	Enter a policy name.
Policy Type	Select the policy type.

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

Click the **Edit Policy** to configure the entry.

Click the **Rename Policy** to change the name of the specific policy.

Click the **Delete Policy** to remove the entry from the list.

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

After clicking the **Edit Policy** button, the following page appears:

Figure 4-24 Policy Configuration – Edit Policy window

The fields that can be configured are described below:

Parameter	Description
Policy Type	Select the available policy type.
Available Class List	Select existing DiffServ class names. The list is automatically updated as a new class is added or removed in the Class Configuration window.
Member Class List	Select the DiffServ classes that have been added to the policy.

Click the **Add Selected Class** button to add the existing DiffServ class to the **Member Class List** drop-down menu.

Click the **Remove Selected Class** button to remove the class from the **Member Class List** drop-down menu.

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

Policy Class Definition

This window is used to associate a class to a policy and to define attributes for that policy-class instance.

To view this window, click **QoS > Differentiated Services > Policy Class Definition** as shown below:

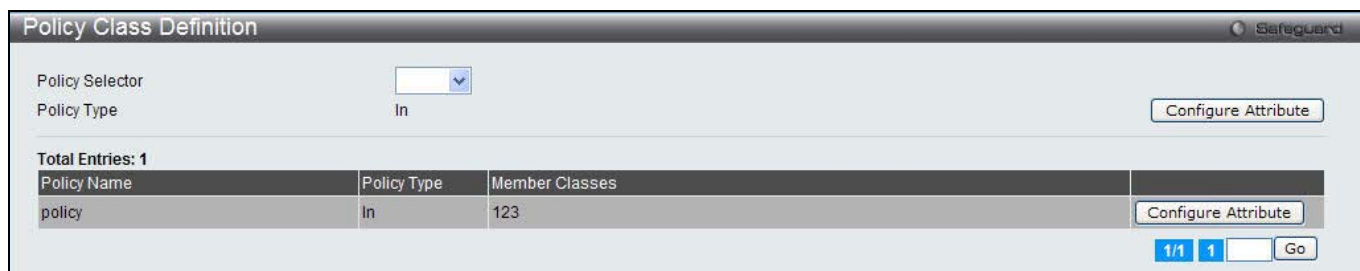


Figure 4-25 Policy Class Definition window

The fields that can be configured are described below:

Parameter	Description
Policy Selector	Select a policy to be configured.

Click the **Configuration Attribute** to configure the specific policy.

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

After clicking the **Configure Attribute** button, the following page appears:



Figure 4-26 Policy Class Definition window

The fields that can be configured are described below:

Parameter	Description
Member Class List	Select the member class to associate with this policy.
Policy Attribute Selector	<p>Use the drop-down menu to select attributes supported for this type of policy. Click the Configure Selected Attribute button to see the attribute configuration for that policy.</p> <p><i>Drop</i> – Select this to drop packets for this policy-class.</p> <p><i>Mark CoS</i> – Select this to enter the specified Class of Service queue number to mark all packets for the associated traffic stream with the specified class of service value in the priority field of the 802.1p header in the next window.</p> <p><i>Mark IP DSCP</i> – Select this to choose the DSCP Keyword in the next window. This will mark all packets for the associated traffic stream with the selected IP DSCP value.</p> <p><i>Mark IP Precedence</i> – Select this to enter IP Precedence Value in the next window. This will mark all packets for the associated traffic stream with the entered IP Precedence value.</p> <p><i>Police Simple</i> – Select this to establish the traffic policing style for the specified class in the next window.</p> <ul style="list-style-type: none"> • Committed Rate (bps) – Enter the committed rate for monitoring the arrival rate of incoming packets for this class. • Committed Burst Size (KB) – Enter the committed burst size to determine the amount of conforming traffic allowed. • Conform Action Selector – Select an action when a packet is considered conforming. <p>Drop – The packets are immediately dropped.</p>

	<p>Mark CoS – The packets are marked by DiffServ with the specified CoS value before being presented to the system forwarding element. Enter a value in the Conform CoS Value field between 0 and 7.</p> <p>Mark IP DSCP – The packets are marked by DiffServ with the specified DSCP value before being presented to the system forwarding element. Select Conform DSCP Keyword from the drop-down menu.</p> <p>Mark IP Precedence – The packets are marked by DiffServ with the specified IP Precedence value before being presented to the system forwarding element. Enter a value in the Conform IP Precedence Value field between 0 and 7.</p> <p>Send – The packets are presented unmodified by DiffServ to the system forwarding element.</p>
--	--

Click the **Configure Selected Attribute** to see the attribute configuration for that policy.

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

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

Click the **Cancel** button to discard the configuration.

Chapter 5 Network Visualization

Download Image Launch...

The WLAN Visualization component is an optional feature that graphically shows information about the wireless network. WLAN Visualization uses a Java applet to display switches, APs, and associated wireless clients. The WLAN Visualization tool can help you visualize where the APs are in relationship to the building.

You can upload one or more custom images to create a background for the graph. Then, you place the WLAN components discovered by the switch on the graph to help provide a realistic representation of your wireless network. From each object on the WLAN Visualization graph, you can access information about the object and links to configuration pages on the Web interface.

Download Image

This window is used to download images for network visualization.

To view this window, click **Network Visualization > Download Image** as shown below:

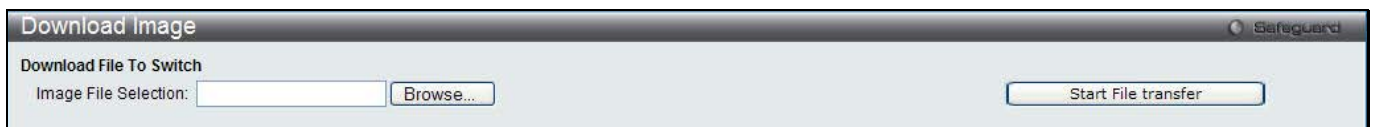


Figure 5-1 Download Image window

Click the **Browse...** button to navigate the image file. The image file should be GIF or JPG file. Click the **Start File transfer** to download the image to the Switch.

Launch...

This window is used to display the D-Link WLAN Visualization.

To view this window, click **Network Visualization > Launch...** as shown below:

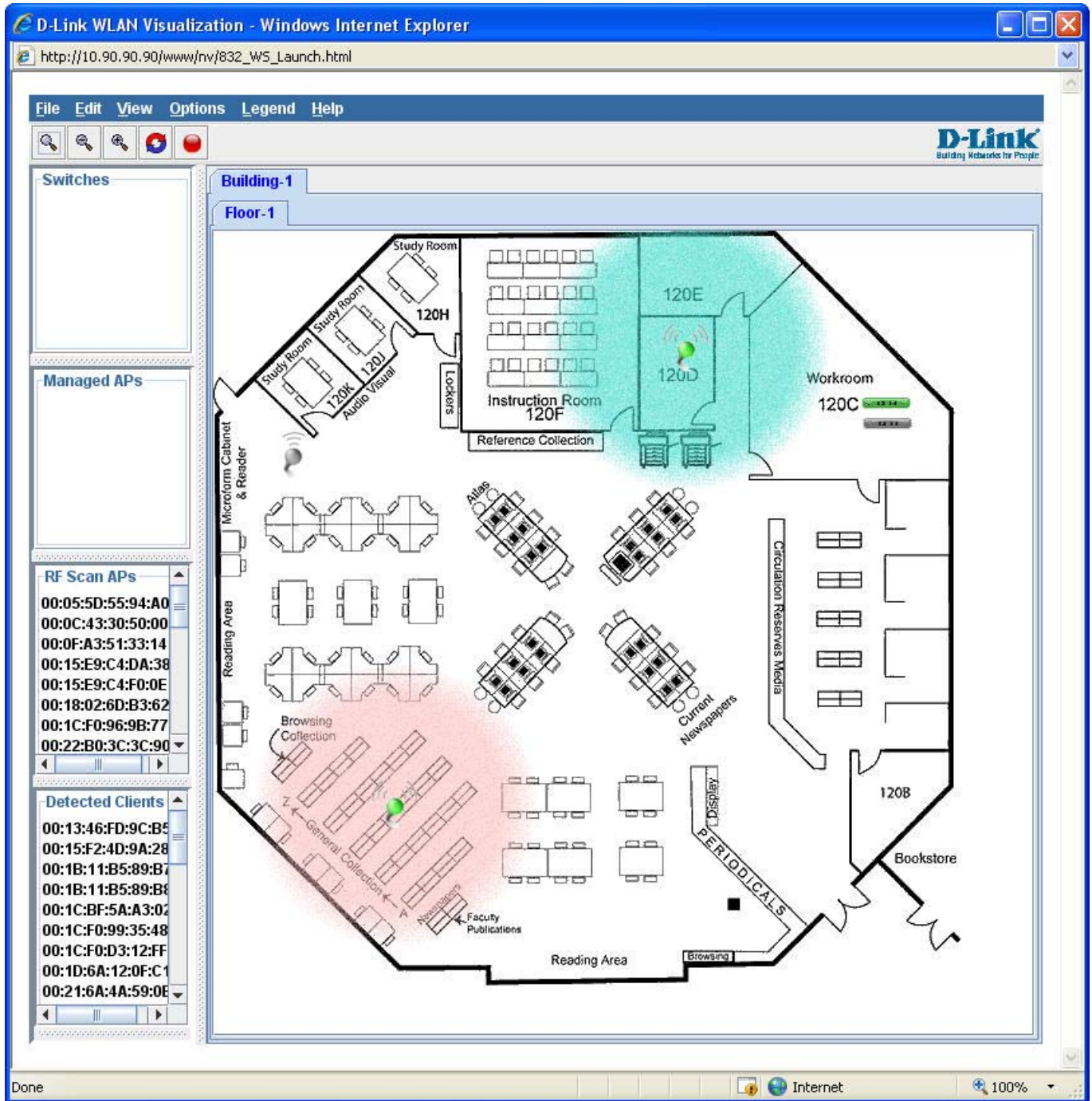


Figure 5-2 D-Link WLAN Visualization window

You can import multiple images to the right window and drag the switches, APs or clients on the left window to the right to create virtual wireless network environment.

Menu Bar

The D-Link WLAN Visualization window contains a menu bar for device configurations, as seen below.



Figure 5-3 Menu Bar of D-Link WLAN Visualization

File

- **Force refresh.** – Resynchronize the Java client application.
- **Reconnect and Refresh** – Disconnect the Java client application from the switch and re-connect it.

- **Exit** – Exit the WLAN Visualization application.

Edit

- **New Graph...** – Select to open a window to create and configure a new graph.
- **Edit Graph...** – Select to open a window to configure an existing graph.
- **Delete Graph...** – Select to delete the existing graph.
- **Image Management...** - List the available background images and allows you to delete any available image.

View

- **Ungraphed Components** – Select to change the view of the left window.
- **AP Power Display** – Select the power range image to display for a managed AP.

Options

- **Show Managed APs** – Select to display the managed APs.
- **Show RF Scan APs** – Select to display the APs detected through the RF scan.
- **Show Managed AP Clients** – Select to display wireless clients associated with managed APs.
- **Show Detected Clients** – Select to display the detected wireless clients.

Legend

- **Images** – Display the icons associated with each WLAN component on the graph.
- **Channel Color** – Map the color of the power transmission image to the channel that the radio is using for transmission.

Help

- **Summary** – A new window opens to display the on-line help of D-Link WLAN Visualization.

Section 4 Save and Tools

[Save Configuration / Log](#)
[Stacking Information](#)
[Download firmware](#)
[Upload Firmware](#)
[Download Configuration](#)
[Upload Configuration](#)
[Upload Log File](#)
[Reset](#)
[Reboot System](#)

Chapter 1 Save

Save Configuration / Log

To view this window, click **Save > Save Configuration / Log**, as shown below.

Save Configuration allows the user to backup the configuration of the switch to a folder on the computer. Select **Configuration** from the **Type** drop-down menu and enter the **File Path** in the space provided and click **Apply**.

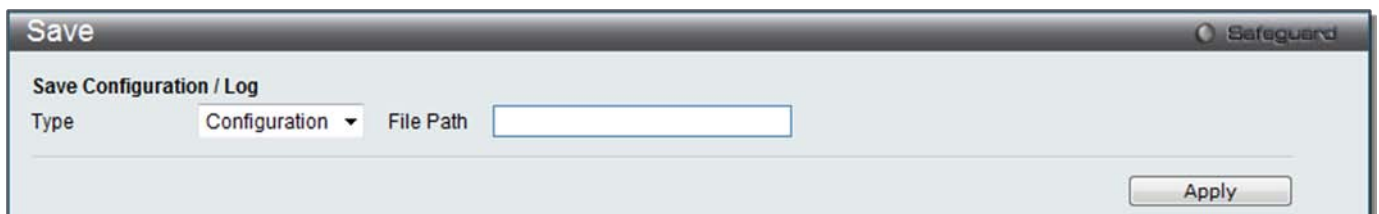


Figure 1-1 Save – Configuration window

Save Log allows the user to backup the log file of the switch. Select **Log** from the **Type** drop-down menu and click **Apply**.

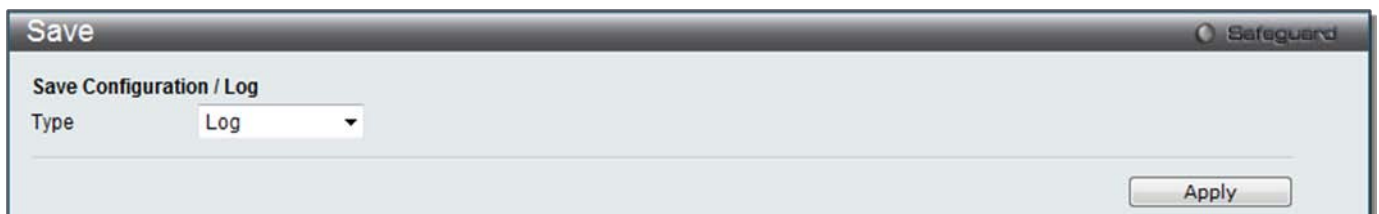


Figure 1-2 Save – Log window

Save All allows the user to permanently save changes made to the configuration. This option will allow the changes to be kept after the switch has rebooted. Select **All** from the **Type** drop-down menu and click **Apply**.

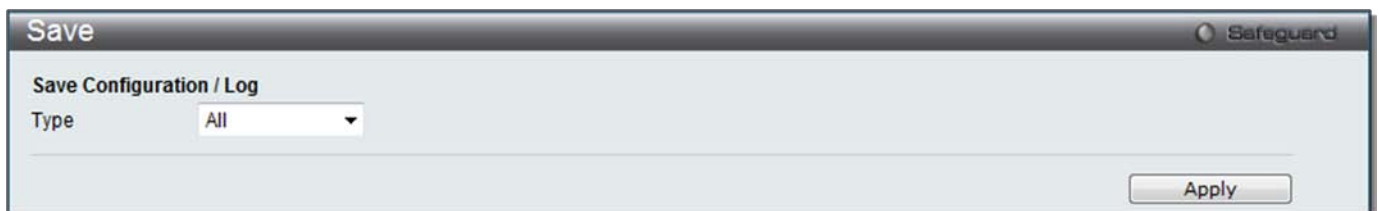


Figure 1-3 Save – All window

Chapter 2 Tools

License Management

This window is used to install an activation code. The activation code is a set of codes which activates/unlocks function on the appliance.

Figure 2-1 License Management window

Enter an activation code in the field and click the **Install** button.

Download Firmware

The following window is used to download firmware for the Switch.

Download Firmware From TFTP

This window is used to download firmware from a TFTP Server to the Switch and updates the switch.

Figure 2-2 Download Firmware – TFTP window

The fields that can be configured are described below:

Parameter	Description	
TFTP Server IP	Enter the TFTP server IP address used.	
	IPv4	Click the radio button to enter the TFTP server IP address used.
	IPv6	Click the radio button to enter the TFTP server IPv6 address used.
Source File	Enter the location and name of the Source File.	
Destination File	Enter the location and name of the Destination File.	

Click **Download** to initiate the download.

Download Firmware From HTTP

This page allows the user to download firmware from a computer to the Switch and updates the switch.

Figure 2-3 Download Firmware – HTTP window

The fields that can be configured are described below:

Parameter	Description
Destination File	Enter the location of the Destination File.
Source File	Enter the location of the Source File or click the Browse button to navigate to the firmware file for the download.

Click **Download** to initiate the download.

Upload Firmware

The following window is used to upload firmware from the Switch.

Upload Firmware To TFTP

This page allows the user to upload firmware from the Switch to a TFTP Server.

Figure 2-4 Upload Firmware – TFTP window

The fields that can be configured are described below:

Parameter	Description	
TFTP Server IP	Enter the TFTP server IP address used.	
	IPv4	Click the radio button to enter the TFTP server IP address used.
	IPv6	Click the radio button to enter the TFTP server IPv6 address used.
Destination File	Enter the location and name of the Destination File.	
Source File	Enter the location and name of the Source File.	

Click **Upload** to initiate the upload.

Download Configuration

The following window is used to download the configuration file for the Switch.

Download Configuration From TFTP

This page allows the user to download the configuration file from a TFTP Server to the Switch and updates the switch.

Figure 2-5 Download Configuration – TFTP window

The fields that can be configured are described below:

Parameter	Description	
TFTP Server IP	Enter the TFTP server IP address used.	
	IPv4	Click the radio button to enter the TFTP server IP address used.
	IPv6	Click the radio button to enter the TFTP server IPv6 address used.
Destination File	Enter the location and name of the Destination File.	
Source File	Enter the location and name of the Source File.	

Click **Download** to initiate the download.

Download Configuration From HTTP

This page allows the user to download the configuration file from a computer to the Switch and updates the switch.

Figure 2-6 Download Configuration – HTTP window

The fields that can be configured are described below:

Parameter	Description
Destination File	Enter the location and name of the Destination 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.

Click **Download** to initiate the download.

Upload Configuration

The following window is used to upload the configuration file from the Switch.

Upload Configuration To TFTP

This page allows the user to upload the configuration file from the Switch to a TFTP Server.

Figure 2-7 Upload Configuration – TFTP window

The fields that can be configured are described below:

Parameter	Description	
TFTP Server IP	Enter the TFTP server IP address used.	
	IPv4	Click the radio button to enter the TFTP server IP address used.
	IPv6	Click the radio button to enter the TFTP server IPv6 address used.
Destination File	Enter the location and name of the Destination File.	
Source File	Enter the location and name of the Source File.	
Filter	Use the drop-down menu to <i>include</i> , <i>begin</i> or <i>exclude</i> 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 Configuration To HTTP

This page allows the user to upload the configuration file from the Switch to a computer.

Figure 2-8 Upload Configuration – HTTP window

The fields that can be configured are described below:

Parameter	Description
Source File	Enter the location and name of the Source File.

Click **Upload** to initiate the upload.

Upload Log File

The following window is used to upload the log file from the Switch.

Upload Log To TFTP

This page allows the user to upload the log file from the Switch to a TFTP Server.

Figure 2-9 Upload Log – TFTP window

The fields that can be configured are described below:

Parameter	Description	
TFTP Server IP	Enter the TFTP server IP address used.	
	IPv4	Click the radio button to enter the TFTP server IP address used.
	IPv6	Click the radio button to enter the TFTP server IPv6 address used.
Destination File	Enter the location and name of the Destination File.	
Log Type	Select the type of log to be transferred. Selecting the Common Log option here will upload the common log entries. Selecting the Attack Log option here will upload the log concerning attacks.	

Click **Upload** to initiate the upload.

Upload Log To HTTP

This page allows the user to upload the log file from the Switch to a computer.

Figure 2-10 Upload Log – HTTP window

The fields that can be configured are described below:

Parameter	Description
Log Type	Here the user can select the type of log to be transferred. Selecting the Common Log option here will upload the common log entries. Selecting the Attack Log option here will upload the log concerning attacks.

Click **Upload** to initiate the 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.

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.

Figure 2-11 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 <i>IP Address, User Accounts</i> and the <i>Banner</i> .
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 following window is used to restart the Switch.

Figure 2-12 Reboot System Window

Selecting the **Yes** radio button will instruct the Switch to save the current configuration to non-volatile RAM before restarting the Switch.

Selecting 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.

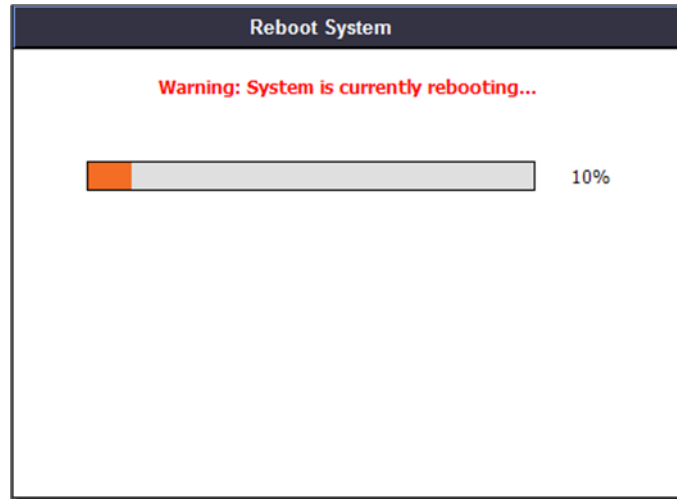


Figure 2-13 System Rebooting window

Appendices

Appendix A Mitigating ARP Spoofing Attacks Using Packet Content ACL

How Address Resolution Protocol works

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.

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.

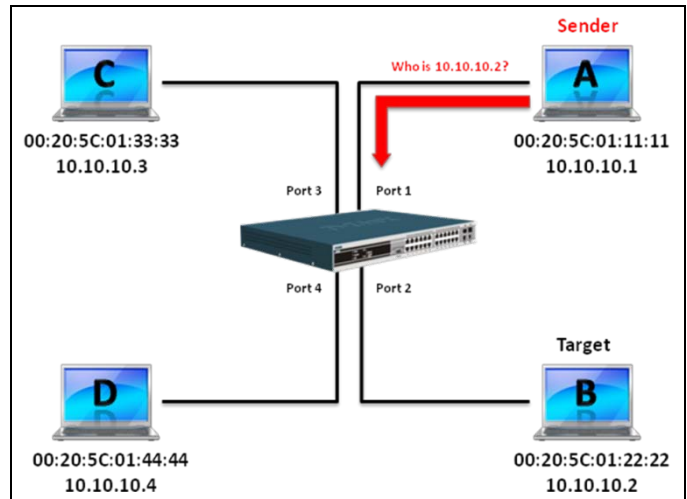


Figure 1

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 Table 1.

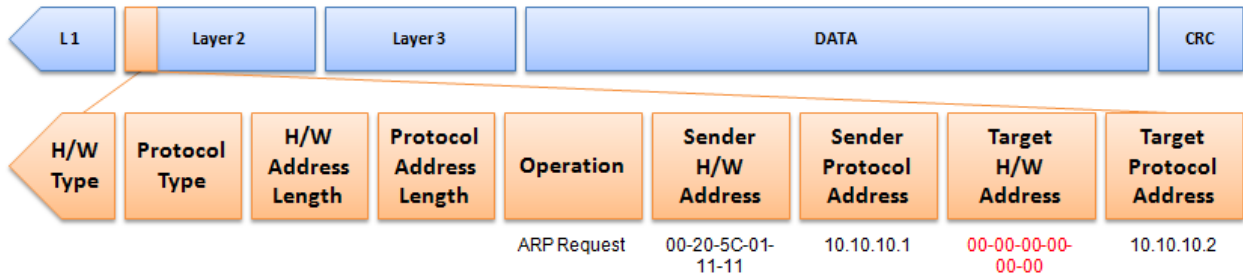


Table 1 ARP Payload

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).

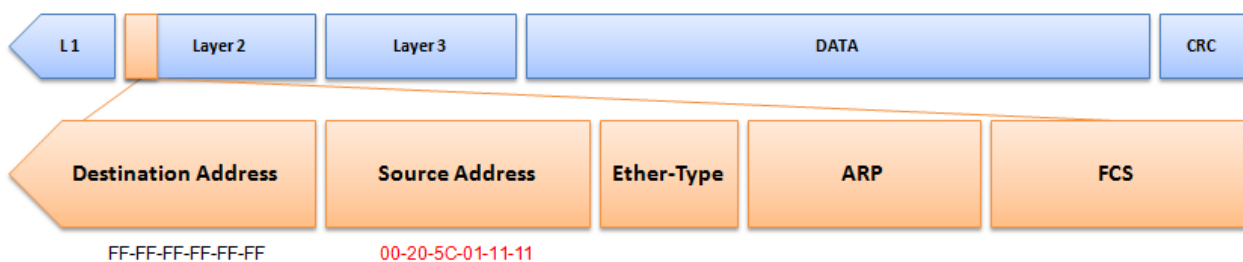


Table 2 Ethernet Frame Format

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.

Forwarding Table:
Port 1 : 00-20-5C-01-11-11

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).

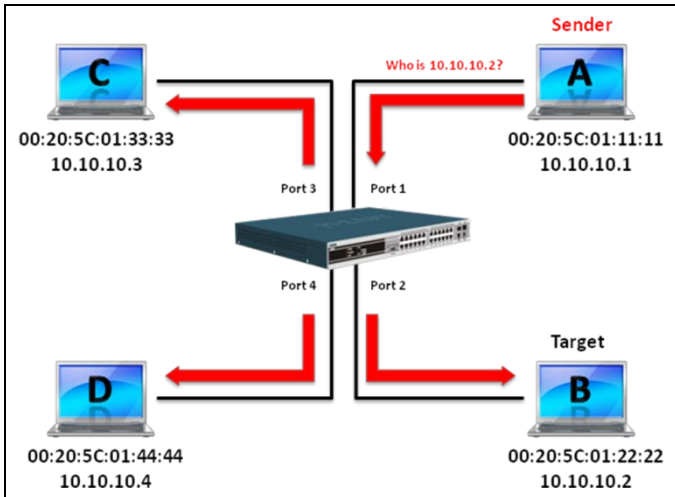


Figure 2

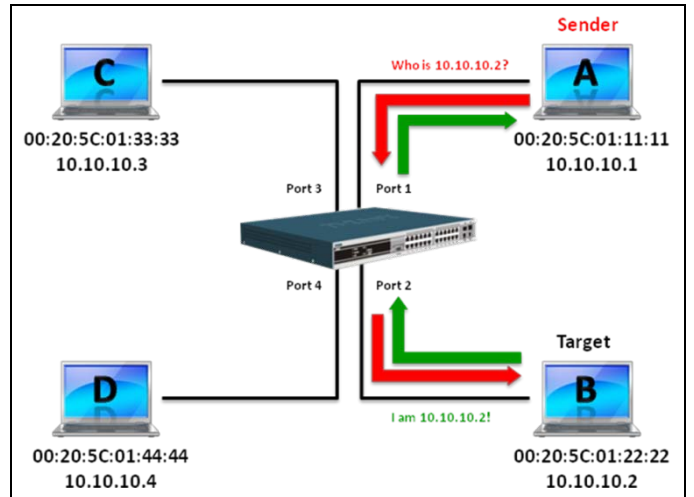


Figure 3

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.

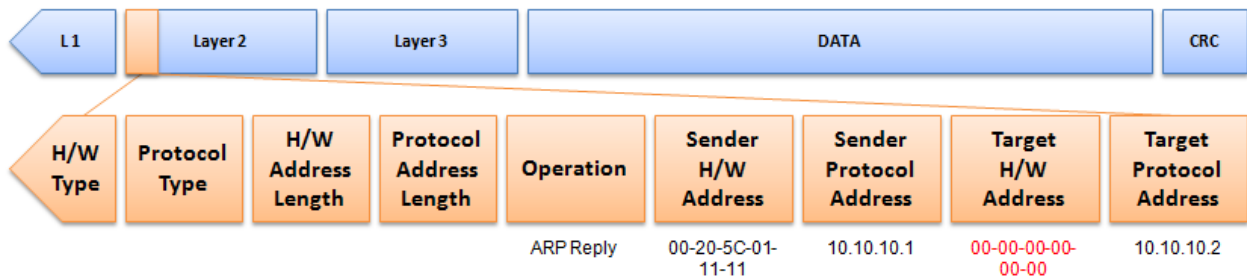


Table 3 ARP Payload

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).

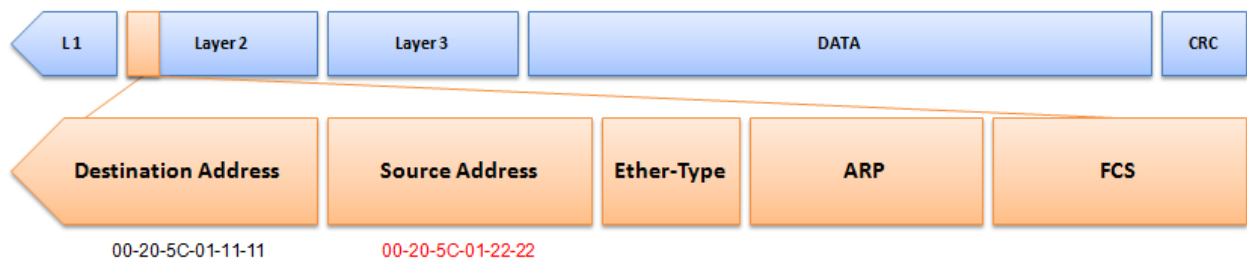


Table 4 Ethernet Frame Format

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.

Forwarding Table:
Port 1 : 00-20-5C-01-11-11
Port 2 : 00-20-5C-01-22-22

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.

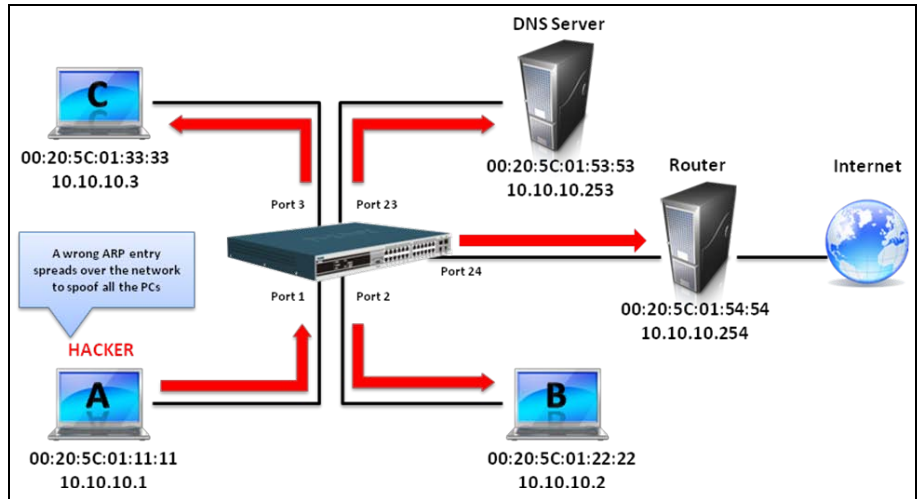


Figure 4

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.

L1		Layer 2			Layer 3		DATA					CRC			
Ethernet Header												Gratuitous ARP			
Destination Address	Source Address	Ether-Type	H/W Type	Protocol Type	H/W Address Length	Protocol Address Length	Operation	Sender H/W Address	Sender Protocol Address	Target H/W Address	Target Protocol Address				
(6-bytes)	(6-bytes)	(2-bytes)	(2-bytes)	(2-bytes)	(1-byte)	(1-byte)	(2-bytes)	(6-bytes)	(4-bytes)	(6-bytes)	(4-bytes)				
FF-FF-FF-FF-FF-FF	00-20-5C-01-11-11	806					ARC Relay	00-20-5C-01-11-11	10.10.10.254	00-20-5C-01-11-11	10.10.10.254				

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).

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.

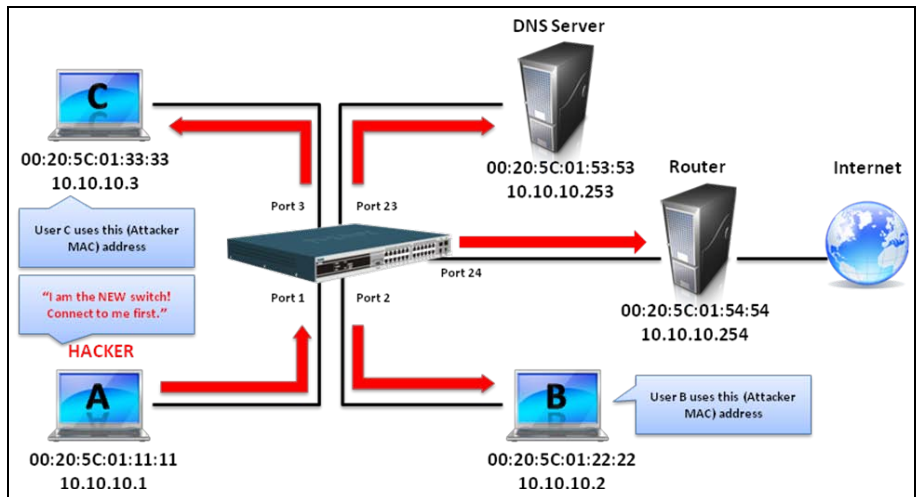
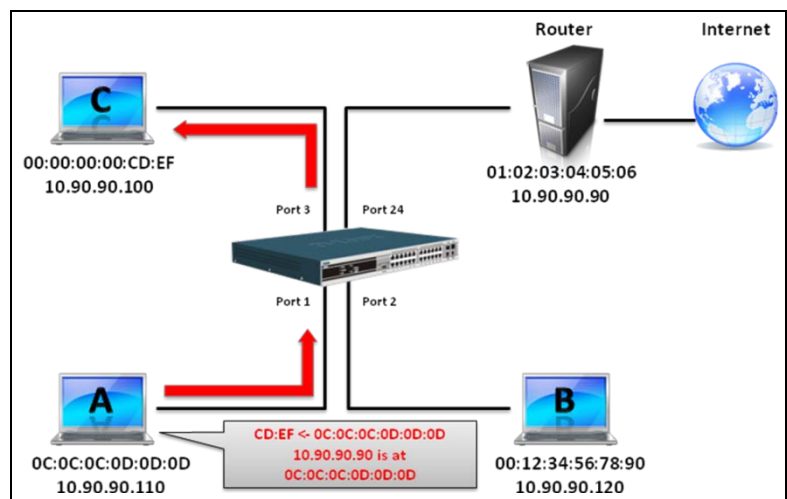


Figure 5

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.

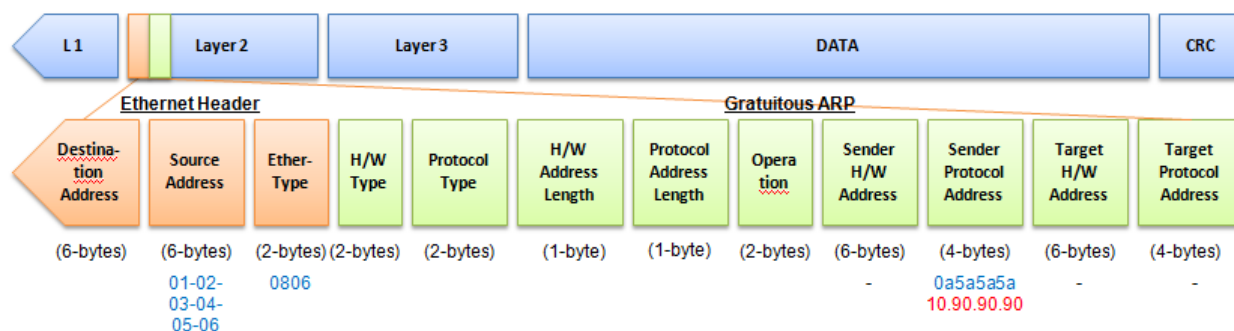


Table 5 A Completed ARP Packet Contained in an Ethernet Frame

Command	Description
Step 1: <code>create access_profile_id 1 profile_name 1 ethernet source_mac FF-FF-FF-FF-FF-FF ethernet_type</code>	Create access profile 1 to match Ethernet Type and Source MAC address.
Step 2: <code>config access_profile profile_id 1 add access_id 1 ethernet source_mac 01-02-03-04-05-06 ethernet_type 0x806 port 1-12 permit</code>	Configure access profile 1 Only if the gateway's ARP packet that contains the correct Source MAC in the Ethernet frame can pass through the switch.
Step 3: <code>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</code>	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: <code>config access_profile profile_id 2 add access_id 1 packet_content offset_chunk_1 0x806 offset_chunk_2</code>	Configure access profile 2. The rest of the ARP packets whose Sender IP claim they are the gateway's IP will be dropped.

	0xA5A offset_chunk_3 0x5A5A0000	
Step 5:	save	Save configuration.

Appendix B 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                                     V1.00.001
-----
Power On Self Test ..... 100 %

MAC Address   : 00-01-02-03-04-00
H/W Version  : A1

Please Wait, Loading V1.00.029 Runtime Image ..... 100 %
UART init ..... 100 %

```

```

Password Recovery Mode
>

```

1. In the "Password Recovery Mode" only the following commands can be used.

Command	Parameters
reset config {force_agree}	The reset config command resets the whole configuration back to the default values. The option 'force_agree' means to reset the whole configuration without the user's agreement.
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 C 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	Remark
System	System started up	System started up	Critical	
	System warm start	System warm start	Critical	
	System cold start	System cold start	Critical	
	Configuration saved to flash	Configuration saved to flash by console(Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	System log saved to flash	System log saved to flash by console(Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Configuration and log saved to flash	Configuration and log saved to flash by console(Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Internal Power failed	Internal Power failed	Critical	
	Internal Power is recovered	Internal Power is recovered	Critical	
	Redundant Power failed	Redundant Power failed	Critical	
	Redundant Power is working	Redundant Power is working	Critical	
	Side Fan failed	Side Fan failed	Critical	
	Side Fan recovered	Side Fan recovered	Critical	
Upload/Download	Firmware upgraded successfully	Firmware upgraded by console successfully (Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there

				will no IP information for logging.
	Firmware upgrade was unsuccessful	Firmware upgrade by console was unsuccessful! (Username: <username>, IP: <ipaddr>)	Warning	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Configuration successfully downloaded	Configuration successfully downloaded by console(Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Configuration download was unsuccessful	Configuration download by console was unsuccessful! (Username: <username>, IP: <ipaddr>)	Warning	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Configuration successfully uploaded	Configuration successfully uploaded by console (Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Configuration upload was unsuccessful	Configuration upload by console was unsuccessful! (Username: <username>, IP: <ipaddr>)	Warning	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Log message successfully uploaded	Log message successfully uploaded by console (Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.

	Log message upload was unsuccessful	Log message upload by console was unsuccessful! (Username: <username>, IP: <ipaddr>)	Warning	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Firmware successfully uploaded	Firmware successfully uploaded by console (Username: <username>, IP: <ipaddr>)	Informational	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Firmware upload was unsuccessful	Firmware upload by console was unsuccessful! (Username: <username>, IP: <ipaddr>)	Warning	"by console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
Interface	Port link up	Port <portNum> link up, <link state>	Informational	link state, for ex: , 100Mbps FULL duplex
	Port link down	Port <portNum> link down	Informational	
Console	Successful login through Console	Successful login through Console (Username: <username>)	Informational	There are no IP and MAC if login by console.
	Login failed through Console	Login failed through Console (Username: <username>)	Warning	There are no IP and MAC if login by console.
	Logout through Console	Logout through Console (Username: <username>)	Informational	There are no IP and MAC if login by console.
	Console session timed out	Console session timed out (Username: <username>)	Informational	There are no IP and MAC if login by console.
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	
	Web session timed out	Web session timed out (Username: <username>, IP: <ipaddr>)	Informational	
	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 (Instance:<InstanceID> ,Port:<portNum>,MAC:<macaddr>)	Informational	
	New Root selected	[CIST CIST Regional MSTI Regional] New Root bridge selected([Instance: <InstanceID>]MAC: <macaddr> Priority :<value>)	Informational	
	Spanning Tree Protocol is enabled	Spanning Tree Protocol is enabled	Informational	
	Spanning Tree Protocol is disabled	Spanning Tree Protocol is disabled	Informational	
	New root port	New root port selected (Instance:<InstanceID>, port:<portNum>)	Notice	
	Spanning Tree port status changed	Spanning Tree port status change (Instance:<InstanceID> , Port:<portNum>) <old_status> -> <new_status>	Notice	
	Spanning Tree port role changed	Spanning Tree port role change (Instance:<InstanceID> , Port:<portNum>) <old_role> -> <new_role>	Informational	
	Spanning Tree instance created	Spanning Tree instance created (Instance:<InstanceID>)	Informational	
	Spanning Tree instance deleted	Spanning Tree instance deleted (Instance:<InstanceID>)	Informational	
	Spanning Tree Version changed	Spanning Tree version change (new version:<new_version>)	Informational	
	Spanning Tree MST configuration ID name and revision level changed	Spanning Tree MST configuration ID name and revision level change (name:<name> ,revision level <revision_level>).	Informational	
	Spanning Tree MST configuration ID VLAN mapping table deleted	Spanning Tree MST configuration ID VLAN mapping table change (instance: <InstanceID> delete vlan <startvlanid> [- <endvlanid>])	Informational	
	Spanning Tree MST configuration ID VLAN mapping table added	Spanning Tree MST configuration ID VLAN mapping table change (instance: <InstanceID> add vlan <startvlanid> [- <endvlanid>])	Informational	
DoS	Spoofing attack 1. The source IP is same as Switch's interface IP but the source MAC is different 2. Source IP is the same as the Switch's IP in ARP packet 3. Self IP packet detected	Possible spoofing attack from IP: <ipaddr>, MAC: <macaddr>, Port: <portNum>	Critical	
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 method	Login failed through SSH from <userIP> authenticated by AAA local method (Username: <username>)	Warning	
	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	There are no IP and MAC if login by console.
	Login failed through Console authenticated by AAA server	Login failed through Console authenticated by AAA server <serverIP> (Username: <username>)	Warning	There are no IP and MAC if login by console.
	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	
	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	
	Login failed through Web 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	
	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	
	Login failed through TELNET 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	
	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	
	Login failed through SSH 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	
	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 Web(SSL) authenticated by AAA local_enable method	Successful Enable Admin through Web(SSL) from <userIP> authenticated by AAA local_enable method (Username: <username>,)	Informational	
	Enable Admin failed through Web(SSL) authenticated by AAA local_enable method	Enable Admin failed through Web(SSL) 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 <TELNET or Web or 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 Web(SSL) authenticated by AAA none method	Successful Enable Admin through Web(SSL) 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	
	Enable Admin failed through Console due to AAA server timeout or improper	Enable Admin failed through Console due to AAA server timeout or improper configuration (Username: <username>)	Warning	

	configuration			
	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	
	Enable Admin failed through Web 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	
	Successful Enable Admin through Web(SSL) authenticated by AAA server	Successful Enable Admin through Web(SSL) from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Informational	
	Enable Admin failed through Web(SSL) authenticated by AAA server	Enable Admin failed through Web(SSL) from <userIP> authenticated by AAA server <serverIP> (Username: <username>)	Warning	
	Enable Admin failed through Web(SSL) 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	
	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	
	Enable Admin failed through TELNET 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	
	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	
	Enable Admin failed through SSH 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	
Port Security	port security is exceeded to its maximum learning size and will not learn any new address	Port security violation (MAC address: <macaddr> on port: <portNum>)	Warning	
MBAC	A host fails to pass the authentication	MAC-based Access Control unauthenticated host(MAC: <macaddr>, Port <portNum>, VID: <vid>)	Critical	
	The authorized user number on a port reaches the max user limit.	Port <portNum> enters MAC-based Access Control stop learning state.	Warning	per port
	The authorized user number on a port is below the max user limit in a time interval	Port <portNum> recovers from MAC-based Access Control stop learning state.	Warning	per port
	The authorized user number on whole device reaches the max user limit.	MAC-based Access Control enters stop learning state.	Warning	per system
	The authorized user number on whole device is below the max user limit in a time interval	MAC-based Access Control recovers from stop learning state.	Warning	per system
	A host passes the authentication	MAC-based Access Control host login successful (MAC: <macaddr>, port: <portNum>, VID: <vid>)	Informational	
	A host is aged out	MAC-based Access Control host aged out (MAC: <macaddr>, port: <portNum>, VID: <vid>)	Informational	
IMPB	Unauthenticated IP address encountered and discarded by IP IP-MAC port binding	Unauthenticated IP-MAC address and discarded by IMPB (IP: <ipaddr>, MAC: <macaddr>, Port <portNum>)	Warning	
	Dynamic IMPB entry is conflict with static ARP	Dynamic IMPB entry conflicts with static ARP(IP: <ipaddr>, MAC: <macaddr>, Port	Warning	

		<portNum>)		
	Dynamic IMPB entry is conflict with static FDB	Dynamic IMPB entry conflicts with static FDB(IP: <ipaddr>, MAC: <macaddr>, Port <portNum>)	Warning	
	Dynamic IMPB entry conflicts with static IMPB	Dynamic IMPB entry conflicts with static IMPB(IP: <ipaddr>, MAC: <macaddr>, Port <portNum>)	Warning	
	Creating IMPB entry failed due to no ACL rule available	Creating IMPB entry failed due to no ACL rule being available(IP:<ipaddr>, MAC: <macaddr>, Port <portNum>)	Warning	
IP and Password Changed	IP Address change activity	Management IP address was changed by console(Username: <username>,IP:<ipaddr>)	Informational	"console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
	Password change activity	Password was changed by console (Username: <username>,IP:<ipaddr>)	Informational	"console" and "IP: <ipaddr>" are XOR displayed in log string, which means if user login by console, there will no IP information for logging.
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 storm 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	
Loopback Dection	Port loop occurred	Port <portNum> LBD loop occurred. Port blocked	Critical	
	Port loop detection restarted after interval time	Port <portNum> LBD port recovered. Loop detection restarted	Informational	
	Port with VID loop occurred	Port <portNum> VID <vlanID> LBD loop occurred. Packet discard begun	Critical	
	Port with VID Loop detection restarted after interval time	Port <portNum> VID <vlanID> LBD recovered. Loop detection restarted	Informational	
	The number of VLANs that loop back has occurred hit the specified number.	Loop VLAN number overflow	Informational	
Gratuitous ARP	Gratuitous ARP detected duplicate IP.	Conflict IP was detected with this device (IP: <ipaddr>, MAC: <macaddr>, Port <portNum>, Interface: <ipif_name>).	Warning	
DHCP	Detect untrusted DHCP server IP address	Detected untrusted DHCP server(IP: <ipaddr>, Port: <portNum>)	Informational	DHCP Server Screening
BPDU Protection	BPDU attack happened	Port <portNum> enter BPDU under attacking state (mode: drop / block / shutdown)	Informational	
	BPDU attack automatically recover	Port <portNum> recover from BPDU under attacking state automatically	Informational	
	BPDU attack manually recover	Port <portNum> recover from BPDU under attacking state manually	Informational	
Monitor	Temperature exceeds confidence level	Temperature Sensor <sensorID> enter alarm state. (current temperature: <temperature>)	Warning	

	Temperature recovers to normal.	Temperature Sensor <sensorID> recovers to normal state. (current temperature: <temperature>)	Informational	
CFM	Cross-connect is detected	CFM cross-connect. VLAN:<vlanid>, Local(MD Level:<mdlevel>, Port <portNum>, Direction:<mepdirection>) Remote(MEPID:<mepid>, MAC:<macaddr>)	Critical	
	Error CFM CCM packet is detected	CFM error ccm. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>) Remote(MEPID:<mepid>, MAC:<macaddr>)	Warning	
	Can not receive remote MEP's CCM packet	CFM remote down. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>)	Warning	
	Remote MEP's MAC reports an error status	CFM remote MAC error. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>)	Warning	
	Remote MEP detects CFM defects	CFM remote detects a defect. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>)	Informational	
CFM Extension	AIS condition detected	AIS condition detected. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>, MEPID:<mepid>)	Notice	
	AIS condition cleared	AIS condition cleared. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>, MEPID:<mepid>)	Notice	
	LCK condition detected	LCK condition detected. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>, MEPID:<mepid>)	Notice	
	LCK condition cleared	LCK condition cleared. MD Level:<mdlevel>, VLAN:<vlanid>, Local(Port <portNum>, Direction:<mepdirection>, MEPID:<mepid>)	Notice	
Voice VLAN	When a new voice device is detected in the port	New voice device detected (MAC:<macaddr>,Port:<portNum>)	Informational	
	While the port join to the voice VLAN while the port is auto voice VLAN mode	Port <portNum> add into voice VLAN <vid >	Informational	
	While the port withdraws from the voice VLAN while there is no more voice device detected in the aging interval.	Port <portNum> remove from voice VLAN <vid >	Informational	
ERPS	Signal failure detected	Signal failure detected on node <macaddr>	Notice	
	Signal failure cleared	Signal failure cleared on node <macaddr>	Notice	
	RPL owner conflict	RPL owner conflicted on the ring <macaddr>	Warning	
Command logging	Command Logging	<username>: execute command "<string>".	Informational	
Wireless State	Wireless Switch enabled	Wireless switch enabled	Informational	
	Wireless Switch disabled	Wireless switch disabled	Informational	
	Wireless locally managed AP limit is exceeded	Wireless Local Managed AP Exceeded MAC: <macaddr>	Warning	
	Wireless AP Hardware Type unsupported	Wireless AP Hardware Type Failure MAC: <macaddr> Hardware Type: <int>	Warning	
Table Full	Wireless managed AP database full	Wireless managed AP database full AP MAC: <macaddr> dropped	Warning	
	Wireless managed AP-AP neighbor list full	Wireless managed AP-AP neighbor list full	Warning	
	Wireless managed AP-Client neighbor list full	Wireless managed AP-Client neighbor list full	Warning	
	Wireless AP failure list full	Wireless AP failure list full	Warning	
	Wireless RF scan AP list full	Wireless RF scan AP list full	Warning	
	Wireless client association database full	Wireless client association database full client MAC: <macaddr> dropped	Warning	
	Wireless Ad Hoc client list full	Wireless Ad Hoc client list full	Warning	
	Wireless peer Switch managed AP database full	Wireless peer switch <ipaddr> managed AP database full AP MAC: <macaddr> dropped	Warning	
	Wireless peer Switch client	Wireless peer switch <ipaddr> client database	Warning	

	database full	full client MAC: <macaddr> dropped		
Peer Switch	Wireless peer Switch discovered	Wireless peer switch: <ipaddr> discovered	Informational	
	Wireless peer Switch failed	Wireless peer switch: <ipaddr> failed	Warning	
	Wireless peer Switch protocol version unknown	Wireless peer switch: <ipaddr> protocol version: <version> unknown	Warning	
	Wireless peer switch Managed AP database limit has exceeded	Wireless peer switch <ipaddr> managed AP database full AP MAC: <macaddr> dropped	Warning	
Managed AP	Wireless managed AP discovered	Wireless managed AP MAC: <macaddr> discovered	Informational	
	Wireless managed AP failed	Wireless managed AP MAC: <macaddr> failed	Warning	
	Wireless managed AP protocol version unknown	Wireless managed AP MAC: <macaddr> protocol version:<string> unknown	Warning	
	Wireless managed AP Association failed	Wireless managed AP MAC: <macaddr> Association failed	Warning	
	Wireless managed AP Authentication failed	Wireless managed AP MAC: <macaddr> Authentication failed	Warning	
RF Scan	Wireless RF scan rogue-AP detected	Wireless RF scan rogue-AP MAC: <macaddr> AP MAC: <macaddr> Radio If: <int> SSID: <ssid> detected	Informational	
	Wireless RF scan new Neighbor AP detected	Wireless RF scan new Neighbor AP MAC: <macaddr> AP MAC: <macaddr> Radio If: <int> SSID: <ssid> detected	Informational	
	Wireless RF scan new Client detected	Wireless RF scan new Client MAC: <macaddr> AP MAC: <macaddr> Radio If: <int> detected	Informational	
	Wireless Client Association detected	Wireless Client Association MAC: <macaddr> VAP MAC: <macaddr> AP MAC: <macaddr> SSID: <ssid> Security Mode: <string> detected	Informational	
	Wireless Client Disassociation detected	Wireless Client Disassociation MAC: <macaddr> VAP MAC: <macaddr> AP MAC: <macaddr> detected	Informational	
	Wireless Client Roam detected	Wireless Client Roam MAC: <macaddr> VAP MAC: <macaddr> AP MAC: <macaddr> detected	Informational	
	Wireless Client Association Failure detected	Wireless Client MAC: <macaddr> Association Failure detected	Warning	
	Wireless Client Authentication Failure detected	Wireless Client MAC: <macaddr> Authentication Failure detected	Warning	
	Wireless RF scan new Ad-Hoc Client detected	Wireless RF scan new Ad-Hoc Client MAC: <macaddr> AP MAC: <macaddr> Radio If: <int> detected	Informational	
Load Balancing	Wireless load balancing utilization overflow	Wireless load balancing utilization overflow: AP MAC: <macaddr> Radio If: <int> Radio MAC: <macaddr> Utilization: <int>	Warning	
Configuration Push	Wireless peer Switch config push command received	Wireless peer switch config push command with mask <int> from switch: <ipaddr> received	Informational	
WIDS	Local Switch is elected as WIDS Controller	Local Switch is elected as WIDS Controller	Informational	
	Wireless Network Managed AP Max AP exceeded on WIDS Controller	Wireless Network Managed AP Max AP exceeded on WIDS Controller <ipaddr> when AP MAC: <macaddr> with IP address <ipaddr> connected to Wireless Switch <ipaddr>	Warning	
	Wireless rogue-AP(s) present in the network	Wireless rogue-AP(s) present in the network	Informational	
	Wireless Detected client list full	Wireless Detected client list full	Warning	
	Wireless rogue-Client(s) present in the network	Wireless rogue-Client(s) present in the network	Informational	
Auto Channel & Power	Wireless Channel Algorithm is complete	Wireless Channel Algorithm is complete	Informational	
	Wireless Power Algorithm is complete	Wireless Power Algorithm is complete	Informational	
Captive Portal	CP Client Connected	CP Client Connected: MAC: <macaddr> IP: <ipaddr> SwMAC: <macaddr> CPID: <int> Interface: <int>	Informational	
	CP Client Disconnected	CP Client Disconnected: MAC: <macaddr> IP: <ipaddr> SwMAC: <macaddr> CPID: <int> Interface: <int>	Informational	

	CP Client Auth Failure	CP Client Auth Failure: MAC: <macaddr> IP: <ipaddr> SwMAC: <macaddr> CPID: <int> Interface: <int> User: <username>	Warning	
	CP Client Authentication Database Full	CP Client Authentication Database Full	Informational	

Appendix D Trap Log Entries

This table lists the trap logs found on the Switch.

Log Entry	Description	ID
L2macNotification	This trap indicates the MAC address variations in the address table.	1.3.6.1.4.1.171.11.101.1.2.100.1.2.0.1
L2PortSecurityViolationTrap	When the port security trap is enabled, new MAC addresses that violate the pre-defined port security configuration will trigger trap messages to be sent out.	1.3.6.1.4.1.171.11.101.1.2.100.1.2.0.2
PortLoopOccurred	This trap is sent when a Port loop occurs.	1.3.6.1.4.1.171.12.41.10.0.1
PortLoopRestart	This trap is sent when a Port loop restarts after the interval time.	1.3.6.1.4.1.171.12.41.10.0.2
VlanLoopOccurred	This trap is sent when a Port with a VID loop occurs.	1.3.6.1.4.1.171.12.41.10.0.3
VlanLoopRestart	This trap is sent when a Port with a VID loop restarts after the interval time.	1.3.6.1.4.1.171.12.41.10.0.4
SafeGuardChgToExhausted	This trap indicates System change operation mode from normal to exhausted.	1.3.6.1.4.1.171.12.19.4.1.0.1
SafeGuardChgToNormal	This trap indicates System change operation mode from exhausted to normal.	1.3.6.1.4.1.171.12.19.4.1.0.2
MacBasedAuthLoggedSuccess	This trap is sent when a MAC-based access control host is successfully logged in.	1.3.6.1.4.1.171.12.35.11.1.0.1
MacBasedAuthLoggedFail	This trap is sent when a MAC-based access control host login fails.	1.3.6.1.4.1.171.12.35.11.1.0.2
MacBasedAuthAgesOut	This trap is sent when a MAC-based access control host ages out.	1.3.6.1.4.1.171.12.35.11.1.0.3
FilterDetectedTrap	This trap is sent when an illegal DHCP server is detected. The same illegal DHCP server IP address detected is just sent once to the trap receivers within the log ceasing unauthorized duration.	1.3.6.1.4.1.171.12.37.100.0.1
SingleIPMSColdStart	The commander Switch will send swSingleIPMSColdStart notification to the indicated	1.3.6.1.4.1.171.12.8.6.0.11
SingleIPMSWarmStart	The commander Switch will send swSingleIPMSWarmStart notification to the indicated host when its member generates a warm start notification.	1.3.6.1.4.1.171.12.8.6.0.12
SingleIPMSLinkDown	The commander Switch will send swSingleIPMSLinkDown notification to the indicated host when its member generates a link down notification.	1.3.6.1.4.1.171.12.8.6.0.13
SingleIPMSLinkUp	The commander Switch will send swSingleIPMSLinkUp notification to the indicated host when its member generates a link up notification.	1.3.6.1.4.1.171.12.8.6.0.14
SingleIPMSAuthFail	The commander Switch will send swSingleIPMSAuthFail notification to the indicated host when its member generates an authentication failure notification	1.3.6.1.4.1.171.12.8.6.0.15
SingleIPMSnewRoot	The commander Switch will send swSingleIPMSnewRoot notification to the indicated host when its member generates a new root notification.	1.3.6.1.4.1.171.12.8.6.0.16
SingleIPMSTopologyChange	The commander Switch will send swSingleIPMSTopologyChange notification to the indicated host when its member generates a topology change notification.	1.3.6.1.4.1.171.12.8.6.0.17
coldStart	A coldStart trap signifies that the SNMPv2 entity, acting in an agent role, is reinitializing	1.3.6.1.6.3.1.1.5.1

	itself and that its configuration may have been altered.	
warmStart	A warmStart trap signifies that the SNMPv2 entity, acting in an agent role, is reinitializing itself such that its configuration is unaltered.	1.3.6.1.6.3.1.1.5.2
linkDown	A linkDown trap signifies that the SNMP entity, acting in an agent role, has detected that the ifOperStatus object for one of its communication links is about to enter the down state from some other state (but not from the notPresent state). This other state is indicated by the included value of ifOperStatus.	1.3.6.1.6.3.1.1.5.3
linkUp	A linkUp trap signifies that the SNMP entity, acting in an agent role, has detected that the ifOperStatus object for one of its communication links left the down state and transitioned into some other state (but not into the notPresent state). This other state is indicated by the included value of ifOperStatus.	1.3.6.1.6.3.1.1.5.4
authenticationFailure	An authenticationFailure trap signifies that the SNMP entity has received a protocol message that is not properly authenticated. While all implementations of SNMP entities MAY be capable of generating this trap, the snmpEnableAuthenTraps object indicates whether this trap will be generated.	1.3.6.1.6.3.1.1.5.5
risingAlarm	This trap is an SNMP notification that is generated when a high capacity alarm entry crosses its rising threshold and generates an event that is configured for sending SNMP traps.	1.3.6.1.2.1.16.29.2.0.1
fallingAlarm	This trap is an SNMP notification that is generated when a high capacity alarm entry crosses its falling threshold and generates an event that is configured for sending SNMP traps.	1.3.6.1.2.1.16.29.2.0.2
newRoot	The newRoot trap indicates that the sending agent has become the new root of the Spanning Tree; the trap is sent by a bridge soon after its election as the new root, e.g., upon action of the Topology Change Timer immediately subsequent to its election. Implementation of this trap is optional.	1.3.6.1.2.1.17.0.1
topologyChange	A topologyChange trap is sent by a bridge when any of its configured ports transitions from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. The trap is not sent if a newRoot trap is sent for the same transition. Implementation of this trap is optional.	1.3.6.1.2.1.17.0.2
wsModeEnabled	A wsModeEnabled trap signifies that the SNMP entity, acting in an agent role, has detected that Wireless functionality on the device is enabled.	1.3.6.1.4.1.171.12.96.11.0.1
wsModeDisabled	A wsModeDisabled trap signifies that the SNMP entity, acting in an agent role, has detected that Wireless functionality on the device is disabled.	1.3.6.1.4.1.171.12.96.11.0.2
wsManagedAPDatabaseFull	A wsAPDatabaseFull trap signifies that the SNMP entity, acting in an agent role, has detected that AP Database is full.	1.3.6.1.4.1.171.12.96.11.0.3
wsManagedAPNeighborAPListFull	A wsManagedAPNeighborListFull trap signifies that the SNMP entity, acting in an agent role, has detected that ManagedAP neighbor AP list is full.	1.3.6.1.4.1.171.12.96.11.0.4
wsManagedAPNeighborClientListFull	A wsManagedAPNeighborClientListFull trap signifies that the SNMP entity, acting in an agent role, has detected that ManagedAP neighbor client list is full.	1.3.6.1.4.1.171.12.96.11.0.5

wsAPFailureListFull	A wsAPFailureListFull trap signifies that the SNMP entity, acting in an agent role, has detected that AP failure list full.	1.3.6.1.4.1.171.12.96.11.0.6
wsRFScanAPListFull	A wsRFScanAPListFull trap signifies that the SNMP entity, acting in an agent role, has detected that RF scan AP list is full.	1.3.6.1.4.1.171.12.96.11.0.7
wsClientAssociationDatabaseFull	A wsClientAssociationDatabaseFull trap signifies that the SNMP entity, acting in an agent role, has detected that client association database is full.	1.3.6.1.4.1.171.12.96.11.0.8
wsPeerSwitchDiscovered	A wsPeerSwitchDiscovered trap signifies that the SNMP entity, acting in an agent role, has detected peer Switch in the network.	1.3.6.1.4.1.171.12.96.11.0.9
wsPeerSwitchFailed	A wsPeerSwitchFailed trap signifies that the SNMP entity, acting in an agent role, has detected that peer Switch connection failed.	1.3.6.1.4.1.171.12.96.11.0.10
wsPeerSwitchUnknownProtocol	A wsPeerSwitchUnknownProtocol trap signifies that the SNMP entity, acting in an agent role, has detected unknown protocol between wireless Switch and peer Switch communication.	1.3.6.1.4.1.171.12.96.11.0.11
wsManagedAPDiscovered	A wsManagedAPDiscovered trap signifies that the SNMP entity, acting in an agent role, has detected the managed AP.	1.3.6.1.4.1.171.12.96.11.0.12
wsManagedAPFailed	A wsManagedAPFailed trap signifies that the SNMP entity, acting in an agent role, has detected the failed AP.	1.3.6.1.4.1.171.12.96.11.0.13
wsManagedAPUnknownProtocol	A wsManagedAPUnknownProtocol trap signifies that the SNMP entity, acting in an agent role, has detected the unknown protocol between wireless Switch and managed AP communication.	1.3.6.1.4.1.171.12.96.11.0.14
wsAPAssociationFailure	A wsAPAssociationFailure trap signifies that the SNMP entity, acting in an agent role, has detected that AP association failed.	1.3.6.1.4.1.171.12.96.11.0.15
wsAPAuthenticationFailure	A wsAPAuthenticationFailure trap signifies that the SNMP entity, acting in an agent role, has detected that AP authentication failed.	1.3.6.1.4.1.171.12.96.11.0.16
wsRFScanRogueAPDetected	A wsRFScanRogueAPDetected trap signifies that the SNMP entity, acting in an agent role, has detected Rogue AP through RF Scan.	1.3.6.1.4.1.171.12.96.11.0.17
wsRFScanAPDetected	A wsRFScanAPDetected trap signifies that the SNMP entity, acting in an agent role, has detected AP through RF Scan.	1.3.6.1.4.1.171.12.96.11.0.18
wsRFScanNewClientDetected	A wsRFScanNewClientDetected trap signifies that the SNMP entity, acting in an agent role, has detected new client through RF Scan.	1.3.6.1.4.1.171.12.96.11.0.19
wsClientAssociationDetected	A wsClientAssociationDetected trap signifies that the SNMP entity, acting in an agent role, has detected client association.	1.3.6.1.4.1.171.12.96.11.0.20
wsClientDisassociationDetected	A wsClientDisassociationDetected trap signifies that the SNMP entity, acting in an agent role, has detected client disassociation.	1.3.6.1.4.1.171.12.96.11.0.21
wsClientRoamDetected	A wsClientRoamDetected trap signifies that the SNMP entity, acting in an agent role, has detected client roaming.	1.3.6.1.4.1.171.12.96.11.0.22
wsClientAssociationFailure	A wsClientAssociationFailure trap signifies that the SNMP entity, acting in an agent role, has detected client association failure.	1.3.6.1.4.1.171.12.96.11.0.23
wsClientAuthenticationFailure	A wsAuthenticationFailure trap signifies that the SNMP entity, acting in an agent role, has detected client authentication failure.	1.3.6.1.4.1.171.12.96.11.0.24
wsAdHocClientDetected	A wsAdHocClientDetected trap signifies that the SNMP entity, acting in an agent role, has detected Ad hoc client.	1.3.6.1.4.1.171.12.96.11.0.25
wsWLANBandwidthUtilizationExceeded	A wsWLANBandwidthUtilizationExceeded trap signifies that the SNMP entity, acting in an	1.3.6.1.4.1.171.12.96.11.0.26

	agent role, has detected WLAN bandwidth utilization exceeding the limit.	
wsAdHocClientListFull	A wsAdHocClientListFull trap signifies that the SNMP entity, acting in an agent role, has detected that Ad hoc client database is full.	1.3.6.1.4.1.171.12.96.11.0.27
wsPeerSwitchConfigurationCommandReceived	A wsPeerSwitchConfigurationCommandReceived trap signifies that the SNMP entity, acting in an agent role, has received Configuration command from the peer Switch in the network. The config mask received is also returned in the trap.	1.3.6.1.4.1.171.12.96.11.0.28
wsPeerSwitchManagedAPLimitExceeded	A wsPeerSwitchManagedAPLimitExceeded trap signifies that the SNMP entity, acting in an agent role, has detected that the Peer Switch Managed AP database limit has exceeded.	1.3.6.1.4.1.171.12.96.11.0.29
wsClusterControllerElected	A wsClusterControllerElected trap signifies that the SNMP entity, acting in an agent role, has elected itself as Cluster Controller in the peer group.	1.3.6.1.4.1.171.12.96.11.0.32
wsClusterMaxAPExceeded	A wsClusterMaxAPExceeded trap signifies that the SNMP entity, acting in an agent role, has detected that the managed APs in the network has exceeded.	1.3.6.1.4.1.171.12.96.11.0.33
wsRoguesPresent	A wsRoguesPresent trap signifies that the SNMP entity, acting in an agent role, has detected one or more Rogues present in the network.	1.3.6.1.4.1.171.12.96.11.0.34
wsDetectedClientListFull	A wsDetectedClientListFull trap signifies that the SNMP entity, acting in an agent role, has detected that Detected client database is full.	1.3.6.1.4.1.171.12.96.11.0.35
wsRogueClientsPresent	A wsRogueClientsPresent trap signifies that the SNMP entity, acting in an agent role, has detected one or more Rogue Clients present in the network.	1.3.6.1.4.1.171.12.96.11.0.36
wsChannelPlanAlgoComplete	A wsChannelAlgorithmComplete trap signifies that the SNMP entity, acting in an agent role, has detected channel algorithm complete event.	1.3.6.1.4.1.171.12.96.11.0.37
wsPowerPlanAlgoComplete	A wsPowerAlgorithmComplete trap signifies that the SNMP entity, acting in an agent role, has detected power algorithm complete event.	1.3.6.1.4.1.171.12.96.11.0.38
wsLocallyManagedAPLimitExceeded	A wsLocallyManagedAPLimitExceeded trap signifies that the SNMP entity, acting in an agent role, has detected that the WS locally managed AP limit is exceeded.	1.3.6.1.4.1.171.12.96.11.0.41
wsAPHardwareTypeFailure	A wsAPHardwareTypeFailure trap signifies that the SNMP entity, acting in an agent role, has detected that the AP Hardware Type unsupported.	1.3.6.1.4.1.171.12.96.11.0.100
cpClientAuthenticationFailure	A cpClientAuthenticationFailure trap signifies that the SNMP entity, acting in an agent role, has detected a client authentication failure.	1.3.6.1.4.1.171.12.97.4.0.1
cpClientConnect	A cpClientConnect trap signifies that the SNMP entity, acting in an agent role, has detected a client connection.	1.3.6.1.4.1.171.12.97.4.0.2
cpClientDatabaseFull	A cpClientDatabaseFull trap signifies that the SNMP entity, acting in an agent role, has detected that client authentication database is full.	1.3.6.1.4.1.171.12.97.4.0.3
cpClientDisconnect	A cpClientDisconnect trap signifies that the SNMP entity, acting in an agent role, has detected a client disconnection."	1.3.6.1.4.1.171.12.97.4.0.4

Appendix E RADIUS Attributes Assignment

The RADIUS Attributes Assignment on the Switch is used in the following modules: 802.1X (Port-based and Host-based), MAC-based Access Control, and Captive Portal Configurations.

The description that follows explains the following RADIUS Attributes Assignment types:

- Ingress/Egress Bandwidth
- 802.1p Default Priority
- VLAN
- ACL

To assign **Ingress/Egress bandwidth by RADIUS Server**, the proper parameters should be configured on the RADIUS Server. The tables below show the parameters for bandwidth.

The parameters of the Vendor-Specific attributes are:

Vendor-Specific Attribute	Description	Value	Usage
Vendor-ID	Defines the vendor.	171 (DLINK)	Required
Vendor-Type	Defines the attribute.	2 (for ingress bandwidth) 3 (for egress bandwidth)	Required
Attribute-Specific Field	Used to assign the bandwidth of a port.	Unit (Kbits)	Required

If the user has configured the bandwidth attribute of the RADIUS server (for example, ingress bandwidth 1000Kbps) and the 802.1X authentication is successful, the device will assign the bandwidth (according to the RADIUS server) to the port. However, if the user does not configure the bandwidth attribute and authenticates successfully, the device will not assign any bandwidth to the port. If the bandwidth attribute is configured on the RADIUS server with a value of "0" or more, than the effective bandwidth (100Mbps on an Ethernet port or 1Gbps on a Gigabit port) of the port will be set to no_limited.

To assign **802.1p default priority by RADIUS Server**, the proper parameters should be configured on the RADIUS Server. The tables below show the parameters for 802.1p default priority.

The parameters of the Vendor-Specific attributes are:

Vendor-Specific Attribute	Description	Value	Usage
Vendor-ID	Defines the vendor.	171 (DLINK)	Required
Vendor-Type	Defines the attribute.	4	Required
Attribute-Specific Field	Used to assign the 802.1p default priority of the port.	0-7	Required

If the user has configured the 802.1p priority attribute of the RADIUS server (for example, priority 7) and the 802.1X, or Host-based authentication is successful, the device will assign the 802.1p default priority (according to the RADIUS server) to the port. However, if the user does not configure the priority attribute and authenticates successfully, the device will not assign a priority to this port. If the priority attribute is configured on the RADIUS server is a value out of range (>7), it will not be set to the device.

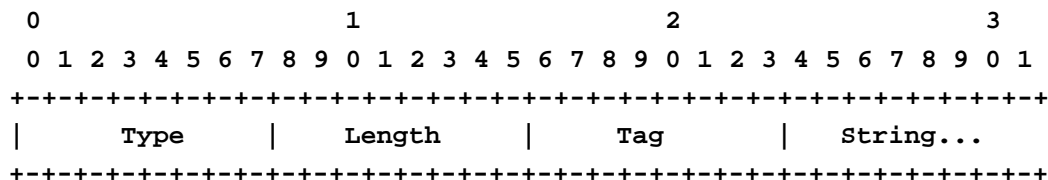
To assign **VLAN by RADIUS Server**, the proper parameters should be configured on the RADIUS Server. To use VLAN assignment, RFC3580 defines the following tunnel attributes in RADIUS packets.

The table below shows the parameters for a VLAN:

RADIUS Tunnel Attribute	Description	Value	Usage
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Tunnel-Type	This attribute indicates the tunneling protocol(s) to be used (in the case of a tunnel initiator) or the tunneling protocol in use (in the case of a tunnel terminator).	13 (VLAN)	Required
Tunnel-Medium-Type	This attribute indicates the transport medium being used.	6 (802)	Required
Tunnel-Private-Group-ID	This attribute indicates group ID for a particular tunneled session.	A string (VID)	Required

A summary of the Tunnel-Private-Group-ID Attribute format is shown below.



The table below shows the definition of Tag field (different with RFC 2868):

Tag field value	String field format	Note
0x01	VLAN name (ASCII)	A tag field of greater than 0x1F is interpreted as the first octet of the following field.
0x02	VLAN ID (ASCII)	
Others (0x00, 0x03 ~ 0x1F, >0x1F)	1. When the switch receives the VLAN setting string, it will think it is the VLAN ID first. In other words, the switch will check all existed VLAN ID and check if there is one matched. 2. If the switch can find one matched, it will move to that VLAN. 3. If the switch can not find the matched VLAN ID, it will think the VLAN setting string as a "VLAN Name". 4. Then it will check that it can find out a matched VLAN Name.	

If the user has configured the VLAN attribute of the RADIUS server (for example, VID 3) and the 802.1X, or MAC-based Access Control authentication is successful, the port will be added to VLAN 3. However, if the user does not configure the VLAN attribute and authenticates successfully, the port will be kept in its original VLAN. If the VLAN attribute configured on the RADIUS server does not exist, the port will not be assigned to the requested VLAN.

To assign **ACL by RADIUS Server**, the proper parameters should be configured on the RADIUS Server. The table below shows the parameters for an ACL. The RADIUS ACL assignment is only used in MAC-based Access Control.

The parameters of the Vendor-Specific Attribute are:

RADIUS Tunnel Attribute	Description	Value	Usage
Vendor-ID	Defines the vendor.	171 (DLINK)	Required
Vendor-Type	Defines the attribute.	12 (for ACL profile) 13 (for ACL rule)	Required

Attribute-Specific Field	Used to assign the ACL profile or rule.	ACL Command For example: ACL profile: create access_profile profile_id 6 profile_name 1 ethernet vlan 0xFFF; ACL rule: config access_profile profile_id 6 add access_id auto_assign ethernet vlan_id 1 port all deny;	Required
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If the user has configured the ACL attribute of the RADIUS server (for example, ACL profile: **create access_profile profile_id 6 profile_name 1 ethernet**; ACL rule: **config access_profile profile_id 6 add access_id auto_assign ethernet**), and the 802.1X or MAC-based Access Control or WAC authentication is successful, the device will assign the ACL profiles and rules according to the RADIUS server. For more information about the ACL module, please refer to the 'Access Control List (ACL) Command List' chapter.

AP RADIUS Attributes

Since an AP configuration is determined by its physical MAC address, the administrator adds a RADIUS entry for each AP with the User-Name attribute set to the MAC address. The following table indicates the attributes that are configured in the RADIUS server entry. The vendor specific attributes are added using the D-Link vendor ID (171).

Attribute	Description	Range	Usage	Default
User-Name (1)	Ethernet Address of the AP.	Valid Ethernet MAC Address.	Required	None
User-Password (2)	A fixed password used to lookup an AP entry.	8-63 characters, default "NOPASSWORD"	Required	None
Vendor-Specific (26), D-Link (171), Location (101)	A description for the AP, often based on its location.	0-32 characters	Optional	""
Vendor-Specific (26), D-Link (171), Mode (102)	Indicates whether this AP is managed by the Switch, by an administrator, or is a rogue AP.	Managed (1), Standalone (2), Rogue (3)	Required	None
Vendor-Specific (26), D-Link (171), Profile-ID (103)	If AP is managed by a Switch, the ID of the configuration profile for this AP.	1-16	Required if mode is WS-Managed.	None
Vendor-Specific (26), D-Link (171), Switch-IP (104)	If there is more than one WS using this RADIUS server, indicates the IP address of the WS to managed this AP.	Valid IP Address	Optional	None
Vendor-Specific (26), D-Link (171), Radio-1-Chan (105)	Indicates a fixed channel for the radio.	0, 1-13, 36, 40, 44, 48, 52,56, 60, 64, 104, 108, 112,116, 120, 124, 128, 132,140, 149, 153, 157, 161,165. 0 indicates automatic channel assignment.	Optional, if defined and valid will override auto channel configuration	0
Vendor-Specific (26), D-Link (171), Radio-2-Chan (106)	Indicates a fixed channel for the radio.	0, 1-13, 36, 40, 44, 48, 52,56, 60, 64, 104, 108, 112,116, 120, 124, 128, 132,140, 149, 153, 157, 161,165. 0 indicates automatic channel assignment.	Optional, if defined and valid will override auto channel configuration.	0
Vendor-Specific (26), D-Link (171),	Indicates a fixed power setting for the radio.	0, 1-100 percent 0 indicates automatic	Optional, if defined and	0

Radio-1-Power (107)		power assignment.	valid will override auto power configuration.	
Vendor-Specific (26), D-Link (171), Radio-2-Power (108)	Indicates a fixed power setting for the radio.	0, 1-100 percent 0 indicates automatic power assignment.	Optional, if defined and valid will override auto power configuration.	0
Vendor-Specific (26), D-Link (171), Expected-Channel (112)	The expected channel for a stand-alone AP.	0, 1-165. 0 indicates that this AP can operate on any channel.	Optional	0
Vendor-Specific (26), D-Link (171), Expected-AP-Security (110)	The expected security mode for a stand-alone AP.	0 - Any Mode 1 - Open 2 - WEP 3 - WPA or WPA2	Optional	0
Vendor-Specific (26), D-Link (171), Expected-SSID (109)	The expected SSID for a standalone AP.	Character string, 0 to 32 bytes. If string is empty, then device may use any SSID	Optional	""
Vendor-Specific (26), D-Link (171), Allowed-On-Wired-Network (113)	Flag indicating whether this stand-alone AP is allowed on the wired network.	0 - AP is allowed on the wired network. 1 - AP is not allowed on the wired network.	Optional	0

Client 802.1X RADIUS Attributes

An Access Point can use 802.1X authentication via the RADIUS to allow or prohibit access to the wireless network for specific users on client stations. Wireless Client QoS parameters can be obtained if (and only if) 802.1X authentication is used, which is based on user name and password identification credentials. Each of the QoS parameters defined here are optional, meaning they may not be present in the client's RADIUS server entry even though a valid 802.1X authentication occurs for the client. Assuming a wireless client successfully authenticates using 802.1X, each QoS RADIUS attribute that exists for the client will be sent to the AP for processing.

In all other cases, either 802.1X authentication is not used, is used but is not successful, or is successful but a particular QoS RADIUS attribute is either not configured or not valid for the client entry. The corresponding AP network client QoS default parameter is used instead for the client. Each such RADIUS attribute is evaluated this way, case-by-case.

Attribute	Description	Range	Usage
Vendor-Specific (26), D-Link (171), Client-ACL-Dn (120)	Access list identifier to be applied to 802.1X authenticated wireless client traffic in the outbound (down) direction. If this attribute is not present then the Client QoS Default ACL Down Type and Name parameters defined in the Network configuration are used instead. If this attribute is present but refers to an undefined access list name in the system, all packets for this client will be dropped until the ACL is defined.	Type: string 5-36 characters (not null-terminated) The string is of the form "type:name" where: • type = ACL type identifier: IPV4, IPV6, MAC • : = required separator character • name = 1-31 alphanumeric characters, specifying the ACL number (IPV4) or name (IPV6, MAC)	Optional
Vendor-Specific (26), D-Link (171),	Access list identifier to be applied to 802.1X authenticated wireless client traffic in the	Type: string 5-36 characters (not null-	Optional

Client-ACL-Up (121)	inbound (up) direction. If this attribute is not present then the Client QoS Default ACL Up Type and Name parameters defined in the Network configuration are used instead. If this attribute is present but refers to an undefined access list name in the system, all packets for this client will be dropped until the ACL is defined.	terminated) The string is of the form "type:name" where: • type = ACL type identifier: IPV4, IPV6, MAC • : = required separator character • name = 1-31 alphanumeric characters, specifying the ACL number (IPV4) or name (IPV6, MAC)	
Vendor-Specific (26), D-Link (171), Client-Policy-Dn (122)	Name of DiffServ policy to be applied to 802.1X authenticated wireless client traffic in the outbound (down) direction. If this attribute is not present then the Client QoS Default Policy Down parameter defined in the Network configuration is used instead. If this attribute is present but refers to an undefined policy name in the system, all packets for this client will be dropped until the DiffServ policy is defined.	Type: string 1-31 characters (not null-terminated)	Optional
Vendor-Specific (26), D-Link (171), Client-Policy-Up (123)	Name of DiffServ policy to be applied to 802.1X authenticated wireless client traffic in the inbound (up) direction. If this attribute is not present then the Client QoS Default Policy Up parameter defined in the Network configuration is used instead. If this attribute is present but refers to an undefined policy name in the system, all packets for this client will be dropped until the DiffServ policy is defined.	Type: string 1-31 characters (not null-terminated)	Optional
Tunnel-Type (64)	For dynamic VLAN usage.	VLAN (13)	Optional
Tunnel-Medium-Type (65)	For dynamic VLAN usage.	802	Optional
Tunnel-Private-Group-ID (81)	For dynamic VLAN usage.	VLANID	Optional

Known Client and MAC Authentication RADIUS Attributes

The database is used to retrieve client descriptive names from the RADIUS server as well as implement MAC Authentication. An Access Point can be configured to use MAC authentication via the RADIUS to allow or deny specific client stations access to the wireless network. This is less secure but can be used for client stations that do not support 802.1X. The following table indicates the attributes that are configured in the RADIUS server entry.

Attribute	Description	Range	Usage	Default
User-Name (1)	Ethernet Address of the client station.	Valid Ethernet MAC Address.	Required	None
User-Password (2)	A fixed password used to lookup an client MAC entry.	"NOPASSWORD"	Required	None
Vendor-Specific (26), D-Link (171), MAC-Authentication-Action (114)	Flag indicating what action to take if MAC authentication is enabled on the network.	0-Global Action 1-Grant Access 2-Deny Access	Optional	0
Vendor-Specific (26), D-Link (171), Client-Nickname (115)	Descriptive Name of the client.	0-32 Character String	Optional	""

Tunnel-Type (64)	For dynamic VLAN usage.	VLAN (13)	Optional	
Tunnel-Medium-Type (65)	For dynamic VLAN usage.	802	Optional	
Tunnel-Private-Group-ID (81)	For dynamic VLAN usage.	VLANID	Optional	

If the global MAC Authentication action is configured as “White List”, then any wireless clients with MAC addresses that are specified in the list, and are not explicitly denied access, are granted access. If MAC address is not in the list, then the access to the client is denied.

If the global MAC Authentication action is configured as “Black List”, then any wireless clients with MAC addresses that are specified in the list, and are not explicitly granted access, are denied access. If MAC address is not in the list, then the access to the client is granted.

Captive Portal RADIUS Attributes

The following table indicates the RADIUS attributes that are used to configure Captive Portal users. The table indicates both RADIUS attributes and vendor specific attributes (VSA) that are used to configure Captive Portal.

Attribute	Description	Range	Usage	Default
User-Name (1)	User name to be authorized	1-32 characters	Required	None
User-Password (2)	User password	8-64 characters	Required	None
Session-Timeout (27)	Logout once session timeout is reached (seconds). If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer (seconds)	Optional	86400
Idle-Timeout (28)	Logout once idle timeout is reached (seconds). If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer (seconds)	Optional	0
Vendor-Specific (26), WISPr (14122), WISPr-Bandwidth-Max-Down (8)	Maximum client receive rate (b/s). Limits the bandwidth at which the client can receive data from the network. If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer	Optional	0
Vendor-Specific (26), WISPr (14122), WISPr-Bandwidth-Max-Up (7)	Maximum client transmit rate (b/s). Limits the bandwidth at which the client can send data into the network. If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer	Optional	0
Vendor-Specific (26), D-Link (171), LVL7-Max-Input-Octets	Maximum number of octets the user is allowed to transmit. After this limit	Integer	Optional	0

(124)	has been reached the user will be disconnected. If the attribute is 0 or not present, then use the value configured for the Captive Portal.			
Vendor-Specific (26), D-Link (171), LVL7-Max-Output-Octets (125)	Maximum number of octets the user is allowed to receive. After this limit has been reached the user will be disconnected. If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer	Optional	0
Vendor-Specific (26), D-Link (171), LVL7-Max-Total-Octets (126)	Maximum number of octets the user is allowed to transfer (sum of octets transmitted and received). After this limit has been reached the user will be disconnected. If the attribute is 0 or not present, then use the value configured for the Captive Portal.	Integer	Optional	0
Vendor-Specific (26), D-Link (171), LVL7-Captive-Portal-Groups (127)	A comma-delimited list of group names that correspond to the configured CP instance configurations.	String	Optional	None. The default group is used if not defined here.

Appendix F Wireless Switch Specific

Captive Portal Guidelines

Authenticated Roaming and Clustering:

In addition to the generic implementation, Captive Portal also provides two key features for the wireless networks called **authenticated roaming** and **clustering**.

1. Authenticated roaming allows the client to roam from access point to access point in a seamless fashion while remaining authenticated.
2. Clustering provides roaming between access points attached to different switches and monitoring Captive Portal status for all switches from the Cluster Controller.

The Switches in the cluster must share the same Captive Portal settings, such as Captive Portal Configuration instances, associated interfaces, local user database and RADIUS server settings. The databases should be synchronized in a cluster to support client authenticated roaming.

Cluster Controller Election

Each Switch in the peer group makes an independent decision about who is the Cluster Controller. If a Switch does not have any peer Switches, then it appoints itself the Cluster Controller.

When two Switches detect each other through the discovery process, they compare the value of the Cluster priority field. The Switch with higher priority becomes the Cluster Controller. If the priority is the same, then the Switch with lower IP address becomes the Cluster Controller. The Cluster priority is conveyed in the initial identification message

The Cluster priority has a range from 0 to 255. Setting the priority to 0, disables the Cluster Controller function on the Switch. Customers may want to disable the low-end Switches from becoming the Cluster Controller if they deploy a large network where only a high end switch or network appliance is powerful enough to act as the Cluster Controller.

The administrator may change the Switch Cluster priority value after the Switch has already joined the peer group. The Cluster priority is also conveyed in the keep-alive message enabling the peer Switches to learn the new Cluster priority of the Switch.

A Switch performs the election process after it boots, after it loses connection to the current Cluster Controller, and every time it receives an initial identification message or a keep-alive message from another Switch. The Switch keeps a list of Cluster priorities and IP addresses for each peer Switch and elects the Cluster Controller based on the criteria described above.

If a Cluster Controller Switch decides that it is no longer a controller because it receives a message from another Switch with higher Cluster priority or lower IP address, then it purges some of the databases.

The decision to transition out of the Cluster Controller state is immediate. If the Switch elects itself as the Cluster Controller immediately. If the Switch elects another Switch as the Cluster Controller, then the decision to declare that Switch as the Cluster Controller is delayed for the duration of the keep-alive timer interval. If another Cluster Controller is detected during this interval, then the delay timer is restarted. The administrator looking at the Switch status during the delay period would see that the Switch is not the Cluster Controller and the Cluster Controller address is 0.0.0.0. In this release the keep-alive timer interval is fixed at 120 seconds.

Each peer Switch independently establishes connections with other peer Switches. In a transient case, it is possible that one of the Switches, that just established a connection with another Switch, does not see all the Switches that the other Switch is seeing, so that the two Switches may select different Cluster Controllers. Although the WIDS security functions do not work correctly when peer Switches disagree about which Switch is the Cluster Controller, this condition does not affect data forwarding through the network and normal operation is restored as soon as all the Switches in the peer group discover each other.

Since the Cluster Controller function may be disabled by setting the Cluster Priority to zero, it is possible that all wireless Switches in the network are configured to disable the Cluster Controller function and the network operates without the Cluster Controller.

The Cluster priority is a global Switch configuration setting. When the global configuration is pushed from one peer Switch to another, the Cluster priority is not included in this configuration because its purpose is to differentiate the preference level for the Cluster Controller function for each Switch.

There are two Switch status parameters that reflect the results of the Cluster Controller election process. The status parameters are the **IP address** of the elected Cluster Controller and a **Boolean flag** which indicates whether this Switch is the Cluster Controller. The flag does not provide extra information since it is derived from comparing the Switch's IP address with the Cluster address, but it offers a quick way for the administrator to know whether the local Switch is the Cluster Controller.

After the Switch decides that it is the Cluster Controller, it sends an SNMP trap.

X.509 Certification Mutual Authentication

X.509 Certification Mutual Authentication:

When the wireless system is configured to perform X.509 Mutual Certificate exchange the Switches and APs configure the TLS connection to perform mutual X.509 certificate exchange. Each device compares the certificate received from the remote end-point with the local copy of the remote device's certificate. If the certificates do not match, then the TLS connection is dropped.

The X.509 certificates are auto-generated by the Switches and the APs, so the devices don't communicate with any trusted certificate authority and the administrator is not required to pay certificate maintenance fees. Each Switch holds a copy of the X.509 certificate for all other Switches and the APs it manages. Each AP holds a copy of the X.509 certificate of the Switches to which the AP may establish a connection. The certificates are distributed when the mutual authentication feature is enabled, during AP and Switch provisioning, and triggered by an administrator command.

The X.509 mutual certificate exchange is the only mechanism for peer Switches to authenticate with each other because Switches don't support pass-phrase authentication. Note that if the wireless Switch is currently managed by a cluster controller, then any provisioning request toward this Switch will fail.

When the X.509 mutual authentication is enabled the AP and peer Switch discovery is slower than when this feature is disabled because certificates are exchanged during the TLS connection setup.

Certification Overview and Usage In the Wireless System:

The TLS connection has two sides: a client side initiates the connection and the server side accepts the connection. In a Wireless System, the APs act only as TLS clients, and Switches act as either TLS clients or TLS servers. The Switch acts as a TLS client when it establishes a connection to a peer Switch.

The TLS protocol supports client verification of server certificates and mutual certificate verification. The Wireless System configures the TLS session to use mutual certificate verification when the mutual authentication mode is enabled. When the mutual authentication mode is disabled, the Wireless System uses anonymous cipher and disables certificate exchange and verification.

In order to verify the certificate each device generates a private key and an X.509 certificate. The private key is kept on the device and is not given out to other Switches or APs. The certificate contains a matching public key. The device certificate is given out to other devices in the wireless system. Data encrypted with the public key using the device's certificate can be decrypted with the device's private key.

The certificates are encoded using PEM format, which is a Base64 encoded file. The Base64 encoding uses printable ASCII characters to represent binary data. Before the certificate files can be used for certificate validation they are loaded into the OpenSSL library.

Each wireless device has a copy of a certificate of the device with which it needs to communicate. During TLS connection establishment the Wireless devices compare the certificate received on the connection setup with all available loaded certificates for other wireless devices. If a matching certificate is found then the certificate verification succeeds. The verification function does not attempt to correlate the IP address of the device with the certificate and it does not check the certificate expiration date.

The TLS connections are configured to validate the certificates only on the initial connection setup. The connection reauthentications don't trigger new certificate validation attempts.

Certificate Generation on the Access Point:

The AP auto-generates an X.509 certificate when it boots. At boot time the AP checks whether the key file and the certificate file already exists. If the files exist then the AP uses them, otherwise the AP generates the files. The /etc/uwskkey.pem file contains the 1024 bit private key. The /etc/uwscert.pem file contains the X.509 certificate. In order to regenerate the AP certificates the administrator may issue a "factory-reset" command on the AP or delete the two files from the file system and reboot the AP.

Certificate Generation on the Switch:

The Switch auto-generates an X.509 certificate and other key files when it boots. At boot time the Switch checks whether the certificate and key files exist, and if they don't then the Switch generates the files.

The administrator can re-generate the X.509 certificates used by the Wireless component. Note that Diffie-Hellman keys are not regenerated. The wireless feature should be disabled while the keys are being regenerated. If mutual authentication is enabled then the Switch must be re-provisioned before it can join the cluster.

IP Address Assignment

The Wireless Switches are assigned IP addresses by the administrator. The routing package is included into the product and the routing is enabled by default. Besides the existing System interface, the administrator may create a routing interface optionally. The wireless software automatically selects the IP Address of the lowest interface index. The System interface is always the interface with the lowest index "1". If the System interface is deleted then the software automatically selects the IP address of a lowest index routing interface. If no interfaces are defined then the wireless function is disabled.

Disabling the interface or changing the IP address of the interface disables the wireless function. If another interface exists then the wireless function starts using it automatically.

Once an interface is selected the wireless function continues to use that interface until the interface goes down.

Changing the IP address of the network interface automatically disables and re-enables the wireless function.

The administrator has the option to disable automatic IP address assignment for the Wireless function and enter a static IPv4 address. The IP address must be the same as an address of an active routing interface in order for the Wireless function to work. If the interface with the specified address doesn't exist or is not active then the Wireless function is disabled and the WLAN Switch Disable Reason is set to "No Active Interface for Statically Configured IP Address".

If the static IP address is configured when the Wireless feature is already enabled then if the configured static IP address is different from the current IP address used by the Wireless feature then the Wireless feature is automatically disabled and re-enabled with the new IP address. If the configured static IP address is already being used by the Wireless feature then the Wireless feature is not disabled and service to the wireless clients is not interrupted.

IP Tunnel versus MBA and IMPB

When Wireless Switches enables IP tunneling for wireless clients, the MAC of the wireless tunnel client has the highest priority. MBA and IMPB will not work to limit the wireless tunnel client MAC.

In addition, when a wireless tunnel client is added by Wireless Switch, the Wireless Switch will notify the MBA module to remove the client MAC if it added the MAC.

In other words, MBA and IMPB will not work when the MAC belongs to a tunnel client.

To achieve IP-in-IP tunnel forwarding, the MAC addresses of the devices under the tunnel are learned and marked as “static” FDB entries on the Wireless Switch. These “static” entries would not be removed using the “clear fdb all” command nor can they be erased by using the “delete fdb <vlan_name> <macaddr>” command. They also would not aged out from the FDB table as long as the devices are still online.